TEACHER PIONEERS

Visions from the Edge of the Map

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Dedicated to Teacher Pioneers everywhere

CONTENTS

INTRODUCTION

Teacher Pioneers has been a labor of love from the very beginning. In the spring of 2014, as I was drowning in my dissertation, I kept coming across amazing work by teachers who inspired my own research. These teachers were building games, modding games, appropriating games, picking up pieces of very old or very new technology and thinking, *What can I do with this?* Conferences and the blogosphere and social media were just absolutely on fire with this extraordinary level of shared creativity.

At the same time, I kept hearing other teachers say, "I'd like to use games in my classroom, but where do I start?" And there were some answers, but they tended to be general introductions,[1] or based on one specific game, platform, or theme,[2] or online collections of games and teacher resources.[3] But often what these teachers wanted—what they were *really* asking for—was the chance to sit down with other teachers who had already used games in their classrooms and to talk for hours. They wanted to hear stories of teaching, and learning, and failing, and learning. They wanted to hear the good, the bad, and the ugly, and from that starting point make their own professional decisions about where to start for their own classrooms and students and content and context.

This book is the chance to sit down for hours with those other teachers and to hear their stories. And I'm delighted to be your tour guide. I recommend you buckle in.

> Teachers often must play the part of the pioneer if changes are to be made. Pioneers forge ahead in spite of difficulty, learning all they can before striking out for new territory. They study maps, anecdotal records, and talk to those on the edge of the frontier. They take old knowledge with them, but expect to develop new strategies, solve novel problems, create new language to describe what they see, and share what they learn with those who have not yet made the journey. Pioneers learn as they go.[4]

This book is divided into three sections, by theme: *Building Games From Scratch*; *Using Preexisting Platforms*; and *Broadening the Genre*. (The table immediately before this introduction breaks down each chapter's categories into content, platform, age group, etc., so that you can more easily figure out which chapters will be most interesting and useful. Reading *Teacher Pioneers* from start to finish is a thing of joy and beauty forever, but if you don't have time, that table will be very helpful!)

1. Such as the NCTM brief by Remi Holden and me: How can teachers use video games to teach their students mathematics? http://www.nctm.org/news/content.aspx?id=43160
2. Such as Seann Dikkers's TeacherCraft: How Teachers Learn to Use MineCraft in Their Classrooms, or Holden et al.'s Mobile Media Learning
3. Such as educade.org and graphite.org
4. Armstrong, B. E., & Bezuk, N. (1995). Multiplication and division of fractions: The search for meaning. In J. T. Sowder & B. P. Schappelle (Eds.), Providing a foundation for teaching mathematics in the middle grades (pp. 85-119). Albany: State University of New York.

The first section, *Building Games From Scratch,* focuses on contributions from teacher pioneers who have designed games without the structure of preexisting platforms to support their development. Seann Dikkers (Chapter 1) details his experience designing, building, and balancing a board-game version of *Civilization* for his middle school geography classroom, with step-by-step instructions on developing your own version for geography or history classes. John Fallon (Chapter 2) offers advice on developing your own augmented reality game (ARG) through the lens of his experience with designing one to augment *Odysseus* for his middle school English course—which resulted in, among other things, students' yelling "horse feathers!" repeatedly at their (amused and forewarned) history teacher. Kip Glazer (Chapter 3) continues the merging of text and game theme by sharing the process she used in her high school class to teach *Beowulf*, arguing for role-playing game (RPG) creation as a pedagogical strategy that can transform traditional English classrooms. Glazer was originally inspired to design and implement RPGs by Trent Hergenrader, which makes putting their contributions together a beautiful coincidence! Hergenrader (Chapter 4) shares his detailed method for developing tabletop RPG experiences for his college-level creative writing courses, with enough information for anyone to be guided and inspired! Closing out the first section is Paul Darvasi (Chapter 5), who turns his high school English class into *One Flew Over the Cuckoo's Nest* by donning Big Nurse's outfit and turning his students into patients, drawing our attention to similarities between formal education and the classic novel.

Using Preexisting Platforms focuses on teacher pioneers who have either designed new games and experiences using digital platforms or incorporated commercial games into their classrooms, varying from the popular games/platforms *Portal 2* and *Minecraft* to location-based activities using ARIS. The section begins with Cameron Pittman (Chapter 6), who shares the process of getting *Portal 2* into his high school physics classroom—with all the nitty-gritty details that other teachers should be prepared for—and reminds fellow pioneers that "failure" has an important role in every learning experience. Then we revisit Paul Darvasi's high school English classroom (Chapter 7) as his students play, study, and present on the game *Gone Home* as they had other—more traditional—cultural texts. Jason Wilmot (Chapter 8) waxes poetic about "the little pixelated blocks" that his elementary school students design and build with in *Minecraft*, with an extended FAQ that serves as the perfect crash course for a new teacher/player. Megan Pusey (Chapter 9) continues the *Minecraft* theme in a very different way, sharing her experience of designing and implementing a world with different types of (little pixelated) rocks and minerals for her high school science class to identify, and what those students thought about their scientific gaming experiences. John Martin (Chapter 10) encourages his summer campers to explore the forest around them by developing a narrative on Outdoor AR, an open-source platform for designing place-based games, and shares the ways in which his campers began to view and experience their world differently. Laini Kavaloski (Chapter 11) continues the ARIS theme—and closes out the section—by exploring different ways that undergraduate English professors can support their students in designing, building, and sharing multimedia historic local experiences.

Broadening the Genre focuses on teacher pioneers who offer a wide variety of stories and experiences, often with overlap into the other themes, but placed here because their chapters go beyond the other themes. William Vann (Chapter 12) uses a preexisting platform in his middle school classroom when he discovers four original *Mindstorm* robots (from 1994!) in his classroom closet—and he shares the story of dusting them off, designing a project-based learning unit around them, and handing them over to his students, saying, “Fail forward.” In Chapter 13, James Howell, Colby Tofel-Grehl, Deborah Fields, and Gabriella Ducamp used electronic textiles (also known as e-textiles) during an electricity unit in Howell’s middle school classroom as a way to support English language learners and incorporate different types of expertise (such as sewing) in science class—their students produced beautiful pieces of art while learning about electricity. Lucas Cook and Sean Duncan (Chapter 14) report on the design, building, implementation, and reflection upon *Kingdoms of Adarya*, a behavior-management game, moving beyond the deeply content-driven games presented in the first theme to a game that would support productive student behaviors in a difficult middle school classroom. Tim Saunders and Remi Kalir (Chapter 15) share the detailed story of the development and iteration of two gameful learning opportunities, *Matter Quest* and *Intergalactic Jury*, designed for Tim’s elementary science classes, and reflect upon the power of *gameful learning* more broadly. Steve Isaacs (Chapter 16) focuses on the iterative design process, specifically for middle school game-design classes using *Gamestar Mechanic* and *Portal 2*, but ostensibly for everyone designing games, regardless of platform—with the added bonus of a detailed plan for creating *Portal 2* puzzle levels at the end. Kip Glazer returns with David Ng (Chapter 17) to propose guidelines for conducting teacher professional development along hackathon lines, with six steps that follow the acronym HACK-IT. The section concludes with the return of Seann Dikkers (Chapter 18), sharing his experience as a principal working with special education teachers to “change the game of school.”

Remi Kalir (née Holden) then finishes the book with a provocative, thoughtful, intense conclusion that synthesizes the themes that emerged from these chapters and embeds them within the broader contexts of education, learning, teacher preparation, technology, and agency. Many of the forces unintentionally hidden beneath the surface in the chapters come to the fore here, as he highlights the complex structures in our educational (and cultural) systems.

One of the reviewers of Remi’s conclusion, Sujata Bhatt, brought up some particularly important questions that this book does not answer. In particular, she pointed out that this book relies upon the agency, creativity, and independence of numerous teachers who are making large changes—but only within the small spaces of their classrooms. This book may be supporting other teachers who have the agency, creativity, independence, and time that these teachers did—but what of the teachers who do not have the support of their principal or fellow teachers? What of the teachers who can’t find outside experts to work with or funds to buy materials? If we truly believe these teachers to be uncovering new paths in teaching and learning, how can we not think about how to further improve our educational system beyond these individuals? Well, until Ms. Bhatt asked, I hadn’t considered the role that this book—and these authors, and myself as editor—could (and should) play in evoking larger change. Consequently, these questions are questions we should all reflect on, as we consider what we can do to change policies and teacher preparation such that more—and perhaps someday *all*—teachers have a chance to become pioneers.

Some housekeeping notes: a definition, to preclude the following authors from having to provide one—STEM stands for Science, Technology, Engineering, and Mathematics; and the various photos, screen shots, and so on throughout this book were provided by the authors unless otherwise sourced.

Naturally, I could not have done this alone! An abundance of thanks to the amazing authors who made this book possible—without your stories, your expertise, your pioneering spirit, this book would not have happened. Thanks to my wonderful, patient, and brilliant Advisory Board: Amanda Ochsner, Beth King, Dan Norton, and Remi Kalir. Extra thanks to Sujata Bhatt, Amanda Ochsner, and Beth King, who dug into the deep and thoughtful concluding chapter by Remi Kalir.

Thanks to ETC Press, particularly Drew Davidson, who quickly answered EVERY. FREAKIN'. QUESTION. that I had about editing and publishing and books and presses and pictures and words and on and on. I considered adding a chapter that was just THANK YOU DREW over and over again, but I decided that folks would probably find that story kind of dull. So I settled for a paragraph with multiple all-caps phrases instead. Seriously: THANK YOU, DREW.

Special thanks to Remi Kalir, who wore many hats for this book. I'm particularly grateful for his brilliance and for his occasional polite prodding as I got married, moved across the country, and started a new job. When my juggling act fell down, he was always there to get me started up again, with grace and aplomb. Remi: You're my favorite. (But don't tell anyone else.)

The incredible cover was conceived and executed by the inestimable Katherine Jameson! You can (and should!) view her full portfolio here: https://kjameson.carbonmade.com. Need your own book cover or original piece? Contact her at kathjameson@yahoo.com and prepare for your vision to come to life!

Thanks to our internal and external reviewers—without your insights, this book would be much less beautiful. Alphabetical by first name: Alainya Kavaloski; Alexandra (Sasha) Lakind; Aimee Cardon; Beau Johnson; Brandon Singleton; Cameron Pittman; Colby Tofel-Grehl; Craig Anderson; Emily Miller; Gabriella Anton; James Howell; John Martin; Jordan Thevenow-Harrison; Judith Andrus; Kip Glazer; Lucas Cook; Megan Pusey; Moses Wolfenstein; Paul Darvasi; Rebecca Vinsonhaler; Ryan Martinez; Sean Seyler; Seann Dikkers; Steve Isaacs; Susanne Strachota; Tamas Makany; Tim Saunders; Trent Hergenrader; and William Vann. Thanks to my graduate assistant, Yan Tian, who helped with organizing the many documents. And of course: undying thanks to our copy editor, Karen G. Bleske, who has the ability to spot a misspelled word or comma splice from across the room, and went above and beyond in the final throes to keep me on track!

Thanks to the Games+Learning+Society conference for bringing so many amazing teacher pioneers close to hand. The circle closed when the 11th annual Games+Learning+Society conference accepted our Teacher Pioneers symposium—many thanks to the attendees who overcrowded the room and forced us to invade the Great Hall![5]

Last but never least, thanks to my husband, jtth. Words can never express …

Finally, a heartfelt mea culpa: I deeply apologize for not having produced a volume that more accurately represents the diversity and strength of teacher pioneers across the world. As Remi Kalir notes in the conclusion:

> First, *Teacher Pioneers* is primarily written by white men. There are many educators whose labors of love agitate against an orthodoxy of disheartening norms and veiled expectations (reflected, unfortunately and more broadly, in the fields of computer science and educational technology). The distinctive explorations of these pioneers should be celebrated as central to subsequent volumes.

5. Williams-Pierce et al. (2015). Teacher pioneers: Adventures with media, pedagogy, and play in K-16 learning. Symposium conducted at the 11th annual Games+Learning+Society conference, Madison, WI.

I am considering developing a second volume, given the incredible interest shown in this book prepublication, and I hereby promise that I will do so only if I am able to more accurately recruit and represent voices from all teacher pioneers. If you are interested in contributing to the second volume, please contact me at caro.williams@gmail.com.

Sincerely, and with much love to our readers—

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PART I.

BUILDING GAMES FROM SCRATCH

CHAPTER 1.

WARLORDS!: DECONSTRUCTING DIGITAL GAMES FOR CLASSROOM USE

BY SEANN DIKKERS

Multiple versions of the game *Civilization* have been released through the years. I've played each of the five versions that creator Sid Meier has offered—along with bonus content and "expansions." For an hour or two each weeknight, I enjoyed managing city production levels, technology trees, and scouting out new lands in which to grow my empire. This chapter is essentially the story of how my evening gaming informed an entire unit of my curriculum and the creation of a classroom desktop version of *Civilization* that I called *WarLords!* I will outline the game first, why I use games in the classroom, the game design of *WarLords!,* and finally I will share the outcomes of this example. First the game itself:

FOR READERS UNFAMILIAR WITH *CIVILIZATION*

The caption on the original 1994 game is still why I play: "Build an empire to stand the test of time." You start the game by founding a single city in a world edged with black, unknown territory. As you encounter other empires (computer controlled or later by human opponents), you find their technology is different, you feel out if they will be friends or foes, and you ultimately seek to keep up or be overwhelmed by them. You may even declare war on them, just to let off some steam. In full-length games, it might take 70-100 hours to work from *granaries* to *space travel.* The game demands that you constantly choose among a focus on military, agrarian, scientific, or financial goals. More recently, Meier has added cultural, religious, diplomatic, and tourism elements to the game; still, all the parts are connected to the growth of your empire. In the end, the game, through many iterations, still appeals to players with a core verb of "managing" an empire. Centrally, players have fun … doing what outsiders would call "working." That was and is fascinating from a teacher's perspective.

For example, if you start the game dreaming of the power of military might, then you can start building warriors who challenge the might of the nearby Assyrians. To do so, you first need to gather food, mine metals, and have an income that can support "troops." The Assyrians, however, reactively build "walls" that counter your warriors and quickly invest in scientists who "discover" irrigation and build granaries that double their food provision rate. The Assyrian food surplus then results in a city that quickly grows and produces two more settlers to build additional cities. In a short century, your single city is well defended, but it cannot outpace the construction of chariots and archers that the Assyrians are building with those two extra cities.

Your dreams of empire are edging further away with each passing turn/year, and you realize something: It's all connected. To build a strong military, you have to feed your people. To feed your people, you need them working. To keep them working, you need to build cultural centers, temples, and coliseums. At the end phases of a game, civilizations can have scores of cities, covering continents, with hundreds of moving units, competing cities, resources, roads, naval forces, and events. This is not so much an action game as a *management* game that appeals to your sense of planning, strategy, and the satisfaction of meeting your own goals within a complex system.

So, for each new version of the game, the selling points are the addition of *more* complexities to manage, not less difficulty or easier gameplay. Fans of these games demand more challenge and more interesting features in a way that seems foreign to classroom learners. All of these elements together create a complex and invigorating system to learn, master, and test ideas within (see Figure 1).

Figure 1. Source: www.civilization6.net: Civilization VI: The Unofficial Site With All the Latest News.

Again, for me as a teacher, this kind of system was worthy of attempting to re-create in the classroom—even without the actual digital game. *Civilization* is and has always been a turn-based game. That means that the game moves forward only as you "take your turn," unlike other fast-moving "reaction" games that require you to press buttons quickly. It's really a giant spreadsheet under the hood, and it attracts gamers who like to strategize and think rather than twitch. So data management, long-range thinking, systems understanding, and discourse are actually part of the fun for this style of game. As a social studies teacher, I found it was a short hop to think about this kind of experience as ready for my classroom. All I needed to do was create a game based on the core elements of *Civilization.* More broadly, many other digital games can be deconstructed accordingly and as an example, this chapter can be applied across games and subject areas for locally relevant learning. In Figure 1.1, you can begin to see more than just a blur of numbers; you can see the joy of managing resources, "world wonder" construction, populations, and food while you build those troops (also see Figures 2, 3, 4, and 5).

When we seek to "teach" high-level thinking across subject areas, this kind of complex system offers potential that basic memorization of facts simply does not provide. In my opinion, these are the greatest games that digital media have to offer. I can learn, manage, process data, test theories, and develop attention to detail over hundreds of hours. Interestingly, so can my students.

Figure 2. The game did get prettier: Civilization I, III, IV, and V. This screen shot is from Civilization I. Source: acepatrol.wikia.com.

Figure 3. Civilization III. Source: www.gamershell.com.

Figure 4. Civilization IV. Source: www.metaboli.co.uk.

Figure 5. Civilization V. Source: www.dualshockers.com.

WHY CREATE GAME EXPERIENCES IN THE CLASSROOM?

As a teacher, you have a choice. First, geography teachers can just *tell* students eight geographic elements that encourage human growth, *test* the students to see if they heard you, and *grade* them based on their ability to take notes, review, and score well. This is common. It makes sense and it's direct. Yet *"tell, test, and grade"* has never been my own learning process. After a year of trying, I failed miserably to teach that way. Even exciting topics rarely got positive reaction from good students—it was more like obedience or compliance. Moreover, a lecture on geopolitical interaction was not what eighth graders woke up in the morning excited for, nor did it provide a chance to interact with, encourage, and give feedback to student thinking. Test scores were predictably based on homework habits and rarely (never?) did an entire class show mastery of a topic. So *tell, test, and grade* was not a reasonable choice for me. As direct and obvious as it is, it also doesn't have the results I want.

A second and more rare approach to teaching is to *"design, watch, and react."* Teachers can *design* and explain an engaging challenge, project, or experience, allow students class time to work on the task while they *watch* for student engagement, and *react* when they see behaviors and thinking they are looking for. Using a few prep hours, I visited the classrooms of teachers who used this option and saw that they spent more time circulating the room, praising students, and giving constant reaction to work they were excited about. The result was that entire classes did engage, content was learned out of interest, and their test scores were equal if not better to those using the first option. More important, these were classrooms where students learned about life, how to work with people, and how to solve problems effectively.

Games are designed experiences that allowed me the ability to watch my students and react to their cues around a topic area. Some become frustrated that this pedagogy doesn't fit neatly with *tell, test, and grade.* Games do not "get" a student to learn; they instead invite a learner to play with a problem. Teachers can build on classroom gameplay to share information naturally, coach social skills, build on critical thinking, evaluation, analysis, and synthesis of experiences, and/or simply create passion around a subject area. If your goal is to tell a set of facts, use lectures. If you want to see your students explore, invent, invest, discover, and interact, try *WarLords!*

Being a lifetime player, I knew for myself that learning was the result of my experiences, not the prerequisite. During three to four years of teaching, I had already gotten more and more comfortable building games into class lessons, presenting scenarios and problems to students, and challenging them to dig in deeply to the topics. Before you read about *WarLords!* or any of the games used in classrooms, this primary approach needs to be understood. Games do not teach; they provide problems and experiences from which a certain kind of teacher can *watch* and *react* to students.

WARLORDS!: THE GAME

Designing the game for class meant some investment. Planning the rule set, organizing materials, and testing gameplay takes preparation time. Before class time, I selected the region of the planet that we were covering in class. (A side note: Using the region as a game board fueled outstanding location test scores later.) Then, I invited a small group of students to stay after school and help build the game boards for class. They volunteered and we played music while we shaded in six large maps for lamination. We used an overhead projector and a line map to project an image of Southeast Asia onto a 3'x3' sheet of butcher paper.

Next, students traced the maps (see Figure 6), covered all the land area with a grid of 2"x2" squares, and shaded in the squares based on physical maps found in our textbook. No square could have two colors, so students had to "pixelate" the smooth lines in the textbook images to corresponding areas on the game boards. Printing a simple spreadsheet table (square the cells, use bold borders, and no "fill") over an imported map can create a guide for student shaders (see Figure 7). Green squares were flat lowland, orange squares were hills/lowlands/plateaus, and red squares represented mountainous areas. I keep all physical titles on the map to help students memorize features as they play. Using rainfall maps, students used heavy brown borders to represent arid territory. Students then drew in blue lined rivers and oceans (see Figure 8). We shaded everything on the map to make it pretty and easy to see, and then we laminated the game boards.

Figure 6. Trace a 3'x3' blank map.

Figure 7. Add grid and guide (small scale).

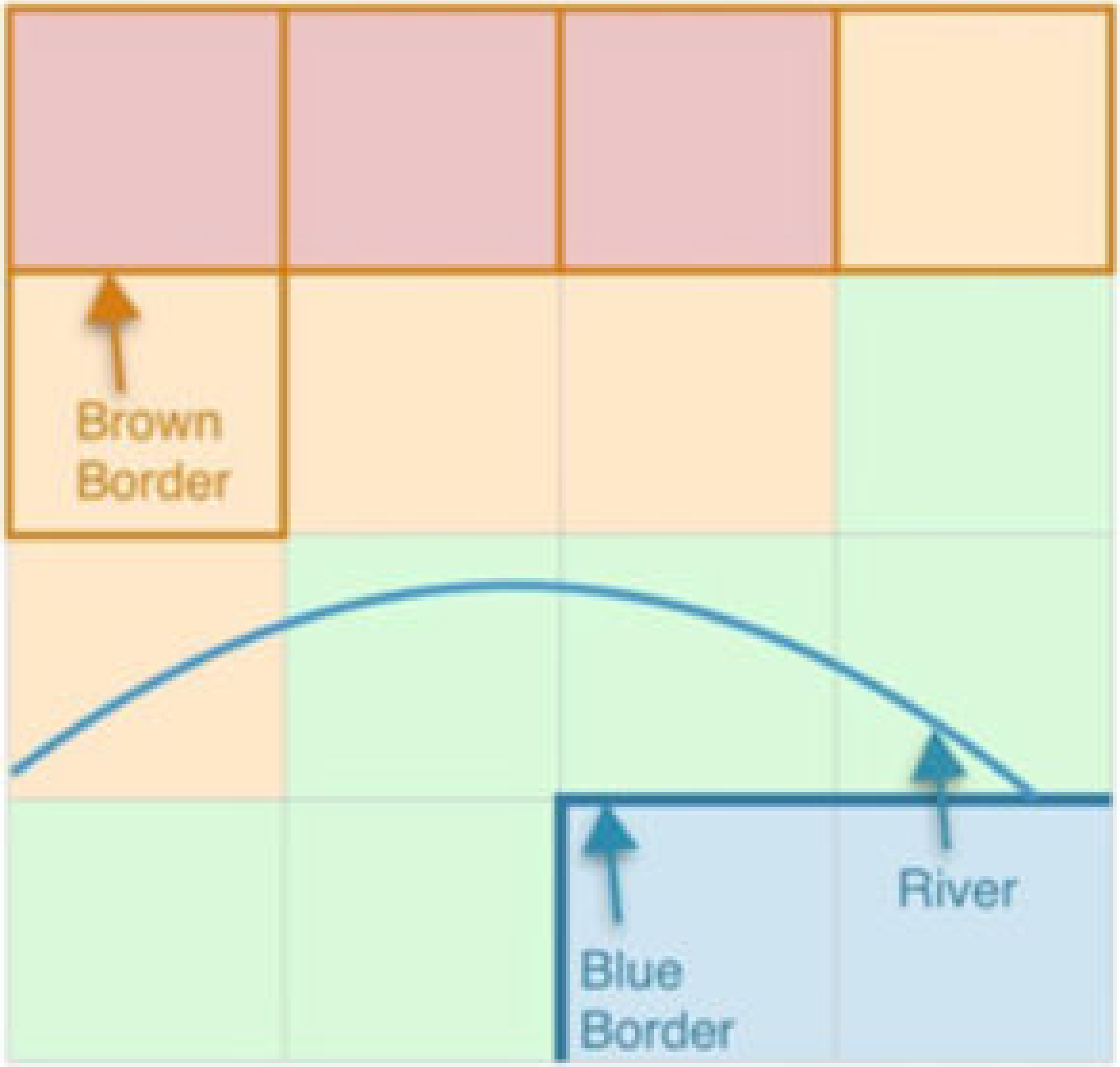


Figure 8. Have students use the guide to shade the large map so that each square has one color. Use a precipitation map to highlight arid areas with the brown border and darken key rivers and coastlines. The map will look pixelated, but it will be much easier to play on.

You will now probably have a small, excited group of gamers who have already helped you make the boards and are talking up the activity to classmates before you even bring it to the classroom. After raiding the supply closet for overhead pens (water erasable), water spray bottles, and a box of rags, I prepared to explain the game to students.

Of course, not all students are strategy gamers. So the first point I made as they walked into class was that I appreciated that not everyone liked strategy games, but that I thought this was worth attempting. I expected that they be good sports and try to learn the game as best they could. Second, playing the game was not connected in any way to student grades, only class participation. I promised them that if they learned the game well enough to teach others how to play, then everything they needed for the test was built in—as you'll see below.

After explaining the context, I presented the game itself. For the next couple of days they would have the chance to test their mettle as a world leader managing an empire! But there were a few rules that all world leaders needed to abide by because they were natural laws (and geographical concepts). Again, this kind of gameplay and structure is not unique to geography; you can use this as a template for any game with rules that frame concepts. Below are the basic rules of the game and suggestions for the teacher—look for how the "teaching" is done after the game is explained. The rest is repetition and fun.

THE RULES

First, the game is played in turns with 4-5 players using a game board. Each turn can represent any duration of time (years, centuries, or "ages"). Each turn has four phases, called:

1. Growing,
2. Moving,
3. Resolution,
4. Building.

Start with a very basic introduction to growth rules and then have students select one square on the group maps to start their empires. You can wait to explain each stage until the class has played to that point. So "Day 1" may include only a few rounds as players get the hang of the game rules.

1. Start and Grow Your Empire

Growing your empire is essential. Through time, humans make more humans. The core goal of the game is to prosper and build the largest population (not territory!) among the four players on each board. The players can attack each other, but like in *Civilization*, you do not need to fight to win; in fact, the more you stay out of costly conflict, the faster you can grow! I scaled the game by introducing only simple growth rules that are obvious to Iron Age leaders. For each turn, a square on the board produces "babies," based on a variety of factors, such as arable land, freshwater, and expert management by the emperor. On the board, write these growth numbers before playing the game:

Green squares (flat lowland)	20 people
Orange squares (hilly lowland)	10 people
Red squares (mountains)	5 people
Brown borders (arid territory)	½ the above growth rates
Blue rivers/coastline	+5 people

Most students will learn how to add quickly as their empires grow. Starting with one square is easy, but in a few turns they will be tallying (and memorizing!) growth factors at a massive level. In addition to memorizing the game rules, they may also ask questions such as, "Why do mountains get less growth?" Notice that the core game rules include the lessons of freshwater, coastline fishing, arable land, plains versus highlands, and is played on a real-world map. Much of your teaching can happen during explanations of the basic rules—change the rules to suit your needs.

On Days 2 and 3, I introduce new factors that add new elements to the game. Students even began to talk over lunch about what historical elements I might add. By catching me in the hallway to guess, they could actually give me ideas for what to add: “Hey, Mr. Dikkers, are you going to let us irrigate our lands?” or “What if we could build mines in the hills?” In the end, have fun with these moments and use them to cover terms and ideas relevant to your standards. Consider a stock response such as “Hmmm, why would I do that?” and let students build geographical arguments from “real” facts. Also consider add-ons that exponentially push the mathematics and increase population. For instance, these learning moments led to my use of historical “add-ons” including:

Food preservation	Double all people production/turn
Cities	Double people production on that particular square/turn
Roads/bridges	+2 people/turn
Boats (fishing)	+5 people/turn
War torn	Population does not grow after a square changes hands
Irrigation	Ignore a brown border

All add-ons “stack” with each other but food preservation and cities always tally first. So a square can be green (+20), with food preservation (20×2=40), and *then* coastline (40+5=45) and boats (45+5=50), and a road (50+2=52). This player would add 52 to whatever mobile population was already written on the square. Use the water spray and towels to erase the old number and replace it with the new total.

2. Moving Your People

After all the students wrote the number of people on each controlled square (using the erasable pens), they could choose to move them. All players wrote their moves on the board at the same time and had a chance to review opponents for legal moves. We did this on the game board to save time, and we justified it with the idea that no army moves without the other side’s generally knowing where (with scouts or supply lines). Also, the public knowledge of moves helped quick learners to help and correct those who were still learning the game rules—encouraging players to reinforce and teach each other. Movement rules included:

Each “person” can cross to one neighboring square in any direction.

Coastlines and rivers: +1 movement per turn

The simpler I kept movement, the less confusion in the game. I usually didn’t introduce many historical elements to movement other than the obvious:

Roads	+1 movement
Railroads	+2 movement
Generals	+2 movement (for troops “moving” with them)
Boats	+3 movement over sea/coastline squares

Once all players say they have their movements marked, using arrows, on the board, they agree to move to the next phase—*Resolution*.

3. Resolution of Movements

Occasionally, multiple players want to "own" a square on the board. (Historically, this has happened on occasion, too!) In these cases, players resolve all uncontested moves first, and then they sort out ownership of each square that has two players through a contest, or battle. Winning or losing a contest does not affect (or allow people to return to the movement phase!) the movement markings from the previous round.

Squares are not sharable, so players cannot ignore an invading force or allow "free passage" as the residents of the square have to support the troops. Also remind students that this isn't a military game; it's an empire game. The number of people on a square represents the expansion and control of the empire, not just "troop" movements.

If both parties have chosen to move into the same square, they are not allowed to retreat or defend. If one party attacks another (moves people into another empire's square), then the defender does have the option to run, or retreat all troops to an adjoining square the defender owns. In all other conflicts, both parties roll a 20-sided die (1d20) as a "random accidents of history and heroism" factor.[1] Then add their troop count (the number of people they declared they are moving from any number of adjacent squares) and geographic variables:

Green squares	No modifier
Orange squares	+10 defense
Red squares	+20 defense

After a few rounds of gameplay, I'll add new technologies that also affect battles. This will show that physical geography and human-environment interactions will affect the growth of empires. For instance:

Fortress/city	+20 defense (One/square)
General	+20 attacker (One/warlord)

Blue Rivers: If attackers have to cross a river to own the square, then +20 defense. (Rivers don't fit neatly into the grids so "Teacher makes the call on rivers; just ask.")

Roads and railroads also increase transportation of troops to a battle.

Do a little math, and the highest number wins.[2] For instance, Player 1 attacks Player 2 with 100 people ("troops" now that they are attacking!). This may be the most complex it gets, and I hope

1. 1d20 are available at any local game store.

2. Yes, we quickly identified students who had missed learning basic math skills, and I would quietly help, ask a helpful student, or use the special education aide/paraprofessional to teach and help them learn math computation in geography class.

you'll see it's not that bad. Remember, this is math that your students get to do. Player 2 has existing people on the square (+30 defense) and is reinforcing that square with +20 people from an adjoining square (+20 defense). The square in contest is orange (+10 defense) and "fortified" (+20 defense) in a previous turn's "Build" phase (making it active in this current turn). The defender can "retreat" any people who do not have a movement to resolve but decides to defend with both the resident and incoming troops. The attacker is led by a general (+20 attacker) of notable skill and strategic ability—trained to conquer the known world.

So Player 1 rolls a 5 attack on the 1d20 and Player 2 rolls a 19. That means 125 attack versus 99 on defense. Both lose 99 people in the fight. Tragic. Without the dice roll, the actual attacker troops would be 100. Removing casualties, subtract the 99 defender total, which equals 1 remaining attacker troop on the square and the territory switches to the attacking empire's realm of control.

Attacker	*Defender*
100 troops moving in	30 people defending + 20 support moving in
+ 20 general	+ 10 orange square
+ 20 fortification	
________________	________________
120 + 1d20	80 + 1d20
120 + 5 = 125	80 + 19 = 99
125	99
WIN	Loss: All units are lost

The attackers take over the square with 1 troop and their general stays alive. Losing generals are killed unless the attacker spares them. Theoretically, players may win a fight but have no troops to hold the square. Usually they figure out the math before attacking and calculate "acceptable losses."[3]

If you want to add more, or give in to player requests for more "authenticity," make sure to weigh this against your class time and the learning experience you are designing for. For most players this is more than enough complexity, but a few avid gamers may want to stay after school and modify the game more. For that reason, save fortresses and generals as game elements to add in on Day 2 or Day 3 for players to wrestle with as they gain comfort with the basic rules. Roads also strongly influence this phase after players get creative about "troop movement"; wait on these until later in the lesson too. Start simple. Finally, you'll need to explain "Building," the final phase of a turn.

4. Building

At the end of each turn, players "build" infrastructure as they see fit. The game represents this as residents who are no longer mobile and players "subtract" them from the square total. Each upgrade requires permanent residents, but these upgrades all have benefits that counterbalance the loss of mobile troops. If the land is later conquered, the residents do not return to the original builder. They

3. "Acceptable losses" is a ripe topic for later class discussions.

stay and support the production of their homes and businesses as part of the new empire. In game terms, when you build something you permanently subtract the count from the total number on the square.

In the first round or two of the game, I simply skip this step to keep the game easier. As the class becomes comfortable with the first three phases, I add infrastructure. To mimic the world wonder "cut scenes" from *Civilization III,* I would stop class for three minutes and unveil the new technologies with short videos or images—the bigger the show, the more rewarding. Classes would even compare notes at lunch as to which class was the furthest along.

The benefits are listed above; the costs are below in order of appearance:

Turn 3-ish	
Food Preservation	20 residents
Cities	100 residents
Turn 4-ish	
Roads/Bridges	10 residents/square
Boats	10 residents/square
Turn 6-ish	
Generals	50 residents (mmm… they need a staff!)
Fortresses	20 residents/square
Turn 8-ish	
Railroads	10 residents/square

You can introduce as many add-ons as you are comfortable with.

Time is of the essence and anything that encourages students to help each other do the math, keep up the boards, and move through turns is helpful. Playing the game to a full eight turns means that students need to come in and set up their game boards before the bell, work as a team to clean up at the end of the hour (we had a timed class-to-class competition), and be ready for each phase as quickly as possible. Also, so we could reuse the laminated maps the next period, classes needed to spray and wipe them down each hour *after* they used paper versions to write down their game progress. Have helpers start writing down population numbers before cleanup time. Paper handout versions of the map can help with this but are not necessary. Today I would have them take photos of the map with their cell phones. As the teacher, I would walk from group to group asking questions such as "Are you ready for moving?" or "Is this group finished building?" I would also help students wrestling with the math and have the entire class move from phase to phase together on the first day.

As groups get the hang of things, they will ask if they can just move when they are ready—let them, but have them run over and tell you each turn number because you'll put new technologies on the board for the build phase. That means that when one group gets to Turn 6, all the groups can see what is waiting for them if they move through the turns a bit more quickly. The orderly teaching of Day 1 will turn into a busy hustle on Days 2 and 3. Warn your neighboring teachers or arrange to use a space where students can make a bit of noise.

That's it. Rinse and repeat. The pace of the game will pick up as players learn the starter rules and students will embrace the gaming experience to different degrees. Encourage the nongamers to focus on learning the rules because the rules will help with the test. Yes, I gave a test at the end of the week covering the complex topic of geopolitical distribution. Each rule for each of the four phases was an element the students needed to understand in order to give rich feedback on the test (more on the test in the final section). There are a few more little life lessons to emphasize for students, as you are a guide on the side of their play.

A GUIDE ON THE SIDE

A few grand themes of history and geography start to play out in *WarLords!* If you are ready for the right teaching moments, you can help students think through some very mature themes and lessons.

For example, in the conflict example above, we could see before the fight that the attackers would win. They had an overwhelming force and the math is predictable. So why would humans defend, knowing they would die? Ask the students, "Why did you stay?" Perhaps they stayed simply for the sake of pride, or strategy, or a sense of inevitable conflict. Perhaps it was a sacrifice because they knew they had more units moving that way soon. Perhaps they simply wanted to take a chunk out of the attackers out of spite. The dice roll allows for plenty of player excitement when they roll and defenders lose fewer troops so the rule set encourages all of these reasons.

When talking to attackers, ask them why they attacked. Both sides lose population (when the ultimate goal of the game is an increase in population), but get this … many students will conclude that if they can control and profit from them later, some squares are worth the temporary loss of humans. They often consider land gains over human losses because the game has already depersonalized the "units" into a number. No matter how much we emphasize the value of life, students are shocked when they catch themselves thinking exactly like so many real generals historically have thought as they send "units" to their fates.

Overall, it costs more to attack than to defend, and attackers must always expect to lose units when charging defended ground. Students may argue this point, but it's a key lesson too … fighting costs people but gains land. Other strategy games reward taking territory without cost, but *WarLords!* accurately leaves the attacker slightly weakened and represents the cost of war—and still students will make war. As the game rolls forward there will be two winners: those who control the fertile plains (with overwhelming population), and those who stay out of unnecessary conflicts (with peace and prosperity) either through diplomacy (rare and glorious!) or by building an empire in the red squares (isolated cultures). The red squares will never "win" by the game rules, but you will find students who frame it as a "win" for themselves. They grew steadily and without conflict—surviving to the end of the game.

As a teacher, look for and point out these very real national identities and provide examples as you hear students tell you their strategies: "Oh, that's like Switzerland! Awesome plan!" When you do this, say it loudly and everyone within earshot will connect that Switzerland is in the mountains and has "thrived" by staying neutral—and it is still on the map. In each case you are helping students to connect their experience to real human-environment interactions as they play out historically at an international scale. The Swiss are connected, essentially, to their mountain territory.

Consider that at the end of the game, you can pull up a real political map of the region. In Southeast Asia, the maps will look nearly identical to the game boards, or, at least after eight to nine turns, the boards were well on their way to mirroring historical developments. How? With independent and intelligent strategists, why are the maps so similar? What is a "natural border," and what does that mean for human history? Help students notice isolating geography features (islands and mountains) and the relationship between food production and population growth. If students wrestle with and understand this idea, they can start to predict national behaviors by looking at geographical features and production capacity of a country. Think of the kinds of questions your students can start to build theories around because they have experienced the very authentic thoughts of an empire builder via *WarLords!* Why did the Mongol hordes end up in Europe and not India? Why did China wait so long to take over Nepal? How has Japan grown so strong despite having mountainous land? Why have Germany and France repeatedly grown powerful throughout history?

Finally, the name of the game: *WarLords!* It's a broken design feature! I hope you can see by this point that the game really isn't about war; it's about growth and land. My thought is that we need to be willing to hook students on an engaging experience. If this name initially sets you off, remember that it's not for you—it's for the kids. If you don't use this name, do pick one that excites players first. In my case, I'll admit I was trying to lure them into unnecessary attacks so that my nonconquerors would gain an early advantage. Wrap up the experience with a discussion that helps learners connect their experiences to realities in history and geography. Help them also to see that *WarLords!* may not be the best title for the game … what might be better?

This title for the game did get some phone calls from parents, but because I'd explained my goals to my principal ahead of time, and because I enjoyed explaining what we were doing (experiencing geography's influence on history), I thought the benefits of an exciting title was well worth a few phone calls and explanations. That said, as with other teachers I speak with who use games for learning, the parental feedback is usually overwhelmingly positive when you bring this kind of experience to the classroom—especially when students ask to borrow the boards at the end of the unit to play entire weekends at home.

ASSESSMENT

Here the lesson comes full circle. Using games for learning, even nondigital games for learning, requires that you allow students to experience the role of player first and then to speak from memory—not memorized facts but *re-membered* content. As a teacher, I had to trust the game would provide relevant experiences. This isn't easy. When I used *tell, test, and grade*, I could "guarantee" learning had occurred. But this is a kind of illusion of learning, because after the test, students didn't necessarily remember what they had memorized, nor did they particularly care to refresh their memories unless required to.

Alternatively, constructing learning by offering a game doesn't "guarantee" learning in any traditional sense, but the learning that does happen is *re-membered* material: Students can not only cite facts, but they can explain why the facts are relevant, connect them to other contexts, build theories, and even translate knowledge to artistic expression. In short, they don't remember studying for a test, but they do remember their frustration/joy of leading an empire (even an abstract one) through the ages.

The first year I tried out the game (without lecturing on the topics!), I gave students the test that I had given the previous year. Students came in on Friday and I prepped them for the test that they hadn't studied for:

> Okay, so we're going to review geopolitical growth and aspects of human-environment interaction today. I'm doing a sort of experiment here and it may fail, so please don't get worried about your grades. At this point, I'm just asking you to do two things; first, try your best, so I can get a good sense of if this game thing worked this week. Second, on the test, every time you want to say a game term like "add units," try to think of a real-world way to say that. Assume that everything in the game, and all of your strategic thinking, actually is connected. For instance, instead of saying "green squares add 20 units per turn," how might you say that in a "real-world" way?

Students get the hang of it fairly quickly: "Fertile plains can help people to grow population faster through time." Once they do, I'm ready to hand out the test. I should point out that this was one of the most difficult tests of the year for my eighth-grade geography students. If they hadn't "studied," they would bomb the test marvelously and offer humorous guesses.

On it were essay questions such as:

- Explain three geographic features that positively influence population growth.
- Explain three geographic features that negatively influence population growth.
- Detail how a river can play into geopolitical interactions.
- What technology most transforms the influence of landforms on populations? Why?

I believe that after a game experience with concepts embedded in the rule set, students will outperform your test to the point that you wonder if it's relevant any more. Traditionally, my students performed on this test in a standard bell curve. Some students fail, some get perfect scores, and the bulk of them miss a few questions but generally understand the ideas. After a relevant experience, learners can move from students to first-hand experts.

The first year we used *WarLords!*, my entire class scored an A on the test, but that doesn't fully explain their competency on the topic. Many students ran out of room explaining their perspective on the questions. Students asked if they could list more than three features if they knew them. Students asked if they could include things we talked about (mining, high-speed rail, and refrigeration) but that were not part of the rule set for the game. (I won't tell the whole story of a fellow teacher who wanted a "retest" for my students because she didn't believe that so many could perform that well on the test.) Learning assessment using a percentage measure of items memorized no longer held meaningful data. Instead the test measured the *degree of expertise* in students. The "common" core standards were simply too … common … to be meaningful for my classroom. On one occasion a student complained, "The test was so easy, and you already knew we knew it all." To some, it was a waste of class time that could have been better spent on the next activity.

WINNING THE GAME

She had a point, but I did keep the test each year, because it was proof to me that games for learning were relevant and that I could trust them beyond my lecture, that guiding was actually a more powerful learning pedagogy for me, and that my students could pass any test if I took the time to give them a worthy challenge. Common standards were no longer good enough for uncommon experiential learning.

Finally, and most important, the test was proof to the students that they could achieve at high levels. Students would take the test and visibly express surprise that they "knew it" all. Far too many students claimed that this was the first time they had really aced a test. Even today, as students are still overly exposed to traditional models of learning, they *need* to see that when they play, they learn. They need to see that their passions are actually their areas of expertise, and that choosing passions is an important choice they make.

Years later, I'm honored to tell you about *WarLords!* Former students have become teachers now and have contacted me for the game rules. This chapter is as useful to us as I hope it is to you. This was my first exposure to a great truth in learning: Gaming and play are qualitatively better than anything that students have to memorize and regurgitate. Just … better. Instead of *tell, test, and grading* learning, I can choose to *design* opportunities, *watch* the degree to which students excitably plan, strategize, plot, look for "cheats," create, add to, and advocate for new conditions, and *react* accordingly to tie experience to lifetime learning. If they do these things, they don't just memorize; they remember their experiences and become experts.

CHAPTER 2.

FINDING THE JOURNAL OF ODYSSEUS: MAKING AND USING ALTERNATE REALITY GAMES IN THE CLASSROOM

BY JOHN FALLON

PROBLEM SOLVING IN ALTERNATE REALITY

Dolus was designed to augment my seventh-grade English class's reading of Homer's *Odyssey*. I didn't envision—or perhaps I just failed to imagine—a *direct* facilitation of the text and content. As of now, the game operates parallel to a more traditional discussion-based unit that covers myths, epics, and the character of Odysseus as a literary hero. Thematically, however, what makes Odysseus a unique hero in the Greek pantheon is that he is a tenacious problem solver who thinks his way through seemingly insurmountable challenges. I designed *Dolus* to require and develop a similar intellectual resilience. At my school, three of our institutional "core competencies" are resilience, collaboration, and critical thinking, and in that regard the game closely supports my curricular goals throughout the year. (To aid those under the constraint of the Common Core, I have included a list of sample Common Core Standards, Learning Outcomes, and Essential Questions to illustrate how an alternate reality game can be incorporated into today's curricula—see the Appendix). Like many English Language Arts curricula, this game unit is focused on *skills,* not content.

I have split this chapter into two overall sections: *What is an alternate reality game?* and *How do I make an alternate reality game?* If you are already familiar with game-based learning, and in particular alternate reality games, feel free to skip down to the second section. If you want to learn more about how I became inspired to use games in my classroom and what alternate reality games are in general, then read on![1]

WHAT IS AN ALTERNATE REALITY GAME?

Dolus is what is known as an "alternate reality game" (ARG). An alternate reality game is a game that blends everyday digital media with the everyday *physical* environment around the player. These digital media include emails, websites (often "fake" ones created specifically for the game), social media, phone calls, physical or digital documents, and more. Essentially, if you can communicate

1. Author's note: An earlier version of this piece appeared in the Proceedings of the 2014 Games Learning Society Conference.

with it, it can be used as part of an ARG! The primary game element is attempting to solve difficult puzzles using information presented through these media and in the real world. ARGs use a core narrative that ties the puzzles together and usually places the player in the explicit or implicit role of an investigator who uncovers the narrative and subsequent content as he or she solves puzzles to bring the game to its conclusion. In addition, the narrative is often "archaeological" in nature: The story develops through "found documents" and media that players discover either directly or indirectly as they solve the game's puzzles. As a result, a dominant ethos of this particular type of game is "this is not a game"—the game is constructed and delivered in ways to suggest that the narrative and content are "real," and the fictional nature of the game is never explicitly acknowledged by the creators. Similar to the "found footage" film genre, a large part of the fun is pretending the fiction is real.[2] The fact that the game exists in the world around the players—in their email, on social media, and even in the physical spaces around them—makes ARGs feel all the more immersive.

ARGs are a natural type of game to use in a classroom. ARGs do not require a preexisting graphical engine, like a video game does, nor do they require a static physical space and equipment, like a tabletop game does. ARGs can be the best of both the digital and physical worlds. Even better for the classroom: *They can be designed by you to fit nearly any lesson, unit, curriculum, or student need*. It is an educational reality that sometimes commercial off-the-shelf games can be very exciting square pegs for the round holes of classroom limitations or curricular demands. The custom and modular nature of ARGs, combined with their relative ease of content creation, allows educators to design fun, engaging games that can directly support their unique curricular goals and learning outcomes. ARGs also use preexisting media, so they require little to no expert design experience. If you are comfortable using YouTube, Facebook, or iMovie, then you can make an ARG! In addition, they are inexpensive; the plethora of free and low-cost tools means that making an ARG is primarily a consideration of time, not cost.

ARGs are also great for the classroom because the game's challenge is not only the explicit intellectual hurdle of the particular puzzles but the greater "macropuzzle" of problem solving in the modern world. In today's information age, virtually any piece of data is accessible in a few keystrokes; the real challenge is knowing what data or tools you need and when you need them. Half the challenge of alternate reality games is figuring out what tools you require for the immediate task and then teaching yourself how to use them to solve that problem. In that regard, ARGs dynamically combine an ancient element of puzzle solving with the modern demand of finding the right resources among the nearly unlimited choices available and then using them to problem solve. However, ARGs' modular nature also uniquely positions them as an accessible game platform specifically for classroom teachers.

AN ACCESSIBLE EXPERIENCE

More and more gaming resources are available to classroom teachers every day. Video games and tabletop games are leading the charge and they are only likely to grow in educational utility as their quantity and quality increase. However, even games that are explicitly designed for students have built-in limitations that cannot be avoided, limitations that can often preclude them from widespread classroom use. The best tabletop game built from the ground up for students can be played only in the same physical location when students are present; assuming you have the luxury of your own

2. http://en.wikipedia.org/wiki/Found_footage_(genre)

dedicated classroom, leaving a tabletop game undisturbed is still a difficult task at best. Even the best commercial off-the-shelf video game for learning cannot change its code to adapt to unique student and classroom needs. ARGs can literally become a custom game for your classroom. The narrative and puzzles can take any shape or form and as a result, so can the game. Any skill set or content knowledge can be used, so any curricular goal can be incorporated. The only impediment to implementing ARGs is that usually you will have to create them yourself; however, they are an investment that will return significant dividends year after year as they create an immersive, challenging learning experience tailored to your students. Many of my students have told me *Dolus* was the academic highlight of the year for them.

However, one of the most significant advantages of the ARG is its accessibility; a game is useless if your students cannot actually play it when and where they need to. According to the National Center for Education Statistics (2009),[3] there was only one computer in the classroom for about every five American students and only 39% of public schools had wireless Internet connections available to the entire campus (2010).[4] Clearly, there is still an accessibility problem when it comes to video games that either require a classroom Internet connection or a dedicated computer, particularly if each player needs their own single device, as is often the case. However, if we take into account the number of mobile Internet-connected devices in general, such as tablets and smartphones, access improves dramatically.

According to the Pew Research Internet Project (2013),[5] 75% of teens had access to an Internet-connected device such as a smartphone or tablet. Once all Internet-connected devices are taken into account, Pew found, 95% of teenagers have regular access to the Internet in one form or another. As Internet access continues to proliferate, ARGs will become only more logistically feasible for students and teachers. It is this existing ubiquity that ARGs can fully leverage. Because ARGs do not rely on a graphical game engine by co-opting existing media platforms, it is easy to design puzzles that interact with any Internet-connected device, not just a laptop or computer. ARGs give you a gaming-based learning experience that you can be confident that most, if not all, of your students will be able to reliably interact with in and out of the classroom.

MAKING EDUCATION EPIC

I became an educator because through the years I had several excellent teachers who showed me that learning, despite my adolescent certainty, is not a harsh but beneficial medicine one must swallow painfully, but a joyful, powerful experience that can—and should—guide one's life. If as a student I had a few lessons every year that really inspired me, surely I could, through time, design an entire yearlong curriculum that captures that joy from beginning to end. This was my personal starting point as a teacher. As a lifelong gamer, I long ago recognized how much intellectual prowess, resilience, and critical thinking that games can demand from their players. To me, games clearly seemed like the ideal

3. Fast facts - Educational technology. (2009). Retrieved from the National Center for Education Statistics website: http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2010003

4. Gray, L., Thomas, N., & Lewis, L. (2010, April). Educational technology in U.S. public schools: Fall 2008. Retrieved from the National Center for Education Statistics website: http://nces.ed.gov/pubs2010/2010034.pdf?_ga=1.75464210.1452541699.1401570250

5. Madden, M., Lenhart, A., Duggan, M., Cortesi, S., & Gasser, U. (2013, March 13). Teens and technology 2013: Main findings. Retrieved from the Pew Research Internet Project website: http://www.pewinternet.org/2013/03/13/main-findings-5/

vehicle to create a dynamic, engaging classroom experience that would get my students excited about learning.

I was even more confident that games had learning potential because I had a few teachers while I was growing up who used games in their classrooms with great success. My ninth-grade English teacher (who inspired me to become an educator) used his love of role-playing games such as *Dungeons & Dragons* to help us dive deeper into our reading of Homer's *Iliad*. He assigned every student a character from the epic and laid out the rules for what was essentially a collaborative creative-writing exercise to write a crowdsourced version of *The Iliad*. By reading deeply into *The Iliad*, including chapters we skipped as a class or outside mythological sources, you could acquire information about your character and try to shape the building class narrative with your own submissions. You could "upgrade" your character using your research: Give the character a legendary weapon, a superhuman ability, a divine ally, and so on as long as it was found in an existing mythological source. It was instantly one of the most enjoyable classroom experiences I ever had despite its relatively simple design. That unit rattled around the back of my mind during my first few years of teaching, but it wasn't until I played Funcom's massively multiplayer online role-playing game (MMORPG) *The Secret World* that I was able to take this vague impulse for classroom gaming into a real executable unit.[6] *The Secret World* places thousands of players all within the same online virtual environment, where they can play, interact, and battle against each other in a variety of different ways. In *The Secret World,* players take on the role of agents in clandestine organizations (e.g., The Illuminati or The Templars) and interact in a game universe full of supernatural dangers and conspiracy theories come to life.

What attracted me to *The Secret World* was what the game calls "investigation missions". I read an early review that lauded them as deep and interesting puzzle-solving experiences, a large departure from the usual fare in MMORPGs, which are infamous for including dull, repetitive tasks whose completion is often referred to as "grinding," because they are necessary for improving one's character and getting ahead in the virtual world but are generally considered boring in their own right. Much like the "busywork"—worksheets, textbook-comprehension questions, and so on—that is present in so many classrooms, even the work of the gaming world is not immune to getting mired in mindless mechanics of previous generations.

The investigation missions in *The Secret World* required the player to not only use the information and events contained within the game but also the built-in Google browser to search the Internet for the right information and clues to solve the puzzle. A few hours into the game I realized what the designers had done was to include ARG-style puzzles and weave them into the virtual landscape of the game. The confluence of these two types of games clarified the elements I needed to harness to make my own game: the portability of cross-media ARG puzzles, the immersive effect of using real-world information in a fictional game world, and the timeless siren song of puzzle solving. I was spending hours researching arcane topics, decoding ciphers, and sweating over riddles just to play a game. I also realized that the game engine itself was not integral to the experience … I could make these puzzles! *Dolus*, the game about the master thief who has stolen the journal of Odysseus, was born.

6. Funcom Productions. (2012). The secret world [Digital download].

Figure 1. Dolus greets students in an email after they solve the opening "Rabbit Hole" puzzle.

HOW DO I MAKE AN ARG?

Down the Rabbit Hole...

The most intimidating factor in creating an ARG is that you are immediately confronted with a nearly overwhelming number of choices. However, that is also the genre's greatest strength, as you have a nearly unlimited palette of tools to create your puzzles, very few of which require any type of expert design knowledge. The first piece of advice for puzzle creation is: *Steal!* Start paying attention to puzzles and problem solving in your favorite games (especially other ARGs if you play them), movies, books, and TV shows (the mystery genre is particularly ripe for the picking). Ask yourself, "Could this puzzle-solving experience exist on its own or in another format?" Any challenge or puzzle that connects to your lesson outcomes or the skills you want your students to focus on can be used. Using the scaffold of preexisting puzzles will not only help you get started, but it will help you branch out and create your own once you see how they work in an ARG. I find it easier to design chronologically, so I started at the first puzzle for *Dolus* and worked from there.

The first puzzle in any ARG is what is referred to as the "Rabbit Hole." Like in *Alice in Wonderland*, this is the first step into the fictional universe of the game (see Figure 1). This is where the "this is not a game" ethos first presents itself and "rabbit holes" are usually designed to create a feeling that the player has accidentally stumbled onto a hidden reality heretofore unknown to them. The multimedia element of the game synergizes perfectly with this: Suddenly the game world is *everywhere*, if you're looking in the right place.

The Rabbit Hole is the door into the ARG universe and the introduction to the game itself. A common way to create a "rabbit hole" is to use a popular mechanism of ARGs: the "false document"; for *Dolus*, that is a fictional article purportedly from the BBC.[7] I decided that a fake news article would be a great way to put the game at my students' fingertips and a perfect introduction into the "this is not a game" mind-set. I found Apple's Pages app to be a great resource for document creation since I lacked experience in Photoshop or other professional-level design programs. To create it, I went to the BBC *World News* site and by using screen shots (pressing Command + Shift + 4 on a Mac lets you take screen shots of specific parts of the screen), I simply copied and pasted the different webpage elements onto a blank page in the same configuration. I then formatted the article's text size, color, and font to match the styles on the BBC's website and typed away (see Figure 2). For simplicity's sake, I opted to make the document a PDF since I did not have immediate knowledge to plausibly render the article as a functional webpage. In the end, I think the restraints ended up helping, and I framed the Rabbit Hole narrative as a "cool article I found but seems to have disappeared from the BBC site (weird, huh?)." Once that document is sent to students, the game begins.

Figure 2. The fictional BBC article is the Rabbit Hole to introduce the existence of the game world.

Early on I decided that the core narrative of the game would be relatively simple but hopefully

7. http://en.wikipedia.org/wiki/False_document

engaging: A priceless document, the "journal of Odysseus", is stolen by a mysterious thief and he is challenging the students, à la The Riddler, to solve his puzzles in order to get it back. The BBC article is written as authentically as possible but does immediately drop some clues that Something Is Strange. The befuddled archaeologist mentioned in the article is named Dr. Henry Jones III (Indiana Jones), for example. The article quotes a mysterious note containing a riddle that begins the hunt; the riddle is worded to explicitly reference an element of my school's culture to draw their attention:

> I have infiltrated the place where the blue door stops all but 9. An email to the mythical creator of that figurine will begin the hunt. Only the blue and white crusaders can play my game.

The "blue door" involves a schoolwide tradition that allows only ninth graders (the oldest students) and adults to pass through that particular entrance. All students would immediately realize this strange note somehow has a connection to the school. To further emphasize the connection, the school colors, blue and white, and mascot, the crusader, are mentioned.

This particular riddle involves some obscure Greek mythology. The article describes a figurine that connects to the myth of Dolus, the Greek god of trickery. Using Google and search terms mined from the article, they should find the myth in question and that "Dolus" created a figurine matching the description in the article. Armed with that name they eventually experiment until they realize that it involves a school email address.

Compared to the types of ARGs found in the corners of the Internet, *Dolus* was designed to deploy comparatively obvious hints and clues, especially in the early game, because this is a genre of game that few, if any, of the students are familiar with. Even then, some students needed a rather significant nudge to read more closely and realize there was a riddle to be solved; this is not surprising because ARGs go to significant lengths to pose as *not* a game! The riddle eventually leads to a fake, but functional, school email address,[8] which was set up with the help of my school's IT department (this was both for immersive effect and to keep game communications within the school network). Once that email is contacted, the student is immediately sent a "welcome video," hosted on a private YouTube video, that sets up the antagonist, lays out the basic "plot," adds some more narrative flavor, and offers up the next puzzle. This also was relatively easy to make. Armed with a laptop, a script, Apple's iMovie, and a quick YouTube tutorial on how to use the free program Audacity to scramble my voice, I laid down an audio track of Dolus introducing himself.[9] In addition to the audio track, I inserted a few relevant images into iMovie (including the puzzle text that was taken from screen shots in Pages; iMovie does not handle large amounts of text well on its own) and uploaded it to a private channel on YouTube under an account made specifically for this game.[10]

iMovie is a great program to use because it mostly relies on simple drag-and-drop mechanics. I dropped relevant pictures and text into the program and then laid the MP3 recording (scrambled in Audacity) on top of those images. The most recent version of iMovie even has an option to directly upload finished videos to different websites, including Vimeo and YouTube, making the process even easier.

8. dolus@fairfieldcountryday.org
9. https://www.youtube.com/watch?v=T0eyx8hvnXU
10. However, I have found Vimeo to be even better, as it has easy-to-use uploading features, especially password protection. I will probably be migrating all game videos from YouTube to Vimeo as a result.

Behind the Curtain

Given the nature of the narrative, I decided it would be best to follow the traditional role of ARG facilitators: "Puppet Master." Being the "man behind the curtain" augments the "this is not a game" element and forces the players to engage directly with the game in order to progress and gain information. In traditional Internet-based ARGs, this is much easier. You simply remain hidden and do not directly contact any game player and communicate only through the "official" game elements and puzzles. In a more pervasive, classroom-oriented game such as this one, it's not as simple. The students usually quickly realize I am facilitating this game—that I *am* Dolus—and try to use me as a resource. However, I chose to remain Mr. Fallon, Mild-Mannered English Teacher, whenever possible and to claim ignorance of the mysterious Dolus and other game elements swarming around the school. In many ways this worked. My students loved the wink-wink-nudge-nudge act and it helped channel them into the game elements instead of trying to short-circuit the puzzles to get the answers from me. However, that did create some issues when students became authentically stuck on a particular puzzle because I wanted to give them hints to keep them progressing, but I also did not want to break character. I have come up with a solution for that conundrum, which I discuss in the "Remaining Questions" section.

Getting Into Character

It is completely legitimate, particularly if you have a dramatic spirit, to put yourself into a character and facilitate the game not only through the puzzles and information, but through yourself as well. For example, Paul Darvasi's *The Ward Game* (paired with his class's reading of *One Flew Over the Cuckoo's Nest* and also included in this book) puts Paul into the guise of a lab coat–wearing henchman of the game's Big Nurse antagonist. Whenever the class playing the game was present, he assumed that character and managed the game directly via that persona. However, the "invisible" Puppet Master role is perhaps easier to manage, but it all depends on your goals and narrative!

Getting Your Sherlock On: Making the Puzzles

The heart of any ARG is the puzzles themselves. This is the most daunting element for those who want to do an ARG for the first time (and second, and third!). The customized nature of ARGs also makes it difficult, but not entirely impossible, to simply import an existing ARG wholesale in your classroom (but individual puzzles can be more easily shared and modified with some effort). Because ARGs use so many different media, they often exist on your hard drive as a sprawl of folders full of documents, images, links, and flowcharts in varying states of organization. In addition, ARGs are often at their best when they incorporate the unique elements of your classroom, school, and community. For example, the Rabbit Hole article and riddle for my game would not work unmodified in another school setting but with some editing, the article could be adapted to be a functional rabbit hole in another classroom. The goal of this chapter is to help you create your own, however, and in that regard, let's take a look at another puzzle created from scratch.

The foundation of many ARG puzzles is codes and ciphers. These not only offer intriguing and challenging critical-thinking exercises but they help avoid a critical design flaw: *false negatives* (Foster, 2013).[11] A false negative—getting or making progress toward the right answer but not realizing it—is perhaps the worst-case scenario for an ARG puzzle. If a student began to correctly solve a puzzle but did not receive clear or immediate feedback that they did so, the game's puzzles could feel arbitrary, or even impossible. In my experience, students do not mind spending *hours* failing, but *progressing*, to crack a puzzle (in fact, they often love it!). However, if they were to invest significant time in a puzzle only to later realize they had abandoned the right solution hours ago, it could be a fatal blow to their motivation. Codes and ciphers, however, instantly and accurately indicate success. Once you solve a code-based puzzle, the answer wholly or in part reveals itself. Even if they haven't solved the entire puzzle, they achieve a crucial sense of progression. As a result, codes and ciphers are the bread and butter of many ARG puzzles.

In this particular puzzle I chose to use a book cipher because it would potentially involve the physical medium of an actual book, and I found an easily accessible example of the cipher's use in the Sherlock Holmes novel *The Valley of Fear*. In fact, I decided to weave the novel directly into the clue. I used the free text-to-video site, xtranormal.com, to create another video clue.[12] It uses a combination of preset animations and a voice synthesizer for text to speech. I used xtranormal to save time compared to doing another custom video in iMovie but I also found it helped augment the pervasiveness of the game: The more media and formats the games incorporates, the better. It also added to the narrative, which played into Dolus's character as the mysterious thief who can be anywhere, at any time, in any form (see Figure 3). The clue itself was spoken in the video but the key text was also copied in the video description to make it easier for students to use.

Figure 3. Dolus assumes a different digital form and taunts the students to try to solve his newest puzzle.

The riddle itself reads:

11. Foster, A. (2013, June 17). Alternate reality game puzzle design. Retrieved from Gamasutra website: http://gamasutra.com/blogs/AdamFoster/20130617/194321/Alternate_Reality_Game_puzzle_design.php
12. xtranormal.com is no longer available; however, it has returned as nawmal.com. There is an education version at http://school.nawmal.com/. It looks to be a similar product but I have not yet tried it out as of September 2016.

> When Doyle's detective went to the Valley of Fear, he used this method to discover his first clue. So shall you. Your key, however, is 1 5 9 1 9 4 0 4 2 7. All you need, though, is 108. It is something that is close at hand, I assure you. Once you find your key the door below will open. Good luck!
>
> 220 246 4 223 121 4 225 121 57

In Dolus's video clue he directly references *The Valley of Fear*, which forces the student, at the very least, to find what that is and likely go to the *Wikipedia* entry. From there (or from the novel itself), the students will realize that the "method" Sherlock Holmes used was a book cipher.[13] Modeling their strategy after Sherlock's, they will realize that they need three things: a particular book, a specific page in that book, and specific words on that page. The book they need, the "key," is their classroom copy of *The Odyssey*, identified by its ISBN 1591940427, hence its being "close at hand," and the page in question is 108. (This is also a callback to an earlier puzzle that required students to decrypt a riddle by finding a book's ISBN.)

But what of the seemingly random series of numbers? If the students execute the cipher correctly, they discover that each number refers to a word on the page; for example, 220 is the 220th word on page 108. Once it is compiled correctly (they will realize that they're doing it right very quickly because a sentence will begin to form—no false negatives!), they will see that they are being asked to email Dolus the name of Odysseus's father, something that memory or a quick search will remind them is "Laertes." Once that name is emailed to Dolus, the next puzzle begins.

Let's look at another type of puzzle, one that puts itself into the students' *physical* environment.

13. http://en.wikipedia.org/wiki/Book_cipher

Figure 4. A clue given to students midway through the game. To solve the puzzle, the students need to solve several different elements, both in the real world and online.

This clue (see Figure 4) showed up in students' in-boxes after they completed an earlier puzzle. It reads:

> Does this look familiar? It should. You've seen it every day.
>
> Find this symbol. But first you will need the password. ' feathers might help.
>
> Bring the password to the one who carries this symbol and you will receive a helping hand. Beware: You will be tested and no one may see you do it.

For this puzzle, I wanted to maximize the physical space around the students and really make the game *pervasive*. If the game suddenly leaped into the physical space around them, it would be even more immersive.

Likely because I had conspiracy-theory narratives floating around in my head after playing *The Secret World,* I tapped the seventh-grade history teacher, who is an actual Freemason, and let him know I wanted to work him and his affiliation somehow into the game. His Freemason lapel pin seemed the perfect way to start the students on their hunt in this particular phase of the game. Realizing that few, if any, students probably ever realized that their history teacher wore that pin every day, I decided to use the symbol directly and have them try to find it. It worked perfectly; quickly, with the help of Google (and some without), they could identify it as a Freemason symbol. However, for a few days this image only simmers in their heads as they search in vain for it around the school, as the clue suggests. Eventually, one day their idle gaze falls on it in history class and they immediately *freak out*. They impatiently wait until the end of class and ambush the teacher, asking for the clue. He, of course, ignores them completely and feigns total ignorance *because they don't have the password*. "Horse feathers" is the only clue in this regard and it has resulted in some hilarious moments of students' shouting HORSE FEATHERS at him, with one thorough student flinging every "horse feathers" synonym (balderdash, hogwash, etc.) contained in the thesaurus at the teacher without avail.

Eventually, students will once more return to the Web hunting for "horse feathers." The most direct route will lead to the *Wikipedia* page for the famous 1932 Marx Brothers film of the same name.[14] Upon perusing the entry they will find that the "Notable Scenes" section contains the following:

> A later scene features Baravelli guarding the speakeasy and Wagstaff trying to get in. The password for entry is "Swordfish".

Finding the teacher alone and uttering "swordfish" causes him to clandestinely administer a test on Freemason iconography that requires some additional research. Once it is completed, they are given a key that allows them to decode the heretofore unintelligible symbols in the rest of the clue, which turn out to be the pigpen cipher, made famous for its use by Freemasons of the past.[15]

Decoding that cipher immediately transitions them to the next puzzle because it reads:

> Find where the Treaty of Tripoli and Wounded Knee are engraved side by side. You may find it is right around the corner…

Continuing the theme of incorporating the physical space of the students, this phase is a hunt for a particular location at school. In classic treasure-hunting fashion, they have to scour the campus trying to find a location that connects to the riddle. By now, they have been made aware that all game information is *very* carefully worded. Key information includes the Treaty of Tripoli (1797), Wounded Knee (1890), the words "engraved" and "corner." This is an example of the pace and scale of the game: This will (probably) not be solved in a day, or even two. ARGs can last for days or weeks as each puzzle in the game may take long periods to break down and solve. Once all elements of the riddle are pieced

14. I should note it is also possible, and pedagogically sound, to edit a Wikipedia page with legitimate information related to the ARG in order to increase the immersiveness of the game, or, from the opposite direction, construct a puzzle that requires students to add legitimate information to a certain article. This could be a great way to directly include writing and research elements common in many ELA curriculums. I have not experimented with that myself, but it could work very well with the immersive element of ARGs.

15. http://en.wikipedia.org/wiki/Pigpen_cipher

together, the students will realize that there are few places at school that have "engravings," but that one of them is the "corner"stone of the school building (right near a main entrance). The engraved years 1797 and 1890, side by side, are the final signpost to look closer. Upon close inspection, they will see that there is a conspicuous stone nestled right under the cornerstone that looks clearly out of place. Within that false stone lies a QR code (see Figure 5); once scanned, it reveals the next page of the journal and the next phase of the game. For many students, this is the climax of the entire game!

Figure 5. This phase of the game is completed once students track down a false stone by the school's cornerstone.

I hope these examples illustrate the "moving parts" of an ARG puzzle. From here, you can go anywhere. All media, digital or physical, are usable, and ciphers and codes are hardly a requirement, but they do set a very useful foundation. You can do something as simple as writing a mysterious code on a whiteboard and see who can crack it. You could "scale" the difficulty down by adding a hint: Perhaps an unexplained bag of Caesar salad mix sits under it (a hint that it is a Caesar cipher). When it comes down to it, the average puzzle mechanics of an ARG is some type of riddle or code whose pieces are strewn about different areas of the digital and physical world that the student can find. They will have to use research and critical thinking to assess the information in front of them and then synthesize that information to solve the puzzle. However, with your unique narrative and tweaking, it can quickly take shape into almost anything your curricular goals require.

Many questions remain to be answered not only for *Dolus* but also game-based units in general. For many teachers the first question is: *How do I grade this?* As *Dolus* was new territory for my students, administration, and me, I avoided having to answer this directly by formulating the game only as a sizable extra-credit opportunity. However, as I add content and grow more confident in the game, I intend to make it required. One change I am making is both a mechanical change and a pedagogical one. I will minimize the requirement of the Dolus email address; as of now, many puzzle elements require the students to email their answers to that address, and for "Dolus" to email subsequent puzzle elements to the students, including the "journal page" rewards (which are excerpts from Zachary Mason's excellent *Lost Books of the Odyssey*). However, the best parts of the game are when the current phase automatically flows into the next. If I don't have time to respond to a student's email, they may lose motivational momentum waiting for a response; even worse, I might completely overlook a student's answer in the clutter of my email in-box. Immediate feedback is a powerful element of games and I want to maximize that. By tweaking the game, I can use password-protected documents and videos to automatically "gate" the game: Once a student gets the right answer (usually a password), the next phase will automatically unlock without needing my intervention.

However, because the game is designed to be difficult and make students be resilient, they can, and almost always do, get stuck. I don't like breaking the fourth wall and directly acknowledging the game to give hints, as that undermines the immersive element of ARGs. To avoid this, I plan to borrow a scoring system used in many mystery-genre video games. Each student group (they are placed into groups for the game to encourage collaboration) will start the game with a set numerical score. Every time a puzzle is solved, that score will go up. However, students will have limited opportunities to ask for a clue from Dolus (via his email address). Every clue request will deduct points from that score. This will not only allow me to maintain the invisible Puppet Master role, but I think it will be a fair system for grading. With this system, I may feel confident enough to require the game in some capacity.

However, on top of the ancient tensions that go with grading group efforts, there is the novel problem of how to make game-based learning mesh with traditional grading systems. For something that is designed to be an "old-school game"—completion is not a foregone conclusion—because it is both challenging and thematically fits with the *Odyssey*, I have been hesitant to require it. Does the first group done get an A+? Does the second get an A? Third get a B+, and so on? What if groups never finish? Do they (should they) "fail"? I am hopeful that the numerical score system will be acceptable to students and accurately reflect each group's work and progress.

With both my age group (seventh grade) and my geographic location (suburbia) I am limited by where I can make the game "exist." Much of this is solved by sticking to the well-trodden path of ARGs—digital environment and media—because that is accessible anywhere with an Internet connection. At a 1:1 laptop school (or a BYOD environment), this is a natural fit. However, some of the most successful moments in *Dolus* have been the times that the game goes "outside" the digital and becomes a fully pervasive game—both in the digital *and* physical world. Hunting for the cornerstone and finding the hidden QR code is one of the game's most successful moments. My experience so far suggests that increasing the physical pervasiveness would increase the overall quality of the game.

However, as a teacher of suburban students who cannot drive, the physical pervasiveness appears to be limited to just the school campus (and that still has plenty of potential). Puzzles *could* be engineered to lead to local settings—and it would be quite fun!—but that could become complicated, especially if the game became mandatory. I think that if I were in an urban area and/or with older students, I would have the freedom to lead them anywhere they could ostensibly travel. Perhaps this is not as bad as I think? Should I not be afraid of a student's begging his parent to go to a local spot so he can solve a puzzle? To me, the game-obsessed teacher, it sounds awesome. But to a busy parent with limited time perhaps it is a ridiculous request.

The second major question: Does the game *work?* After four iterations, I see clear "proof of concept." The students love the "this is not a game" ethos of the ARG. The "Sherlock Holmes" type of thinkers—who have to crack any puzzle or challenge given to them—get addicted fast. There are always a number of students who routinely beg for the next step and then proceed to spend hours of their own time that night to solve the puzzle. The middle-ground students are either interested in playing a "game" or are incentivized by extra credit, or both. Some students hit the first wall and stop; this could be due to a lack of resilience or even disinterest in game-based learning. As hard as it is for me, the game-obsessed teacher, to understand, some people just aren't that into games. And yet it is common for students who struggle in traditional settings to shine in this unit because they can "think outside the box" in the game-based setting. I have seen students, especially the "gamers," feel much more empowered about their learning because they are able to bring their gaming-honed problem-solving skills into the classroom in a way they usually cannot. Conversely, the by-the-book, left-brain type of students can receive a surprising challenge when a unfamiliar puzzle completely stumps them.

But what is really exciting to me is seeing the game utterly warp student conceptions of "school." I'll never forget the shocked look on a student's face when he discovered the game's Rabbit Hole during a study hall and the opening video played out on his smartphone. This was a young man who rarely made a public effort with his academic work and embodied that ever-common "too cool for school" adolescent affectation, but he immediately became one of the most enthusiastic and dedicated *Dolus* players.

The power of this unit and game-based learning in general is that it *compels students who are normally not engaged*. Many traditionally motivated students are still motivated by the challenge and jump into it. However, there are students who are usually less engaged within more conventionally constructed units who dive in headfirst and do not stop. That is a crucial advantage of game-based learning and it illustrates an underappreciated concept*: Games are a learning style.* Teachers should seek to incorporate game-based learning the same way they would for the traditionally advocated spectrum of learning styles.

FINAL THOUGHTS

ARGs are a powerful platform for game-based learning and they offer a unique level of customization, access, and engagement that few other game types offer. Any teacher who knows how to tweet, copy and paste, or make a YouTube video is capable of creating a deep gameplay experience for his or her students that can rival what is found on any video-game screen.

If you want to follow updates to the game and check out some of the created media, see my Working Example.[16]

16. http://www.workingexamples.org/example/show/633

APPENDIX

Example Common Core Standards, Ongoing Learning Outcomes, and Essential Questions for the *Dolus* Game Unit

Common Core Standards

CCSS.ELA-Literacy.CCRA.R1	Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusion drawn from the text.
CCSS.ELA-Literacy.CCRA.R2	Determine central ideas or themes of a text and analyze their developments; summarize the key supporting details and ideas.
CCSS.ELA.Literacy.CCRA.R3	Analyze how and why individuals, events, or ideas, develop and interact over the course of a text.
CCSS.ELA.Literacy.CCRA.R4	Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
CCSS.ELA.Literacy.CCRA.R5	Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text relate to each other and the whole.
CCSS.ELA.Literacy.CCRA.7	Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.

Ongoing Learning Outcomes

SLO #1	Students will navigate, evaluate, and ultimately solve a series of problems similar to those Odysseus is faced with in the epic in order to experience the critical-thinking process of overcoming obstacles.
SLO #2	Student will identify, use, and manipulate media and media tools in order to problem solve using 21st-century technology skills.
SLO #3	Students will analyze the choices Odysseus makes on his journey in order to model their own gaming strategy to achieve the same success.

Essential Questions

#1	How can we learn to solve a wide variety of real-world problems using critical-thinking skills?
#2	How can we use media and media tools to solve problems similar to those present in *The Odyssey?*

CHAPTER 3.

BEYOND GAMEPLAY—USING ROLE-PLAYING GAME CREATION TO TEACH BEOWULF IN A HIGH SCHOOL ENGLISH CLASS

BY KIP GLAZER

WHY LITERATURE EDUCATION?

"I guess [we] can cut the arts as much as [we] want…Sooner or later, these kids aren't going to have anything to read and write about," said the main character in a gut-wrenching moment from the movie *Mr. Holland's Opus*, which describes a career of a music teacher who made a difference to thousands of students.

As an English teacher teaching in the current educational environment that privileges STEM education over humanities education, I find myself in an uncomfortable situation of having to defend my discipline more often than not. In California, we now have a special senior English class dedicated to reading only nonfiction pieces to "train" students to write better. After all, don't students need to learn to write better essays than say, a sonnet?

However, such an approach deprives many students of gaining critical skills that come from being exposed to what Gee called "academic varieties of language" (p. 3) in his book *Situated Language and Learning: A Critique of Traditional Schooling.* Furthermore, with all the talk about grit[1], growth mind-set[2], and improving critical-thinking skills with the recent adoption of the Common Core State Standards, literature education that encourages open-endedness, imagination, and empathy is needed more than ever before.

By reading great works of literature, we enter what Northrop Frye describes as the limitless world of human imagination. In his essay "The Motive for Metaphor," he argued how reading literature could help humans transcend the boundaries of our physical world. He declares, "What's produced the aeroplane is not so much a desire to fly as a rebellion against the tyranny of time and space" (p. 14).[3]

1. To learn more, watch Angela Lee Duckworth's TED talk "The Key to Success? Grit." http://www.ted.com/talks/angela_lee_duckworth_the_key_to_success_grit?language=en?
2. More information can be found in Dweck, C. S. (2006). Mindset: The new psychology of success. New York, NY: Random House.
3. Frye, N. (1964). The educated imagination. Bloomington: Indiana University Press.

If we were to help our students devise solutions to the problems that have never been identified or imagined, literature education is essential in situating our students in the complex world where such rebellion is highly encouraged.

Tragically, today's students in a conventional classroom often don't get the awesome benefits of literature education. Think back on your high school English class experience. What did you do? Your teacher probably assigned the reading and then asked questions about it in class. You might have had a pop quiz or two just so your teacher knew you were reading. You probably wrote an essay about a character or theme after you were done reading. You might have watched a movie after reading a tough text as a reward for your hard work. If you were lucky, you might have performed a scene from a play you were reading. You might have written letters to the characters or made a poster of the most important scene. No matter what you experienced, however, I bet there were students who called the experience utterly "boring."

If you are a teacher reading this, you might say, "Hang on! I do more than that. I have them create a digital book trailer. And I do other things such as… ." Bravo! Please keep doing what you are doing to engage your students. I know you are doing everything you can to make sure your students learn. And please allow me to be crystal clear. I am not saying that you should stop doing what worked for you. You should continue doing what you have done as long as it works for your students. But I assume you are reading this because you want something more. Something different. And it is my hope to provide an alternative pedagogical strategy for you.

USING RPG CREATION AS A PEDAGOGICAL STRATEGY

In September of 2013, I decided to use role-playing game creation as a pedagogical strategy after attending a presentation by Dr. Trent Hergenrader at the 2013 Games, Learning and Society Conference. In his presentation, Hergenrader described how he used role-playing game creation to teach creative writing. According to Hergenrader,[4] teaching fiction writing using a traditional workshop model is highly ineffective for aspiring fiction writers because it tends to limit students to simply imitate obvious literary techniques in other works. He argued for using the role-playing game catalog as a viable solution to teaching creative writing because of its affordance of creative flexibility for the participants.

While listening to his presentation, I realized that I could use a similar process to teach my students to interact with great works of literature in a new way. It became clear to me that I could use his process to teach my students to read classics and produce better writing products. With his mentorship and support, I developed the following instructional steps.

Because I was not familiar with the role-playing games, I enlisted my students as helpers every step of the way. I also connected with local board gamers and role-playing gamers. Capitalizing on the popularity of *Dungeons & Dragons*, I chose *Beowulf* as my first text, which turned out to be ideal (see Appendix A for the lesson plan). Eventually, I tried the method using *1984* and *Frankenstein*. That was when I realized the true power of this strategy for teaching literature. When asked to choose just one

4. For more information, please read Hergenrader, T. (2011). Gaming, world building, and narrative: Using role-playing games to teach fiction writing. In GLS 7.0 Proceedings (pp. 103-108). Pittsburgh, PA: ETC Press; and Hergenrader, T. (2013). The narrative potential of tabletop role-playing games. In GLS 9.0 Proceedings (pp. 168-174). Pittsburgh, PA: ETC Press. Retrieved from http://press.etc.cmu.edu/files/GLS9.0-Proceedings-2013-web.pdf

piece to create a new game, a group of students argued for combining both stories as the source for their game. Rather than seeing it as a hindrance, students reveled in the idea of creating a mashup of two stories. If you are a high school teacher, you know how amazing it is for your students to want to do more work than was asked of them.

Based on my experience, I can see this strategy being used for typical high school texts such as *To Kill a Mockingbird*, *Fahrenheit 451*, *The Grapes of Wrath*, *The Adventures of Huckleberry Finn*, or even *Romeo and Juliet*. I believe that any complex literature piece that allows layered behaviors for the characters, which covers pretty much any great work of literature, can be used as the content for the game. Furthermore, because of the power that comes from enlisting students to become problem solvers and creators of new content, I believe in this strategy's being used for additional subjects such as history and science.[5]

GAME CREATION

Although there are many substeps, students underwent two distinctive phases: game creation and gameplay. During the game-creation phase, students created the role-playing game pieces while reading *Beowulf*. It began with research on the geography and historical facts about the poem. This step worked as a solid scaffold for the students to gain background knowledge of the poem, which contributed to their understanding of great literature as a byproduct of its time. Once they had enough background knowledge, they began reading the piece to write about the worlds or the setting of the poem. Students continued to write and even created several drawings of the various characters. They also created the game board. In the beginning, I had one of my artistic students create a single board for the whole class to use. But by the second iteration, I required every student to participate in the board creation (see Figure 1) because I realized its potential as an assessment tool. Listening to my students argue over how best to construct the game board gave me an idea as to whether they understood the entire story or not.

5. Some might question how it would work in other subjects. I did not have the space to describe the plan in this chapter; however, I am working on developing lesson steps for such subjects and plan to write about them in the future.

Figure 1. Examples of game boards.

Once students demonstrated their understanding of the setting and characters, they were tasked to write about the possible adventures of their chosen characters, both for the characters in the poem and any imaginary characters based on the poem. Although this step allowed the students to gradually move beyond the text into the world of their own creation, I continued to evaluate both the quantity and quality of their writing to gauge whether my students understood the piece, and whether they were able to apply what they had learned in their own writing. Once I thought that they had gained sufficient knowledge of the poem, I asked them to create their own game rules. The process was designed to personalize the game for each class to increase student buy-in. In addition, I made my students write reflections every day and discuss what they liked or disliked about what we were doing in class.

GAMEPLAY

Once we had everything in place, we had to choose gamemasters to run the game in small groups. In a role-playing game, a gamemaster typically provides a basic storyline for the game, guides the players by providing additional challenges throughout the game, plays additional characters as needed, and administers the rules for the game. Because I had more than 30 students in each of the two classes I taught, each group had five to eight members, which meant that I needed four to five gamemasters to run the game. At first, boys who were used to volunteering for leadership roles were tasked to run the game; however, many groups soon realized that it was better to have a gamemaster who was skilled in storytelling. As a result, many of female students ended up taking over as gamemasters, which led to an opportunity for them to demonstrate their leadership skills. This certainly was one of the most delightful tangential benefits.

After the first iteration, I asked students about their experiences in a survey. Part of the survey and results are included in Appendix B. The survey results showed that many students reported positive feelings toward both the game creation and gameplay.

I also asked students to describe their favorite part as well as least favorite part about the process. My intent was to gain additional insight from the students' experience to improve my instructional practice. Many students reported that their favorite part about the game creation was being able to use their imagination. One student said, "I liked making up characters and using my imagination because I don't feel like I could do that as much in my previous English classes."

What was more interesting to me as an experienced classroom teacher, however, was what the students identified as their least favorite part about the game-creation process. After being required to describe their least favorite part, many of the students indicated that the amount of writing they had to produce was their least favorite part about the whole experience. One student said, "[The least favorite part about creating the game] was trying to solve how detailed the world that our character live through must be described with the adventures that might occur during their journey." Another complained, "My least favorite part about creating this game was how time consuming it was. It required a lot of research and time spent reading the story and searching the Internet." Time and time again, students described how time consuming the process was because the creation process required them to be extremely detailed in their descriptions. One student said, "It was very time consuming, and I had to think a lot of ideas to make my worlds and characters very interesting." Such statements indicate that the students were encouraged to think deeply about the literature piece and develop metacognition skills and writing skills through game creation, illustrating that game creation is a powerful pedagogical strategy that engages students in deep thinking and descriptive writing processes.

CONCLUSION

James Patterson once said, "What are we but our stories?" For our civilization to continue, we must ensure that our future generations are able to not only read great stories of our past but that they are also able to create their own stories. Literature education matters now more than ever before, and it is important that we continue to develop ways to improve it. By providing authentic opportunities for students to create their stories based on great works of literature and act them out through gameplay, we can improve literature education. By experiencing the horror of one's hubris as they read about the errors of Dr. Frankenstein, students can learn the peril of science without soul. By experiencing the horror of totalitarian government through the experiences of Winston Smith in *1984*, students can be empowered to devise solutions to combat such atrocities. Most important, by creating their own games and controlling the universe that they created as active participants, students can now see themselves as the builders of the future that they want to live in, rather than passive occupants of an unimaginative past. That alone is worth the time and effort spent in using this process as a pedagogical strategy.

APPENDIX A

Sample Lesson for Character Creation

Beowulf Character Creation[6]

Standards Addressed

CCSS.ELA-LITERACY.RL.11-12.3	Analyze the impact of the author's choices regarding how to develop and relate elements of a story or drama (e.g., where a story is set, how the action is ordered, how the characters are introduced and developed).
CCSS.ELA-LITERACY.RL.11-12.10	By the end of grade 12, read and comprehend literature, including stories, dramas, and poems, at the high end of the grades 11-CCR text complexity band independently and proficiently. / By the end of grade 12, read and comprehend literature, including stories, dramas, and poems, at the high end of the grades 11-CCR text complexity band independently and proficiently.
CCSS.ELA-LITERACY.WHST.11-12.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
CCSS.ELA-LITERACY.WHST.11-12.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
CCSS.ELA-LITERACY.WHST.11-12.6	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
CCSS.ELA-LITERACY.WHST.11-12.10	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Lesson Objectives

#1	Students will be able to read and understand the historical background in the epic poem *Beowulf.*
#2	Students will be able to reproduce the descriptive languages in *Beowulf.*
#3	Students will be able to synthesize information from *Beowulf* and create their own descriptions of characters.
#4	Students will be able to evaluate each other's writing and provide feedback on syntax and the use of figurative language.

Task

You are to create a detailed written description of a characters based on *Beowulf*.

Step 1: Character Description (1,000-plus words)

Your task is to describe two characters from *Beowulf* and two imaginary characters who could appear in *Beowulf*. Each character must have:

1. A detailed physical description—Starting with the color of his/her hair to what kind of shoes he/she is wearing. If the character is barefooted, describe how his/her feet look.
2. A detailed mental description—Is the character intelligent? In what ways? What kind of knowledge would he/she possess? If the character was not very intelligent, why would that be? Based on what?
3. A detailed physical strength—How strong is the character? Based on what?

4. Special talent, tool, or abilities—Does the character have any special abilities? If so, what are they?

Step 2: Small-Group Feedback

Share your writing product with your small-group members in class. Check to see whether all of your descriptions have the components listed above. Please pay attention to whether the character descriptions are based on the historical background of the poem. Evaluate each other's description and provide written feedback.

Discuss[7] what you liked about the description and[8] what the author should add or subtract. Consider whether the imaginary characters are likely to appear in the poem. Be sure to consider the plausibility of the relationship to the existing character(s).

Step 3: Revise and Post

Based on the feedback you received from your small group, revise your description. Once you finish, please post your descriptions online. Please create four different posts to facilitate replies and additional comments from your classmates.

Each entry should include:

1. Character name. If you created a character using your imagination, you should say what the character name is and what title that character has.
2. Descriptions—As always, please write them using complete sentences. No bullet points allowed!

Step 4: Read and Provide Feedback

Read at least three "real" character posts from the poem and three imaginary character posts. Provide feedback as to 1) whether the writer added all the required components, 2) what you liked about his/her descriptions (As always, please refer specifically to the figurative language and syntax. For example, instead of saying, "I liked it," you should say, "I liked that you chose 'brawn' to describe Beowulf."), and[9] what he/she can do better (For example, instead of saying, "Be more descriptive," say, "You can use phrases such as 'the archer was as nimble as an acrobat who could tumble on a high wall without any trouble. She was, in fact, an acrobat who could shoot while standing on a rope that connects two watchtowers at the top of the 100-foot-tall fence surrounding Hrothgar's kingdom.'")

Step 5: Grade Another Group's Descriptions and Choose the Winner.

Please look at the grading schedule and grade four members of your assigned group using the student rubric. Please refer to the group-grading schedule.

7. To learn more, watch Angela Lee Duckworth's TED talk "The Key to Success? Grit." http://www.ted.com/talks/angela_lee_duckworth_the_key_to_success_grit?language=en?

8. More information can be found in Dweck, C. S. (2006). Mindset: The new psychology of success. New York, NY: Random House.

9. Frye, N. (1964). The educated imagination. Bloomington: Indiana University Press.

Beowulf Character Description Student Rubric

1. Writer's last name:
2. Writer's first name:
3. Writer's character name:
4. Vividness of the description: (Circle one) 5 6 7 8 9 10
5. Why did you give the points above?
6. Character development: (Circle one) 5 6 7 8 9 10
7. Why did you give the points above?
8. Creativity: (Circle one) 10 12 14 16 18 20
9. Why did you give the points above
10. Your last name:
11. Your first name:
12. Your period:

I suggest using a Google Forms–like platform that allows all questions to be required.

Beowulf Character Description Winner Selection Form

As always, completing the form indicates whom we should consider to have achieved the "boss" level on this assignment. Choose top four contenders and explain why you think the person should win. You may nominate yourself and explain why you deserve the honor.

1. Who do you think has the best description of a real character?
2. Why? (Remember to cite actual text from the writer whenever possible.)
3. Who do you think has the second-best description of a real character?
4. Why? (Remember to cite actual text from the writer whenever possible.)
5. Who do you think has the best description of an imaginary character?
6. Why? (Remember to cite actual text from the writer whenever possible.)
7. Who do you think has the second-best description of an imaginary character?
8. Why? (Remember to cite actual text from the writer whenever possible.)

Teacher Rubric

You will be graded on:

1. Vividness of the description (A+ = 10 / A = 9.9-9 / A- = 8.6-8.7 /B+ = 8.5 / B = 8 / C+ = 7.9-7.1 / C = 7 / D+ = 6.9-6.6 / D = 6.5 / D- = 6.4-6.0 / and F = 5.9=0)
    - I will consider: Level of vocabulary / Complexity of syntax /Use of poetic language.
2. Character development (A+ = 10 / A = 9.9-9 / A- = 8.6-8.7 /B+ = 8.5 / B = 8 / C+ = 7.9-7.1 / C = 7 / D+ = 6.9-6.6 / D = 6.5 / D- = 6.4-6.0 / and F = 5.9=0)
    - Character development = the character must be "playable."
3. Creativity (A+ = 20 / A = 19.9-19 / A- = 18.6-18.7 / B+ = 18.5 / B = 18 / C+ = 17.9-17.1 / C = 17 / D+ = 16.9-16.6 / D = 16.5 / D- = 16.4-16.0 / and F = 15.9=0)

1. I will look at how well you blended the information from *Beowulf* and your own imagination. Cleverness counts a lot here!

APPENDIX B

Survey Results

The following questions relate to creating your game.

1. After creating the game on Beowulf, I feel that my understanding of the time period and Beowulf's world has increased.

- Strongly disagree: 1.6%
- Disagree: 8.2%
- Agree: 57.4%
- Strongly Agree: 32.8%

2. How challenging was it to create the game?

- Extremely challenging: 6.6%
- Challenging: 52.5%
- Somewhat easy: 37.7%
- Too easy: 32.8%

3. While creating the game, I consulted my classmates often on the content of the poem.

- Strongly disagree: 6.6%
- Disagree: 24.6%
- Agree: 49.2%
- Strongly agree: 19.7%

4. While creating the game, I had to write often.

- Strongly disagree: 1.6%
- Disagree: 3.3%
- Agree: 29.5%
- Strongly agree: 65.6%

5. While creating the game, I had to edit and rewrite various texts.

- Strongly disagree: 1.6%
- Disagree: 6.6%
- Agree: 52.5%

- Strongly agree: 39.3%

6. While creating the game, I got ideas from reading my friends' texts.

- Strongly disagree: 1.6%
- Disagree: 18%
- Agree: 49.2%
- Strongly agree: 31.1%

7. While creating the game, I feel that I had to use my imagination often.

- Strongly disagree: 3.3%
- Disagree: 0%
- Agree: 8.2%
- Strongly agree: 88.5%

8. Would you say that you learned a lot about Beowulf by making the game?

- Yes: 91.8%
- No: 8.2

The following questions relate to playing your game.

9. While playing the game, I consulted my teammates often.

- Strongly disagree: 0%
- Disagree: 3.3%
- Agree: 47.5%
- Strongly agree: 49.2%

10. While playing the game, I often thought about how to manage my points.

- Strongly disagree: 1.6%
- Disagree: 8.2%
- Agree: 37.7%
- Strongly agree: 52.5%

11. While playing the game, I feel that I had to use my imagination often.

- Strongly disagree: 3.3%
- Disagree: 1.6%
- Agree: 18%

- Strongly agree: 77%

CHAPTER 4.

IMMERSIVE LEARNING—USING ROLE-PLAYING GAMES TO TEACH CREATIVE WRITING, LITERATURE, AND HISTORY

BY TRENT HERGENRADER

INTRODUCTION: ROLE-PLAYING GAMES AND STORYTELLING

As a kid growing up, I always knew I wanted to be a writer. I had no idea what that really meant but I had an unmistakable knack for telling stories. I read whatever I could get my hands on but I particularly liked adventure books, short stories, and comics. And, like most kids, I also watched a lot of science fiction and fantasy movies. In the 1980s, J. R. R. Tolkien's *Lord of the Rings* and George Lucas's *Star Wars* had a firm grasp on the public imagination and there was no shortage of material featuring knights fighting dragons or space explorers probing far-off galaxies. I was three years younger than my older brothers and thus I was exposed to a lot of exciting, mysterious, and confusing things that were just beyond the reach of my understanding. Foremost of these was the tabletop role-playing game (RPG).

I remember trying to play *Dungeons & Dragons* when I was 7 years old. I'd seen my brothers playing with their friends and I wanted to give it a go. I enlisted a friend my age and we attempted, and failed, to make sense of the rule books and character sheets, with the latter's myriad boxes and blank lines meant for recording a bewildering number of combat bonuses and penalties. We figured out enough to roll up a couple of characters with basic stats—strength, dexterity, constitution (whatever that meant), and the rest—and then had them whale on each other with long swords. I don't think the two of us ever played the game together again, and for all I know he soon forgot about it. But for me it was merely the beginning.

My parents were always good about feeding their children's interests and we acquired several RPGs, most of them published by TSR, the company that invented *Dungeons & Dragons*. Our stack of games spanned every genre and time period imaginable. In addition to the classic fantasy *D&D* and its library of supporting material (called sourcebooks), we also owned *Boot Hill*, a Wild West game; *Top Secret*, a spy thriller; *Star Frontiers*, a game set in deep space; the postapocalyptic *Gamma World*; and later, the media tie-ins of *Indiana Jones, Conan the Barbarian*, and *Marvel Super Heroes.* Every game had its own distinct rule system that explained how to create customized characters and description of the fictional world, often in excruciating detail. The game sets always included a sample adventure and a few maps to help you start playing. I spent many hours flipping through rule books, perusing the tables of random encounters, examining the weapons and armor available, and studying the monsters and enemies that players might face. These RPGs weren't stories in themselves, but they were chock-full of storytelling *potential*. Even when my siblings refused to play with their uncool little brother, I'd take some dice, a rule book, and a notepad and roll up as many adventures as I could on my own. Afterward, I'd often write stories about what happened to my imaginary characters.

Though I didn't realize it at the time, the experience of participating in a personalized story is one of the primary reasons RPGs came into being in the first place.[1] Back in the early 1970s, a group of war gamers were interested in adding a more personal touch to their play. War games of the period focused on military tactics in which players controlled the movements of hundreds of soldiers as they refought famous battles across historical periods, including the medieval era. RPGs were an innovation because they allowed players to control the actions of a single combatant by the way of the player-character (PC), and they soon injected elements of fantasy, such as ogres and dragons. PC creation quickly expanded to include a wider range of attributes, attitudes, and motivations. While characters were still founded on basic archetypes—the warrior, thief, or wizard—they possessed unique personalities. The PC allowed these players to enjoy a simulated experience of the fantastic worlds presented in J. R. R. Tolkien's *Lord of the Rings* or Robert Howard's *Conan the Barbarian* series. The popularity of the RPG grew exponentially and quickly eclipsed that of traditional war games, especially among adolescents and young adults. RPGs influenced a number of today's most important authors of both literary and genre fiction, including Junot Díaz, Sherman Alexie, China Miéville, and George R. R. Martin[2], to name a few.

HOW RPGS WORK

When I first started teaching creative writing to college students, I employed traditional workshop methods. The basic process entails having students dissect a published work of writing; identify its various narrative elements; produce work that demonstrates their ability with some aspects of craft; and have that writing critiqued by their peers. While the traditional workshop has its merits, I quickly became frustrated by what I perceived as an overall lack of engagement. When we discussed the published fiction, many students thought they needed to know what a story meant before they could talk about issues of craft. They seemed unconvinced when I said that stories have broad themes but no specific, singular meaning. Many students approached their writing with similar single-mindedness, in which flat characters voiced some universal truth the writer wanted to express, and they rarely showed enthusiasm for each other's work. Overall, it felt as if too many of my students were simply going through the motions.

As a lifelong lover of literature and writing, I thought this made little sense. Reading stories and writing your own was supposed to be *fun*, not a chore. So I dispensed with the traditional workshop and focused instead on more experimental forms of creative writing instruction centered on collaborative writing, digital tools, and critical thinking. Print forms of literary fiction did not model

1. For an exhaustive history of the origins of tabletop RPGs, see Peterson, J. (2012). Playing at the world: A history of simulating wars, people and fantastic adventures, from chess to role-playing games. San Diego, CA: Unreason Press.
2. Gilsdorf, E. (2014, July 13). A game as literary tutorial. Retrieved from http://www.nytimes.com/2014/07/14/books/dungeons-dragons-has-influenced-a-generation-of-writers.html

the kind of work I wanted students to complete so, as a solution, I turned to a very different source: the RPG.

Before I describe my methodology, it's useful to describe how a tabletop (also called pencil-and-paper) RPG works. Generally speaking, a gaming session involves a group of players (usually no fewer than three and no more than six or seven) during which one person serves as the gamemaster (GM), the one who describes the setting, has inside information about the story, and uses the game rules to determine whether the players succeed or fail in their efforts to overcome challenges. The GM also assumes the role of every other character the players may encounter, called non-player characters (NPCs). The players each control a PC (player-character) and choose actions they will take to overcome any challenges. Digital RPGs are a very popular genre of video game in which the GM's role of determining outcomes is assumed by the computer. Digital RPGs offer plenty of advantages, including the ability to play by oneself and the opportunity to replay scenarios multiple times, but players are restricted to the choices presented in the game's code, unlike a tabletop RPG, in which the story can go wherever the group's collective imagination chooses to roam.

Here's an example of how a tabletop RPG works. Let's say that the GM has the PCs meet a queen who promises to pay them handsomely if they can collect information about a rebellion that's allegedly brewing. The GM directs them to a tower in a seedy part of town where a rebel conspirator is rumored to have set up his headquarters, but a burly well-armed guard stands at the door. The players confer and form a plan. Do they try to fast-talk their way past the guard? Sneak up and knock him out? Climb through an open window around the corner? Based on the decisions the players make—and thus the actions their PCs take—the GM decides how the various challenges will be addressed. If a PC attempts to climb through a window, the GM may require that she roll dice against her dexterity ability to see if she succeeds; failure may mean that she attracts attention or even falls and hurts herself. Meanwhile, another PC may be trying to distract the guard through small talk. In this case, the GM plays the role of the guard and engages the player with some impromptu dialogue mixed with dice rolls to see if the PC is successfully convincing, or whether she's roused the guard's suspicions. And a third PC may be lurking in the shadows, aiming his bow at the guard's head while the rest of this is happening. …

As this example illustrates, game sessions are free-flowing and unpredictable. In his book *The Fantasy Role-Playing Game: A New Performing Art*, Daniel Mackay defines the RPG this way:

> [It is] an episodic and participatory story-creation system that includes a set of quantified rules that assist a group of players and a gamemaster in determining how their fictional characters' spontaneous interactions are resolved. These performed interactions between the players' and the gamemaster's characters take place during individual sessions that, together, form episodes or adventures in the lives of the fictional characters. (p. 4)[3]

That's a mouthful but let's break it down into the essential parts. For Mackay, RPGs are:

- *Episodic*, meaning the action happens in discrete episodes, similar to a TV series. RPG game sessions in which the players get together of course have a start and end time in our real world, but the action in the game world is continuous and open-ended.

3. Mackay, D. (2001). The fantasy role-playing game: A new performing art. Jefferson, NC: McFarland.

- *Participatory*, meaning that it requires participation from every player. Because everyone is involved in the action, no one can sit on the sidelines during an RPG. Every player's decisions affect the story and everyone else in the group.
- Based on *rules* that give players tools to resolve challenges and give them boundaries for their play. Some of the rules are flexible; others are not.
- *Spontaneous*, meaning that the players generate the game events on the fly. While typically the group has some agreed-upon general plotline, more often than not the game veers in unplanned directions.
- *Lived experiences* of fictional characters, each of whom has personal histories, attributes, desires, flaws, and motivations. The better the players know the dispositions of their characters, the easier it is for them to make decisions on how they would act. This increases their engagement with, and enjoyment of, the game.

In short, an RPG drops players into a fictional world where they control the actions of a detailed, unique character of their own creation. For players to be successful, they must understand both the distinct nature of their character as well as how the world works in terms of its politics, economies, values, societies, and many more details. Thus RPG stories derive from the decisions the character makes as he or she navigates the particular challenges of the given environment.

RPGs promote this flexibility in storytelling by providing sourcebooks full of weapons, armor, maps, NPCs, monsters, vehicles, adventure scenarios, and more. Players can easily mix and match whatever elements they want to bring into the game thanks to the compatibility of the entries in sourcebooks. These entries have *quantitative* and *qualitative* aspects that allow them to be easily integrated into the game. *Quantitative* information is usually objective, expressed numerically, and ensures the world has an internal consistency. The *qualitative* information is usually more subjective in its application, expressed narratively, and gives suggestions for how the entry can be brought into play.

Figure 1 shows an example of a typical sourcebook entry from the *Song of Ice and Fire Role-Playing Game.*[4] The *quantitative* information allows players to understand quickly how the Scout stacks up against other characters. For example, if he has a marksmanship ability of 3, players know the Scout is a better shot with a bow than characters with a marksmanship value of 2, but would be half as good as a character with a marksmanship value of 6. The *qualitative* information gives a short narrative describing a Scout, including details of how he or she might act if encountered in the game.[5]

4. Schwalb, R. (2009). A song of ice and fire roleplaying game: A Game of thrones edition. Seattle, WA: Green Ronin.

5. Carriker, J. (2012). Night's watch: A sourcebook for A song of ice and fire campaign guide: A Game of thrones edition. Seattle, WA: Green Ronin.

SCOUT

Middle-Aged Rogue/Fighter

Whether raiding another tribe or following the seasonal movement of wildlife, any group moving across the wild lands north of the Wall needs to know where they are going, and who (or what) else is likely to cross their path. The scout serves as the advance eyes of the war or hunting party, ranging far afield from the main line of travel and returning to report on the lay of the land. As a part of a more sedentary community the scout can serve as a picket, providing advance warning of incursions, or as a hunter, supplying the village with game. In any case, the scout must have a broad and balanced skill set, to be able to operate independently for days at a time, living off the land and surmounting challenges on his own.

Though he may be something of an outsider, the scout knows the value of the community, and from bitter experience the consequences of being alone in the wild. His missing ears, lost to frostbite, pay testimony to the hazards of isolation, and he counts himself fortunate to have lost as little as he did.

Abilities		
Agility	4	
Animal Handling	3	Ride 1B
Athletics	3	
Awareness	4	
Cunning	3	
Deception	3	
Endurance	3	
Fighting	4	Axes 2B
Marksmanship	3	Bows 2B
Status	1	
Stealth	4	Sneak 1B
Survival	3	Hunt 2B, Orientation 2B
Will	3	

Qualities

Benefits: Blood of the Wildlings, Provider (see page 105)

Figure 1. An excerpt from an entry for a Scout from the Night's Watch sourcebook from the Song of Ice and Fire Role-Playing Game showing both quantitative and qualitative information.

This combination of the qualitative and quantitative information present in each entry allows players to draw from sourcebooks for their game on the fly. Given the wealth of details RPG sourcebooks provide, players can assemble an infinite number of stories tailored around their specific interests. At the time of writing this chapter, *A Song of Ice and Fire Role-Playing Game* has only four resources—a core rule book, a campaign guide, and two sourcebooks—but those total more than 800 pages detailing the minutiae of the fictional world, its inhabitants, and scenarios for play. It's impossible to browse them and not be flooded with ideas for role-playing stories.

USING RPGS TO CREATIVE AN IMMERSIVE LEARNING EXPERIENCE

So how can RPGs relate to the work teachers do in creative writing, literature, and history courses? It's because they provide what James Paul Gee refers to as a *situated* and *embodied* experience that educators can use to leverage deep learning.[6] In a *situated* experience, all learning happens within the context of a specific question or problem. In a game, this means players pursue specific goals using a variety of strategies that can be attempted, reflected upon, refined, and then tried again in a model similar to the scientific method. In an *embodied* experience, learning happens through the act of physically doing something or experiencing it through a virtual avatar. Gee argues that this combination of situated and embodied experience leverages deep learning far better than merely

6. Gee, J. P. (2003). What video games have to teach us about learning and literacy. New York, NY: Palgrave Macmillan.

reading a textbook of exercises, which tend to be more conceptual and decontextualized, not to mention dull.

This means that educators can use RPGs as a way to immerse students in a world unlike our own in an embodied way through the virtual avatar of the PC. The foreign world being explored might be in a work of literature, a period of history far removed from the present, or a world of the class's own creation. While a commercial RPG will describe the world of the game in detail, for teaching creative writing I prefer to have the students create the world themselves. We spend a good chunk of the course debating how our invented world's societies, economies, politics, and other factors combine to constitute the "daily life" for the characters who live in it. The general framework consists of the following:

- Step 1: *Select an RPG system and discuss its rules.*
- Step 2: *Conduct a world-building survey* as a point of discussion for talking about social structures, institutions, economies, politics, culture, and other dimensions of daily life.
- Step 3: *Populate the catalog with items, locations, and characters.*
- Step 4: *Plot entries on a map* to introduce spatial relations and sense of place.
- Step 5: *Create perspective characters* who experience the world in unique ways based on their attitudes, personalities, and skills as well as their position in society based on their sex, race, age, sexual orientation, and economic class.
- Step 6: *Write short narratives* about the world from the perspective of that character.

Like the RPGs from which this methodology was inspired, this approach is meant to give educators many different pieces with which they can experiment and tailor to their specific purposes. The nature of the activity will require students to work collaboratively and think critically throughout the entire process.

Step 1: Select an RPG System and Discuss Its Rules

While this might seem a daunting task given the wide array of RPGs on the market, it's actually not that hard. RPG players want a system that finely balances various game elements so it doesn't result in lopsided play. For the purposes of the classroom, though, balance is less important because we're using only the core rules, namely the quantitative and qualitative data that define the people, places, and things in the world and the basic game mechanic—dice rolls, cards, and so forth—that determines whether a player succeeds in making a desired action.

Plenty of RPGs offer "quick start rules," which allow players to test the system before making a purchase, and these bare-bones versions allow students to work from the same rules without having to make a costly purchase. I recommend downloading a few and skimming the section on player creation.[7] As you read, ask yourself: Is this easy to understand? If not, choose a different system. Some popular games include *Dungeons & Dragons*, *Pathfinder*, *Savage Worlds*, various *GURPS (Generic Universal Role-Playing System)* environments, and *World of Darkness.* In my creative writing classes I've

7. The website DriveThruRPG (drivethrurpg.com) offers dozens of free "quick start rules"; free basic rules for Dungeons & Dragons can be found at http://dnd.wizards.com/articles/features/basicrules.

used *World of Darkness* because I appreciate how the system foregrounds the range of attributes, both physical and mental, that go into the character-creation process, but the choice is rather arbitrary because much of the classroom work will be customizing the system to specific learning outcomes. Even the core system of the high-fantasy, combat-oriented *Dungeons & Dragons* could be a model for a setting, such as a historically accurate 19th-century Southern plantation, for example. Have the students read the description of the world presented in the rules, and then ask them: In about as much space, how might they describe the most prominent features of the world they're creating? *Dungeons & Dragons* emphasizes the language and tone that emphasize adventure and exploration. What language and details might be appropriate when describing the setting of a 19th-century plantation?

Once you've chosen an RPG system, spend some time in class discussing what kinds of quantitative and qualitative information makes up the catalog entries of the role-playing game and begin making adjustments. For example, I used *World of Darkness* (*WoD*), a supernatural horror RPG, for a creative writing class that chose to create a postapocalyptic world. Character creation in *WoD* consists of players' assigning a finite number of points across three primary Attribute and Skill qualities (divided into physical, mental, and social categories), allowing for a tremendous amount of character diversity. Some of the skills, such as the mental skill of Occult Knowledge, for example, were specific to the supernatural horror genre and made no sense for a postapocalyptic setting. We swapped this out for Faction Knowledge, meaning characters with this skill would have information about various factions that had formed after society's collapse. Likewise, we didn't think the physical skill of Larceny would mean much in a lawless world, so we changed it to Scavenging, an action characters commonly perform in postapocalyptic stories.

Changing the rules to suit your needs provides a good classroom introduction to this entire process. It relies on a group dialogue that flows freely in a constant exchange of ideas, and decisions can always be revisited and altered later. The instructor acts as both facilitator and moderator, pushing students to think about alternatives while ensuring the process doesn't veer too far off the task at hand.

Step 2: Conduct a World-Building Survey

To create an immersive learning experience for students assuming the role of characters, they need to fully understand the complexities of the world in which they'll be immersed. This means becoming familiar with a wide range of factors that influence daily life for the people living in the world, including social forces they might not recognize. In creative writing lingo, describing such minutiae is called *world building*.

Before you begin world building, it's a good idea for students to practice deconstructing worlds distinct from our own and to identify the various social, political, economic, and cultural influences present in them. In my creative writing class, I had students read postapocalyptic short stories in the collection *Wastelands*, watch the film adaptation of Cormac McCarthy's *The Road,* and play the digital RPG *Fallout 3* as an introduction to role-playing games. We discussed the varieties of apocalypses we'd experienced, including talking about the social structures formed after society's collapse, what constituted "power" in these new worlds, the roles adopted by men and women in these societies, and much more. We also roughed out sketches of the protagonists and main characters as if they were RPG characters, identifying their primary skills and abilities. This exercise exposed them to a range of ways that writers and artists built worlds and also foregrounded the kind of work they'd be doing during their own world building.

When it came time to create our own world, I conducted a Web survey that consisted of two parts: one that answered "big questions" about the postapocalyptic world and a second that addressed more specific social, economic, and political concerns. Both parts provide a starting point for discussions about writing the world's metanarrative, or the story that told the story of the world. The "big questions" part asked the following:

- How the apocalypse happened (biological warfare, nuclear war, pandemic, etc.)
- When the apocalypse happened (ancient, Renaissance, Industrial Revolution, early 20th century, present, near future, or far future)
- How long ago the apocalypse had happened (anywhere from yesterday to 100 years ago)
- Whether the world was an alternative version of our reality or an entirely new world
- The size of the explorable world (a country, an average-sized state, large city, small city)
- The geographic features present (coastline, desert, forest, mountains, etc.)
- The season (winter, spring, summer, or fall).

The questions were quantitative, that is, radio buttons and sliders as opposed to short answers. Such questions provide a general framework for the fictional world and also stimulate thinking about how answers might combine in interesting ways. For example, a world where a disease wiped out most of the population one year earlier will be quite different from a world 100 years after a nuclear holocaust. Beginning writers often fail to think about geography and the season when starting a new story, yet shelter and travel are dramatically affected based on the weather; frigid winter and hot summers present unique challenges for characters, especially those living in a world without a stable infrastructure.

The second and longer section was titled "tricky social questions" and laid the groundwork for critical classroom discussions. Each question features a rating scale of 1 to 5 and covered the following:

- Gender relations (from strongly matriarchal to strongly patriarchal with 3 being gender equality)
- Economic strength (from depression and scarcity to a booming economy)
- Economic distribution (from near total equality to extreme inequality)
- Race relations (from little tension between races to extreme levels of tension between races)
- Sexual orientations (from complete acceptance to zero tolerance of non-heteronormativity)
- Population size (from small [25K people] to very large [1.5 million-plus])
- Law and justice (from complete anarchy to robust system of laws, policing, courts, and jail)
- Political infrastructure (from "war of all against all" to strong democracy and free elections)
- Health care and education (from virtually nonexistent to widely available to all)
- Religious influence (from nonexistent to religion's being central to all aspects of daily life).

The questions are intended both be value neutral and thought provoking. For example, a world with a strong economy but high inequality could either be primed for a popular revolution against those in power, or it could be fragmented with gang factions fighting in the streets over scarce goods. Either option could provide a rich backdrop for storytelling. The process works just as well for discussing a work of literature or for a historical setting. Think about how a class might try to quantify Mary Shelley's *Frankenstein*, Mark Twain's *Adventures of Huckleberry Finn*, or a series of historical accounts about cities in the antebellum South.[8]

As we discussed the survey results in class, I asked students to relate their answers to our *actual* world. For example, I asked students where they thought our society is in terms of gender equity. While no one suggested we have a matriarchal society, some (usually young men) suggested we're somewhere between equality and slight patriarchy. Predictably, other students (usually young women) took exception to that, and as instructor I moderated the conversation as necessary, keeping discourse civil while suggesting questions students perhaps hadn't thought of themselves, including questioning how they quantified their answers. For example, I asked, "What does it even mean for a society to be *slightly* patriarchal? What would be the hallmarks of slightly patriarchal society? How does that differentiate from a mostly patriarchal society, for instance?" Such questions press them to ground theoretical concepts into a real world or situation. When the class reached some consensus, or when I called time, the question turned back to how the issue should be handled in the fictional world and the conversation continued. I repeated this for all 10 questions, a process that took several class periods.

The final decisions needed be turned into narrative for the qualitative part of the process, which proved to be an interesting writing challenge for students, especially when they opted for pat answers. For example, if a class decides that the postapocalyptic world has reached perfect gender equality, the logical question is "So how did that happen? Given the history of the world as we know it, that would be an extraordinary accomplishment." Such questioning across all categories prevents the speculative world from becoming mere escapist wish fulfillment and requires the authors to think hard about how social, political, and economic realities come to pass, and then to express that in the form of a narrative. The quantitative answers from the survey help pose these "tricky questions," and the qualitative narrative descriptions attempt to answer them.

During this process, appointed note takers recorded class decisions and posted them to a course wiki. Wikis have the advantage of being editable by any authorized user and each page features change logs and discussion threads. This prevents users from deleting content anonymously and also allows them to carry on conversations after class. I reserved class time for students to work in small groups and encouraged groups to consult with each other as they wrote. For example, the students working on the world's economic system were in constant discussion with the group writing about governmental structures. As instructor, I remained actively involved to steer any content away from genre clichés or essentialist depictions of groups of people, and I also prompted students to create new categories as they saw fit. For example, I encouraged them to begin adding professions and political factions once the economy and governmental structures had been better fleshed out. The process is flexible in terms of time requirements, as a less detailed world may be fleshed out in a matter of hours with details to be filled in later, or the process can span multiple class periods over weeks.

8. For an example of using this methodology in a literature class, see Kip Glazer's chapter "Beyond Gameplay—Using Role-Playing Games to Teach Beowulf in High School English" in this volume.

In my classes, we took about two weeks—the equivalent of six to eight classroom hours—and the students produced roughly 8,000 words or more than 30 pages of collaboratively written metanarrative.[9] While some students contributed more than others (which I tracked and assessed via the wiki page histories), no one could claim sole authorship for the work, because all parts of the world were inextricably linked to the others. Furthermore, students developed deep interests in certain aspects of the world and wanted to start filling in the narrative with more concrete details, which led to the next phase: populating the catalog.

Step 3: Populate the Catalog With Items, Locations, and Characters

Students revisited our game rules and determined which attributes were necessary for each of three entry types—items, locations, and characters—and how catalog entries should be quantified and qualified. In most cases, using a wiki allows students to add entries with a minimum of fuss; however, in situations in which technology might not be readily available, a wiki might introduce an unnecessary level of complexity. In this case, color-coded note cards would work almost as well. You could determine that all characters would be on red card stock, locations on green, and items on yellow. As long as the students provided consistent quantitative information on each, this would be a perfectly acceptable work-around.

I steered students toward making comparative, rather than numeric, terms to increase an entry's interpretive possibilities and resist essentialist claims.[10] For example, rather than stating that a wooden crate required a Strength of 6 to lift, it could be defined as being "very heavy." As long as entries use the terminology consistently—an encyclopedia and grand piano cannot both be described as "very heavy"—then the descriptors can suggest more fluid, interpretive relationships. A "very strong" person might be able to lift a "very heavy" object, but a "weak" one could not; for a "strong" person it would be a spontaneous judgment call.

Once the class reached an agreement about how catalog entries should be quantified and qualified, the world built out very quickly. I took the requirements for each type of entry and created a page template to ensure entries were completed consistently. For example, every item required a weight, value, and rarity—expressed either numerically or descriptively—and a brief narrative that gave it some context for how it is used in the world. Assigning students even a modest number of entries results in a very dense world. If every student creates only five locations and characters, in a 25-student class the catalog will have 125 unique locations and characters available to them for fiction writing, all in a matter of a few weeks.

Step 4: Plot Entries on a Map

The world-building survey establishes whether the catalog will be contained in a geographically small but dense urban area (e.g., Manhattan, Tokyo) or spread across an entire region, such as Southern California. The density of entries on the map will also affect the narrative: Do characters have to travel 30 miles to see their neighbor, or can they simply walk down the hall? How might that shape character

9. To see the scope of the writing produced during this time, visit the student-built site Welcome to Hellwaukee's Master narrative page here: http://hellwaukee.wikispaces.com/Master

10. To read more on some of the problems with essentialism in role-playing games, see Arjoranta, J. (2014, August 1). Game definitions: A Wittgensteinian approach. Retrieved from Game Studies: http://gamestudies.org/1401/articles/arjoranta

interactions? My first class chose the greater Milwaukee area, and the second chose the region of southeastern Wisconsin.

Using markers in Google Maps results in a map very similar to the ones found in digital RPGs such as Bethesda's *Fallout 3* or *Skyrim*. Figure 2 shows a close-up of more than a dozen map markers—some of which are locations and some are characters—in postapocalyptic Madison, Wisconsin. Note that the marker description contains a link to the wiki entry so users can easily move between the map and wiki.

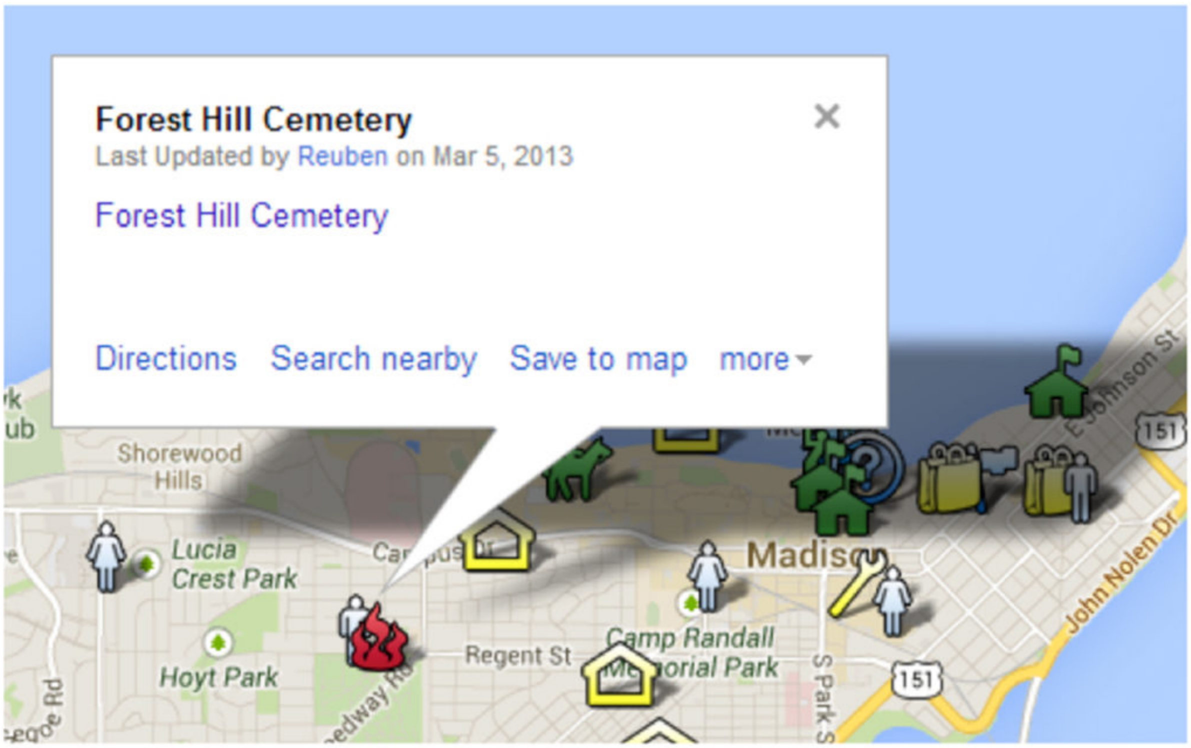


Figure 2. Map markers in postapocalyptic downtown Madison in Google Maps.

Students also gain a better spatial and temporal relationship between locations and characters through plotting locations on an actual place. Mapping also encourages them to use monuments and other culturally significant spaces in their fiction in meaningful ways. The map section can also be layered over the city where the students live, giving them incentive to reimagine and explore their own communities through the lens of a fictionalized world. If a Google map isn't feasible because of technology limitations, a large paper map would work just as well. Students could place numbered stickers, color coded by category, to identify various locations.

Step 5: Create Perspective Characters

With the completion of the critical world-building part of the course, the students should have a firm understanding of the multifaceted, complex world that will serve as an integral and active backdrop for their fiction. However, good stories need emotionally well-rounded characters too, lest the characters wind up feeling more like soulless lists of stats.

Tabletop RPG players often create elaborate identities for their player-characters (PCs) and write stories about them that take place before, during, and after game sessions.[11] For my fiction writing courses, I have adopted the term *perspective characters* to describe the personalities the players assume when writing their fictions, and I refer to them using the same abbreviation (PC).

First off, PCs should have at a minimum the same statistical categories as the wiki entries to ensure consistency across all characters in the catalog. Using the character-creation method described in the RPG system you chose is also a good option, though you might need to modify the rules to prevent student PCs from becoming larger-than-life superheroes.

Second, as an in-class activity, I ask a series of quantitative and qualitative questions inspired by creative writing textbooks and RPG character prompts.[12] This begins with their PC's "driver's license" and "tax return" information—height, weight, eye color, race, gender, occupation, level of education, economic class, current living situation, and so forth. They then include more personal details such as tattoos, style of dress, or other distinguishing features. In summary fashion, I ask them how a stranger at a bus stop might describe the PC at a glance in one to three sentences.

Next we move to broader, evaluative questions. I ask them to describe in three to four sentences their character's home life growing up and attitude toward education; then I ask for three to four sentences on the character's social network, attitudes toward the opposite sex, and his or her short- and long-term life goals.

Then we move into a series of quantitative aspects. I ask them to review a list of dispositions (angry, anxious, apathetic, ashamed, calm, contemptuous, curious, excited, joyful, melancholy) and choose the top two that best represent the character. I also encourage them to offer any alternatives. Then I ask them to rank their characters' following attributes on a scale of 0 to 100:

- *Outlook*—from pessimistic (0) to optimistic (100)
- *Integrity*—from unscrupulous (0) to conscientious (100)
- *Impulsiveness*—from spontaneous (0) to controlled (100)
- *Boldness*—from cowardly (0) to daring (100)
- *Flexibility*—from stubborn (0) to adaptable (100)
- *Affinity*—from cold/aloof (0) to warm/hospitable (100)
- *Comportment*—from gruff/antisocial (0) to charming (100)
- *Interactivity*—from reserved/loner (0) to engaging/outgoing (100)
- *Disclosure*—from secretive (0) to candid (100)
- *Conformity*—from conservative/orthodox (0) to heterodox/shocking (100).

11. For more on storytelling and role-playing games, see Cover, J. (2010). The creation of narrative in tabletop role-playing games. Jefferson, NC: McFarland. For a psychological perspective on character creation, see Bowman, S. (2010). The functions of role-playing games: How participants create community, solve problems and explore identity. Jefferson, NC: McFarland.

12. The prompts here are a combination of character-development exercises culled from Bernays, A., & Painter, P. (1990). What if?: Writing exercises for fiction writers. New York, NY: Harper Collins; and Bowen, A. (n.d.). The guide. Ash's guide to RPG personality & background. Retrieved from http://rpg.ashami.com/

I then have them give five-word catchphrase answers for their character's opinion on religion, general political views, sex and sexual relations, war and violence, drugs and alcohol, and the government.

The next section asks them to select their characters' two primary motivations and assign them values between 1 and 99 that cannot exceed 100 from the following list:

- *Achievement*—to be a career- or goal-oriented person
- *Acquisition*—to accumulate world possessions
- *Balance*—to seek an equilibrium between personal, social, and professional lives
- *Beneficence*—to give to others and improve society
- *Chaos*—to disrupt social institutions and sow chaos
- *Competition*—to find ways to test and prove oneself against others
- *Creation*—to value artistic endeavors
- *Destruction*—to tear down institutions and creations
- *Discovery/Adventure*—to explore the world and try new things
- *Domesticity*—to create and maintain a safe home space for a partner and family
- *Education*—to engage in intellectual pursuits or gain new skills
- *Enslavement*—to submit the will to authority figures and obey orders
- *Hedonism*—to revel in the pleasures of the flesh
- *Liberation*—to be free from social conventions or institutions
- *Nobility/Honor*—to live and lead by following a strict moral code
- *Order*—to promote specific social structures by which to live
- *Play*—to push the boundaries of social acceptability
- *Power*—to acquire the ability to make life-changing decisions on the behalf of others
- *Recognition*—to gain outward validations from members of the community
- *Rebellion*—to undermine authority and institutions
- *Service*—to give one's life to improve life for others
- *Torment*—to harry and harass enemies
- *Tranquility*—to find inner peace
- *Understanding*—to develop insights into the complex workings of the world.

They are also free to suggest other motivations not listed.

The final section is a series of 24 questions I ask in 24 minutes, or one minute per question. Students are encouraged to complete each question in the time allotted, though they may come back to questions later if they get stumped. The pressure to answer under duress replicates the quick thinking required when playing a tabletop RPG, and such snap decisions help them learn more about their own characters. These are some examples of questions I have used:

1. What would shame or embarrass your character?
2. What is your character most afraid of?
3. What's your character's greatest flaw?
4. Does your character have any prejudices? Why or why not?
5. What secrets does your character keep from others?
6. When is the last time your character cried and why?
7. What are your character's greatest strengths?
8. What's your character's idea of a perfect date?
9. What makes your character most happy in life?
10. What person had the biggest positive impact on your character's life?
11. How does your character feel about animals? Keep any pets?
12. How does your character feel about personal grooming and dress?
13. How many friends does your character have? How many close friends?
14. How many people has your character slept with? Currently sleeping with?
15. How many people in your character's immediate family?
16. What's your character's favorite book?
17. What's your character's most prized possession?
18. What's your character's favorite food?
19. What one album would your character take with him or her to a desert island?
20. If your character dressed up for Halloween, what costume would s/he choose?
21. If someone made a movie about your character, who would be the lead actor and why?
22. If your character were one of the four seasons, which one would it be and why?
23. If your character were an animal, what kind would s/he be and why?
24. If a bartender created a drink and dedicated it to your character, what's in it and why?

The PC customization process can be completed in one class session. The time limit forces spontaneous thinking similar to that required during an RPG session. To mix things up, I also choose certain attributes for students' PCs. For example, in my postapocalyptic class I had 70% of their PCs living in crushing poverty, which dramatically altered their relationship to other characters, especially wealthy ones.

Step 6: Write Short Narratives

At the end of the process the class will have a sprawling, collaboratively built world complete with a detailed history plotted onto a map, and each student will have a unique PC. The entire process can be completed in about six weeks, based on three hours of class time per week. While students typically develop plenty of story ideas in this time, instructors can also add more gamelike variations such as:

- Choose at random two characters, an item, and a location for each PC and have students write a story that prominently features each entry.
- Choose two locations and have the PC travel between them, describing what he or she experiences along the way.

- Ask PCs to give a detailed, personalized history of a specific location on the map.

If you're teaching literature or history, such prompts can easily be adjusted for critical essays. For example, you could draw a random character or location from the entries and ask students to write on how the protagonist from a literary work would react to such a person or place, and have them ground their answer in evidence from the primary text. For history, you could select two random characters from the entries and have students write an essay explaining what those people's typical day might have been like in the given time period, reflecting on the unseen social forces that would likely shape their behaviors.

THE RPG AS TOOLBOX FOR IMMERSIVE LEARNING

Like the world we inhabit, fictional RPG worlds are extremely complex. Both worlds are in a sense governed by rules. The difference, however, is that RPGs must make the rules explicit; otherwise the game becomes no different from little kids' playing make-believe. These rules are inscribed on the fictional world through a combination of quantitative (numeric) and qualitative (narrative) elements that help players quickly and consistently add to their play. RPG stories derive from well-developed characters' making a series of interesting choices based on a variety of factors, including the characters' personal histories, motivations, and abilities, all which are factored against the types of challenges the game world throws at them.

In the fantastical worlds of commercial RPGs, this usually means some kind of adventuring, such as fighting dragons or hunting vampires. RPGs remain extremely popular because they provide a unique experience of being able to assume an identity different from your own and immersing yourself in an unfamiliar world. This immersive experience closely resembles the disciplinary goals of creative writing, literature, and history, through which we want students to think critically about the human condition from different perspectives that span multiple cultures and historical time periods. Thus the RPG offers an excellent model for collaborative classroom projects in which students attempt to first quantify and then narratively explain the complex workings of a world, and then to rationally describe the actions of the people who live in it.

The modular nature of the RPG also makes it an ideal teaching tool, or rather a set of tools: a toolbox. This chapter outlined a complex multiweek project with many different moving parts, but using just a part of this—the world-building survey, the mapping, or character creation—completed during a class period or two can be very effective as well. The goal is not to create a world for play, but rather to lay bare the workings of a world through rules. Expressing these rules through a combination of numbers and words presents a unique challenge for students, who must work together to create a coherent and consistent model through debate and compromise. Making these decisions requires that they return to the primary texts as they search for relevant details. Asking them to inhabit a personality, perhaps one unlike themselves, requires them to reflect on how social forces can affect an individual life, and how such forces change through time. Rather than passively absorbing content from a textbook, students develop a deep understanding of the course material through a situated and embodied experience that fosters critical thinking, and their newfound knowledge can be easily extended to how they view and live their own daily lives.

STUDENT WORLD-BUILDING SAMPLES

- http://steampunkrochester.wikispaces.com
- http://hellwaukee.wikispaces.com
- http://rivertown.wikispaces.com

CHAPTER 5.

THE WARD GAME: HOW MCMURPHY, MCLUHAN, AND MACGYVER MIGHT FREE US FROM MCEDUCATION

BY PAUL DARVASI

The Ward Game was born of despair late one night while I tried to work out how to introduce *One Flew Over the Cuckoo's Nest* to my senior high school English class. My graduating students were in the throes of *senioritis*, an annual descent into lethargy after university acceptances had been sorted out. Graduation was around the corner, and they were deeply committed to do the bare minimum with as little effort as possible. I had to introduce this novel in a climate of utter disengagement, but I thought the book was too good and the message too important to let fall by the wayside. What could I do to fire up their hearts and minds when they already had one foot out the door? How could I connect them to the world of Kesey's asylum while most of them wouldn't even bother reading the novel with prom and freedom so tantalizingly close?

I knew that my best chance at engaging them was to devise some kind of creative approach, but nothing came to me. It was late, I was tired, frustrated, and my ideas all felt flat and recycled. I was about to pack it in for the night, when I was struck by a comic image, likely induced by sleep deprivation. I saw myself sitting behind my desk at school, tapping at my laptop, wearing an oversized cartoony nurse's cap with a big, bright red cross. Weirdly enough, that image sparked a flow of ideas that led to the creation of *The Ward Game*: My English classes would become the psychiatric ward from Ken Kesey's classic novel. Students would be transformed into patients, playfully subjected to the mock-tyranny of a behaviorist regime. The game would be theatrical, ironic, satirical, unpredictable, oblique, self-reflexive and, ideally, insane. It would be a video game played in the real world. And maybe, just maybe, it could lead to a cure for *senioritis*.

ESCAPING THE SCHOOL ASYLUM

It's unnerving to consider how much a school can resemble an asylum. Both institutions strive to improve minds with the aim of producing functional members of society. Students and patients are extracted from the currency of daily life, institutionalized (often against their will), and subjected to a rigid diet of rules and schedules. They are placed in the care of authoritative specialists who keep records and reports on their charges, and failures to meet specific behavioral objectives are corrected with medication, coercion, and punitive measures. This analogy is clearly reductionist and oversimplified, but it carries an air of truth, partially because asylums and schools (we may as well add prisons) share common industrial roots. They function as assembly-line systems that aim to mass-produce a more or less uniform product. That product being a cured mental patient, a reformed prisoner, and an educated student, all milled and buffed to contribute to the smooth operation of the social machine.

In his depiction of the mental hospital in *One Flew Over the Cuckoo's Nest*, Kesey specifically attacked the very industrial elements and behaviorist strategies that linger in schools today. So it wasn't too much of a stretch to blur the lines between reality and fiction and graft a game inspired by the novel's mental ward to my school setting. It worked particularly well with my school, as I teach all boys who begrudgingly wear uniforms, and the patients in *Cuckoo's Nest* are also all male and uniformed. The game was played during the final 30 days of school so their imminent graduation and release from high school paralleled their release from the asylum. This happy coincidence of art and life caused my students to reflect on how deeply the novel and its central themes connected to their own lives and institutional experiences.

I strove to design the game in such a way as to preserve the novel's oppressive atmosphere and narrative arc but also, paradoxically, to bestow my students with the freedom and agency to play as they saw fit. As patients, they were immersed in a pseudo-Orwellian asylum world run by the ever-vigilant and controlling Nurse Ratched, who encouraged them to spy on each other and maintain concentric rings of secrecy. However, while committed, they undertook self-selected tasks, played games, carried out personalized activities and missions, and created artifacts to gain points and work toward their release. Gameplay was carried out on laptops and mobile devices combined with real-life activities and events. I'm not a programmer, and had no dedicated software, so I cannibalized everything from our school's internal mail system to freely available online software to meet the game's requirements.

The Ward Game is a type of hack, a transgression and reprogramming of the traditional education system. It's a Frankenstein-like installation piece cocreated by my students and me that critiques some problematic aspects of schools as it explores and proposes some alternatives. It asks big and uncomfortable questions, and many aspects of the game are risky, disruptive, and messy. I teach in a unique setting and the game was played at a time of year when I felt empowered and supported to push boundaries and trusted my students to approach the game in the playful spirit with which it was cast. I have now run it with two consecutive graduating classes and both iterations went largely without incident, but I would not recommend transplanting the game wholesale to another school. Like *One Flew Over the Cuckoo's Nest*, *The Ward Game* challenges mass production, scale, and a one-size-fits-all approach to education—what I like to call *McEducation*. Rather than a product to be exactly duplicated, I share my experience as a model with the hope of inspiring other educators to see what is possible and channel their inner artist and designer to create their own games that correspond to their unique personalities, subject areas, and school cultures.

In the sections that follow, I'll outline gameplay specifics, but I'll also frame the experience within a larger context of how *The Ward Game* and the novel that inspired it point to a renewed perspective of what learning can become in the 21st century.

THE EPIC BATTLE FOR CHIEF BROOM'S SOUL

Before delving into the game, I'll quickly recap the story on which it is based, particularly the themes that have a direct impact on education. Ken Kesey's *One Flew Over the Cuckoo's Nest* recounts the tale of a group of patients in an Oregon psychiatric hospital who suffer under the iron rule of the tyrannical Big Nurse. The story lives in the collective pop culture consciousness primarily because of Milos Forman's 1975 Academy Award–winning adaptation starring Jack Nicholson as the rebel patient and bon vivant Randle Patrick McMurphy—The Big Nurse's archnemesis. The novel still appears on some high school and college reading lists, but it has been largely eclipsed by the immense success of the iconic film. Like so many adaptations, the movie is a significant departure from Kesey's novel. One key difference is that Chief Broom Bromden, the self-effacing schizophrenic Native American war vet who is the narrator and protagonist, gets only a small part in the film. Kesey was so upset that Bromden's character was sidelined to a supporting role that he successfully sued the film's producers. Again, art reflects life, as the novel's main plotline is that the rebel McMurphy helps recover Chief Bromden from social marginalization and invisibility.

Chief Bromden is a child of nature who grew up freely hunting and fishing wild salmon on his people's reserve, but who has now succumbed to the machine of war, government, and, most recently, The Big Nurse's ward. He is prone to hallucinations and sees the machines of industry everywhere, a paranoia that leads him to believe that his life is controlled by a powerful shadow organization called The Combine. In simplest terms, Bromden's spirit and individuality have been crushed by a factory society that seeks to impose uniformity and conformity. He exists in a tragic state of death-in-life, feigning deafness, refusing to speak, hiding in corners, and generally hoping not to be noticed. Bromden can represent all those who have been robbed of self-esteem and self-confidence for their inability or unwillingness to conform to the prevailing system. In terms of education, Bromden *is* the Chief of the lost tribe of learners who have been disregarded, demoted, drugged, coerced, and discarded because they did not subscribe to assembly-line schedules, conveyer-belt rows, quality-assurance tests, performance evaluations, and top-down authority. Look around you, look inside—you may find Bromden there. Look around any school and you may see him there too.

Kesey's novel is an epic clash for Bromden's soul, an extreme depiction of a battle that takes place in almost every classroom in the world. On one shoulder sits the proverbial devil: The Big Nurse, whose smooth beauty and angelic white uniform speaks of icy sterility. She sees all, controls everything, and exacts a punishing course of treatment that relies on humiliation, coercion, and medication to scrub her defective patients of their unique personalities. She embodies the industrial machine reducing human nature to a state of malleable docility. Her methods of discipline and punishment have left Bromden in the broken state in which we meet him. She is an extreme—an archetype that distills and exemplifies the most destructive elements of McEducation.

On Bromden's other shoulder we have his angel, the devilish rebel R. P. McMurphy, who resists and challenges authority and conformity at every turn. He's a convicted felon, a con man, a gambler, and a scam artist. But don't let that fool you—he also has the makings of passionate and inspiring teacher—a resourceful and creative critical thinker who favors expression over repression, celebrates individuality, takes risks, embraces failure, and cures the patients with a curriculum of games, motivational speeches, embodied learning experiences, collaboration, and friendly competition. Ultimately, his unorthodox techniques save Bromden from the machine and help return the Chief to his natural state, allowing him to reclaim the rivers and pastures of his youth and recover his true identity and self-worth.

The clash between The Big Nurse and McMurphy's approaches to cure Bromden are the collision between our industrial present and the emerging digital future in education. The beauty of *One Flew Over the Cuckoo's Nest* as the narrative source of *The Ward Game* is that the players not only embody the events of the novel, but they also temporarily inhabit and reflect on a concentrated microcosm of the flawed education system and society that has shaped them.

COOKING WITH GAME MECHANICS

Whether board games, video games, pervasive games, or sports, game mechanics are the rules and constraints designers employ to make games fun and engaging. These might include rolling dice, eliminating an opponent's pieces, using a timer to limit task completion, or drawing a card from a deck. When I first designed *The Ward Game*, one of my tactics was to search for lists and explanations of game mechanics on the Internet and to choose the ones that I thought would best fit the game, engage and motivate my students, and express the novel's narrative. Besides accessing lists and catalogs of game mechanics, teachers might be mindful of how they are being entertained when they play games themselves and think about how they can apply these principles to their practice.

Game design involves much more than simply throwing mechanics and reward systems together. A balance must be struck between all the moving (and stationary) parts to produce an enjoyable and engaging experience. Like all art forms, including the art of teaching, this is achieved with a combination of knowledge, instinct, dedication, and trial and error. In the section below, I survey a series of gameplay components, or mechanics, that were used in *The Ward Game*. Rather than a recipe, it's a list of ingredients that any motivated educator or designer can draw from to produce his or her own creation. However, before embarking on a description of some of the individual mechanics, it would be useful to review the first day of the game, as this is how players are first drawn into the world of the asylum that was formerly their school.

SESSION 1: ADMISSIONS

On the first day of play, students arrived to class to find me, their English teacher, in a lab coat bearing a cartoonish oversized "Dr. Spivey" name tag. I was curt, officious, and edged with slightly menacing tone as I ordered them to sit down and listen carefully. I addressed the players as patients: "Welcome, patients" and individually I referred to them as "Patient Smith" or "Patient Patel," a practice I would maintain throughout the game. Once they'd settled in, I introduced myself, welcomed them to the ward, and reviewed some basic expectations and regulations, as well as the session's (no longer called "class") agenda. I explained that they would strive to earn up to 100 points on the Mental Metric Scale, which would then translate into 10% of their English grade. They had 30 days to achieve the highest score possible, and if they reached the 100-point maximum before the chronological end of their stay at the ward, they'd be discharged or released early, at which point they were free to use their time as they saw fit. Many were visibly enticed at the prospect of an early release.

I projected the online calendar that normally contained class agendas, homework, and relevant links to show that it had been modified and renamed The Bulletin Board. Inspired by the ward bulletin board in the novel, the redesigned webpage served a similar function to its predecessor, but with a decidedly institutional flavor. Session agendas, rule updates, and new elements to the game would be posted here. Because the page was visible to other members of the school community, a number of the links on The Bulletin Board were password protected to prevent prying eyes from accessing sensitive ward information. Players were provided passwords on a need-to-know basis.

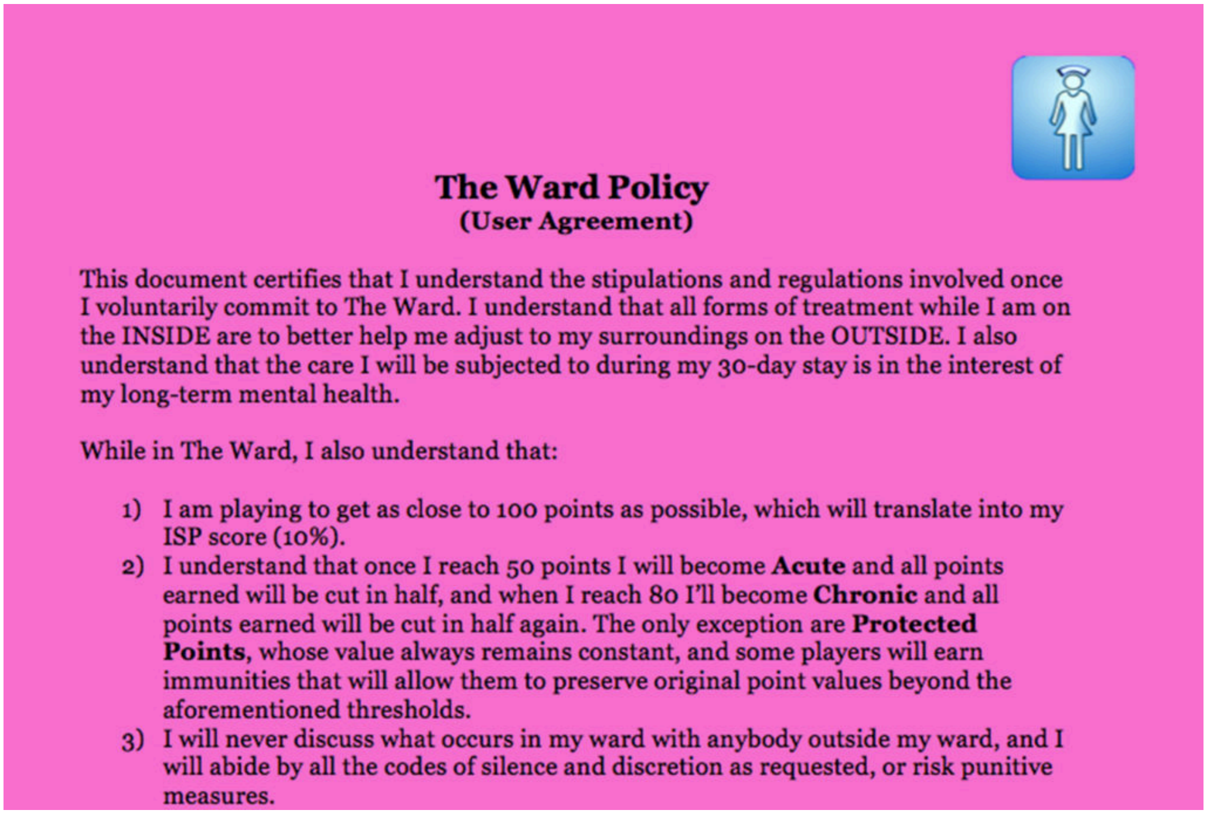
Next, I introduced all-seeing Big Nurse by projecting her admissions video prominently on the classroom screen. What began as an unusual class took a sharp turn for the bizarre. The Big Nurse was their teacher in drag, with a 5 o'clock shadow, misapplied lipstick, and a cartoony nurse's costume and shades that only added to the creepiness. Her voice was electronically altered using GarageBand, and the video was produced to look like a grainy and washed propaganda reel à la Big Brother. The video was received with a combination of shock and nervous laughter.

In the game, The Big Nurse never appears in person but communicates through social media, email, text messages, and the occasional propaganda video from her secret nurse's station. My design goal was to make her seem more daunting, mysterious, and powerful, but keeping her behind a wall of media also made it easier for me to portray multiple characters in a single game. After her brief introduction to her course of treatment and institutional philosophies, The Big Nurse asked that patients follow her on Twitter for an easy 5 points (see Figure 1). The Twitter account was tied to The Big Nurse's Facebook page, so that players would be alerted to any updates.

Figure 1. The Big Nurse video.

After the video, I distributed bright pink forms with The Big Nurse's blue logo printed on the top right-hand corner. Employing a common fascist propaganda strategy, I branded the game with The Big Nurse's logo on every possible document, artifact, social media site, and video. The pink sheet was a Ward Policy admission contract that, when signed, "committed" patients to the ward for 30 days (see

Figure 2). I playfully blended the language of a medical release form with the user agreements that players must accept before installing a video game. The document set out the basic rules, but I wrote them in an ambiguous and porous way to allow for the rules to be changed and altered on the fly.



The Ward Policy
(User Agreement)

This document certifies that I understand the stipulations and regulations involved once I voluntarily commit to The Ward. I understand that all forms of treatment while I am on the INSIDE are to better help me adjust to my surroundings on the OUTSIDE. I also understand that the care I will be subjected to during my 30-day stay is in the interest of my long-term mental health.

While in The Ward, I also understand that:

1) I am playing to get as close to 100 points as possible, which will translate into my ISP score (10%).
2) I understand that once I reach 50 points I will become **Acute** and all points earned will be cut in half, and when I reach 80 I'll become **Chronic** and all points earned will be cut in half again. The only exception are **Protected Points**, whose value always remains constant, and some players will earn immunities that will allow them to preserve original point values beyond the aforementioned thresholds.
3) I will never discuss what occurs in my ward with anybody outside my ward, and I will abide by all the codes of silence and discretion as requested, or risk punitive measures.

Figure 2. Part of the Ward Policy document.

Once the contracts were signed and returned, I told players that they had to create lockers and journals by the next session. The "lockers" were Google Sites pages and the "journals" were online blogs that they were instructed to embed in their lockers. The lockers were used to house a miscellany of player-generated data: records of completed missions, images of artifacts, personal point tallies, achievements, and any other important items or documents that they picked up during their stay in the ward. Throughout the game, players were prompted to write brief, directed entries in their journals. Once created, each locker URL was sent to The Big Nurse, who tracked them from a master page. I reminded them that The Big Nurse could enter any player's locker at will and read the journals whenever she liked. Furthermore, I warned players to keep their lockers secure, as some of their fellow players might succumb to the temptation of gaining unlawful entry for reasons yet to be disclosed. Murmurs erupted as they wondered what would cause them to break into each other's lockers. This never actually happened, but I learned that seeding misleading tidbits kept them on their toes and contributed to the game's atmosphere of paranoia. I also warned them that they could be subjected to arbitrary locker checks, and if anything were found to be missing or incomplete, points would be lost. Alternately, points would be gained if everything were in order and up-to-date. Locker checks were determined by randomly picking cards from a deck marked with each player's name.

Each player then had to take out his "Authorized Edition"—the exact required edition of *One Flew Over the Cuckoo's Nest*. I took each book in turn and placed a sticker on the front cover printed with the patient's name, a unique serial number, and The Big Nurse logo (see Figure 3). They were told that they must have the Authorized Edition with them for every session, and a failure to produce it upon request would lead to punitive measures, including the possible loss of points. The players-patients were thus numbered and serialized, all uniformly reading the exact same edition of the book.

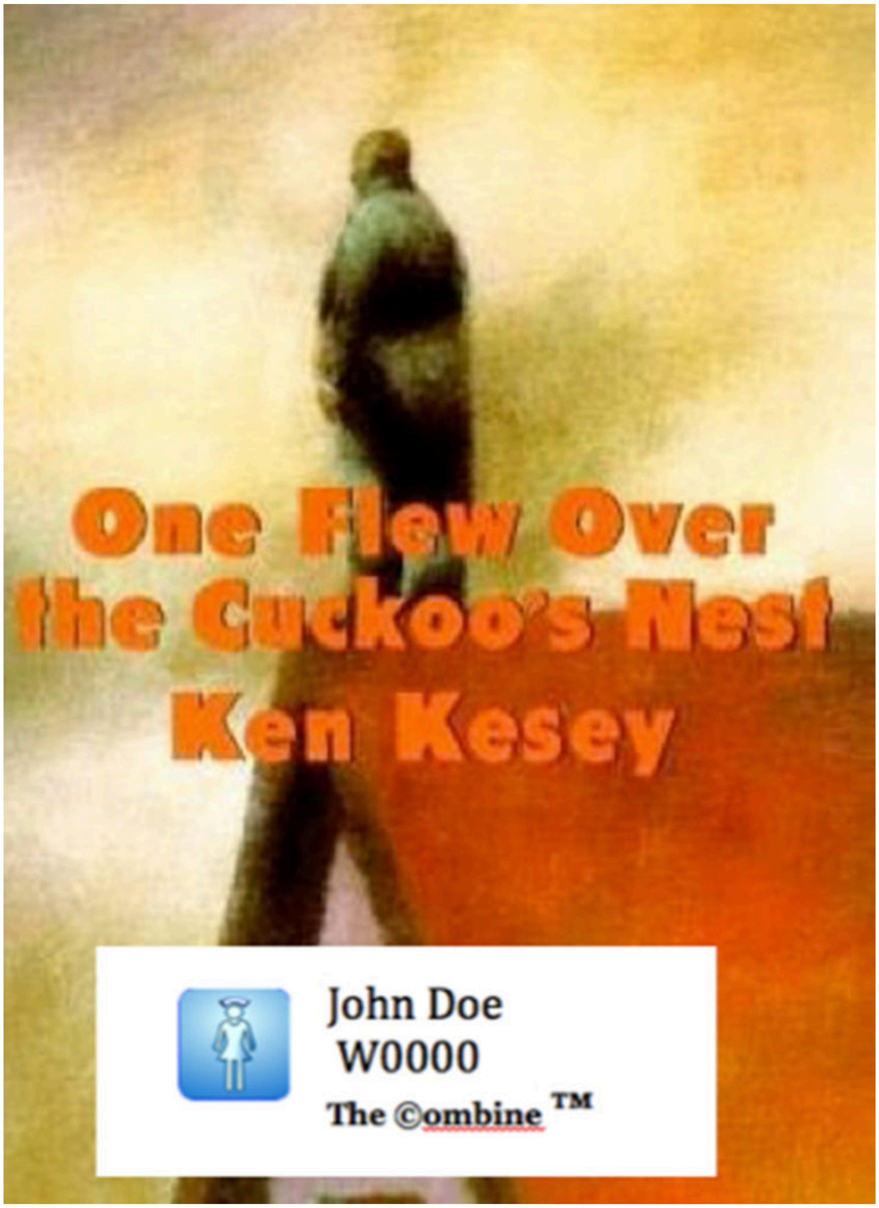


Figure 3. The Authorized Edition with patient ID sticker.

I ended the first session with a few quick rounds of a mini-game called *Random Admissions Interview*. I shuffled a standard deck, each card having a sticker with a player's names, picked a card, and read the name aloud. Players could accept or decline to be interviewed. If they accepted, they were asked three content questions about the novel taken from their assigned reading. If the player responded to two out of three questions correctly, he received a sealed envelope with a bonus inside (see the "Envelopes" section below).

My final warning to the players before dismissal was that they could not discuss any aspect of the game outside of their ward (class) other than with their ward mates. To ensure the observance of this rule, The Big Nurse offered to reward any player who sent proof of an "unauthorized discussion." Players caught discussing the game out of turn would be punished with point deductions. Any damning evidence (Facebook and smartphone screen shots, audio recordings, etc.) had to be sent to an email address called The Log Book, where The Big Nurse would review it and act accordingly.

With a few minor variations, this session was repeated for each participating class.

SURVEILLANCE AND ESPIONAGE: THE BIG NURSE IS WATCHING

Mirroring the atmosphere of Nurse Ratched's ward in *One Flew Over the Cuckoo's Nest*, *The Ward Game* was enveloped in a cloud of secrecy and low-level paranoia. In the novel, Nurse Ratched keeps a log book at her station in which patients are encouraged to document any transgressions by their fellow inmates, which is why all evidence of unauthorized discussion in the game were sent to an email address also called The Log Book.

It's not hard to imagine why this was one of the most exciting and problematic elements of the game. On the positive side, it is a faithful and immersive embodiment of the novel that discourages outside discussions of the game, lending it intrigue and mystery. Inversely, it seeded genuine mistrust among players and encouraged the violation of the oldest and deepest school-yard code: No snitching. I mitigated any potential fallout by taking measures to protect the identity of players who forwarded evidence to The Log Book, including denying perp access to the evidence produced against them, as it might lead them to the informant. If the charge were challenged, a committee of teachers would review the evidence to verify and confirm its validity. To soften the blow, first-time perps were sent an initial warning from The Big Nurse (see Figure 4), and only repeat offenders were actually docked points, which happened on only a handful of occasions. In the end, no visible disputes arose, but the potential certainly existed. Further design changes could preserve this element of the game to eliminate the possibility of bad feelings or retribution.

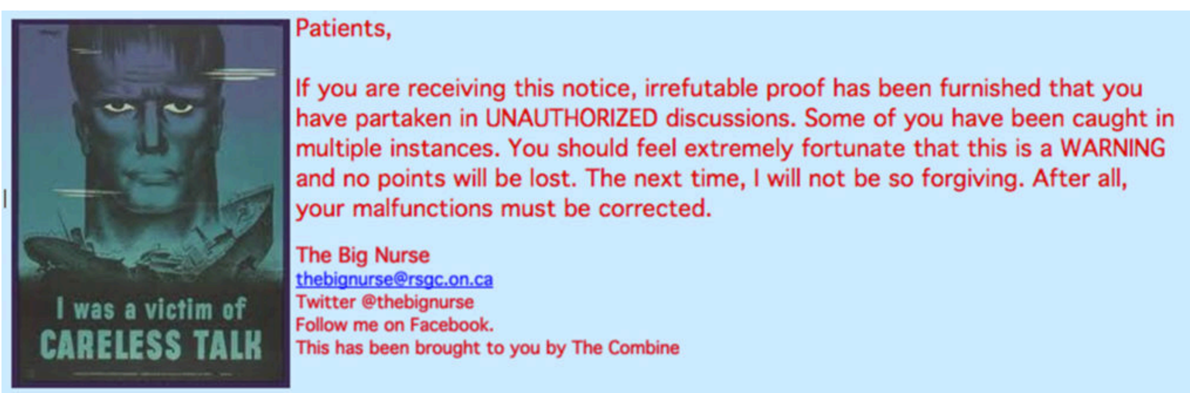


Figure 4. A warning to patients caught in unauthorized discussions.

This mechanic is timely and relevant when viewed as a critique of the rise of surveillance in the digital age. Will low-level paranoia become a norm in a society where, at any point, individual, corporate, and government entities record our data and activities? Is it time for schools to start taking surveillance literacy and digital citizenship more seriously? Experiencing the perils of the invisible eyes and ears of the digital world firsthand is an effective way to create awareness, even in short-term simulated form (see Figure 5).

Figure 5. The Big Nurse is always watching.

ROLE OF ROLE-PLAY IN PLAY

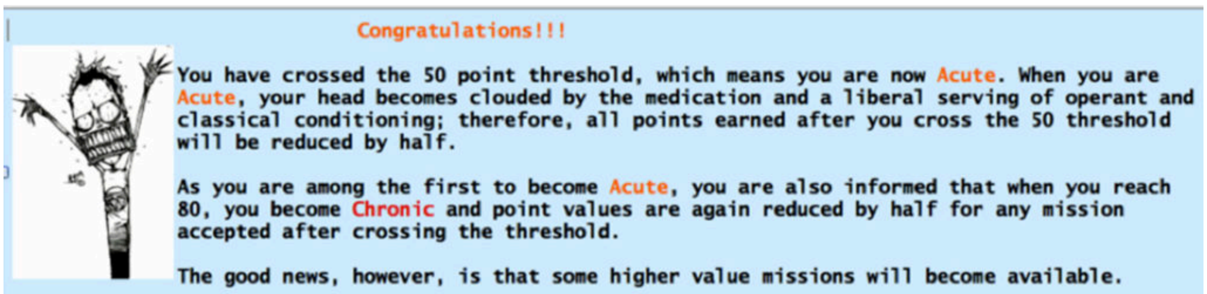
Whether assuming the role of The Big Nurse, Dr. Spivey, or others in the cast of nonplaying characters (NPCs), role-play was an important aspect of the game. I had six lab coats and name-tags handy, so that if other teachers and observers entered my class, they could also assume the role of a clinician from the novel.

Players themselves, however, were not asked to role-play. Most of my students would not be keen to stay in character or assume an artificial persona for a sustained period or at all. They were treated as patients but were not asked to act like them. There were some missions that players could choose that required they act like a character in the novel but, for the most part, they merely acted as themselves. I thought this created more buy-in and deeper immersion as their true, unmitigated personas were subjected to the asylum's mock tyranny, and their responses and actions would thus be genuine and unscripted.

ACUTES, CHRONICS, AND ESCALATING DIFFICULTY

The first time the game was played, scores started to add up at an alarming rate, as I had blindly distributed points without considering the rate of accumulation. This was a significant design problem, as many players could conceivably earn 100 points and finish the game in a few weeks.

Typically, the further a player progresses in a video game, the more difficult it becomes. Inspired by this mechanic, I issued a "patch" advising players of a change to the point system. Once they reach 50 points they become *Acute* and all points earned were cut in half. Similarly, when players reach 80 points they become *Chronic* and the value of points earned were cut in half again (see Figure 6). For example, as a Chronic, the completion of a 10-point mission would earn the player 2.5 points. In the novel, Acute is the label for the curable patients and Chronics are those considered incurable. In a reversal of the expected outcome, and keeping consistent with the novel, this system implies that the patients' mental health deteriorates the longer they are subjected to The Big Nurse's course of treatment.


Congratulations!!!

You have crossed the 50 point threshold, which means you are now Acute. When you are Acute, your head becomes clouded by the medication and a liberal serving of operant and classical conditioning; therefore, all points earned after you cross the 50 threshold will be reduced by half.

As you are among the first to become Acute, you are also informed that when you reach 80, you become Chronic and point values are again reduced by half for any mission accepted after crossing the threshold.

The good news, however, is that some higher value missions will become available.

Figure 6. An email notice that a player has become Acute.

Some of my colleagues with whom I shared this solution wondered if players would take my on-the-fly modification badly. I was, after all, fiddling with points that equated into grades. Technically, the contract provided for this type of flexibility, but legalities do not always satisfy justice. My students would riot if I changed my grading rules to their significant disadvantage halfway into an assignment. Oddly enough, I did not receive a single objection or complaint.

Why such a forgiving attitude? Maybe many of the players are lifelong gamers who innately understand the value and necessity of escalating difficulty. Also, university acceptances were in, so grades were not quite as important as they had once been. I'd like to think that a number of players welcomed the change as an additional challenge with the prospect of prolonging the game. Finally, players realized that the game was a work in progress and perhaps sympathized with my predicament. Maybe they were simply too scared to confront The Big Nurse.

Keeping track of points was extremely time consuming. I had no dedicated software, so I tallied everything with pen and paper, updating scores every few days. This could be easily rectified with an Excel spreadsheet or some other automated system that would create a tighter feedback loop so that players could reap more immediate gratification for their actions.

GAMIFICATION AND THE TWO FACES OF MOTIVATION

A discussion of points in games played in educational contexts leads to a consideration of extrinsic versus intrinsic motivation and raises the specter of *gamification*, or applying game mechanics to a nongame context. As with many new words, its definition remains somewhat fluid, and different parties have appropriated the term in different ways. Without delving too deeply into some of the controversy clouding the concept, I'll simply say that some designers and academics believe that gamification does not really create a game but artlessly slaps on points, badges, levels, gold coins, and leaderboards to extrinsically motivate participation. Those who malign gamification think this undermines the virtue of a good game, whose motivation to play should come from the game in and of itself rather than from the lure of external rewards. It bears adding that these external rewards are clearly analogous to grades and salaries in the games of school and life, respectively.

Ideally, students would not be motivated merely by grades, but by the love of learning, and workers would be motivated by a fondness for their labor and not their salaries, but this is clearly naive and unrealistic. My experience both as a classroom teacher and running *The Ward Game* has taught me that there are many people out there who are happily driven by extrinsic rewards. Ultimately, this points to a question of choice and the individual. I don't see a problem with an inherently good game also including extrinsic motivators. Players who respond well to extrinsic motivation should be granted the opportunity to satisfy this need in a game.

The Ward Game combines both intrinsic and extrinsic incentives. Players strive to earn 100 points and have the choice to amass money or badges (called Achievements), both of which are cashed in for points at the end of the game. *The Ward Game*'s ability to motivate intrinsically is attested to by the numerous players who reached 100 points before the game was over and continued to play. There were also many players who carried out tasks or initiated activities that yielded no points or external rewards other than the simple joy of play. As the game's design evolves, I'd like to make the entire point system optional as well, granting yet more choice.

In the case of *The Ward Game*, the inclusion of both intrinsic and extrinsic motivators is also an artistic decision that expresses an important theme in the novel. To some degree, intrinsic motivation can be associated with McMurphy, who uses games, excursions, and the freedom of agency to incentivize the patients. Inversely, The Big Nurse motivates patients with a system of reward and punishment to exercise control and achieve her therapeutic goals. If the game is a proper encapsulation of the novel, it should include the two faces of motivation.

DAILY MEDS

A significant aspect of ward life in the novel is the consumption of daily medication, in which patients partake both willfully and by force. To embody this element of the story, players had the option to email Nurse Pilbow a medication request from 7:55 a.m. to 8:05 a.m. every weekday morning. If they succeeded in doing this for five consecutive mornings, they would be rewarded with 10 points. A single missed day meant that they had to start again. This was inspired by a video game mechanic called *appointments*, in which players must carry out an action at a specific time/place. It's a core gameplay feature of many online games, including the immensely popular *Farmville*.

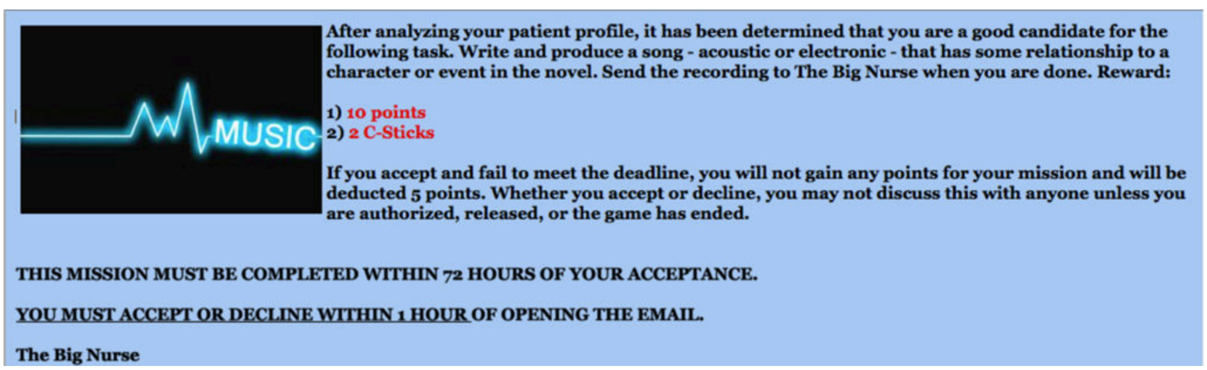
THE MISSION SYSTEM

Missions are the central game mechanic in *The Ward Game*. Missions were designed to serve a variety of functions and interests, and they allowed players to manage their own schedules with much greater flexibility and independence than a traditional classroom structure. Generally, they were to be completed individually, but many also tasked players to collaborate. I first sent missions randomly via email but later moved to a system in which players requested them directly from The Big Nurse. I'm now reworking the system to create a mission pool that players can access directly and pursue self-selected mission paths. Regardless of the delivery system, all missions were optional and could be accepted or rejected at will, preserving the element of player agency and choice. To keep in line with the game's clinical atmosphere, missions were called "prescriptions" during the game, but to avoid confusion, I'll continue to refer to them as missions.

A week before launch, I asked my students to fill out surveys to determine their areas of interest, whether art, business, writing, sports, science, math, and so forth. Whenever I sent a player a mission, I would review his survey responses and tailor it according to his interest. This strategy worked well, as most players accepted the first or second mission they received. Once accepted, players had to meet a completion deadline and, if not met, the prescription was considered failed and points were deducted. Every mission has its unique rewards that might include points, envelopes, in-game currency, and/or the option to complete further related missions. Missions were the game's primary engine of productivity, recruiting players to produce artifacts, carry out tasks, and help build, organize, and document the game. General mission categories and descriptions are listed below.

Creative Production Missions

These required players to respond creatively to the novel and included the production of creative writing, music, videos, fine art, and performance (see Figure 7). All tasks were related to the novel, and usually aligned with the part of the story being read when the mission was issued.



After analyzing your patient profile, it has been determined that you are a good candidate for the following task. Write and produce a song - acoustic or electronic - that has some relationship to a character or event in the novel. Send the recording to The Big Nurse when you are done. Reward:

1) 10 points
2) 2 C-Sticks

If you accept and fail to meet the deadline, you will not gain any points for your mission and will be deducted 5 points. Whether you accept or decline, you may not discuss this with anyone unless you are authorized, released, or the game has ended.

THIS MISSION MUST BE COMPLETED WITHIN 72 HOURS OF YOUR ACCEPTANCE.

YOU MUST ACCEPT OR DECLINE WITHIN 1 HOUR OF OPENING THE EMAIL.

The Big Nurse

Figure 7. Mad Music, an example of a creative production mission.

Blind Collaboration Missions

In this subset of creative production missions, students created artifacts collaboratively without knowing they were working with other players. For example, a player was asked to write a two-page script humorously describing how schools resemble factories. Once it was completed and submitted, a second student was tasked to create a podcast from the script. Finally, a third player was sent the podcast and tasked to turn it into a short pastiche video. None of the players were told the origin of their source material, which was possible because missions were secret and could not be discussed.

Research and Synthesis Missions

Students were tasked to research specific topics, usually related to mental-health issues. These might vary from finding out the name and purpose of certain types of pharmaceuticals (see Figure 8) to researching laws affecting those who suffer from mental-health issues. Depending on time constraints and relevance, the results of these missions were sometimes presented to their ward.

After analyzing your patient profile, it has been determined that you are a good candidate for the following task. Research three types of anti-psychotic drugs that are used in modern mental health practices. Create a small chart that has their brand name, generic name and general purpose.

If you accept, you will be rewarded as follows:

1) 10 points
2) Unlocks an offsite mission chain

You may accept or decline this mission. If you accept and fail to meet the deadline, you will not gain any points for your mission and will be deducted 5 points. Whether you accept or decline, you may not discuss this with anyone outide your ward unless you are authorized, released, or the game has ended.

Figure 8. Pill Drill, an example of a research mission.

Organization Missions

Players were tasked to organize events such as a secret art exhibit or a basketball tournament, like the one that staff and patients played in the novel.

Documentation Missions

These missions helped document the game as it was played. While I was busy running the game, these missions enlisted students to film, photograph, and record a variety of events during gameplay. The items and artifacts generated by the creative missions and other undertakings also became part of the game's documentation.

Game-Building Missions

Much like the documentation missions, this family of missions tasked players to contribute to the growth and development of the game. For example, these included designing the in-game economy, writing a speech for a Big Nurse video, designing propaganda posters, authoring missions, planting QR codes and devising corresponding clues, producing images and videos that would become part of a larger treasure hunt, and so forth (see Figure 9). These missions grew from my having moments of feeling overwhelmed and outsourcing tasks to keep the game rich, engaging, and varied. Players often did not realize that their missions were part of a greater project or that they were contributing to the design and construction of the game.

After analyzing your patient profile, it has been determined that you are a good candidate for the following task. Create a mission for The Big Nurse. It must be formatted, designed and written exactly like a standard mission. The more creative the mission the better.

1) 10 points
2) 2 C-Sticks
3) 15 if you can design it as a 2 step chain mission.

If you accept and fail to meet the deadline, you will not gain any points for your mission and will be deducted 5 points. Whether you accept or decline, you may not discuss this with anyone unless you are authorized, released, or the game has ended.

THIS MISSION MUST BE COMPLETED WITHIN 96 HOURS OF YOUR ACCEPTANCE.

YOU MUST ACCEPT OR DECLINE WITHIN 1 HOUR OF OPENING THE EMAIL.

Figure 9. Mission Possible, an example of a game-building mission.

Ward Missions

During a few regularly scheduled sessions, players were given the option to undertake individual, small-group, and large-group ward missions. Individual activities varied from finding a quiet place to catch up on reading the novel to creating an infographic on some aspect of the story. Small ward missions for two to three participants might involve creating a one-page comic or poster. Large ward missions for four to eight participants included making short films or a trading-card set based on characters in the novel. Larger ward missions had an assigned project manager who would coordinate the group. All of these missions had to be completed within one hour. It was astonishing and impressive to see what players could produce while laboring under the pressure of a countdown timer, a mechanic common to board games, video games, and game shows.

Chain Missions

Some missions were chains, meaning that the completion of one mission unlocked the option to complete another thematically relevant mission. A good example is a mission that tasked students do some basic research around psychiatric pharmaceuticals. A chain of subsequent missions eventually led them on a self-directed visit to the Centre for Addiction and Mental Health (CAMH) and the completion of relevant tasks related to their tour. This was an important event, as the students were exposed to the reality of treating mental illness in an institutional setting, which they could compare and contrast with how it was being depicted in the novel.

GAMES, CHOICE, AND DIFFERENTIATED INSTRUCTION

Missions, quests, and challenges are effective means to create personalized and meaningful gameplay experience, which occasions a brief discussion on the importance of choice. As I've mentioned, I tried to individualize most aspects of the game to promote engagement and player ownership. Many conscientious educators try to apply differentiated instruction and cater to individual student needs. The problem is that despite best intentions, teachers who manage large classes with a broad spectrum of needs don't have the time and resources to successfully address each individual. It's unrealistic to expect that in a single year teachers can familiarize themselves with each student's unique profile and devise and follow through with an individuated learning plan. Looking down the road, perhaps computers and software may be able to help.

Video game developers have long known that a key to engagement is to allow players to customize in-game options to create personalized play experiences. A common strategy to foster individuation within games is to offer options and choice, whether it's choosing an avatar's class or hairstyle, following a unique skill tree, or simply ranging freely in an open world where missions and quests can be accepted or ignored. Players are motivated to proceed and persist because they enjoy the freedom and agency that let the game evolve according to their unique profile. Education can learn much from video games. Imagine the transformative possibilities if the design resources that go into creating high-caliber video game software were harnessed for the purposes of education. I don't believe that software should or can replace dedicated flesh-and-blood teachers—yet—but it can be a powerful tool to support and assist in getting the best out of their students.

Guided by one of *One Flew Over the Cuckoo's Nest*'s central themes, *The Ward Game* celebrates the individual and strives to cater to each player's unique personality. On the narrative surface the game satirically implements The Big Nurse's oppressive and unyielding regime but, in terms of functional gameplay, players have the freedom to choose their own paths. To begin with, they are given the option to play or not play the game at all. The handful of students who decided not to play undertook parallel independent-study projects on the novel. Those who chose to play could opt in or out of most aspects of the game, and they even contributed to the development and design of the game with unanticipated elements of their own devising. Even without dedicated software to help with individuation, no two players in *The Ward Game* had the same experience, and each played to his strengths and interests. This may explain why some of my most unmotivated students became the game's most productive players. They were released from a restrictive system that didn't gel with them and were given the freedom to play and express the best version of themselves.

There is, of course, such a thing as too much choice. Whether in a game, or any other type of pedagogical system, granting choice is an important strategy to help cultivate engagement and solicit the best an individual has to offer. I do believe, however, that there are limits to choice. Students will likely make choices that reinforce their strengths and interests, which is good, but this could easily become indulgent. Ideally, a well-designed system provides choice but also exposes learners to unfamiliar areas and encourages them to explore new knowledge and skills that they may not pursue of their own volition. Ultimately, a balance must be struck between guided learning and choice.

THE CIGARETTE ECONOMY

In the novel, the patients use cigarettes as black-market currency, but adopting cigarettes as the in-game currency posed an obvious ethical dilemma. It might be construed as an endorsement of smoking by fostering what advertisers call a "presence" and glamorize cigarettes in the players' spongy adolescent minds. I took this issue up with our principal, who suggested I get around the problem by calling them "cancer sticks," thus building a health advisory into the name. The name was eventually shortened to "C-Sticks" or, as some patients started calling them, "pixie sticks" or simply "pixies." I follow the word's evolution only to give a glimpse at how the game was such a cultural force with the player that it is spawned its own jargon.

In the first run I had used hard currency, but for the second I aligned with the modern world and digitized the entire economy. I added a column called "C-Sticks" to the online grade system so players could monitor their accounts at their convenience. Each player started with 10 C-Sticks and I modified their accounts when informed of transactions, or when C-Sticks were earned for completed missions or other activities. To facilitate transactions I created an auction and trading center in an open conference (essentially an online forum) on our email client called The Day Room. Many video games, such as *Diablo III* and *World of Warcraft,* employ auction houses, and in *Cuckoo's Nest*, the day room is the common space where patients socialize, play games, and conduct transactions, illegal or otherwise.

Players used The Day Room to buy and sell goods and services and conduct many of their transactions. Having it centralized to one place let me monitor activities and adjust accounts accordingly. The Day Room was extremely active, and money regularly flowed from one account to another. They would buy and trade envelopes, artifacts, passwords, and items and information necessary to complete missions. On a few occasions I received a notice requesting a C-Stick transfer without more explanation than "for services rendered." I let it go and complied because I was happy to see that the economy had taken a life of its own and was clearly being used for real-world transactions. At the end of the game, players cashed in their C-Sticks for points.

ENVELOPES

Envelopes were an exciting part of the game's reward system. As with most in-game items, they were branded with The Big Nurse's logo and awarded for winning games, competitions, and completing missions (see Figure 10). Players who won envelopes pulled them randomly from a stack. Inside they would find bonus cards that could be saved, used, sold, or traded. Some examples of the bonuses are listed below.

Figure 10. Envelope with bonus card.

Password Hack

Players could request any in-game password from The Big Nurse.

Mission Extension 24 or 48

This card granted players a 24- or 48-hour extension for completing any mission.

Acute or Chronic Immunity

This valuable card granted players immunity to the loss of point value imposed at the Acute and Chronic levels, respectively.

Film Festival

I disallowed players to use images from the Milos Forman film for their artifacts, as I thought it curtailed their creative apprehension of the novel. This card temporarily exempted them from this rule.

Make It Stop

In *One Flew Over the Cuckoo's Nest*, Nurse Ratched controls the music in the ward, which consists of a short and mundane playlist with a heavy emphasis on Lawrence Welk. McMurphy is driven crazy by the repetitive music and pleads with Ratched for a change, which she categorically refuses. Staying faithful to the narrative, I played Lawrence Welk's "Misty" on repeat for entire sessions. Like McMurphy, players begged me to change or stop the music, but I ignored them. This card licenses a player to force me to stop playing Lawrence Welk.

GAMES WITHIN GAME

Throughout the game, I employed mini-games that strove to genuinely express an aspect of the story at the appropriate part of the narrative arc. These games-within-game generally reinforced knowledge of the novel's content and could be seen as creative and entertaining alternatives to traditional content tests. I've already discussed the first game, *Admissions Interview,* in my review of the first day of gameplay, and the others follow.

Pecking Party

Pecking Party is a competitive elimination game inspired by McMurphy's description of The Big Nurse's emotionally punishing therapy sessions. He compares the sessions to a pecking party, a term for a flock of chickens that peck each other to death one at a time. The point of *Pecking Party* is to eliminate all other players by stumping them with player-generated quiz-style questions about the novel.

The flock of players arrange themselves in a circle with Authorized Editions in hand, which they can access at any time. The first player to "peck" has 30 seconds to formulate a question that can be directed at any other player remaining in the flock (circle), who has 30 seconds to respond. If the victim responds incorrectly, or the time runs out, he is "pecked out" and must leave the circle. The correct answer does not have to be provided and the attacker can ask the same question of another player. Technically, a single player can eliminate an entire flock with one good question. If the victim responds correctly, he sidesteps the "peck" and becomes the one asking the questions, thus taking control of the game. The game ends when the flock has been wiped out and one player is left standing. The last three players to be eliminated all earn points that contribute to their overall total.

The Inquiry

In the novel, The Big Nurse holds a roundtable discussion with a group of doctors and clinicians from the hospital to discuss what to do with the troublesome McMurphy. In the game, it's the players as patients who undertake a similar discussion, which is a slight departure from the narrative.

The Inquiry is a structured discussion format based on the Harkness method, originally developed in the Phillips Exeter Academy. The method tracks each participant's contribution both in terms of length and content and provides a framework that promotes a balanced, deliberate, and constructive analysis of a concept and/or development of an idea. Participants gather around a conference table and are assigned roles such as timekeeper, note-taker, prompter, and so on to self-regulate and organize the discussion. Players were tasked to discuss the concept of behaviorism, for which they prepared by taking notes on a reading and two short videos on the topic. The discussion aimed to unpack three questions: How does behaviorism operate in (a) the novel, (b) the school as a whole, and (c) their specific ward (class)? A second session asked them to come up with a diagnosis and course of treatment for Chief Bromden.

The Inquiry is a team effort, and points were uniformly awarded to the entire group, albeit scores were sometimes modified for individuals who underparticipated or did not adequately fulfill their role.

Sefelt and Fredrickson

This game was inspired by the dynamic between two epileptic characters in the novel. A patient named Sefelt refuses to take his medication because he fears that his teeth and hair will fall out, and his friend Fredrickson seeks additional medications because he's terrified of having a seizure. Consequently, they develop a symbiotic relationship in which Sefelt secretly pawns off his pills to Fredrickson.

For this game, players are paired off, one becoming Sefelt and the other Fredrickson. Each Sefelt is given a paper medication cup with three candy pills, while the Fredrickson cups are empty. Each pair starts at zero and they are forbidden to access their books during gameplay. Each Sefelt and Fredrickson team is called up to the front of the class one pair at a time and have 30 seconds to collaboratively respond to a question about the novel. If they answer incorrectly or not at all they earn no points and the medication cups remain unchanged. If they answer correctly, a pill is transferred from Sefelt's cup to Fredrickson's and they each earn 2 points and move to the end of the order. Each pair has three opportunities to answer questions. If a pair answers all three questions correctly, in addition to the points each team member receives an envelope with a bonus inside.

The Fishing Expedition

Near the end of the novel, McMurphy takes his fellow patients and Dr. Spivey on a fishing expedition on a stolen boat. There are three rods on the boat, and the patients take turns to try and reel one in. For this game, a deck of cards is rigged with stickers depicting a variety of fish specifically mentioned in the novel, varying from lowly chum fish to the cherished halibut (see Figure 11). Most of the cards, however, are marked with a "Hell's Bells! Try Again!" sticker that indicates an empty line.

Three desks (fishing stations) are set up at the front of the class and, like the patients in the novel, the players come up in groups of three to try their hands at the reels. Once players take their stations, I shuffle the deck and lay a card in front of each player. If they get a "Hell's Bells! Try Again!" they're automatically out and must move to the back of the line. If they receive a fish card marked with a point value reflecting the size of the fish (chum fish = 1, Chinook salmon = 5, halibut = 8, etc.), they are asked a question about the novel. If answered correctly, they receive the points marked on their card. If they are incorrect they are out. Once a round is over, three new players move up take their places at the reels.

Figure 11. The cherished halibut card from The Fishing Expedition.

Aside from being fun, the advantage of these games over tests or quizzes is that they are a union of form and content. The *way* in which players are tested for knowledge reinforces a narrative element of the text. Questions about the fishing expedition, for example, occur while on a simulated fishing expedition. Also, the questions and answers are spoken aloud, allowing all players to listen in and strengthen their understanding of the novel's content.

TREASURE HUNT: THE STOLEN BOTTLE OF DILANTIN

At the end of the second week of play, a very angry Big Nurse issued a video announcing that the ward's medicine cabinet had been broken into and a large bottle of Dilantin stolen (see Figure 12). Any player who found the bottle would receive 100 points and become automatically discharged from the ward. The prospect of a perfect score and quick exit instantly caused a stir. To find the missing jar, treasure hunters had to solve a long and complex trail of clues that included videos, passwords, puzzles, and ciphers that were accessed through hidden websites and QR codes. I'd enlisted players who unwittingly created clues for me through missions.

There was lots of interest in the hunt but, sad to say, no player made it past the first few clues. I knew it was doable because in the first year I ran the game two students successfully finished a similar hunt with many of the same clues. Regardless, the path to total victory had to be challenging.

Figure 12. The missing bottle of Dilantin.

Even after the game was over, players pestered me to reveal the jar's location, but I kept my lips sealed in case I used the symbolically apt hiding spot again. The story is ultimately about Chief Bromden's redemption and escape to freedom. He is incarcerated in the asylum and symbolically associated with dogs so, fittingly, I hid the jar under a blanket in an unused dog cage in one of the classrooms. A number of players had a creative writing class in that room, totally unaware that the much sought-after medicine bottle was only a few feet away.

SOCIAL MEDIA AND PROPAGANDA

The Big Nurse's ubiquitous reach included a Twitter account and a Facebook page, both branded with her logo. My students usually have Facebook open on their phones and browsers, and most of them abided by The Big Nurse's request on the admissions video to follow her on Twitter, so the flow of communication broke through spatial and temporal boundaries, making the game much more immersive and an around-the-clock activity.

The Facebook page served many purposes, becoming a site for propaganda, missions, clues, updated results, and announcements.

Propaganda

The Big Nurse regularly posted propaganda pictures of herself in a variety of settings, reinforcing her power and ubiquity. The images were created using online image generators that blend a user-provided picture with a preexisting image (see Figures 13 and 14). Once the player-hackers entered the fray, The Big Nurse also posted defamatory propaganda and warnings about her adversaries.

Figure 13. An example of Big Nurse propaganda.

Figure 14. Another example of Big Nurse propaganda.

Challenges

At any time of day or night, The Big Nurse kept players on their toes by posting challenges on her Facebook page. These could be questions about the novel, timed tasks, or publicly posted mini-missions. The examples below were lifted directly from the Facebook page:

- "An envelope will be awarded to the first patient to provide a thorough explanation of why the song McMurphy sings on the second day is ironic."
- This one relates to the Lawrence Welk song that was played ad nauseum in class and was posted on the evening it was first played: "The ward plays such lovely music, but what is it? 3 points if you are the first to post the name of the musician. 5 points if you complete the above and post how it relates to the novel AND include a corresponding quote. 10 points if you complete all of the above and can tell me the name of the song."
- "The first patient to post five complete segments of dialogue that I (The Big Nurse) have spoken in the novel with corresponding page numbers will receive 5 points. Each dialogue segment must be a new post and if multiple patients are competing, you may not post the same dialogue as another patient."
- "Post a line from the novel and a corresponding picture of your choice."
- Players were sent a secret mission to find a painting depicting mental illness, provide the name of the artist, the year it was painted, and how it relates to and/or depicts mental illness. They had to post the results on the page.

The great benefit of posting quotes, images, paintings, and any other material connected to the novel on the Facebook wall was that all other players could see the posts. This reinforced knowledge of the novel and also exposed them to art and ideas that encouraged awareness around the theme of mental illness.

Clues

Occasionally, The Big Nurse posted diverse clues on her Facebook page, which might include hints for treasure hunts and password-protected documents (see Figure 15).

Figure 15. A clue from The Big Nurse's Facebook page.

Results

Results from public competitions were also posted, including leaderboards for inter-ward challenges, rankings for the basketball tournament, and final scores for the endgame showdown.

Announcements

Announcements were regularly posted on the page, which included gameplay updates, changes or improvements to the rules (which were also posted on The Bulletin Board), alerts that certain missions were closed (see Figure 16), or that the game was about to end, and so on. The Big Nurse also reminded players not to discuss the game outside of the ward. One frequently posted message was "Many have been caught. A number have been sent warnings. Remember: Loose Lips Sink Ships."

Figure 16. An announcement from The Big Nurse's Facebook page.

TEXTING

Before the start of the game, players were asked to volunteer their personal mobile numbers. These were compiled in a free online service called Remind 101 that sends mass texts for the purposes of reminding students of homework or informing parents of class activities. The Big Nurse used this service to update players on urgent news items and to announce that their scores and finances had been updated, which occurred every few days (see Figure 17). Again, this was part of the strategy to create a presence for The Big Nurse through every available channel of communication.

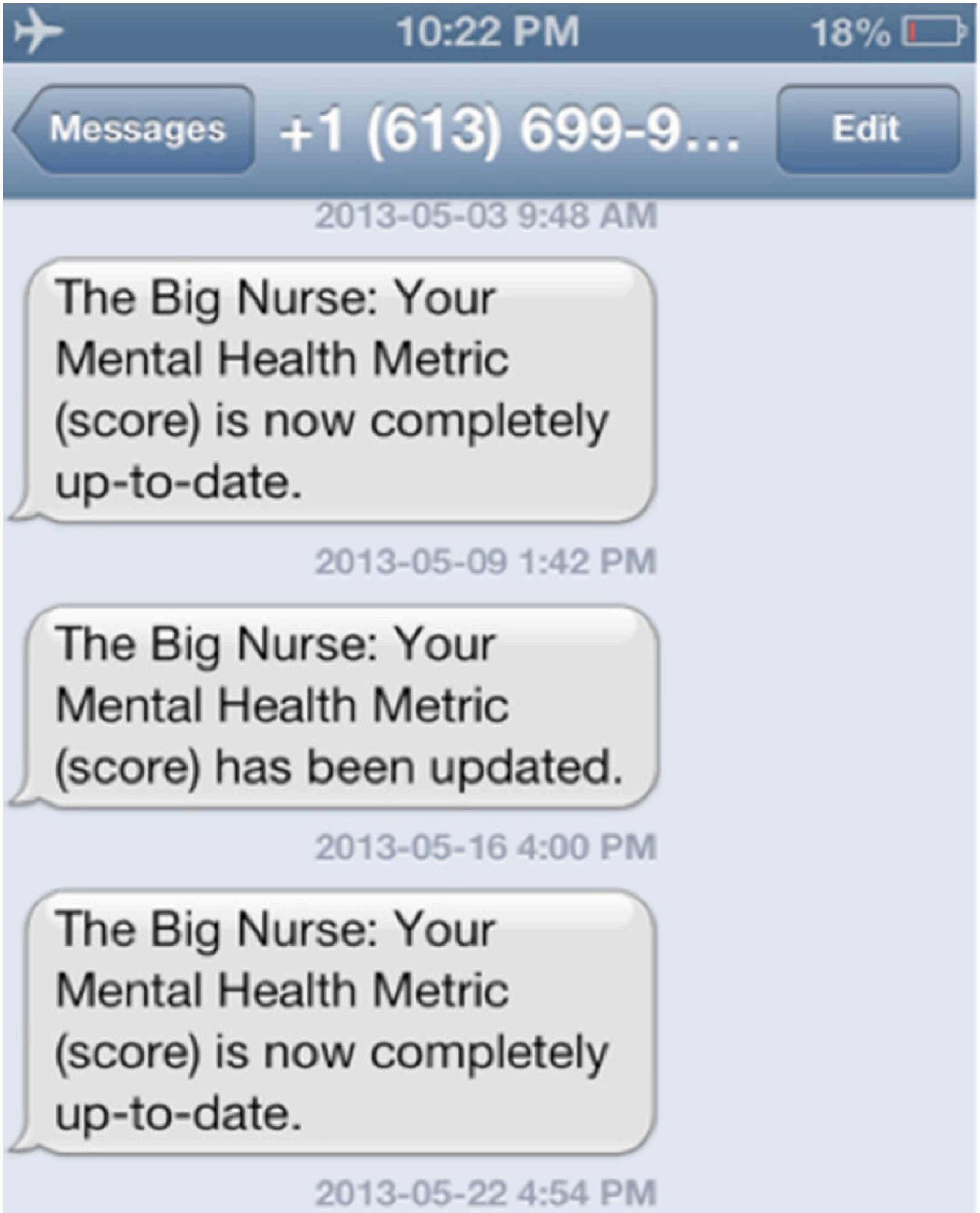


Figure 17. Text messages from The Big Nurse.

HACKING THE HACK: MCMURPHY RISES

It wasn't long into the game before players banded together to form secret groups to subvert The Big Nurse. This, in my mind, was one of the most remarkable aspects of the entire game. Re-creating the totalitarian atmosphere of the ward in *One Flew Over the Cuckoo's Nest* spurned players to genuinely behave like McMurphy and rebel against the regime in a natural and unscripted way. In the two iterations of the game, four separate hacker groups rose to challenge The Big Nurse's authority. The membership of these groups was highly secretive, even from the other players. In most cases, the disruption of the game was largely harmless and kept consistent with the edgy and satirical atmosphere of the game. A brief description of each group follows:

The Committee

This was the first and greatest of the hacker groups. Members sent phony missions from email accounts that seemed to originate from The Big Nurse, left strange notes in players' lockers, stole The Big Nurse's Authorized Edition and replaced it with another identical edition, but without my notes and marginalia. They also posted anti-Big Nurse propaganda posters, and employed double agents who offered to help The Big Nurse uncover the group members identities but really just threw her off the trail. Their style of play was creative and humorous, and.many players wanted to join them but did not know who they were or how to contact them. The nine core members only revealed themselves after the game was over.

Figure 18. The Committee logo.

Little John and Robin Hood

This squad consisted of two players who counterfeited the in-game currency (the counterfeits were obvious and did not really pass as legitimate cash), put up mysterious posters around the school of an apple with an arrow through it (their logo), and left playfully menacing notes for The Big Nurse. I remember leaving a class and finding a pile of game money at the threshold of the doorway with their logo at the top of the pile. After the game was over they explained that they wanted only to get The Committee's attention so that they would be asked to join. The plan worked, as they became members 8 and 9 of The Committee.

The Ward Angel

The Ward Angel was a benevolent individual who appealed to The Big Nurse to take a kinder and more forgiving tack. He posted images of a celestial angel on the Facebook page, sent The Big Nurse emails asking her to change her ways, and convinced the kitchen staff to let him plant his calling card in the school vending machine. Sad to say, in what I think was one of the most offside actions in either installment of the game, a member of another subversive group hacked into his Ward Angel's email account and disabled it. The victim of the hack was understandably upset and ceased his activities altogether. Interestingly, I discovered the account hacker to be an excellent student who had never had a behavioral problem, but he had clearly crossed a line.

This brings up an important consideration for this type of game: Its palpable power dynamics and freedom to play can lead to malicious or injurious action. The Ward Angel incident is one of the few that occurred while I ran the game, but every school culture and every class is different and will produce different reactions.

The Outside

The six members of my AP English class were the only group of students in Grade 12 who could not participate in the game because of a scheduling conflict. This didn't stop them. *One Flew Over the Cuckoo's Nest* wasn't even on their reading list, but they familiarized themselves with the novel and every member of the class assumed the persona of a character from the story. To that end, each one created a Facebook page for his persona and stayed in character while communicating with The Big Nurse and the other players.

Their activities, or at least the ones I was aware of, included recording students' having unauthorized discussion about the game and then selling back the recording to said players for C-sticks on a secret black market auction page they'd set up on Facebook. They tried to solve the Dilantinhunt before the legitimate players did but did not succeed. They also sent out disruptive propaganda and engaged The Big Nurse on her Facebook page.

VICTORY AND THE TRIALS OF THE BULL GOOSE LOONY

Like a video game, *The Ward Game* offers many paths to victory. Individual players are discharged when they reach 100 points, or they walk away with as many points as they manage to earn by midnight on the 30th day of play. If anybody had found the jar of Dilantin, he would have also enjoyed an instant victory. Because there was also a sense that the wards were competing against each other, I also organized a grand finale challenge between the wards that took place on the last day of play.

Members of each ward chose a Ward Champion to represent them in three final trials. The first task was The Gauntlet of Knowledge, in which Champions competed to answer 100 questions about the novel. The second trail was the Monopoly of Madness, in which they competed in a modified Monopoly game, a popular pastime of the patients in the novel. Each Ward Champion's starting Monopoly money was determined by the total C-sticks earned by his ward during the course of the game, which contributed to the idea that the Champion was the embodiment of the collective ward effort.

The final trial was The Presentation of Artifacts in which each Champion had to present as many artifacts as possible from the Champions Checklist, a list of 35 artifacts that had been created by various players during the game. It was impressive to see the long cafeteria tables packed with player-produced brochures, comics, posters, scripts, models, schematics, and maps (see Figures 19, 20, and 21). These were the tangible products of the game. Besides being physically presented on the last day, items also had to appear on a website. A player from each ward accepted a mission to create the website housing the artifacts. The real challenge in completing the checklist was that all wards did not produce all items, so an inter-ward negotiation process was inevitable. The Day Room auction house was alive with offers and trade opportunities, but some players also resorted to wily means to acquire artifacts.

Figure 19. Player Artifact example 1: A propaganda poster.

Figure 20. Player Artifact example 2: An electroshock therapy machine.

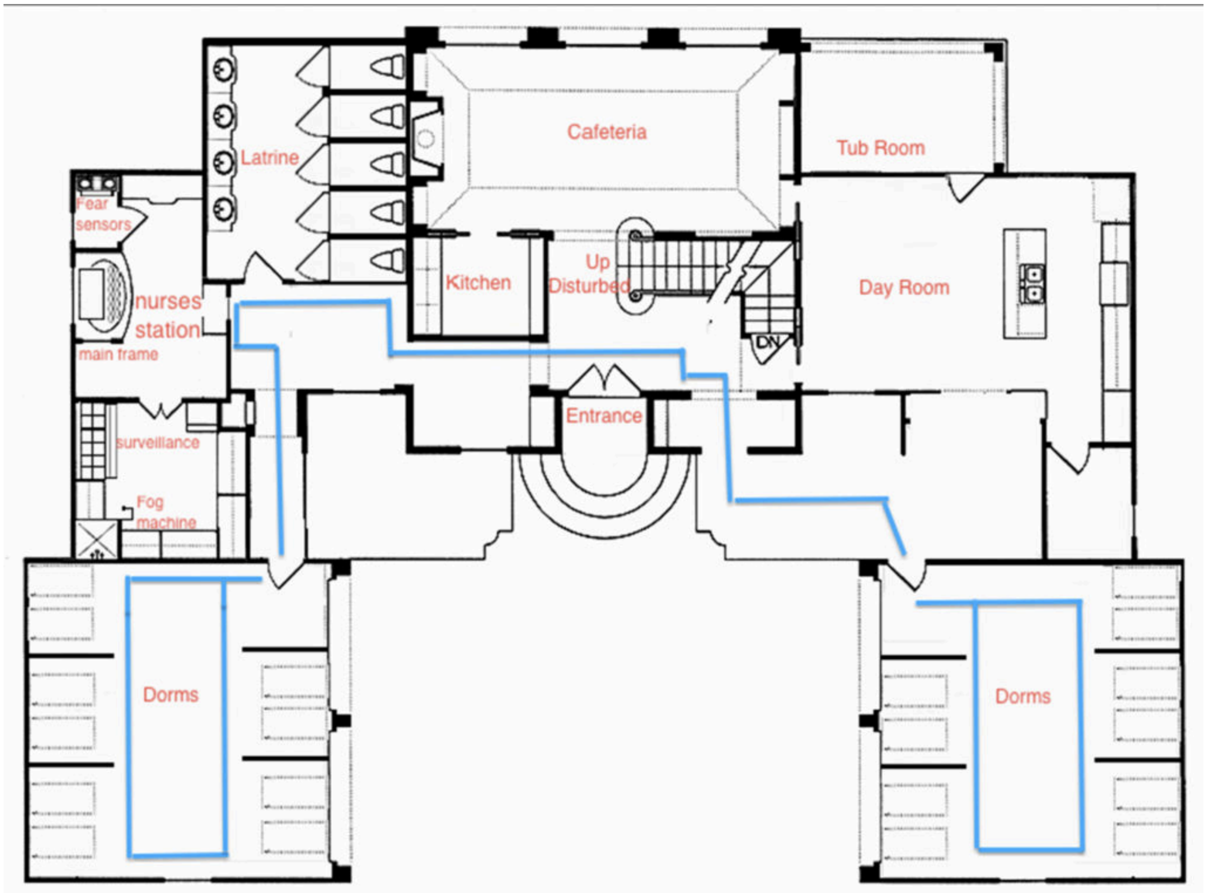


Figure 21. Player Artifact example 3: A map of the ward.

The Ward Champion who emerged from the three trials with the most points would be crowned Bull Goose Loony Grandmaster Ward Champion and his ward would be declared the winner. All players from the winning and runner-up wards would receive additional points to their final scores, which gave them incentive to prepare their champion.

The finale was engaging and exciting but not narratively accurate. In the novel, the patients have a big party, after which McMurphy and a few others plan to escape. The escape fails and McMurphy, deemed incurable, is subjected to a lobotomy and reduced to a near vegetative state. Chief Bromden escapes through a window and runs out into the world. I think that, to some degree, this ending naturally occurred outside the game. My students (Bromden) have their prom (party) and escape the asylum (graduation), but I would ideally like to incorporate that part of the story more faithfully into the game.

THE WARD GAME AS A PERVASIVE GAME

So what kind of game is *The Ward Game*? How can it be classified? I didn't design it with a specific game genre in mind and was really guided only by the concept of combining video game mechanics with real-life play. The real-life part saved me the trouble of writing scripts and creating immersive graphics and audio. After the first run, I spoke to a few people and did some research and discovered that *The Ward Game* fits into a genre known as *pervasive games.* This broad term covers many subgenres such as alternate reality games, mixed and augmented reality games, mobile games, and locative games, to name a few. Because I didn't intentionally subscribe to a specific genre, *The Ward Game* emerged as an exotic hybrid that combines elements of all of these but doesn't cleanly fit in any one category; therefore, the more general term *pervasive game* is probably the best way to describe it.

I suspect that as we journey deeper into the 21st century, pervasive games will become more commonplace both in and outside of schools. Wearable technology, the Internet of things, and augmented reality interfaces are becoming commonplace, which will allow for an easier blend of the digital and the real. Video games are now a massive cultural force, which has led academics such as Dr. Henry Jenkins to proclaim that they will become the defining art form of the 21st century. Video games have a great deal of potential both as art and as instructional tools, but they are generally sedentary activities. Many consoles, such as Wii, Xbox, and Sony, now offer motion-sensing devices that allow for full-bodied physical participation, but these are still restricted to a relatively limited physical space. Wired mobile and wearable technology such as the now-defunct Google Glass layer digital information on the real world, allowing video game–like experiences to be carried out in the world at large.

It's not difficult to see how a brave new world where the real and the digital coexist seamlessly holds great potential for education. Learning can become an embodied, immersive, anytime-and-anywhere experience that is no longer constrained by classroom walls and clocks. This world holds the potential to more accurately measure student performance based on steady data streams, to provide freer and more individuated instruction, and to produce meaningful interactions with the real world, to say nothing of engagement. All technology, though, is a double-edged sword and there are clearly downsides to this vision. The generation and analysis of substantial personal data can lead to privacy concerns, and students freely wandering in the real world will raise safety issues, to name two biggies. But I'm an idealist, and I believe that our rapidly transforming social context might help us successfully negotiate these issues and deeply transform our outdated and broken system of education.

The Ward Game was inspired by video game culture, but rather than being driven by technology, it yearns for more technology to reach its full potential. All the parts are there, but thus far it has relied on crude improvisations to compensate for the lack of dedicated software, wearable technology, and other techno-goodies that would make the game so much richer, more immersive, and easier to run. Despite these dreams of high-tech, real-world gaming, I think the most important lesson is that anybody anywhere can create a game such as this no matter what the available technology. The only resources necessary are creativity and the willingness to take a few risks and hack the system.

Creating an educational pervasive game is much more demanding, time consuming, and stressful than planning a traditional lesson, but the effort pays off in dividends. I found that the second run was much smoother and easier to deploy, as I was able to reuse much of the material as well as add some time-saving features based on lessons learned my first time around. There is also a great deal of flexibility in the design: Teachers can make it as simple or as complex as they like, and they can adapt the game to work with whatever technology is available to them.

MACGYVER AND THE TEACHER-HACKER: MODDING SPACES AND REPURPOSING TOOLS

The players who hacked *The Ward Game* in defiance of The Big Nurse's tyranny incarnated one of the novel's most important themes: resourceful and playful subversion as an agent of change. I now realize that, like these in-game rebels, I was also channeling McMurphy by playfully pushing boundaries and reprogramming the structures and routines of my school and classes. I never consciously created the game as a hack but, by preserving the novel's key conflicts, I inadvertently conjured the McMurphy/rebel/hacker ethos. *One Flew Over the Cuckoo's Nest* celebrates individuality, subversion, resourcefulness, collaboration, and creativity as the means to combat conformity and control. It conveys the message that educators who are frustrated with the system or want more for their students can effect change through creative and benevolent subversion.

Those of you who survived the '80s might remember a television show called *MacGyver*. Every week, secret agent and government operative Angus MacGyver found himself in some kind of embroilment, but instead of relying on his gun, he resorted to a Swiss army knife and duct tape. MacGyver had a genius for improvisation and drew from his vast knowledge of science to repurpose anything from hairpins to lasers to get him out of a bind. He disarmed missiles with paper clips, built land mines from pinecones, and fashioned a lie detector with a blood-pressure cuff and an alarm clock. MacGyver saw the world through a lens that allowed any object to be transformed to function differently from its intended purpose. Where mere mortals such as you and I see an umbrella or a fishing pole, he sees a grappling hook and a slingshot. The show's popularity led to his name's becoming a verb: You might MacGyver bull clips as cable organizers, or MacGyver egg whites into glue. To a generation, these clever solutions were once known as *MacGyverisms*, but today they are more commonly referred to as *hacks.*

Hackers occupy a prominent role in digital culture. Some scholars argue that coding is the new literacy, and much as with the power wielded by the minority of the population who could read 500 years ago, those who can code will be favorably positioned to succeed in a world that becomes more digital by the minute. Hackers are the shadowy outlaws and activists whose mastery of the digital world has vested them with unprecedented individual power. A single hacker can rattle the stock market, steal millions of dollars from corporations, expose the most intimate details of a person's private life, and, in the case of an Edward Snowden or a Julian Assange, send powerful nations scrambling into damage-control mode when highly classified information is posted for public consumption. Like McMurphy in *One Flew Over the Cuckoo's Nest*, hackers are creative, resourceful rebels who rewire the system to subvert traditional structures of power and authority. Like MacGyver, they can repurpose any part of the digital world to suit their needs and purposes.

Today, the word *hack* can apply to any number of situations. A player who exploits a loophole in a game is said to have hacked the game. A popular website called Lifehacks provides endless tips to repurpose household items or provide solutions for everyday problems such as folding fitted sheets or keeping track of who borrows your books and movies (take a picture of the borrower holding the item). The word has even crept into educational circles, as in the case of the University of Washington's Hackademia project, which seeks to bypass expertise and accreditation and give nontechnical students technical skills to undertake open-ended challenges. Even the terms *disruption* or *disruptive technology* that have recently entered edujargon imply an agitation of traditional methods and systems, which plays directly into the hacker ethos.

Marshall McLuhan, who coined the term *global village,* believed that electronic communication, computers, and automation would return society to what he referred to as a tribal mode of behavior and interaction. He suggested that the specialization of the postindustrial workforce causes the fragmentation we experience in the modern world, and that modern technology would help reclaim the holistic or "well-rounded" life of nomadic and tribal societies. Increasingly, we see that McLuhan may have been on to something. The word *hack* also implies amateurism, or somebody who lacks formal training, specialized knowledge, or expertise in the activity he or she carries out. Never has it been more possible to be a hack, as the wide-open user-friendly affordances of the Internet have edified the amateur and amateurism. Bloggers are essentially hack journalists, YouTube facilitates hack broadcasting, and Twitter, with its emphasis on "follower," points to a form of hack celebrity. Even the highly unadvisable but common practice of "Googling" health symptoms encroaches into the territory of the medical specialist. But how does this affect teachers and teaching, and what does it have to do with *The Ward Game*?

Teachers can become hackers in every sense of the word: resourceful MacGyvers who repurpose their tools and spaces, McLuhan-inspired amateurs who subvert narrow specialization and don numerous hats with the assistance of digital technology, and McMurphy-like rebel agents who will ultimately recode and modify the system to implement large-scale change. Teachers already wear many hats, but this can be intensified as they expand their identities and assume holistic, hyphenated roles such as the teacher-artist, teacher-designer, teacher-rebel, teacher-actor, teacher-writer, and, most important, teacher-hacker. In the best cases, they will become all of these and more at once. These roles help express and fulfill their unique identities, rather than simply grinding as gears in the mass-production machine. If McLuhan is to be believed, he asserts that tribal people did not feel the laborious and encumbering sense of "work" as we do in the specialized life of civilization. The teacher-hacker will doubtlessly be busy, but this free, open, expressive, and whole mode of production might feel more like hard play than its opposite.

In many ways, *The Ward Game* fulfills McLuhan's vision as it embodies the hacker ethos. As the designer and implementer of the game, I have no overly specialized knowledge. I am not a professional game designer, film producer, actor, or software programmer, but, despite my amateurism, I managed to combine all of these and creatively repurpose my tools and environment to deliver the game.

CROSSING THE THRESHOLD

The Ward Game continues to be a rough draft and a work in progress, but designing and running it changed my classes, showed me a different side to my students—in many cases bringing out the best in them—and opened a window to what education could be. It also had a transformative effect on me. It opened up so many creative opportunities and tested me in ways I had never experienced before. It helped redefine my role as a teacher and as a person. The game was a site for personal and collective renovation and convinced me that education must make a space for these types of experiences.

The Ward Game can be conceived of as an experiment to sound out possibilities. It is a game, but it is also a dynamic art-installation piece that explores the shape and potential of education in the modern world. It is naturally multidisciplinary, demands a variety of tools and literacies, explores privacy and surveillance, freedom and control, hacking and making, disruptive technologies, intrinsic and extrinsic motivation, and the changing roles of learners, all in a playful format. It can thus be seen as a microcosm of the current state and struggles of education and the society that contextualizes it. It is what I discovered when, like Bromden, I learned from McMurphy to swallow my fears and insecurities and threw the control panel at The Big Nurse's barred window to escape my confinement. Once I'd crossed that threshold, I never looked back.

PART II.

USING PREEXISTING PLATFORMS

CHAPTER 6.

CONSERVATION OF MOMENTUM

BY CAMERON PITTMAN

Like most guys in their 20s and 30s, I grew up playing video games. One of my earliest memories takes place at a neighbor's house when I was about 4 years old. We were playing the original *Super Mario Bros.* game on NES and I remember loving everything about the experience of making a pixelated Mario jump across the screen. Not much has changed since then.

After I graduated from college with a degree in physics and astronomy, I taught high school science for four years (see Figure 1). During my last two years I tried and finally succeeded in teaching physics with a popular commercial video game called *Portal 2,* merging my favorite studies with one of my favorite pastimes.

Figure 1. Cameron helps his physics students build levels.

This chapter is not an in-depth look at *how* I taught physics with *Portal 2,* as that has already been described in quite a bit of detail in a journal article and on my blog physicswithportals.com (see

Notes).[1] Rather, I will focus on how I've applied my teaching philosophy to my classrooms and my career. I'll walk you through the choices I made as I planned for and implemented a curriculum using technology that is normally not considered educational.

In Part 1 of this chapter, I'll describe how I came to the decision to teach with *Portal* and my overarching philosophy toward using it as a virtual lab tool. But I couldn't do it alone. In the second part, I'll explain how I found support for my classroom from everyone involved—from students to parents, teachers, administration, *Portal*'s developer, Valve, and the gaming community at large. In the third part, I'll touch on the theme of failure in experimentation and how learning from failure has played such a large role in my professional adventure and my students' labs.

In the end, I hope you'll see that creating new teaching tools is simply fun for everyone involved, and that trying to build something new can be a reward in and of itself.

PART 1: WHY TEACH WITH VIDEO GAMES?

At the end of my second year of teaching in 2011, I started daydreaming about a classroom with a free-form virtual physics lab. I was working in Nashville, Tennessee, in a high-needs high school with insufficient lab equipment and an ordering process so bogged down by bureaucratic nonsense that it would realistically take at least a year to acquire any new lab supplies. I wanted a way to make it easy for my students to experiment with new ideas. As an avid gamer, I came to the realization that the cheapest, most powerful, and most accessible physics simulations came with names such as *Crysis*, *Halo*, *Battlefield,* and *Portal*. At the cores of ultrarealistic modern video games like these stand physics engines that calculate the way in-game objects should move and behave. As game makers continue to profit from games that look and feel realistic, they strive to build physics engines that more realistically reflect the real world (see Figure 2).

1. See Teaching With Portals: the Intersection of Video Games and Physics Education at http://www.learninglandscapes.ca/images/documents/ll-no12/pittman.pdf and my blog at http://physicswithportals.com.

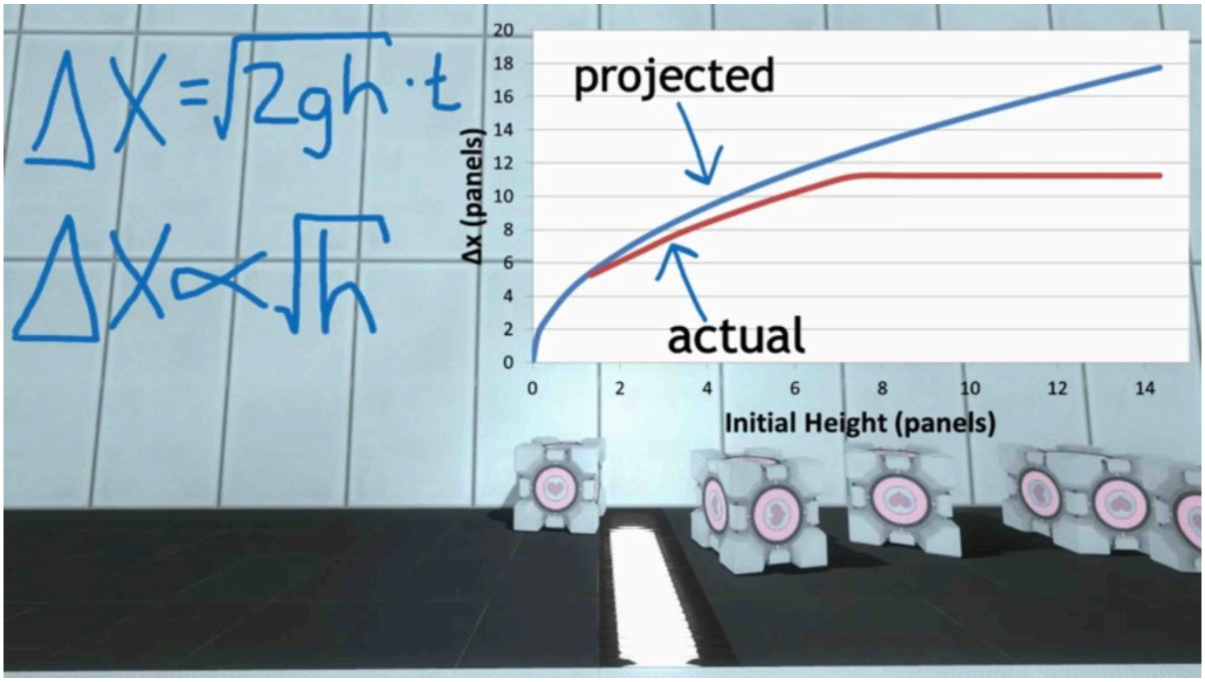


Figure 2. A graph from a physics experiment in which cubes were flung from a portal on a wall at different velocities (because they were originally dropped from different heights). The actual versus expected graph demonstrates the difference between how far from the wall the cubes would land in the real world versus how far away they landed in the game.

I quickly decided to write a curriculum that made the PC game *Portal* the centerpiece of a virtual physics lab curriculum. I choose *Portal* for a few reasons—the lack of violence, the ease of getting copies, and the low technical specifications.[2] As a bonus, the story has a science-y theme and it is extremely well regarded for its quality within the gaming community.

I battled district administration throughout my entire third year of teaching for the ability to install *Portal* on school computers. Eventually I moved to a new position at a charter high school and found some help from Valve, the developers of *Portal.* In my fourth year of teaching I finally implemented a semester of labs using *Portal*'s sequel, *Portal 2.*[3]

To understand how I taught with *Portal 2,* let's talk about how the game is played. *Portal 2* is a puzzle game. The game consists of a series of rooms (called "test chambers"), whereupon entering a room, you simply try to reach the exit. You play from the first-person perspective.

At a glance the game looks like a violent first-person shooter. The player clearly has some kind of gun in front of her. But this gun doesn't shoot bullets. It's called the portal gun for the obvious reason that it creates portals. There are two portals—an orange one and a blue one. The orange and blue portals are essentially wormholes. When an object enters one, it instantaneously exits the other (see Figure 3). The player uses the portal gun to place portals on various surfaces around the puzzle, spatially

2. The term technical specifications refers to the minimum requirements for computer performance needed to install and use a piece of software.

3. To learn more about exactly how I taught physics with a video game, check out the in-depth article I wrote for LEARNing Landscapes documenting my approach: http://www.learninglandscapes.ca/images/documents/ll-no12/pittman.pdf. And check out my blog, Physics With Portals at http://physicswithportals.com.

connecting disparate areas of the level in order to overcome obstacles that would be impossible otherwise.

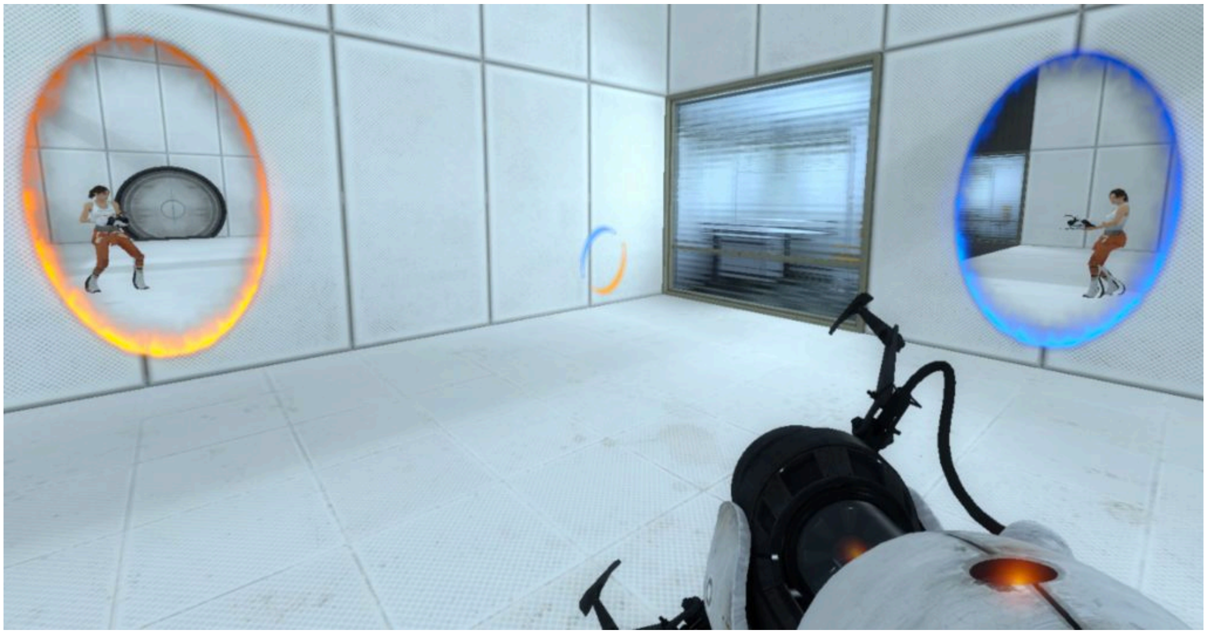


Figure 3. In this image you can see two connected portals—one orange, one blue—and the portal gun in the foreground. Notice that you can also see the player herself through the portals, as looking in one portal allows the player to look out the other.

The video *Portal 2 E3 2010 Gameplay Trailer* demonstrates the basic gameplay alongside a few different gameplay mechanics, such as excursion funnels (also known as tractor beams), aerial faith plates (also known as launchers), and laser puzzles.[4]

As it is a puzzle game, the amount of time a player can spend playing *Portal* is essentially a function of the number of puzzles. But each puzzle needs to be built by hand. There are a finite number of people at Valve who make puzzles and they have finite amounts of time. So, in order to create new value for the game, Valve created the Puzzle Maker, which makes it incredible easy for players to create and share custom puzzles (see Figure 4). It's easy enough such that someone with limited technical expertise, and even limited experience playing the game, can still create his or her first custom puzzle in a matter of minutes.

4. https://www.youtube.com/watch?v=JZD17pQSqUU

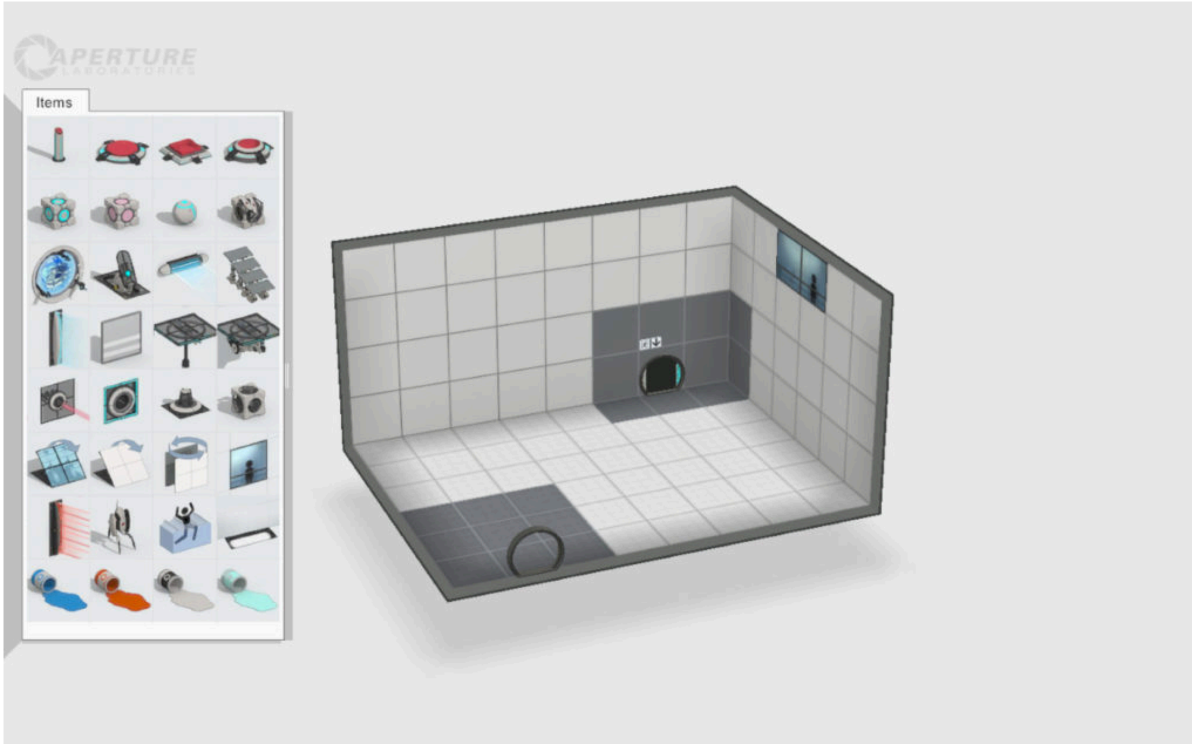


Figure 4. A typical view of the Portal 2 Puzzle Maker. Players add elements to the room by simply clicking and dragging them from the panel on the left.

So, let's go over the two main features *Portal 2* offers. It has a realistic physics engine and it has a mechanism to quickly create custom physical environments. You know what that sounds like to me? A full-blown, fully interactive physics simulator in a format palatable for a classroom.

My students treated *Portal 2* like a virtual lab by building experiments with the Puzzle Maker, hopping into the game, running their experiments, and collecting data. Using tools built into the game itself to measure distance, time, and mass, my students could collect enough data to answer pretty much any question from classical mechanics (the study of how and why objects move). I had my students building machines that launched objects with different forces, analyzing the trajectory of projectiles, creating infinite loops to measure terminal velocity, predicting the results of elastic and inelastic collisions, and even simulating thermodynamics.[5] It felt as if I were putting kids in the *Matrix* and letting them run wild trying to answer interesting physics questions.

It was pretty cool.

Beyond physics, video games in the classroom prepare students to succeed in the 21st century. The simple act of getting things done on a computer and troubleshooting when something inevitably goes wrong helps students practice the skills required to use technology in the modern workplace. (Here's a short list of things that went wrong during *Portal 2*: Games crash for no apparent reason, Steam, the platform used to launch *Portal 2,* loads halfway and stops without ever telling the user something is wrong, this weird glitch in which the menu in *Portal 2* shows up with only "NO STEAM" and "QUIT,"

5. http://physicswithportals.com/2012/06/26/ideal-gas-law/

levels that don't save, students who prefer a trackpad to a physical mouse, and Steam accounts that randomly log themselves out and crash the game.)[6]

My students were forced to work around new problems, such as installing Xbox 360 controller drivers, game progress that couldn't be saved, using the game's developer console to modify the environment, as well as figuring out how to fix or work around bugs. Given the number of people using computers at work, it makes sense for schools to purposefully teach students to work through minor issues with computers. Loading and playing *Portal 2* was a fun opportunity to teach some basic computer troubleshooting techniques alongside physics.

PART 2: HELP! IS ANYONE OUT THERE?

Teaching with a video game meant that I needed to collect enough copies of the game for my classroom. And games are not free. After writing a series of lesson plans describing how my students could experiment with the physics of various scenes in the game, I went to the Internet to ask for help.

Luckily, Valve tends to treat *Portal* as a giveaway. It was free for a number of years and routinely sells at $5 a copy or as part of bundles with other games. I already had an extra copy of the game and I knew that other gamers did too. So I took to r/gaming (reddit.com/r/gaming), an online community on reddit devoted to all things gaming, and asked for extra copies of the game.[7] I explained who I was and shared my lesson plans with the community. Within two days redditors (the denizens of reddit) were kind enough to share more than 20 copies of *Portal* with my classroom.

At the same time I emailed Valve, because why not? I had nothing to lose but the few minutes I spent typing. A little bit of research revealed that the company had an education-outreach email address, which seemed a pretty obvious recipient.[8]

As I did with reddit, I explained who I was, shared my lesson plans, and asked for enough copies of *Portal* for my classroom.

Someone from Valve messaged me on reddit *and* responded to my email within a few days, which I did not expect to happen.

It is worth remembering that people like to help teachers. Everyone knows that classrooms frequently lack funds.[9]Reaching out to people beyond the walls of my classroom made my *Portal* lessons a success. Had I not gotten in touch with Valve or asked reddit for help, this story might not have happened. If you need help for your classroom, do some research to find people who have ample amounts of what you need and be as specific as possible when you ask for help.

During the months that followed my first email to Valve, I met some people within the organization who were interested in education. Leslie Redd, Valve's former education guru, took particular interest

6. Steam is what I call the "iTunes of video games." You have to load Portal from Steam.

7. The name reddit is always spelled with a lowercase r. For the letter to redditors, see https://www.reddit.com/r/gaming/comments/j88ft/rgaming_this_inner_city_high_school_physics/.

8. While I believe this email address, education@valvesoftware.com, is still active, Valve's education efforts have significantly diminished since my time as a teacher.

9. I highly recommend checking out Kickstarter (https://www.kickstarter.com) or Donors Choose (http://www.donorschoose.org/) if you need resources.

in my classroom. When we first got in touch, we discussed my school, my students, and my plans for labs with *Portal.* Within a few days she made sure I had as many copies of *Portal* and its sequel as I needed.

At that point I realized I had gotten what I wanted from Valve and, even if my next email or next request went unanswered, I was happy. Cold-emailing Valve had been a good idea.

In the summer of 2012, I changed schools and was hired to teach physics and chemistry at LEAD Academy, a new charter high school also in Nashville. During my interview with the school's administrators, I learned that LEAD had 30 new MacBook Pros on order. And the school's Internet was free of blocked ports. Before mid-August I had a classroom set of high-quality laptops with *Portal 2* installed and running smoothly.

At this point, I had convinced my colleagues that this was a good idea. I wasn't worried about my students' support, but I still needed parental support.

I organized a Physics Night for parents in my classroom at the beginning of the year (see Figure 5). With a lot of luck, I had at least one parent or guardian for all 30 of my physics students. I spent two hours explaining exactly why I wanted to use *Portal,* what this meant for their children, and answering questions. I also gave parents a chance to play.

Figure 5. Cameron and the parent of a physics student enjoying Physics Parents Night at LEAD Academy.

Afterward, I had nothing but support from parents throughout the semester.

Without support from Valve, the Internet, LEAD's administration, my students, and their parents, *Portal 2* never would have become a virtual physics laboratory. If you are fearful of reaching out for help, remember that the worst anyone can say is "no," which actually isn't a big deal. You've got nothing to lose. So, try again.

My life has changed quite a bit since I finished teaching with *Portal 2* in 2013. Since leaving my high school classroom, I became the director of content for a website, taught myself how to code, became a software engineer, and eventually joined Udacity. Now I make websites and create courses that teach people to develop modern websites that look cool and do cool things.

I am in an existential crisis with a course I am developing at the time of this writing (which will have been released well before the book you are reading is published). I desperately want to be proud of it but the only thing I notice when I review my work is that I need to do a better job of looking natural on camera. I look so awkward. (Why am I standing there in a Superman pose for the whole course!?) I half want to delay the release of the class to reshoot scenes plagued by my wooden acting. What's worse, the course's learning curve holds potential pitfalls for novice students.

But I have had an epiphany, too. People who make awesome things always, always start by making something awful first. Perfection takes practice. It takes mistakes and missteps. But, most important, perfection happens when you learn from imperfection. So I can be happy about releasing an imperfect course because it gives me the opportunity to learn and inch a little closer to perfection in my next one.

Video games are learning experiences. They embrace imperfection and invite players to fail and learn from their mistakes.

You cannot lose in *Portal 2*. Dying is the worst thing that can happen to you in the game, but when you die you simply respawn at the beginning of the puzzle, ready to tackle the challenge with newfound knowledge of what won't work. Players are invited to try new strategies to beat levels. I invited my high school students to do the same thing. They were building experiments inside the game. And their experimental apparatuses failed constantly. I taught them to recognize their mistakes, go back to the Puzzle Maker, make some changes, and try again. No harm, no foul.

Mastering puzzles and running experiments (virtual or physical) necessitates trial and error. The same held true for my lesson plans.

I designed an experiment investigating terminal velocity in which students were to set up an infinite loop. When two portals are vertically aligned, meaning one is directly above and facing the other, objects repeatedly fall out of the first portal, fall into the second, and then fall out of the first portal again. Hence, objects fall forever in an infinite loop (see Figure 6). In the experiment, students were to measure the time it took an object to fall an arbitrary number of loops at various heights. By comparing the time it took objects to loop through the portals, students could calculate how fast they were falling and get an estimate of the maximum velocity an object falling through air can obtain, which scientists call *terminal velocity.*

Figure 6. A midair cube falling in an infinite loop. Notice that the portals are directly on top of one another. As soon as the cube falls into the blue portal, it falls out of the orange portal in a never-ending cycle.

When students started presenting their findings at the end of class, I realized that I had made a huge mistake. If an object maintains conservation of momentum as it travels through portals, then it follows that the distance between portals should have no effect on terminal velocity. It might take an object a few more loops between two close portals to reach terminal velocity; nevertheless, it should still reach the *same* maximum velocity as an object falling through two distant portals.

Student data, however, indicated that as distance between the portals increased, so did terminal velocity. I had screwed up. The students helped me realize that portals in fact have a speed limit. So the law of conservation of momentum actually does *not* completely hold for objects traveling through portals and the basis of the lesson's showcase experiment was fatally flawed. Whoops.

After the lab and in my later class, I challenged students to instead prove why that experiment was a poor method to find terminal velocity. I wanted to turn a mistake into a learning experience for everyone involved.

Incidentally, the act of demonstrating that portals failed to follow the law of conservation of momentum requires an understanding of physics at least equal to, if not deeper than, the knowledge needed to run a lab on conservation of momentum with accurate physics. If I find myself teaching with *Portal 2* again, I would actually try to incorporate lessons in which students disprove the physics of the game. I might even make the same "mistake" again and let them try to catch it. Learning from failure, even a teacher's failure to vet a lesson, creates big impacts.

Don't be afraid to fail. Learning happens through failure. The only way to create something amazing is by experimenting with a lot of awful ideas first.

CONCLUSION

Before I could teach with *Portal,* I had to install it on 25 laptops. This was an interesting problem. First off, the game is massive, requiring about 10 gigabytes of space. On a broadband Internet connection, it might take anywhere from a few minutes to a few hours to download one copy. I needed 25. Downloading the same massive file 25 times is simply unreasonable on a high school's Internet connection.

You're probably wondering if you can just copy and paste the same game on 25 different computers and get all of them to work. As it turns out, you can, but it's tricky.

Portal 2 has to be launched from Steam. On Steam, every game has to be attached to an account. So what I really got from Valve was 25 different accounts, each with a copy of *Portal 2* attached. In order to copy and paste the game onto a new computer and expect it to work, you have to follow a short set of steps that need to be completed in the right order; otherwise Steam would fail to recognize that the game was already installed.

To get everything ready, I needed to install Steam, paste a copy of *Portal 2* in the right location, log in to Steam with the right account info, check to make sure the game existed and that it loaded bug free. And I needed to do that 25 times.

I had the added bonus of needing to finish in two days, which meant a total of two planning periods (180 minutes total) to complete the whole process. I figured out a neat little conveyor belt with which, if I timed all of my actions right, I could work on five laptops at once, each at a different stage in the install process. I had a blast making sure I was always busy and never pausing to wait for some long operation to finish.

I love big projects because they are made up of little problems. Every step along the way is a chance to win a little victory. Teaching with *Portal 2* took so much time and energy, but every little victory reinforced the fact that, above all else, creating a new teaching tool is just fun.

If you have an idea for something crazy in your own classroom, or if you want to improve your teaching tools, I want you to consider following the same general steps I took to teach with *Portal 2*:

1. Identify the problem (lab supplies are hard to get).
2. Identify a possible solution (*Portal 2* is a physics simulator that's easy to get).
3. Rally support from everyone involved and reach out for help. (Thanks, reddit and Valve!)
4. Realize that the worst thing you can do is nothing. Failure is a good thing because you can learn and try again.

The real lesson here, I think, is not that *Portal* is a fantastic teaching tool (even though I think it is). Rather, improving a classroom is just like any other problem. I want you to apply creativity and persistence to surprise yourself with your capacity to create a better way to teach. The world is simply changing too quickly to continue teaching the same way year after year. Have some fun and give your students the opportunity to have fun as they start to understand the world around them in new ways.

CHAPTER 7.

GONE HOME AND THE APOCALYPSE OF HIGH SCHOOL ENGLISH

BY PAUL DARVASI

Late in the summer of 2013, a review of the indie video game *Gone Home* crossed my Twitter feed. The game received a perfect score on Polygon and the reviewer could barely contain her excitement, gushing praises such as "spellbound," "beautifully written," "universal experience," and "emotionally honest." I did a double take. Was this a video game critique or a book review? I dug a little deeper and Googled a few more reviews and was met with similarly enthusiastic reactions. The critic at *The New York Times* went so far as to say that it was the "closest thing to literary realism I've encountered in a video game." Praise aside, it sounded like no other game I'd ever played, and I've played quite a few. As a busy dad and English teacher, I was further encouraged that it could be completed in less than three hours. My interest was most definitely piqued.

In a mainstream gaming world crowded with assault rifles and fireballs, there was something refreshingly simple and humane about the premise of *Gone Home*. It's set in 1995, and the player assumes the role of 19-year-old Katie Greenbriar, who has returned home after a year of backpacking in Europe. While she was tramping around Paris and Amsterdam, her family inherited and moved into a big old mansion on the outskirts of her Oregon town.

The game opens when Katie arrives from the airport to the unfamiliar house at 1 a.m. only to discover that nobody is home. She's in the mansion's covered front porch, it's pitch-black outside, and a thunderstorm rages. Katie drops her bags and finds an enigmatic and worrisome note from her younger sister, Sam, pinned to the front door (see Figure 1). The note sets up the game's key conflicts—where are Sam and her parents? What happened to the family while Katie was away? What secrets are harbored in the family's new home? Will she encounter ghosts and ghouls on this dark and stormy night, or maybe some family skeletons in the closet?

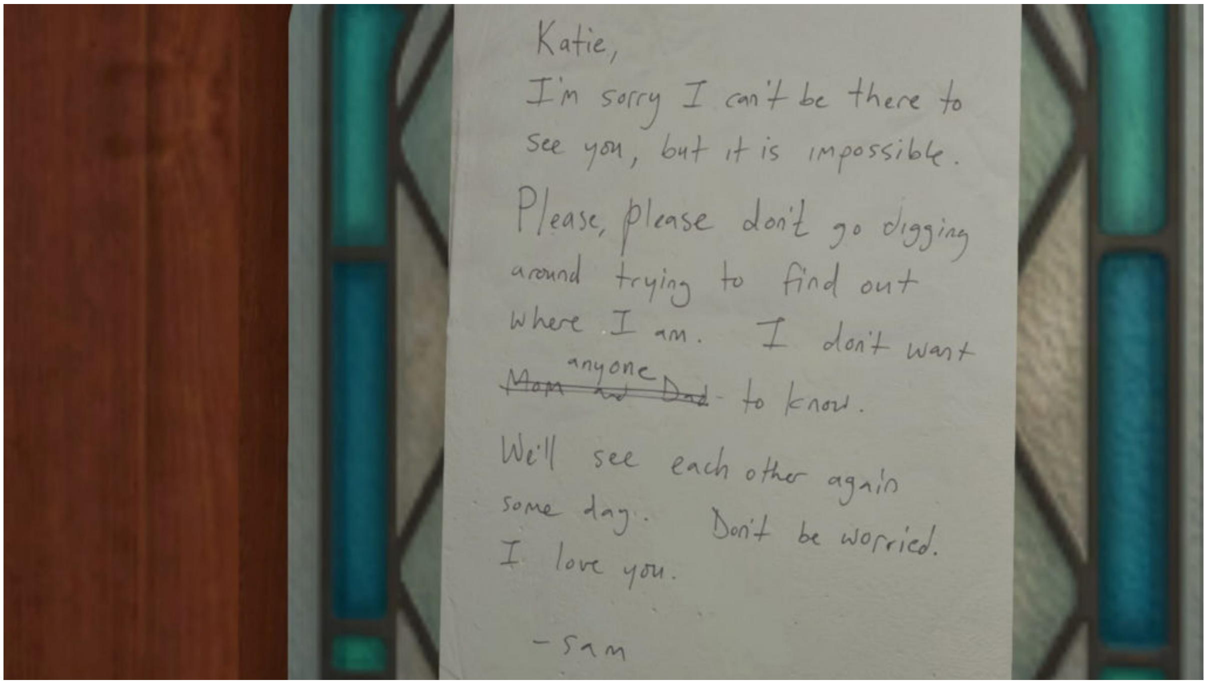


Figure 1. Sam's note for Katie.

Once you figure out how to unlock the front door, the next few hours are spent wandering around hunting for answers. Remember, this is 1995—no Facebook, Skype, or even the widespread use of email. Katie's communication with her family was bottlenecked to a few scattered postcards, so she's been largely in the dark about her family's life since her departure. You wander around rummaging through closets, drawers, and boxes, where you find realistic documents and personal possessions. The items all act as small windows into the Greenbriars' private lives and gradually reveal an intersecting web of family secrets. There was a great and guilty pleasure in being licensed to intrude into a family's private life. I was a burglar and a detective, a family outsider and insider—a stranger in my own home.

The game yielded a rich, layered, and emotional experience not unlike a captivating short story or novella, with the key difference being that I was an agent in the narrative. I was impressed by how much I came to care about a family that I'd met only by way of their personal possessions. I echo what one of my students would later observe about the game: This type of dynamic would not work as well in a novel or film. This video game had staked out narrative territory where its more traditional literary forerunners could not follow.

THE LIGHTBULB

Fast-forward to September, and I am on the cusp of resuming my duties as a high school English teacher. I'm always on the lookout for fresh ways to keep my classes relevant and meaningful. My first love has always been literature, but I am also an avid gamer. For years, I'd been seeking an opportunity to marry the two, but I hadn't come close to figuring out what that would look like. Games that had worthwhile narratives were usually clouded by gratuitous violence, and most video games were of unwieldy lengths. Then the lightbulb lit up—why not use *Gone Home* as a text for my senior English class?

It ticked all the boxes. Baseline, it was devoid of graphic violence, gratuitous sex, and gender bias. From a technical perspective, the game is relatively inexpensive, and the graphics would not tax our school laptops. Many commercial video games offer hundreds of hours of gameplay, which would not work for my purposes, but *Gone Home* could be completed in a few hours. I also liked the absence of extrinsic motivators—no levels, points, gold, or zombies—just good ol'-fashioned interactive play.

Functionally, it had legs, but how would it fit as part of my English curriculum? As a text, it exemplified the literary strategy of revealing character through setting. Its prolific and diverse documents might help instruct on how the conventions of language change, depending on intent and purpose. The nuances of each character yield ample ground for analysis. The game's emphasis on coming out, adolescent romance, and rebellion would resound with my high school students and ideally prompt some meaningful discussions. *Gone Home* also opens the door to delve into nonlinear narrative, and how a coherent story can be told without railroading a reader along a set path. Finally, the lit geek in me was happy to note that the game fulfilled Aristotle's dictums of the three classical unities more successfully than any of Shakespeare's plays.

I drafted the course outline for my 2013–2014 senior English class and, with some trepidation, I slipped *Gone Home* in somewhere between a short-story unit and Tim O'Brien's *The Things They Carried*. There was no backing out now. I was sure most of my students would be happy. Even if they didn't like the game, it would be a matter of principle: We get to play video games for English homework? Bring it!!! But just because they like it doesn't mean they'll learn anything. Video games definitely have the engagement part locked up, but educators who use games often find it hard to ascertain and prove the pedagogical value of the experience. Assessment is a big question when using video games in the classroom. What do they learn? How do we measure what they learn? What are valid and suitable forms of assessment? For the time being, I pushed these questions out of my head and assured myself that I would figure it out … later.

And what about Mom and Dad? There is an innate suspicion of video games, even as a form of entertainment. Parents often battle to pry their kids away from the screen and back to the books. Now, their children's so-called English teacher (of all people!) was usurping literature with video games? What happened to walking on desks, O *Captain! My Captain!,* and teary-eyed recitations of Sylvia Plath?

Thankfully, I didn't have to dance too much to convince the parents in my community of the validity of the enterprise. I was honest—this might or might not work, but it won't take up too much time and they will think critically and write throughout. I sold it as a short story masquerading as a video game. A few eyebrows were raised, but most questions revolved around the technical aspects of acquiring and installing the game. In the end, there wasn't a single objection.

VIDEO GAME AS TEXT

With the first major hurdle cleared, I now had to confront the daunting task of hashing out the specifics of how the unit would play out. Would I let my students wander the house freely? Would I somehow direct their gameplay? Aside from playing the game, what would the response apparatus look like? How would I assess and evaluate them? On one hand, this was a lit class and I could approach it much like a short-novel study, but this seemed a bit of a cop-out; a video game, after all, is formally different from a literary text, and it should be examined and considered in its own light.

A cultural theorist would tell you that, much like songs, TV shows, and comic books, video games are cultural artifacts and can be considered texts in their own right. Like novels or other literary texts, video games operate on a symbolic level, employ rhetorical strategies, and can be "read" or interpreted for meaning. A consideration of figures of speech and literary devices and the unique properties of a literary text are diluted (but not entirely lost). However, video games furnish opportunities not typically available in a literary text: choice and agency, exploration, a sense of embodiment, and a visual reinforcement of the narrative. We can safely say that the reception of a video game involves a type of literacy and is worthy of critical analysis, as Dr. James Paul Gee entertainingly and persuasively argues in his classic *What Video Games Have to Teach Us About Learning and Literacy*.

A video game's unique technical and formal features invite a fittingly unique response mechanism. It would be an easy and valid activity for students to write analytical essays about their experience, but I wanted to take a more creative approach. A film isn't studied in the same way as a novel and, likewise, a video game should be examined with its own distinct set of considerations. Sad to say, I wasn't altogether clear on how to productively emphasize and leverage the unique textual features of *Gone Home* and still deliver a valuable and pedagogically sound lesson. I decided that my best bet was to dive into an "in-depth" replay (dare I say close reading?) of the game that would, I hoped, trigger a few lesson plan ideas.

REPLAYING, NOT PLAYING, IS WHAT COUNTS

By a stroke of luck, Fullbright added a developers' commentary feature to *Gone Home* just a few weeks before our scheduled classroom launch date. When activated, Fullbright's trademark cartoony lightbulbs appear at set locations throughout the Greenbriar mansion (see Figure 2). Clicking on a bulb icon triggers an audio commentary from members of the creative team providing insights into their process. They discuss music, sound, technical elements, hidden content, and development anecdotes—usually related to the space where the specific bulb appears. This was solid gold!I now had a whole new layer of material that I could mine for the unit.

Figure 2. Developers' commentary lightbulb icons in Sam's room.

I'd played the game twice casually, but it was now time to dig into the nitty-gritty details. I woke up early one Sunday morning, set myself up at the kitchen table with a hot cup of java, and undertook a meticulous inspection of the creepy old mansion. I activated the developers' commentary mode and methodically explored every corner of the house, dividing my notes according to room and creating a comprehensive inventory of every meaningful artifact. I also jotted down anything valuable I could glean from the commentary. Seven hours later, I'd found just about every bookmark, sticky note, and newspaper clipping and felt intimately familiar with the game. By this point, I could probably better orient myself in the Greenbriar household than my own. Despite my thorough CSI-style sweep of the place, my students would later find a number of items and details that had slipped through my fingers.

In all honesty, I wasn't thrilled at the idea of retreading every inch of the big ol' Greenbriar mansion. I'd already played twice, but I thought this third forensic run would be a bit painstaking and laborious. Happily, I was wrong. The time flew by, the developers' commentary was extremely engaging, and I discovered many new details that I'd missed the first two times around. I was reminded of a quote by one of my favorite writers—Jorge Luis Borges—"rereading, not reading, is what counts." The scheme had yielded fruit—a few exciting assessment ideas had percolated and a vision for the lesson began to materialize.

A LITERARY APPROACH TO A VIDEO GAME

My goal for the first lesson was to acquaint my students with the game's style, get them comfortable with the controls and interface, and introduce the story's main characters—the Greenbriar family. I thought that starting with the common literature-studies strategy of an annotation and close-ish reading (or close playing) would encourage an initial detail-oriented examination of the game. Annotations and close readings are two fairly common practices in high school and college-level lit classes. Annotation essentially involves scribbling notes, underlines, highlights, symbols, and observations directly onto the text. It's interactive and helps reinforce an attention to detail that supports a close reading, which is an analysis and interpretation of a passage.

Like many high school English teachers, I've employed this approach when teaching a novel, poem, or short story, and I thought that it might also prove useful for the study of this video game. The problem was how would students annotate when the "text" in question is a three-dimensional digital space? Not having access to a digital tool that allows students to insert their thoughts and notes directly into the game space, I improvised.

As I mentioned earlier, *Gone Home* begins on the enclosed porch of the Greenbriar home, and once a player walks through the front door he or she enters a large foyer—the hub of the sprawling mansion (see Figure 3). The foyer has a few features that distinguish it from the other rooms in the house. First, it's a sort of dramatis personae, as all the major characters are introduced by way of documents, voice recordings, and artifacts dispersed throughout the room. Also, players must necessarily traverse this room first before choosing to head up the main staircase or down the west hall on their self-selected paths. This makes it an ideal site to introduce the game. It was the perfect room (or "passage") in which to center the first lesson. I aimed for my students to play freely and force their hands as little as possible. Open exploration, after all, is a key to engagement. Otherwise, if I overly controlled or restricted their movements, it would suck the fun right out of the experience. I requested that my students, for this first class only, stick to the foyer and abstain from exploring the rest of the house, which wouldn't railroad them so much as slow them down.

Figure 3. The Greenbriar foyer.

So I had my textual passage, but how to annotate it? I designed a chart that prompted the students to find specific information about each of the major characters. The last column in the chart was reserved for screen shots of the artifact or document that had furnished the requested information (see Figure 4). The chart encouraged a methodical and guided exploration in a contained space. It familiarized the students with the Greenbriar family, the *Gone Home*'s artifact-based exploration mechanics, and the game's controls. It also allowed them to practice gathering evidence by means of in-game screen shots. They would continue to take screen shots for the activities that followed, so the sooner they learned, the better.

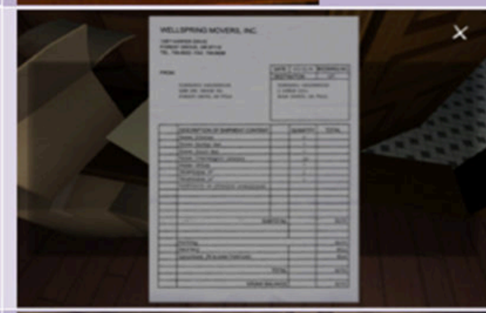
Description	Response	Screenshot evidence
(Example) Avatar's name	(Example) Kaitlin Greenbriar	(Example) 
Father's full name	Terry Greenbriar	
Mother's full name	Janice Greenbriar	

Figure 4. A completed foyer annotation chart.

When writing critically about a literary text, cited quotes are used as evidence to support arguments, claims, and propositions. This can also work with video games, as they can include written and spoken narrative and dialogue. When studying a game such as *Gone Home*, however, I thought that screen shots and video captures were a logical addition to the citation toolbox, as they are an efficient means by which to extract specific evidence from a digital medium that is primarily visual. Screen shots also support and expand on traditional note taking, as they help record and document important and relevant highlights of the player's journey.

LAUNCH DAY

Most of the class remembered to bring the headsets and mice that I'd requested, and I had a few extras for anybody who forgot or didn't have them available. We have a 1:1 laptop program, so I asked my students to download the game in advance on their machines, but, somewhat predictably, a number showed up unprepared and spent about half the class installing it. Some of those who did have it ready to go were getting stuck on the cassette-load screen. One kid quickly surmised that the graphics settings had to be set on "low" for the game to advance smoothly. Nothing like the collective classroom intelligence to solve a technical issue! *Gone Home* is not a taxing game hardware-wise, but some of our laptops, especially the older ones, have a rather limited processing capacity. Personally, I couldn't see the difference in graphics between the high and low setting.

It wasn't long before they were nosing around the foyer, taking screen shots, and filling in their charts. Once they were in the flow, the they became eerily quiet as they became absorbed in snooping and rummaging. The silence was occasionally punctuated by students' audibly murmuring to themselves as they played: "Hmmm—what's this?" or "Goodfellow High School, eh." or "That's pretty sick." or "Finally! There it is." I had to remind a few students to stay within the confines of the foyer when I caught them crossing into other areas of the house. It's interesting to note that almost all the students who transgressed outside the foyer were the ones I know to be the hard-core gamers. I wondered, in chicken-and-egg fashion, if these game aficionados were hardwired to push boundaries, subvert authority and explore, and therefore take to video games, or that their experience with games had fostered an eagerness to break out and explore. For most of the lesson, I just sat at the back of the class, very much the guide on the side, watching my students immersed in their games, each approaching it in his or her unique way.

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ORDERING THE FREE-ROVING CHAOS

For the first class, student in-game movements were limited to the foyer, but now we were about to embark on open exploration in which they could wander around as they pleased. This was the real test: How would they handle the newfound freedom? On a personal teacherly level, this marked an almost total loss of control. Some worst-case scenarios had been percolating: They might run around the mansion, entering every bedroom and closet, but not bother to read the documents or examine the items that contribute to the deliberate unfolding of the story. They could miss important clues or figure out how to finish the game in a 47-second "speed run." There was also the possibility that they might devise some unintended forms of amusement, such as transporting every single item in the mansion and adding it to a big pile in a bathroom.

Let's face it; at worst schools are extremely controlling environments. Clocks, bells, and schedules regulate time, and space is marshaled by constraining learners to classrooms and seats. These systems of control have the objective of creating uniformity, making sure that all students have the same experience and, ideally, acquire the prescribed knowledge in the same way. This is a carryover from our industrial past. Yes, things are slowly improving as concepts such as differentiated instruction and student-centered learning enter the edusphere, but the underlying apparatus remains largely unchanged.

Whether conscious or not and whether willing or not, as teachers we are all too frequently the product and perpetrators of this system. We pull levers, we release valves, we adjust dials, and, if the product is deemed defective, we toss it off the conveyor belt. We have to assert control to maintain order, to fulfill our legal obligations, to parcel out specific knowledge at a specific time, and to make sure that our charges are more or less given the same opportunity to learn the same material. It is extremely difficult to resist the machinations of mass-produced education. I openly confess that I can be and have been a controlling teacher, and a video game has caused me to reflect and reconsider this failing.

CUTTING PAPER FLOWERS OR PLANTING SEEDS

Marshall McLuhan, aptly nicknamed the Oracle of the Electronic Age, once wrote that "the notion that free-roving students would loose chaos on a school comes only from thinking of education in the present mode – as teaching rather than learning" (p. 25).[1] So what's the difference between teaching and learning? And, what does it have to do with "free-roving" kids' running around, whether in the digital mansion in *Gone Home* or the real world?

Through the years, I've taught many Shakespeare plays, including several kicks at the *Hamlet* can. For me, every line of the play is candy-coated confection that I seek to share with my students. In the past, I've wanted to teach them to see everything I see and to know everything I know about the nuances and rhythms of the language, the subtle allusions, the weave of motifs, and the compelling characters. I've wanted to impress my template of knowledge wholesale on each of their plasticine brains. Fine and dandy, but here's the rub—their brains aren't plasticine. They do have a high degree of malleability but, like snowflakes, each brain is different with its unique form and pressure and, for all my efforts, those brains will never receive information uniformly. There is only one play titled *Hamlet*, but every single mind will seize and imagine it differently, which may be why Prince Hamlet memorably proclaims, "I could be bounded in a nutshell and count myself a king of infinite space." The prince is tightly bound by the unchanging text, but he will be imagined in an infinite number of ways, my conception being only one.

Yes, my passion and love of the play is a good thing and it's important for them to see it, but I know from years of experience that passion is not taught, passion is learned, and, in McLuhan's use of the terms, there's a big chasm between the two. In my case, my passion largely stems from what I have arrived at on my own, not from where I was tenderly led by the nose.

As much as our system imposes the contrary, meaningful learning happens on its own clock. We should not aim to cut paper flowers but, instead, practice the patient botanical art of planting seeds and nursing saplings. Those who are interested and dedicated will eventually get there in their own good time, and those who are not will at least have a general sense of the material and will, one hopes, find fulfillment elsewhere. Learning is always better absorbed and more meaningful when arrived at by genuine, self-motivated discovery rather than imposition. Ideally, we make allowances for individual choices and interpretations, but we also provide guidance, direction, feedback, and scaffolding. Rather than lead the expedition, it may be better to give them flashlights, compasses, and

1. McLuhan, M., & Leonard, G. B. (1967). The future of education: The class of 1989. Look, February 21, 23-25.

maps and allow for some "free-roving" explorations of Elsinore Castle and environs, your school's neighborhood or, in this case, the old Greenbriar mansion in *Gone Home*.

1995 ARCHAEOLOGY, TRACKING RIOT GRRRL, AND INTERTEXTUAL SALAD DRESSING

When thinking about how to structure the gameplay phase of *Gone Home*, I formulated a few schemes to ensure that my students discovered and read every sticky note, letter, document, and postcard. But where is the fun in that? The very idea of an ensured discovery is contrived, controlling, and counter to *Gone Home*'s primary engagement mechanism: free and open exploration. I eventually abandoned this tack and opted for a course that would support their exploration of the home but not determine their path.

I presented the class a choice of six possible topics to "track" as they played. Students would select a topic that interested them and undertake an exercise in focused evidence gathering. The tracking assignments allowed for unguided but purposeful exploration. Students could travel where they pleased, but they were mindful of finding, noting, and documenting artifacts that supported their topic. It was the natural extension of the annotation exercise in the foyer, and I reasoned that by furnishing them with a choice of topic they would take greater ownership of their learning. The six topics were:

Terrance Greenbriar (M), Uncle Oscar (m), Dr. Richard Greenbriar (m)

- Janice Greenbriar (M), Rick (m), Terrance (m)
- Sam (M), Lonnie (m), Daniel (m)
- 1995 Archaeology
- Riot Grrrl References
- Video Game References

The first three options involved character tracking. I grouped one major character (M) with the two minor characters (m) that I thought best supported and fed into the major character's story arc. 1995 Archaeology entailed noting, gathering, and researching artifacts endemic to the mid-'90s, a task that would be of interest to history and pop culture buffs and would encourage a consideration of the historical and physical setting of the story. Riot Grrrl References appealed to students interested in music and music history and allowed them to consider why Sam was drawn to a West Coast feminist punk movement. Finally, the Video Game References option proved enticing to the gamers. Interestingly, one might be tempted to dismiss this final video game topic as the most nonliterary, but I would argue the opposite.

Most literary works are referential systems, containing allusion to myths, biblical stories, and other works of culture and literature. These references enrich the text and often act as a nod to the sources that inspired the creation of the work. This type of intertextuality is by no means exclusive to literature, as fine art, film, music, and other cultural texts often do the same. Similarly, *Gone Home* is replete with both subtle and ostensible references to the video games and genres that preceded it and contributed to its creation. Uncovering these secret references adds an extra dimension of depth and entertainment to the gameplay experience, especially for the gamers in the class who connect to the works being referenced. The in-game references also open a door to discuss why they are included in the game, which can be extended to a consideration of how intertextuality works in other cultural products and texts. Students may not always be fascinated by why John Milton nods to the book of Job in *Paradise Lost*, but they may be keen to discover why game developer Ken Levine is referenced on a salad dressing bottle in the Greenbriar pantry (see Figure 5).

Figure 5. Salad dressing referencing Ken Levine's BioShock Infinite in Gone Home.

I introduced the class to the six tracking topics with a handout and had students select their choice through a show of hands. Remarkably, I had to do very little rearranging as all three of my classes naturally distributed themselves fairly evenly across all six topics. I don't imagine this will always be the case, but I was happy it worked out that way. Once the topics were set, I explained that when the gameplay phase was completed, students would be grouped together according to the topics they chose and collaborate on a group presentation to share their findings with the rest of the class. This would be a good way for the entire class to have an in-depth look at the game from a variety of perspectives.

Some chose to play without interruption and leave the screen shots and notes until later, while others took notes and screen shots as they played the first time through. I provided a topic-tracking sheet for anybody who wanted to use it, but it was optional. They could gather and organize their data as they saw fit. In essence, I tried to insert myself as little as possible. We hadn't quite torn down the classroom walls, but I watched each player running around freely in the old mansion, jotting notes, taking screen shots, and exploring closets. They were essentially nomads hunting and gathering in an information environment—activities that fulfill McLuhan's prediction of retribalization in the digital age.

PARTING THE CLOUDS OF MOOD AND TONE

The setting of a spooky old mansion on a dark and stormy night playfully positions *Gone Home* within the horror genre. I say *playfully* because the tone is ever so slightly tongue in cheek, and the source of terror is ultimately more psychological than metaphysical. A great example of this is a bathtub that seems to be covered in blood but that turns out to be red hair dye. While playing, one student remarked: “I keep expecting Uncle Oscar’s ghost to appear, or some psychopath to jump out at me with a knife,” underscoring how *Gone Home* leverages a haunted house mood to create tension. I thought this was perfect fodder for a lesson on mood and tone.

In literature, much of the emotional climate is determined by the mood and tone of the narrative, two concepts that are commonly confused. To refresh your memory, “tone” is the narrator or speaker’s attitude toward the subject, while “mood” is the atmosphere of the piece and the emotions it conjures in the reader. Mood and tone can be identified in most narrative forms, including film and video games. The distinction is between the emotional impact of what is being described (mood) versus how it is being described (tone). In books, this is entirely relayed through words, but in visual mediums such as video games, the graphic depiction also affects these two atmospheric elements. A funeral represented in a dark, severe, and realistic style would convey a different tone than if the funeral were conveyed in a playful, cartoony style.

I introduced the lesson by asking students to find definitions for mood and tone, and then we discussed the distinctions between them. I then directed them to a website with extensive lists of tone words and mood words and tasked them to choose 10 words from each category that best fit the game. Each student then sent his or her list to two volunteers—one received all the mood words, the second all the tone words, with which they compiled two master lists. Finally, the master lists were dumped into Wordle, a free online service that generates colorful word clouds (see Figure 6). The size of the words in the cloud are determined by their frequency in the list, so the larger words visually represent those most used by the class.

Figure 6. Tone word cloud.

The clouds were a great way to visually reinforce the differences between the two concepts. The exercise also allowed the students to reflect on their collective perception of the game's mood and tone. I posted each class's final products to our online learning-management system and concluded the activity by having them write paragraphs on the mood and tone of *Gone Home*.

AN EMBODIED VISION QUEST: SUMMONING AUTOSTEREOGRAMS

What's an autostereogram, you ask? If you remember the '90s you may recall a fad in which people purposefully stared at prints and posters that looked like kaleidoscopic white noise. Some had the almost magical ability to look at these images in a certain way and discover a 3D picture hidden within the chaos of colorful pixels. Staying faithful to its '90s setting, *Gone Home* features two autostereograms on Sam's bedroom wall (see Figure 7).

Many of my students wondered what these were and, eventually, a few became somewhat obsessed with seeing the secret image in these carryovers of '90s kitsch. It wasn't unusual to catch them in full vision-quest mode, staring wide-eyed through (as opposed to at) their laptop screens, murmuring, "I can see it. It's a shark—it's definitely a shark." If you want to give it a shot, check out the Magic Eye website and hope that you'll have better luck than I did, as I've never been able to see one. I epic fail as a man-child of the '90s!

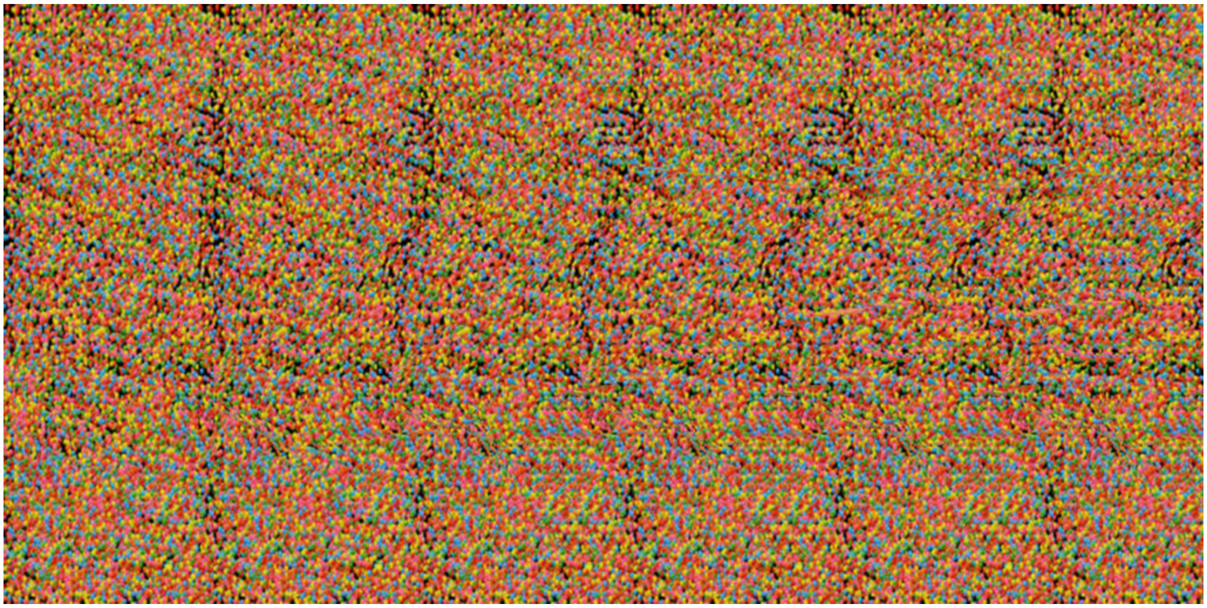


Figure 7. Can you see the hidden image? (This autostereogram appears as an example in Wikipedia.)

The game had become a sort of cultural time capsule. It didn't merely prompt my students to experience the '90s from the outside, but it allowed them to partake in and relive genuine '90s experiences. Similarly, by virtue of the game's audio and the playable music cassette strewn around the mansion, they could listen to Bratmobile and other Riot Grrrl bands that Sam was into. In a book, these artifacts would be abstracted by words, but in a game they became tangible embodied experiences. Students can gaze into the autostereograms (with mixed success) and hear the music, as opposed to only read about it. I argue that this gives them greater proximity to the narrative, as it is less mitigated. I would be the last person to diminish the value of reading or literature, but I only point out some unique features and perhaps advantages of a video game as a text. It's only fitting that *Gone Home*'s haunted house atmosphere successfully summons these palpable spirits of the past.

THE PROS AND CONS OF THE REVIEW REVOLUTION

Terry, the Greenbriar dad, writes pulpy sci-fi thrillers whose hero travels back in time to alter American history. Judging by the boxes of overstock scattered all over the house, his novels don't sell too well. Terry is forced to make ends meet by writing consumer electronic reviews for a home-entertainment magazine (see Figure 8). When he is publishing his home electronics critiques in *Gone Home*'s 1995 setting, reviews, whether for film, music, books, or other consumer goods were still largely a professional undertaking. Publishers and broadcasters governed access to the masses, and only a select circle of professional critics and reviewers could reach a wider audience.

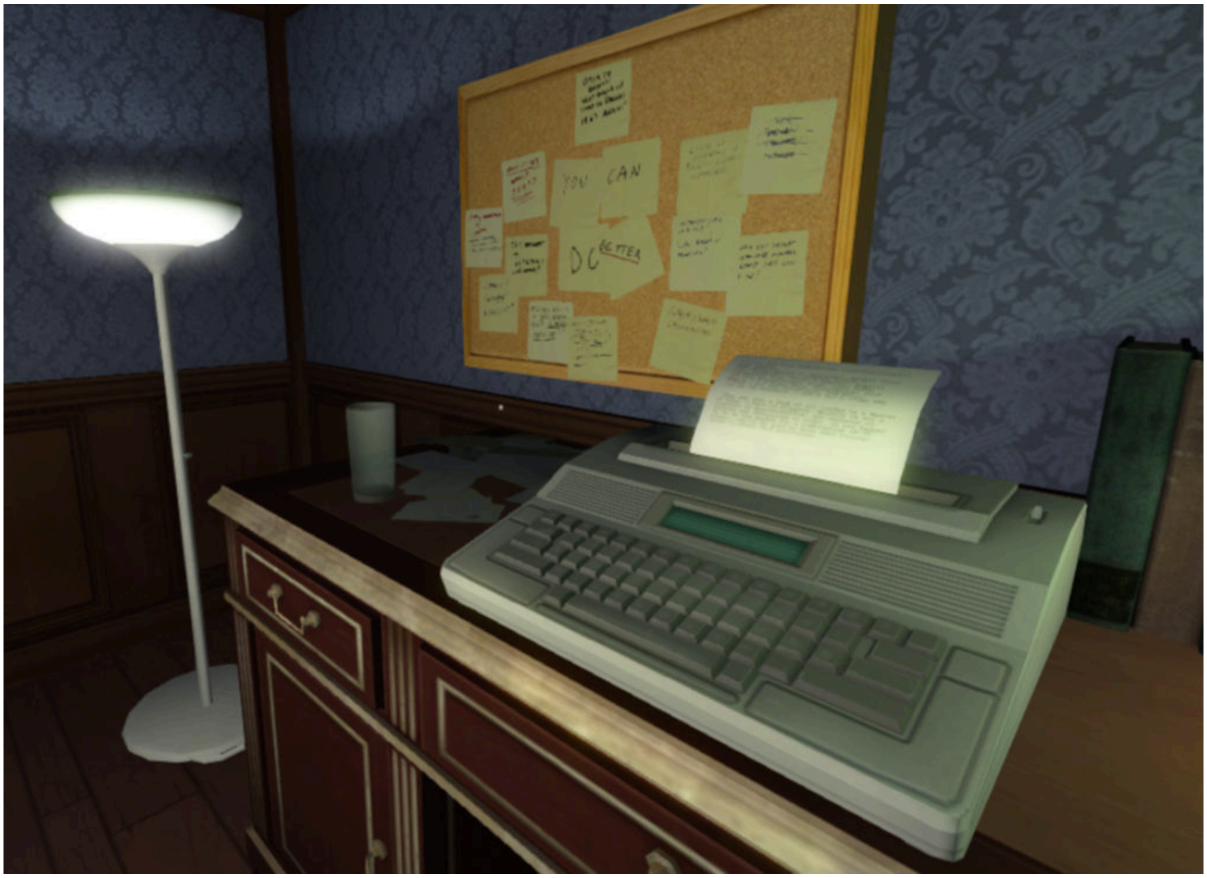


Figure 8. A review in progress at Terry's desk.

It wasn't too long after the mid-'90s that the advent of the Interweb threw open the floodgates. Today, for better or for worse, amateurs from all walks of life have wide-open forums in which to sing praises or vent dissatisfactions. This immense chorus of critical voices is highly democratic, but the sheer volume and lack of quality control clearly presents some downsides. For one, there is little accountability, as many reviews are anonymous. Consumers are often forced to sift through deeply divided and often conflicting opinions. There is also the issue of credibility. Could the review be a fake planted by the producers of the product or service? "Astroturf," as these promotional reviews are sometimes called, is big business in today's competitive online marketplace. In the end, the coexistence of both professional and amateur critics offers a broader range of perspectives from which savvy consumers can decide whether to add to the cart or take a pass.

Why not get my students to join the conversation and write a review of the game? It would tell me how they felt about the experience, they would think critically about their play, experiment with a prevalent and contemporary form of writing, and channel a little Terry Greenbriar along the way.

FANTASY CLASSROOMS AND REAL-WORLD REVIEWS

An ongoing problem with schools is that they largely operate within a bubble that is separate and distinct from productive society. Schools aim to prepare students for a workforce in which they don't actively participate until school is over. This is made clear whenever teachers refer to the menacing universe outside the school as "the real world," which makes the classroom a "fantasy world" by default. I remember that when I was in school, a few of my teachers would brandish "wait 'til you get to the real world …" as a sort of threat, as if I would find myself instantly unemployed for failing some test or exam. I never stopped to think that there aren't many tests or exams in the real world; they exist only in the fantasy world we call "school."

The real world should not be a threat, but an invitation. I am convinced that many unmotivated students would love to have more of the real world in school, and more school in the real world. Much of school life is suspended in a zone of ineffectual inconsequence, and many students feel that acutely. They bide their time for 18 years and longer before they can make "real" contributions to society. In the worst cases, math problems are abstracted from practical application, language classes are taught in isolation from their genuine use, and English assignments are marked, returned, and ceremoniously deposited in a three-ring sarcophagus to be interred in some closet or crawl space. Schoolwork travels a tight circuit between student and teacher only to meet its end in storage, landfill, or burned in a ceremonious end-of-year bonfire. Occasionally, a gold-star effort might make it to the fridge door.

In preindustrial village or tribal life, youth and adolescents assumed a variety of duties that contributed directly and meaningfully to the good of the community. Life was intergenerational, not segregated by birthdays and ages. Young people helped gather and prepare food, carry water, look after and mentor the young, or conduct graduated menial work as part of an apprenticeship. They also spent much time in free and healthy play, an important part of meaningful social preparation and participation. They very much took part in the real world and their actions directly affected the livelihood of their community. This, of course, took a dark turn with the advent of industrialism, in which the mechanical regiments of clocks and factories transformed meaningful youthful contributions into the nightmare of child labor. Schools today retain many elements of the factory, but the student workers are their own products, conjuring the image of a hamster on a wheel. Ideally, schools would do a better job of safely and meaningfully harnessing the vast potential of their students for the productive betterment of their communities. We should strive toward an integrated lifelong program that fuses learning, work, and play. So how does this all relate to writing reviews for *Gone Home*?

In recent years, I've tried to think of ways to give my student work some real-world traction. The Internet has been helpful in taking baby steps toward this goal. As I mentioned earlier, product and service reviews are everywhere today. They are a valid and important contemporary form, as they play an important role in our consumer society. Writing reviews promotes critical thinking, synthesis, the logical organization of ideas, and even requires a specific form of literacy. We don't have to think critically just about a subject when we write a review, but we also have to think critically about the reviews that we read. Consequently, I thought that having my students produce reviews about *Gone Home* was a timely and practical response to playing a video game. Best of all, there are endless real-world online forums and game sites to post these reviews. They could genuinely contribute and participate in the knowledge community that the game has generated. Their work would not be graded only by their teacher but, more important, their efforts would be subjected to the scrutiny of the legion of invisible eyes that inhabit the "real world" of the Internet.

As long as security measures are taken, students today can be both critical consumers and active producers, partaking in online discussions, writing reviews, posting their pictures to Flickr, their videos to YouTube or Vimeo, and their music to SoundCloud. Their work no longer has to languish in sterile obscurity but can now contribute meaningfully to dynamic communities and receive genuine feedback. This definitely bursts out of the school safety bubble, and it can lead to some painful interactions, especially in the emotionally charged environment of online gaming forums. There are always risks associated with exposing ourselves, but isn't this the world we are moving into? How many of my students have been bullied on Facebook or made ill-advised posts they can never take back? Posting work online can be an important lesson in digital citizenship. I'd rather they experience the trials and rewards of online communication by way of an impersonal game review than by unwisely posting something much more personal and damaging. Fantasy worlds are places without consequence, both in the negative and positive implications of the word. If and when schools decide that they want to better integrate students to the "real world," there will undoubtedly be consequences to be paid for the great prize of being consequential.

In preparation for this assignment, I had them read and take notes on a variety of reviews about *Gone Home* from a wide range of publications. I also provided them with a loose outline on how to structure their work and gave them a little more than a week to complete it, as they were also working on their topic-tracking presentations. Their completed reviews had to be posted to both their English blogs and on online game sites such as Metacritic, IGN, GameSpot, Giant Bomb, and so forth. They also had to include a screen shot of their online post on their blog as proof that their work had been dispatched to the real world (see Figure 9).

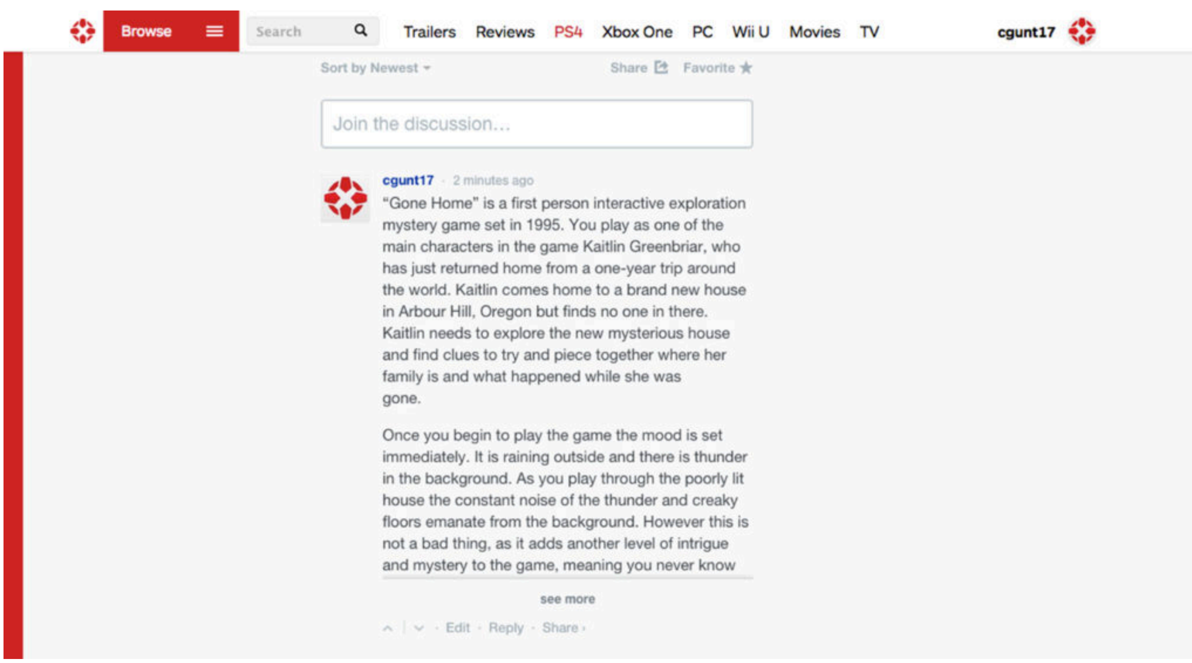


Figure 9. A review of Gone Home posted by a student to an online forum.

FINAL PRESENTATIONS

Students were given two classes to complete their reviews and work on the final presentations. Their presentation teams were made up of two to four members who had tracked the same topics. The groups were tasked to prepare 15-minute presentations that surveyed their findings and responded to the key question I assigned for each topic.

Group presentations were an ideal way to conclude the unit for a variety of reasons. The format encouraged genuine collaboration, in which each student brought something to the table and was made directly accountable to his or her classmates. Teams had to sift through their collective findings to determine what was important, organize speaking order and topic, and design a cohesive and attractive slide show. It was an exercise in group coordination, critical thinking, design, and creativity. It also furnished an opportunity to practice public speaking and visual literacy, two skills whose usefulness transcends many professions and undertakings. Finally, the presentations would expose the entire class to a variety of perspectives on the game, the narrative, the setting, and the characters.

Epic Slideshow Guidelines

I've seen many professional and student slide-show presentations through the years, and I have witnessed everything from gouge-my-eyes-out appalling to edge-of-my-seat spectacular. An effective slide show can be inspirational, motivational, informative, and entertaining, and these positive outcomes can be achieved by following a few simple rules that I share with my students:

- Know your topic.
- Rehearse your entire presentation at least twice, if not more.
- Avoid reading from the slide.
- Favor images over text—avoid excessive bullet points and text when possible.
- Keep it clean—avoid busy slides with too many images, animations, colors, and so on.

In the hands of a capable designer/presenter, some of these rules might be broken while still achieving positive results. However, following these simple rules can certainly lead to epic results.

Show and Tell

During the presentations, I sat at the back of the class and took copious notes from which I would complete rubrics and provide ample feedback to each group. I budgeted 5–10 minutes between presentations for my classes to ask questions and provide feedback, most of which ended up being thoughtful and constructive. As mentioned above, the topics included a study of thematically linked major and minor characters, artifacts and items endemic to 1995, the Riot Grrrl music movement, and video game references.

Character Clusters

Key Question: *How has the major character changed during the course of the story? Is s/he better off at the end of the game than at the beginning? Why or why not?*

Those who tracked characters explored relationships, motives, and personality traits to flesh out the individual story arcs. They discussed complex issues such as alcoholism, sexual abuse, infidelity, sexual identify, rejection, and loneliness, to name a few. They also addressed how the characters dealt with their particular crosses. Interestingly enough, groups presenting on the same topic had varied and sometimes even contradictory perspectives. One group, for example, was understanding of Janice for flirting with infidelity because her husband was emotionally unavailable, while another group was completely unforgiving and thought she was a terrible person who betrayed her husband and family.

In every case, they supported their ideas and character analysis with hard visual evidence from the story (see Figure 10).

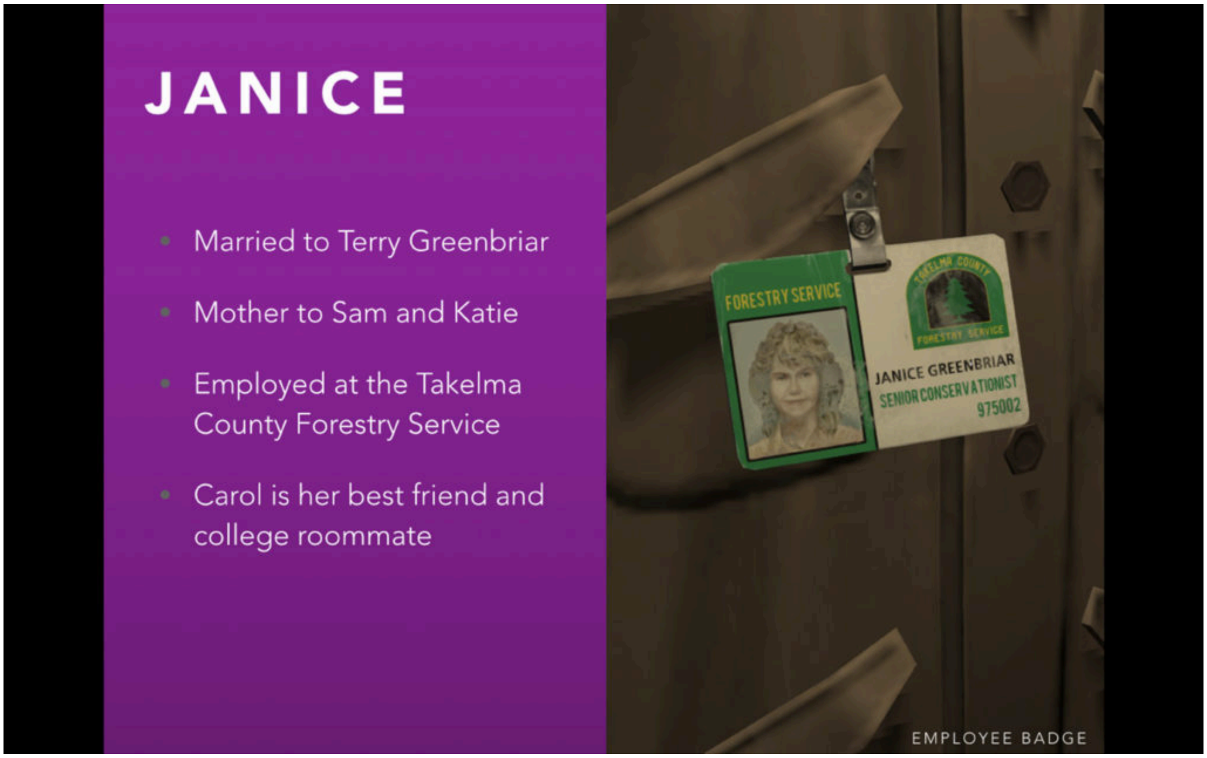


Figure 10. A character cluster slide on Janice, the Greenbriar mom.

Their slides included images of diary entries, letters, day planners, clothing, and documents that corresponded with what they were discussing. Their analysis was as rich and nuanced as it would be for a literary work. They not only demonstrated critical thinking and insight about the characters, but this exercise also let them think about how the challenges affecting the Greenbriar family connected to their own lives.

1995 Archaeology

Key Question: *How did the historical setting of 1995 affect the game? How would the game have changed if it were to take place today?*

Much like an archaeologist, a player in *Gone Home* rebuilds the life of the family by piecing together the fragments and artifacts of its members' lives. The game is set in 1995 and, for those of us who grew up in the '90s, VHS and cassette tapes, electric typewriters, *TV Guides,* telephone books, and Magic Eye posters are the stuff of nostalgia (see Figure 11). But for my students, these may as well be bone fragments and pottery shards from a lost civilization. Those who presented on this topic chose items and practices that were characteristic of the period and designed their slide shows to resemble museum exhibits. They researched each artifact, provided background information, and discussed, where applicable, how the items affected the story or the game. It ultimately amounted to a deep consideration of the literary concept of setting.

Figure 11. A VHS tape from a 1995 Archaeology presentation.

Riot Grrrl

Key Question: *How did this style of music work well with both the geographic and historical context of the game? Why is Riot Grrrl a genuine expression of Sam's journey?*

The music and culture from this Northwest '90s feminist punk movement pervades many parts of the story. The thrashing guitars and in-your-face vocals are the soundtrack to Sam's journey of self-discovery. Groups who chose this topic explored the movement through the bootleg cassettes, zines, music magazines, and posters spread throughout the house (see Figure 12). They included music video and audio samples in their presentations, and a few enthusiastically shared anecdotes they'd encountered while gathering background info on the Riot Grrrl scene. Music enthusiasts were able to discover a musical subgenre but, more important, it also occasioned them to reflect on the connection between music culture, adolescent identity building and self-expression.

Figure 12. A slide from a Riot Grrrl presentation.

Video Game Reference

Key Question: *Why do cultural texts such as films, books, and video games include references to other relevant cultural works? In what video game tradition does* Gone Home *participate? What is* Gone Home*'s video game genre?*

Gone Home is replete with subtle references to the video games that influenced its own creation. Because the references are hidden and easy to miss, the presentations on this topic were by far the most eye-opening. Students who had played the game and not noticed a single one were surprised to discover that there were dozens of nods to video game culture in everything from motorcycle adsto varsity jacket embroideries. The slide shows were rich with images and many included screen shots and videos from the games that were being referenced, such as *BioShock* and *Deus Ex*. The video game reference presentations opened a window to how the literary concept of intertextuality is manifest in the game world. Furthermore, it contributes toward the validation of the game as a complex and nuanced text that does not easily give up all its secrets.

THE RESULT

In the end, they were easily some of the best student presentations I've experienced to date. Why? They responded well to the guidelines I provided to produce effective slide shows. Also, most of the students were allowed to choose their topics, which leveraged genuine interest and encouraged ownership. It also helps that *Gone Home* is a predominantly visual experience and translates well to the visual nature of a slide-show presentation. Contentwise, students connected with the topics on a personal level as they demonstrated keen insights into family psychology, adolescent angst, teen-parent power dynamics, and how historical circumstances can shape and affect the stories of our lives.

They were articulate, generally well prepared, and often enthusiastic. Although I hadn't required it, many wrote scripts that they used to cue them during their talks. Some even discussed mood and tone, demonstrating that they had successfully absorbed the concept from an earlier lesson.

Were all the presentations successful? Of course not—no matter how much we may strive for uniformity, which is probably misguided anyway, teaching and learning are messy affairs. Two presentations were subpar and, in a few cases, some group members were not as prepared as others. Another detrimental factor was that the Greenbriar mansion is dimly lit, so some of the screen shots on the slides suffered from being on the dark side.

The slide-show presentations enlisted the entire class to openly contemplate and participate in a visually rich, analytical retrospective of the entire gameplay and narrative experience. It was a revelation of the game's secrets and nuances, eliciting thoughtful insights and discussions. Students honed a broad spectrum of skills, reinforced knowledge on character and narrative, and, dare I say, even seemed to enjoy themselves along the way.

HIGH SCHOOL ENGLISH APOCALYPSE

Is this then the apocalypse of the traditional English class? Will Holden Caulfield and Atticus Finch be replaced by Mario and Zelda, all at the expense of the written word? I hate to say it, but the four horsemen showed up a long time ago. Those of you who teach English, search your dark and complicated souls and ask yourselves: How many of your students really finish the novel? Even worse, how many boys finish the novel? My experience dictates that, in many cases, I may as well be teaching directly from SparkNotes, eNotes, Shmoop, and BookRags (those four horsemen I was talking about), because that is where many adolescents turn in lieu of the original works.

English class can become a sort of theater where everybody pretends the texts are being read. The sheer abundance of communications alternatives is making it harder and harder to focus on reading as we once did. The quickly changing ecology of modern communication expands the notion of literacy to include nonalphabetical visual elements, interactive texts, and a renewed emphasis on orality (Skype, YouTube, Siri, anybody?). Our duty as educators is to design our courses to prepare students to think critically and succeed in their current communication context, as that is the environment where they must survive and, we hope, prosper.

High school English class should continue to be the temple of the written word, but the goal should expand to effective and meaningful modes of communication. All media have the written word at their foundation and it should be given priority, but a space might be made for other meaningful forms of communication. Video games are a new medium and have a long way to go before they can compete with the depth and nuances of literature. A game such as *Gone Home* has a foot in both worlds as it reinforces a range of skills traditionally associated with high school English, but it also opens the door to skills that are forward thinking and relevant to our rapidly changing age. *Gone Home* undoubtedly lacks the richness of a literary text, but it compensates in other areas.

One of my hardest-working students and a nongamer told me he found it easier to remember names and facts by accessing them through the game than he did when he read them in a novel or short story. He was initially suspicious of using a video game for English, but his accessing the narrative in an audiovisual and embodied medium better suited how his brain retained information. This is significant, as it plays into the ideas of differentiated instruction and multimodalities. Different brains learn in different ways and, to his surprise, this style seemed to work for him.

Most of my students reported enjoying studying *Gone Home*, but not all. A few didn't like the story, others didn't like the game, and some were indifferent, but at least I knew that these critical perspectives were all based on actually having worked through the narrative and not gleaned from an online summary or study guide. They delved into the text, drew their own critical conclusions about it, and responded in kind. Despite the unusual choice of text, or site for analysis, their learning outcomes were consistent with the skills demanded by lit class curricula from around the world, including Common Core State Standards.

I use the term *apocalypse* not only for dramatic effect but also conscious of its original meaning in Greek as a revelation of something hidden or a disclosure of knowledge, not as an end or cataclysmic finality. By unearthing the hidden possibilities and rending the veil we refresh our teaching to align with the world as it is, not as we want it to be. This allows us to open up the possibility for a meaningful renewal of our practice, which is the greatest way to serve and prepare our students. McLuhan famously quipped that "we look at the present in a rear view mirror"—a good reminder that maybe it's time to turn our attention to the road ahead.

CHAPTER 8.

A SPACE TO CREATE: TEACHING WITH MINECRAFT

BY JASON WILMOT

Figure 1. GR2 Joey builds his ideal classroom in this screen shot from Minecraft.

I am addicted to the notion that all people are creative. I believe we truly find ourselves in the creative process. I believe we find a deeper, richer understanding of our own aptitudes and capabilities when we stop consuming and start creating.

When I walk into my classroom I see brilliance. I see art and artists of all kinds. I see partnership and problem solving. I see architects and engineers. I see developers, coders, and hackers. I see programmers, designers, and advertisers.

But I also see kids just trying to have fun and be happy at school, to learn about life and grow in self-efficacy. I see kids who love to collaborate in ways that excite and expand their imaginations. I see classmates connecting in completely relevant ways.

What I see is that we need more things like *Minecraft* in school. More things that kids are actually talking about. What we need is less of our own agenda and more of theirs, more of their interests and more of what they find meaningful.

I'm not saying that *Minecraft* is the answer, but I am saying that it might be. It might be. It might be for that kid who has not mastered the art of school. It might be for the kid who is tired of being tested and just wants to be a kid again. It might just be that *Minecraft* is exactly what these kids need—what every kid needs: a space to imagine. A space to explore. A space to dare. A space to fail and fail and fail. A space to be bold. A space for resilience. A space to finally get it right.

A space to craft.

A space to create.

A space to build understanding—one little pixelated block at time.

WHAT IS *MINECRAFT?*

Minecraft is a pixelated powerhouse for digital play. It is a sandbox environment that allows users to build and alter their surrounding world. *Minecraft* can be played on a number of devices, including PC, Xbox, PlayStation, iOS, and Android. *Minecraft* is a game created by Swedish programmer Markus "Notch" Persson, later developed and published by Mojang, and most recently acquired by Microsoft.

Minecraft can be played as a game centering on strategic thinking and deductive reasoning. The user must prioritize, set goals, and problem solve to explore the in-game world. Throw in an optional threat of danger (monsters) and this fosters a need for security and necessitates preservation strategies.

Minecraft can also be played in a "Creative" mode. This mode provides for an endless virtual sandbox of creativity (think digital Legos). Here users can imagine, design, build, engineer, program, develop, code, and simulate almost any type of learning environment. Users can play individually, in small groups, or they can play on servers holding hundreds of players.

On top of all that, *Minecraft* also allows for virtual field trips. Here, a teacher could drop the entire class into a precreated world. You'll find ancient Roman dwellings, China's Forbidden City, and Egyptian pyramids. This feature is called "Adventure" mode. It gives students the ability to visit a world but disables their ability to break anything within it. It's a class trip to the art gallery with no need to worry about oily fingers.

How Do Kids Use Minecraft in Class?

I started using *Minecraft* in my classroom in the fall semester of 2013 with the help of Guy Trainin, PhD, of the University of Nebraska, Lincoln. Since then, I've used *Minecraft* in several different ways. I've used it for individual, whole-class, and entire-school builds.

We have learned about digital citizenship, computational thinking, and connected the everyday classroom curriculum into student creativity (see Figure 1). Kids have created and solved math problems (see Figures 2 and 13), combined research projects and digital dioramas to model the Great Wall of China, the Orphan Train (an 1800s orphan-relocation program), our solar system (see Figure 7), water-conservation displays, and everything else you might imagine. We have simulated learning goals from Language Arts, done basic programming, and even used it for our Hour of Code during Computer Science Education Week (CSED). With *Minecraft,* the possibilities are almost endless.

What Are the Educational Benefits?

When people ask about the educational benefits of *Minecraft,* I often ask them to clarify what they mean. Yeah, I'm pedantic like that, but "educational" can mean a lot of different things to different people—and really, that's probably right where we should keep it—amorphous. I subscribe to the idea that education can happen anytime and anywhere.

Maybe I'm "old skool," new school, or something in the realm of other. But as an educator, what I hold onto more than anything else is this: *Learning must be meaningful and it must be relevant.* That means content must be presented in real-world ways. It should make sense on an individual level and whenever possible content should be simulated, not just presented in information-only formats.

Our job as educators is not to provide the dots, but to facilitate the connecting of dots. This means taking student experiences and building *into* that specific knowledge base. It means getting to know the students individually. It is discovering what they find interesting, what they believe about the world, and where they find significance. For all these things—for this affinity space—the best place to start was *Minecraft.*

I say this because *Minecraft* is not an information-only medium. With *Minecraft,* information can be presented and then simulated in hundreds of ways. When students can take new information and build into their schema through experiences or simulation—that's where knowledge, know-how, and learning start driving themselves.

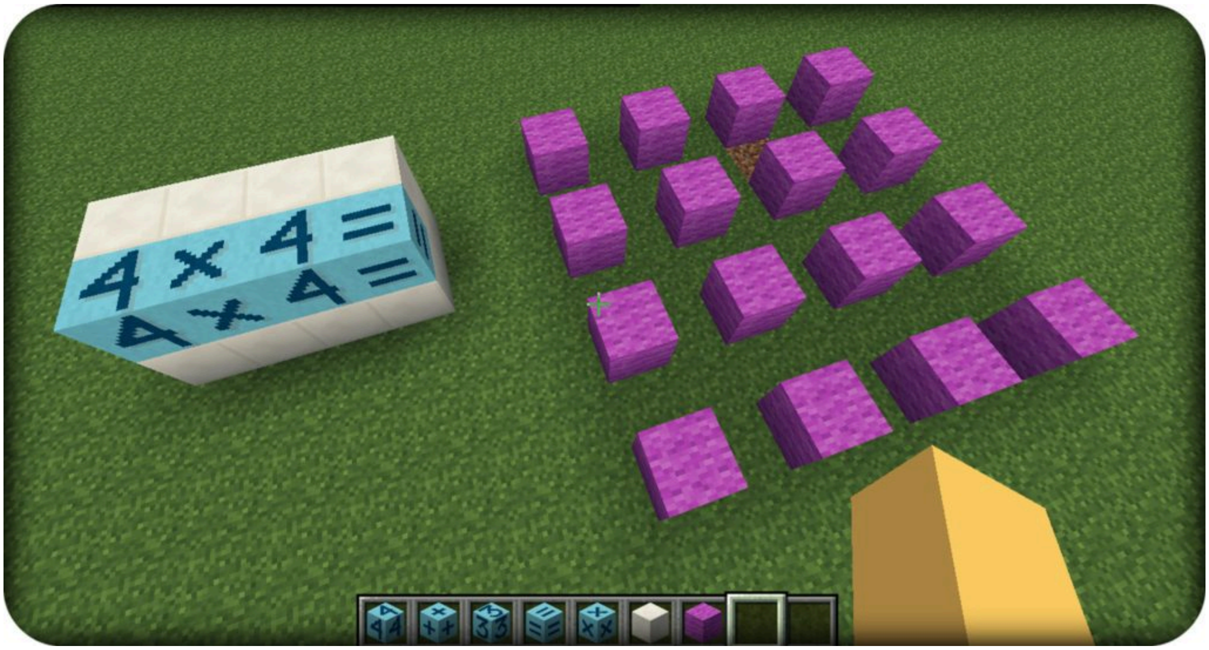


Figure 2. Using Minecraft blocks to demonstrate an understanding of multiplication.

Minecraft Is a Platform

A hurdle I often come across in teaching with *Minecraft* is not merely having to explain what *Minecraft* is, but actually addressing what *it is not.* I start by saying that *Minecraft* is not merely a game, just like Amazon.com is not just merely a website.

Yes, Amazon.com is a website, but you're familiar with Amazon because it is a platform. And that is a very important difference—because a true platform *is a new way of doing something*. Amazon changed the face of commerce, not by inventing commerce, but by creating a new avenue for it to exist. It created a new way for the consumer to interact—almost directly—with the producer. Amazon is a new way of doing something we humans have been doing for a very long time.

But when I talk about using *Minecraft* in education, I think most people probably conjure some greaseball trying to suck down their taxpayer dimes playing computer games. And that's frustrating because—yes, of course it is a game—but that is just scratching the surface. Instead, *Minecraft* should really be seen as a new way of doing something: a platform. A platform that provides a basic structure, yet from that structure one can do, literally, thousands of things.

I think Lego fits somewhere into this little assembly of an argument. Lego has a simple concept: Assemble individual blocks to make something awesome. You can follow the directions or you can be as creative and imaginative as you want. There is no wrong way to play with Lego, just as there is no right way or wrong way to play *Minecraft*—they are both sandbox environments designed for play and imagination.

But here is the contradiction that I find. You would be hard pressed to find individuals who would write off Lego or who would criticize it and label it as a foolish distraction. Yet if you put that same idea on a computer screen, people will fly into fits and pull the old-fashioned "Well, back in the Gilded Age of Learning when I was in school" blaspheme card.

For some reason, creativity, innovation, and imagination don't come in pixelated form. For some reason, we have convinced ourselves that real learning comes in the form of textbooks and worksheets. For some reason, if you're playing and gaming, then you're obviously not learning.

But I think that's wrong.

Before we had *Minecraft,* we encouraged kids to play and create with Legos. A little before that it was Tinker Toys and Lincoln Logs. Before that it was wooden cubes, sticks and rocks, or whatever kids could get their hands on.

You see, we humans long to play and create. We desire to learn, build, design, and discover. We always have and we always will. *Minecraft* is no different. It is a platform delivering what kids desire. It allows students to construct their own meaning. It paves the way for students to try and fail, or to experiment with their own imagination and creativity. It allows kids to simulate newly acquired information in completely relevant ways. *Minecraft* makes sense. It's a platform for learning. It's a platform for play. It's a platform where students and teachers can actually connect.

Figure 3. GR5 Imran building a redstone crusher with circuits and a switch to activate the pistons.

Minecraft: Learning by Doing

I recently helped a friend put his IKEA kitchen table together. After half an hour or so of building this table, the ever-so-simple directions walked us through to having a table that stood mostly upright. We beat our chests, reveled in glory, and life was good. Hurray for us. Hurray for dinner. End of anecdote.

Maybe you can't relate to my built-it-yourself adventure, but here's the idea: The instructions and the table are a perfect pair—but separate them and they're practically useless. Without the directions the table goes unused. On the other hand, if you have all the table's parts but no directions, the process can easily be stifled.

Author James Paul Gee, PhD, illustrates the same idea with the example of a video game in his book *Good Video Games and Good Learning*.[1] Basically, a prepackaged video game normally comes with two main features: the game itself and the instruction manual. While you can get along just fine without the manual, it does come in handy every now and then when help is sought or needed.

But don't try giving someone a game manual without giving him or her the actual game. Why? *Because no one wants the manual without the actual game.* What's the point of reading about the game if we never get to play? What's the point in memorizing facts in the manual if we never get to simulate or experience it?

You can see where this argument eventually leads when it comes to school. One would argue that we spend far too much time concerning ourselves with content rather than working to blend that information with an experience. In other words, we take the time to read all the manuals but never leave any time to play the game. When we do this, we leave out one of the most essential components of learning: understanding by doing.

If we know that authentic learning happens when we connect experiences and simulations, then we know that methods such as teaching through *Minecraft* make a lot of sense. What if after we read the manual, we could actually play the game? What if we actually gave kids a chance to simulate newly acquired information and turn it into knowledge? What if we could synthesize the information in such a way that kids found it relevant to their lives? What if—rather than just learning about the transcontinental railroad, a Sioux earth lodge, or the Eiffel Tower—what if we could just build them from scratch?

Well, there is a way. It's called *Minecraft.* It is a game and it is awesome for learning. With *Minecraft,* these kids are teachers, learners, and full-blown artists. Artists who innovate, imagine, and create. Eiffel Tower? We could build that. Earth lodge? Yeah, we could build that, too. We could build a pirate ship, a Pilgrim village, the Colosseum, or whatever else we wanted. We could even build a table.

With *Minecraft,* students aren't just consuming those manuals either—they are actually making the manuals themselves. Kids are teaching and learning from one another. They are reading wikis that other kids help create. They are starting YouTube channels to share and explore ideas. Kids are creating tutorials and reviewing mods and created worlds to share. They are using mediums they actually find meaningful and applicable. They are creating; they are cultivating. They are inventing and testing, hypothesizing and experimenting. They are learning through inquiry. They are learning through discovery. They are learning by doing.

1. Gee, J. P. (2008). Good video games and good learning: Collected essays on video games, learning, and literacy. New York, NY: Peter Lang.

MY *MINECRAFT* STORY:

Pioneering *Minecraft* in the Elementary Classroom

Figure 4. GR5 Jason builds an entire castle!

I'm that guy who likes his job so much it is annoying. I find meaning in what I do, and for that I'm grateful. I'm lucky enough to spend my day teaching 650 K-5 kids through computers. That's 50 minutes a class, 30 classes a week, and 650 little individual minds.

Technically speaking, I'm a computer specialist at Campbell Elementary School in Lincoln, Nebraska—home to good people, happy people. I know Nebraska and all these Midwestern states have a pretty lame label as flyover states, but, in actuality, Lincoln is a little gem of hospitality. It is home to an economy probably doing much better than yours, it has a vibrant university, and its diversity and culture are ever growing. Plain and simple, Lincoln is in its own coming-of-age story and I'm glad to be in the thick of it.

On any given day at Campbell, I have kids from all over the world in my computer lab. I can practice Vietnamese, Farsi, Arabic, you name it. Congolese French? Check. Tigrinya? I didn't even know that was a language (Hint: It's spoken in Eritrea and Ethiopia.) We have *hijabs* and *bindis.* We have rich kids and poor kids. We have white kids, black kids, and every shade in between. What we have at Campbell is a rich mix of a whole lot of cultures.

I cannot think of a more ideal classroom. I have these amazing kids from all walks of life and all corners of the globe. And sure, they may look different on the outside, they may speak different languages, and they may have different cultural practices, but they're a lot more similar than you would think. Because there's something kids everywhere have in common: They actually like to learn, just like the rest of us. Because learning is actually pretty simple. Learning is like breathing. We breathe in oxygen, we grow cells; we take in impulses, we connect dendrites. It is natural, normal, addicting, and never ending.

For kids, *Minecraft* is that never-ending discovery process. It's a digital destination for play and exploration. It's an unbelievably great platform for learning. It encourages kids to be curious and imaginative. It unbridles creativity and promotes originality. It forces kids to think critically and in an orderly way. It creates opportunities for programming, partnerships, and provides all the STEM environments you could want.

Minecraft is a giant platform of adventure and quest. It's a space for strategic, prioritized, and executive thinking. It's an area to create, connect, and collaborate. Throw in a freedom to fail, an ability to set goals, and the opportunities to take risks. Mix them all together and you get a pretty epic environment for learning.

But chances are you already knew that. And it's for all these reasons that you probably started reading this chapter. You've peeked into tomorrow and know what these kids will need. I'm suggesting that *Minecraft* is one way—one really good way—to get them there.

So in this chapter, my hope is to make a case for *Minecraft* and to start spreading this idea. Here is how it is going to work: I have already tried to lay down a little philosophy and pedagogy for *Minecraft.* It's not everyone's cup of tea, but it is the heartbeat of why this matters. It is also the stuff you will need to be able to explain to parents, teachers, and principals along the way.

Next, I'd like to fill you in on my story; it's brief, will help you know the setting of the story, and I hopeful will fill in a little of the background. Last, I'm going to list everything you ought to know if you want to get started, large or small. I even have links and a QR code for example videos and tutorials.

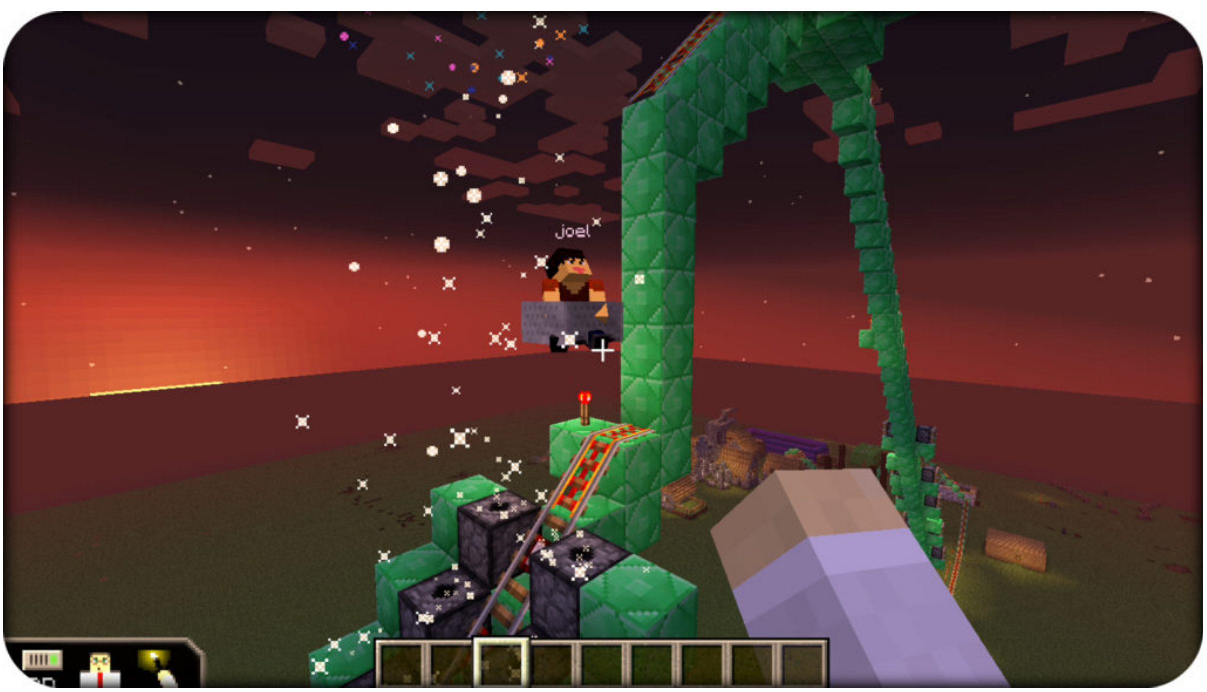


Figure 5. GR4 Joel and Melina build a redstone-powered roller coaster that shoots fireworks when triggered.

Here's Our Story

Before I was a computer specialist at Campbell, I was a fourth-grade teacher for six years. I made the move for a number of reasons, but one of my primary motivations for the switch was to learn how to further embed technology into education. But it was more than that: I didn't just want to sprinkle in techie gadgets or electronic worksheets. I wanted to find where curriculum, creativity, and student desires could intersect.

Upon my arrival at Campbell Elementary, one of the first things I did was try to get to know the kids. Plain and simple, I wanted them to be involved in their own school day. So, I explained, "A lot of times in life, there are things we *have* to do before we do the things we *want* to do." It's in this way I introduced our curriculum for the year. I told the students the curriculum requirements, but I also informed them that I had left plenty of room for their ideas.

All week long I met with 650-plus kids and took inventory of what they wanted to do. I heard great ideas, such as making movies, memes, and music. So we did that. Kids wanted to learn how to edit photos and create digital art. So we did that too. The ideas were fantastic. We grew in our understanding of digital literacies, but we also connected school with real-world experiences and everyday life.

But there was one other thing we talked about. Grade after grade, class after class, what the kids really wanted was to play *Minecraft.* Just like the students at my former school, the kids at Campbell had caught wind of *Minecraft.*

Fortunately, their new computer teacher had heard of *Minecraft* too. Between the transition from my old setting to the new one, I started researching *Minecraft.* My former students had convinced me to download it on the classroom iPads and taught me how to play. It didn't take long to see the potential it had for the classroom.

MINECRAFTEDU *TO THE RE$CUE*

So when my fourth-grade classroom introduced me to *Minecraft,* I couldn't wait to pay it forward and introduce an entire school to it. But as it turns out, *Minecraft* doesn't hand out copies for free (maybe someday it will). What I needed was 30 copies/licenses for my entire computer lab. I did some simple math and it got pricey really quickly. At the time of this writing, one license of *Minecraft* will run you about $27—that's a little steep when trying to fill an entire computer lab.

Luckily, you and I have a lovely little tool called the Internet. After doing some research and digging around, I came across *MinecraftEdu.* Essentially, *MinecraftEdu* is a modification, or mod, of regular *Minecraft.* Basically, a mod changes what the game looks like or enhances how it is played. Now, loads of mods are out there in the *Minecraft* world, but *MinecraftEdu* puts some pretty handy controls together and makes it easy enough for almost anyone to get started.

And here's the magic sauce: If you buy *MinecraftEdu,* you also get full access to regular *Minecraft.* On top of that, it all comes at half the price. The more copies of *MinecraftEdu* you buy, the cheaper they get. One copy is $18—not bad; 25+ copies are $14 each; and 100+ copies are $9 each. It's affordable, which means it's doable. And it was all the motivation I needed to keep this crazy idea rolling.

$2 Closer

Upon this delightful discovery of good news, I was all the more convinced that getting *Minecraft* at Campbell was something we could pull off. We needed about $450 to get started and that seemed pretty realistic. So, I took the idea to the kids to get them in on the conversation. I wanted them to have a stake in this project and that meant being transparent about the cost and about any obstacles along the way. That meant being open about cost, logistics, hurdles, and troubleshooting. It meant asking my kids for help and for input. And that's exactly what I got. Because when I presented these hurdles to hundreds of little kids, I had hundreds of little minds actively trying to solve them.

My favorite idea was from a fifth grader, Nick. He came up with the idea of starting a schoolwide fund-raiser. To Nick, raising $450 in a school of 650 kids seemed all too easy. Nick explained that if each Campbell student were to bring a dollar we could have enough money to buy *MinecraftEdu* for our entire computer lab.

In fact, he followed it up the next week by stopping by the computer lab with two $1 bills in hand. He gave me the money and reminded me of his plan.

"But, you have two dollars there," I said, rather astutely.

"Oh," Nick said, "Well, yeah, I brought two dollars. You know, just in case someone can't afford to donate a dollar."

What a champ, that Nick. I didn't take those two dollars. But I should have. It's good for us to contribute to causes we believe in. It's healthy to give. That would have been a teachable moment or something like that. Anyway, I didn't take Nick's money because I didn't need it: Someone had just footed the whole bill.

Guy Trainin, Extraordinaire

My previous year of teaching had been a fantastic one. During my sixth year as a classroom teacher, I started building a relationship with two amazing souls at the University of Nebraska-Lincoln (UNL), Guy Trainin, PhD, and Laurie Friedrich, PhD. I met both via UNL TechEdge, a conference filled with tech-savvy teachers, emerging ideas, and top-shelf speakers such as Dr. James Paul Gee. As with any quality conference, I left filled to the brim with new knowledge, new goals, and two would-be friends.

It was Professor Trainin whom I approached with the idea of using *Minecraft* in the classroom. I told him of the idea, laid out my goals, and told him my plan to get there. More than anything, I just wanted to know his opinion. Had I known walking into the conversation that he would be my benefactor, I probably would have practiced my elevator pitch a little better.

So after I told him my plan and my goal to get *Minecraft* into the classroom, Professor Trainin asked me how much it would cost. After I told him my plan to raise funds, he stopped me in my tracks.

"I'll fund it," he said.

Um. What?

"I'd be willing to fund the project if we could also study the educational benefits," he explained.

And in that instant, the idea of bringing *Minecraft* into the classroom started looking more like a reality. Instead of focusing on the fund-raising, I could start focusing on getting the plan in place. I walked into that conversation looking for advice, but I left with so much more.

And maybe the takeaway is this: Talk to people about your ideas and ask for help—especially if you think those ideas are really worth it. Going after your ideas may mean looking outside your personal resources. But the reality is this: People will always be interested in good ideas. Plenty of individuals and organizations want to invest in young minds, in their education, and into the hopes and dreams of tomorrow.

Figure 6. GR4 Hamza creates a fire maze for his friends and classmates.

The Spinning, Spinning, Spinning Beach Ball of Death

It's wise to remember that things move slowly down the bureaucratic assemblage line. After getting the great news from Professor Trainin, I ended up with months of waiting. We had to get all the yes sirs, yes ma'ams, and signatures from an assortment of folks. I had to talk with my principal, parents, district administrators, and university partners. And while the process took way more time than I had anticipated, in the end I had all the OKs I needed. The green light was finally given. *Minecraft* at Campbell was finally a go.

I Got Lemons. That's What We'll Call It.

When life gives you lemons in little blocks and pixels you must right-click and squeeze. But when those lemons look and sound a lot like grad students, you smile, shake their hands, and offer those poor kids some coffee.

When Professor Trainin and I had originally discussed this project, he asked one of his graduate students, Ji, to help out. Ji had come from China looking to pursue his doctorate in technology and education. He was interested in digital citizenship, collaboration, and educational gaming.

Ji and I had connected after hearing the good news and started setting up my computer lab to get things going. He arrived and we started talking servers, IPs, and RAM. I immediately started feeling overwhelmed, a bit ignorant, and even a little embarrassed. Here I was, trying to implement this game played over servers when I didn't even know how to set up a server myself.

But this is what learning looks like: We ask for help, we acknowledge our own shortcomings, and look to others for resources. Fortunately, there are tons of people like Ji—people who are patient enough and humble enough to show even a computer teacher (of all people) a little thing or two about computers.

Ji and I discussed other issues, too. We had to manage user profiles, maneuver directories, and find out the specs for 25+ kids on the same server at the same time without crashing everything. Yet little by little, Ji and I deciphered this little Swedish computer game. He researched server IPs while I registered accounts. We worked. We tested. We fixed. Rinse and repeat. By working together, in a matter of a few days we had everything we needed to push the "Go" button. At least we thought we did.

Advice: Get to Know the Folks You Don't

Then a brand-new wave of problems occurred. Basically, I had trouble accessing the *MinecraftEdu* launcher on our computer-lab student accounts. This meant kids couldn't all connect in whole-class settings. Instead, if our whole class wanted to connect, we had to use regular *Minecraft.* That, in turn, meant having TNT, lava, and fire as common occurrences. And although the mass destruction led to great discussions of governance, property, and digital citizenship, the students were having a hard time buying into the creation of digital art only to have it blown to pieces moments later.

This is when I really got to know and appreciate our tech gurus at Lincoln Public Schools (LPS). Just as advertised, these computer ninjas got me all the help I needed. They customized our app launcher and even surprised us with a super-stable virtual server. This meant I could start a *MinecraftEdu* server and use the in-game controls to stamp out fire, TNT, and all those little urges to grieve and destroy.

These tech masterminds never get the credit they deserve. They're not teachers or principals or department heads, but they are so essential to our schools. They problem solve, they troubleshoot, and they think outside the box. They are the people who make our modern age work. These behind-the-scene-ers deserve awards, our applause, and troves of Bitcoin.

While I was lucky to have some much-needed help, I also consulted a lot of forums online. Even with no tech support, help was always only a few clicks away. We live in a day and age in which affinity spaces have self-supporting resources. *Minecraft* has an absolutely huge web presence. You will find wikis, YouTube tutorials, Twitter, and a Google community dedicated to all things *MinecraftEdu.*

The Paradox of Choice

After months of waiting, planning, hair pulling, mouse slamming, and everything in between, the kids at Campbell finally had *Minecraft.* The major issues were tackled, the servers held stable, and the kids knew the high expectations. The time to play, create, and craft had finally come.

And I think this is where the project's vastness hit me all at once. All of the prep work, all of the defending, convincing, and pursuing—all of that was just the first step. Now, I had to actually implement it and prove it useful.

This is where the work of an entrepreneur, a visionary, a pioneer—this is where work can get frustrating and isolating. I think it's because we are so apt to envision a new way and so inclined to welcome fresh ideas, but actually bringing that change to fruition is a really difficult feat. We can get so caught up in the lofty vision that when it's time to implement the idea, we find ourselves facing an impasse of our own unrealistic expectations.

And that's where I found myself regularly: treading water in this ocean of ideas, not sure where to go. There were so many different ways to implement *Minecraft* that I didn't know where to start. It was the Paradox of Choice: You know, there are so many options that you're unsure which one is best. The worst part is struggling to actually embrace any game plan because it may not be the best one. So, here I speak to you, astute reader and aspiring *Minecraft* teacher: Don't get caught in this mind-set. Trust your gut. Make a plan and stick to it. Ask for help. Don't be a hero or a go-it-aloner.

Ultimately, I decided to just go. And what that looked like was just my stepping back. I wanted this to grow organically, not in a contrived or conditioned manner. I didn't try to rush in my own agenda or attempt to shoehorn *Minecraft* into some standardized curriculum. So, at first we just played. We learned the controls, we stretched our imaginations, and we discovered what we could make this game do.

Figure 7. Crossing curriculum: Fourth-grade girls team up to build a representation of the solar system.

Collaborative. Creative.

I want to leave you, reader, with a taste of what you can actually do with this game. It's hard to know where to start, so I want to run through a few highlights to get your imagination going. We've engaged in whole-class projects of giant roller coasters (see Figures 5 and 20), and we have built arenas, stadiums, and fire mazes.

The biggest project we have pulled off was a schoolwide build properly named Campbell City. The city project was actually done pretty early on in our adoption of *MinecraftEdu.* To be honest, I wanted to do something schoolwide and I wanted to make it showy. I wanted to show skeptical parents, doubtful teachers, and any onlooker what these kids were capable of doing.

Campbell City is a feat. It's a staggering collection of thousands upon thousands of textured blocks. Comprising 500+ individual plots with 500+ brilliant, individual ideas, each grade holds its own subsection of the community. Within that grade-level community, each classroom has its own street. Alongside that street, all students had their own plot of land where they were allowed to imagine, design, and build whatever they could dream up.

Campbell City includes mini-theme parks (see Figure 21), movie theaters, pools, restaurants, galleries, and shops. Students conjured pyramids, giant tree houses, castles (see Figures 4 and 18), statues, hotels, parks, and fountains. There were skyscrapers, mansions, train stations, museums, and loads and loads more.

Overall, it was an all-consuming, collaborative, self-governing adventure. We talked about governance, consensus, and digital citizenship. Kids worked together, laid ground rules together, and inspired one another to be innovative and original. We built together, learned together, and saw how much potential this game really had.

Continuous, schoolwide builds aren't always all that practical, though. I still had commitments to curriculum and standards to meet. So we started working in small groups for smaller projects. Within these small groups, the greatest variable I didn't see coming was the collaboration: real, genuine, cooperative discovery. The kids learn and work with one another. They team up, they set goals, and they even arrive at class with plans in hand.

Students have done collaborative research projects, biography builds, Google Earth re-creations (see Figure 19), social studies connections, digital dioramas, and history lessons. They have mapped our solar system (see Figure 7) with glowing planets and surrounding asteroids. They have built the Orphan Train, Pompeii, the Great Wall of China, pyramids, functioning lighthouses, petting zoos, malls, hotels, theme parks, bomber planes, and pirate ships (see Figure 11). Students have programed turtles to mine tunnels for them and have written code to build structures automatically. They have created incredible command block and redstone projects that contain so much ingenuity that it baffles the hired "expert" in the room.

That's just a taste. The list grows every day we fire up *Minecraft.* You see, there is no right or wrong way to use *Minecraft.* It's a platform, a medium, a digital meeting place. So if you don't know where to start, just stop and listen to your students—they will give you all the ideas you need. Sure, you can weave in your pedagogy and your philosophy, as you must. But for now, just let the kids show you what they can do. Sit with them. Build with them. Create. Play. Enjoy.

One Last Bit

So what I am going to do is encourage you to take the next step: Just get started. No more waiting, no more "maybe tomorrows," no more excuses. In the next part of this chapter, I have provided everything you need to get started. I will give you the tips, tricks, and all the key info you need to know in order to start teaching with *Minecraft,* whether it is just a handful of kids or an entire classroom. On top of that, I will provide you with links to videos I have created that show you exactly how to set up a server, back up your digital worlds, and even import new worlds into your classroom.

So this is it; this is where I leave you. This is where my story ends and where your story begins.

But first I want to thank you. I want to thank you for taking a risk, for doing something fresh and new. I want to thank you for inspiring minds and encouraging hearts; your classroom is lucky to have you. You are the reason students come to school smiling: You instill dreams, incept ideas, grow minds. You are exactly who your students need. Thank you for who you are and all you do.

Now, go have some fun.

MAKE MINECRAFT HAPPEN IN YOUR CLASSROOM:

A How-To and FAQ

This last section comes from a resource I created to help anyone get started teaching with *Minecraft.* By no means is it an exhaustive how-to, but it should cover all of the basics you come across. I would also recommend visiting the QR code (see Figure 8) for video tutorials, a Parental Permission Form, a printout of the controls, blog posts, as well as any updates that may have come after this publication.

Figure 8. JasonWilmot.com/minecraft

Your Need-to-Knows:

1. Learn how to create and customize a world.
2. Learn how to open a LAN connection.
3. Learn how to set up a server.

Figure 9. GR3 Cian builds a refrigerator that shoots meat!

Getting Started: Singleplayer and Multiplayer

Singleplayer

Select this to start a solo campaign in either Creative or Survival game mode. Singleplayer is to be used for solo playing, but it also allows the user to open up his or her game to a small group of players using the local area network (LAN) feature.

Multiplayer

Go here to join an open LAN world or to connect to a server address, or IP.

LAN worlds will automatically be detected upon selecting "Multiplayer." To join an open server, users will Direct Connect or add a server by inputting the known IP address.

LAN Connect

A local area network can be created to host a small group of players on one local network. The LAN world is hosted on the computer that starts the Singleplayer game. With a LAN world there is no need to set up a server. Servers are only for groups of kids greater than a LAN connection can handle. Ideally, I wouldn't be running any more than five to six kids per LAN, but this depends on your hardware.

Tip: A LAN connection is a great place to start playing with others if you do not understand how to set up a server).

Tip: Up to eight players can play in a LAN world. Remember, the game performance has greater lag with every additional player.

Tip: If you are having trouble detecting LAN worlds, check your security settings to allow Java through your firewall.

LAN Step-by-Step

Want to open a LAN world for small-group gaming? Start a Singleplayer world and press the "esc" key to pull up your menu options. From there, select "Open LAN." This next screen determines the settings for those who join. To launch your LAN world, simply press "Start LAN World" when finished.

Game mode determines type of play, while "cheats" refer to operator abilities. If you want all players to have operator abilities, turn cheats to "On." I would recommend cheats on for Creative but off for Survival.

Figure 10. GR5 Reagan builds a redstone-powered circuit to open and close a sliding door.

Game Modes

Survival Mode

In this mode players must gather and mine resources in order to craft items. A sense of discovery and strategy are prerequisites. Throw in the optional threat of danger (i.e., monsters), and this fosters a need for security and necessitates preservation strategies.

Tip: The most productive way to use Survival mode is to have students preplan their goals for the day. Think project-/purposed-based learning.

Creative Mode

Creative mode is the mode in which players can access all blocks and are limited only by their imaginations. This mode is great for creative builds, programming endeavors, and redstone designing.

Tip: You can actually switch between game modes at any time. I've provided the actual game commands under the "Commands" section a bit further below.

Adventure Mode

This is yet another crazy, amazing aspect of this game. Adventure mode is a mode for virtual field trips. People all around the world have created *Minecraft* worlds that you can visit. There are ancient Roman dwellings, China's Forbidden City, puzzle worlds, coding-based worlds, and even creations such as the Wonderful World of Humanities—a vast, virtual world for exploring ancient civilizations. Adventure mode gives students the ability to visit a world but disables their ability to break blocks.

MinecraftEdu *Mode*

This is another mode that comes within the bundle *MinecraftEdu* sends your way. In *MinecraftEdu* mode, users will have Survival settings but will not need to worry about health, hunger, or PVP (player versus player), as these can be disabled.

Figure 11. Second graders build themselves a pirate world.

World Types

You have a number of options to customize your world in *Minecraft,* but if you're just getting started, then keep it simple: Stick with either a default or superflat world. A default world includes various landscapes and biomes. A superflat world is a flat world without biomes or landscapes.

Default World

I recommend starting within a default world the first time anyone plays *Minecraft*. There is something about being dropped into a huge gaming environment that only the default world can provide. The sheer vastness of the world is incredible. There are biomes of grass plains, swamps, mountains, and jungles, just to name a few. Want to wow new players? Start them in a default world.

Flat Worlds

If you want to do a creative build, then a superflat world is a better way to go. These superflat worlds are perfectly flat and seem to expand forever. Another plus about these worlds is that there are no mountains of blocks to weigh down your server.

How to Select Your World

After selecting "Singleplayer," you have the ability to customize your new game by pressing "More World Options. …" Next, you have the ability to turn on cheats, structures, and bonus chests. You can customize your world type by selecting "World Type." From here, my advice is just to explore your world options. Again, if you just want to get started, keep it "default" or change it to "superflat."

Tip: A huge bummer about a superflat world is that it is generated with a very shallow digging depth. A lot of new players will fall through the world just by digging. If you want a deep world with a flat surface, try using the Redstone Ready or the Tunneler's Dream presents found under Create New World > More World Options ... > World Type > Customize > Presets.

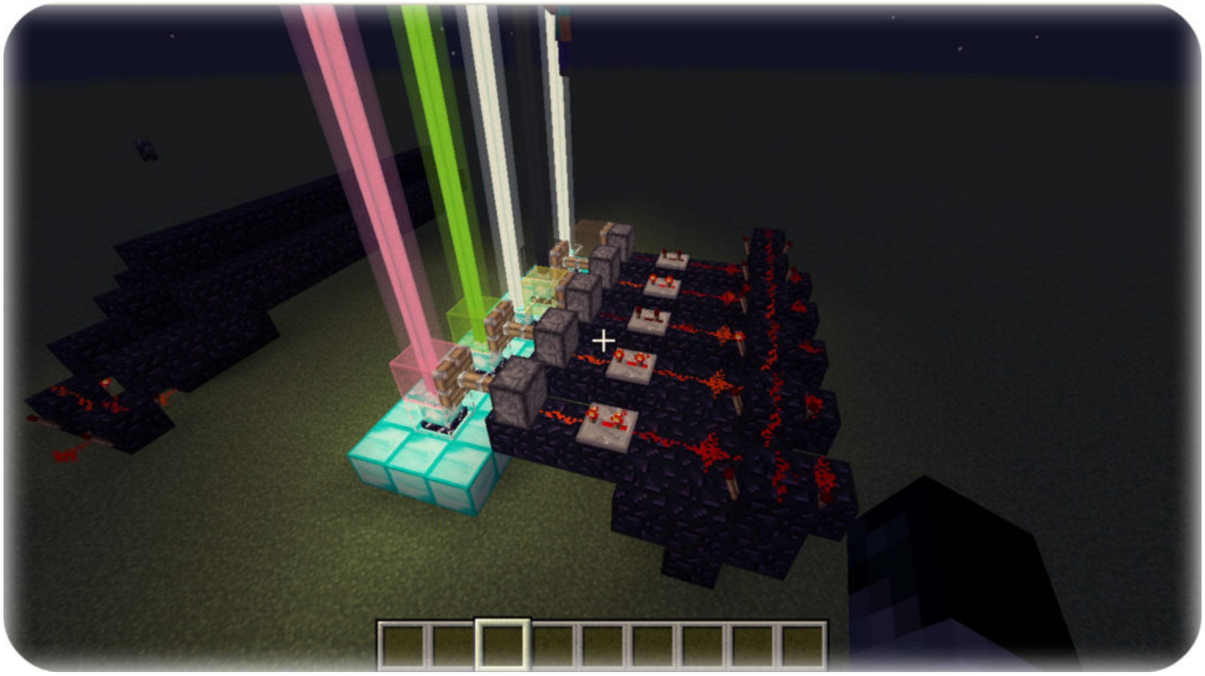


Figure 12. Repeating redstone-powered pistons change color and light up the night sky.

Commands

Make Minecraft Do What You Want

One of the best features of *Minecraft* is the ability to pull up the command prompt and tell the game what you want it to do. For beginners these are commands you should probably know:

/gamemode 0 (Changes game to Survival mode)

/gamemode 1 (Changes the game to Creative mode)

/time set 0 (Changes it to daytime)

/time set 13000 (Changes to dusk)

/weather clear (Stops the rain)

/tp <username> <username> (Teleports one player *to* another)

Teachers should encourage students to learn these controls, too. The more you enable kids to do, the less you need to be the Operator, or OP. Plus, it's way more fun to build and interact with the students than being the continual source of daylight. Pawn that off. You've got better things to do.

You Need to Know About TP

TP stands for "teleport." An operator can teleport any one player to another, and you'll probably need to know how to do this on Day 1. Here's how it works: Pull up the command prompt by pressing the / key and then type in the letters "tp" (for teleport). The teleport feature always transports the first player to the second. Here is an example: */tp playername1 playername2*. In this case, Playername1 will be transported to Playername 2.

Tip: Instead of writing out the entire name of the user, type in the letters "tp" and then press "tab"; it should pull up the names of users on your server. You can also start typing in the first letters of any username and press "tab" to finish the name.

Figure 13. GR3 Andy shows off his math skills.

Servers

A server is a node on the World Wide Web. It exists as a digital space where users can connect. Every server needs an address to exist. This address, or space, is designated by its Internet protocol (or IP) address.

You don't need anything fancy for a server—you can even use your own computer. If it's a newer computer and has at least 4-8 GB memory (RAM), you could probably run about 15 users on a default world server.

I started out using two servers, each running on 2008 iMacs with 1GB RAM. In other words, you don't need much. These computers would run 8-10 kids and would crash about two to three times a period. Obviously, a server's crashing isn't ideal, but it's not the end of the world because it takes only a few seconds to start things back up. If and when those servers go down, remember—it gives excellent teaching moments about servers, IPs, RAM—all that stuff you should be teaching kids anyway.

Tip: The server/computer must monitor everything you generate in Minecraft. *The more blocks you lay, the more animals you spawn, the more TNT you blast away—all of that takes up memory. Everything taking place determines the need of memory, and this determines the quality of the environment. (A default world takes more computer memory than a superflat world does.)*

Setting Up a Regular Minecraft *Server*

There is an initial learning curve when setting up a regular *Minecraft* server. You can customize your server within your *server.properties* file. It may take a while to figure out everything you can do, but I'll give you the basics to get you started. Also, rather than writing you through the process, I would recommend viewing my video tutorial. Check it out with the QR code or link I provided.

- **IP address.** If you are directing students toward your own server, make sure the IP you provide is the same as the IP within your *server.properties* file.
- **Difficulty.** Difficulty refers to the level of intensity for mobs and monsters. If you want to get rid of them all together, set your difficulty to Peaceful.
- **PVP.** This means "player versus player." If you do not want kids to be able to attack one another, set PVP to =false. If you're using regular *Minecraft,* this will be found in the *server.properties* file in your server folder.
- **Game mode.** The Game mode determines the type of environment for all players. Game mode = 0 is Survival; = 1 is Creative; and = 2 is Adventure.
- **Stopping a server.** If you are running a regular *Minecraft* server, don't just close out of it when you're ready to stop it. Instead type in the command "Stop." This will save your game and bring things to a close, all right and proper. If you're running a *MinecraftEdu* server, the software allows you to save your world and everything created within it.

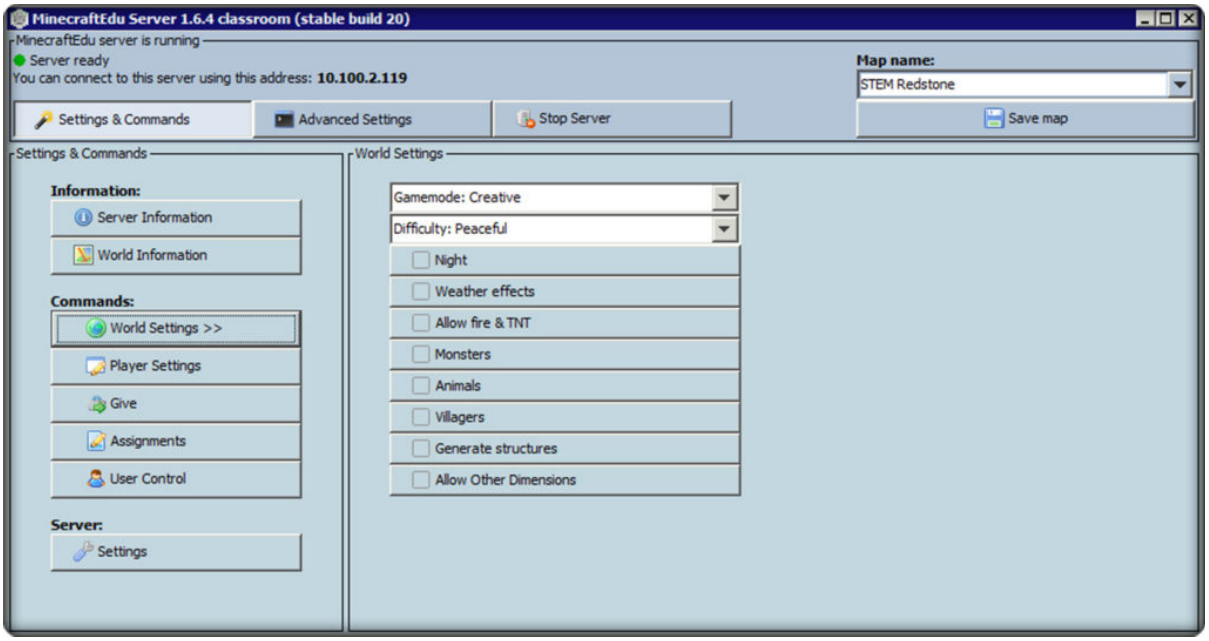


Figure 14. The MinecraftEdu server is easy to set up and even easier to manage.

The MinecraftEdu Server

The *MinecraftEdu* server tool (see Figure 14) makes starting a server, managing users, and inputting commands super simple. There are many customizable features built within the software and it allows for a quick and easy start. Whether you're running your server on a computer or virtual IP, the controls and options on the *MinecraftEdu* server tool aren't too difficult to learn. Within this server you can change your world settings, control the command prompt, provide assignment or building information, manage users settings, give users items, allow and disallow users to join, and even start players off with a message of the day. Within the *MinecraftEdu* server, you can even launch your old worlds and save any updates. Again, I would recommend viewing my video tutorials for a more detailed explanation.

Figure 15. MinecraftEdu comes with a unique and useful set of blocks.

MinecraftEdu Teacher Menu, Commands, and Blocks

Eventually, you may want to learn how to use the teacher menu, "copy," "cut," and "paste" commands, as well as *MinecraftEdu* specialty blocks (see Figure 15). Again, this is not something that you need to know to get started, but learning the *MinecraftEdu* teacher tools will make your life easier as the facilitator. I've made tutorials explaining the teacher menu and commands, and I have complied a playlist on the *MinecraftEdu* specialty blocks. Information about the MinecraftEdu blocks is given below.

MinecraftEdu *Blocks*

MinecraftEdu comes with nine additional specialty blocks and 19 number blocks. Really, I see two ways of figuring out what these specialty blocks do: Try the do-it-yourself (DIY) trial-and-error approach, or explore a world from the *MinecraftEdu* World Library and see how other educators have used them. This will give you a better understanding of how these specialty blocks can be used.

According to *MinecraftEdu,* the additional blocks and their descriptions are:

- **Build Allow block.** Used to set up areas where students can build even if student building is disabled in the world.
- **Build Disallow block.** Used to set up areas where students cannot build even if student building is enabled in the world.
- **Border block.** Used to set borders.
- **Information block.** Stores messages inside it. Used to show information, messages, links …
- **Information sign.** Used to inform students that there's something important near this block.

- **Foundation block.** Foundation blocks can be helpful when you are building large, symmetrical buildings. They measure distances to other foundation blocks in three-dimensional space.
- **Spawn block.** Defines the starting point where all new users enter the world.
- **Home block.** The home block can be placed anywhere within a world by teachers or students. Once placed, the player may teleport back to the home block any time he or she wishes by accessing the student menu. Home blocks can be broken only by teachers and the students who originally placed them.

Figure 16. GR5 Ethan programs an automatic TNT launcher.

Redstone

Want to grow scientists, programmers, and engineers? Use redstone. Redstone is used to create circuits that perform tasks. Circuits can be created by using redstone dust and redstone component blocks. Redstone can be used to turn on lights, open doors (see Figure 10), program pistons (see Figures 3 and 12), power mine carts, power repeating TNT launchers or dispensers (see Figures 16 and 22), create mini-games, puzzles (see Figure 6), and anything else you can conjure up (see Figure 9). This is a major STEM connection.

Like anything else in *Minecraft,* it takes a little time experimenting with redstone to get the hang of it. I have created a few video tutorials demonstrating pistons, pressure plates, repeaters, dispensers, command blocks, roller coasters, and more. The key to using redstone is first seeing what it can do. I suggest watching some YouTube videos or having experienced students show one another. There are videos showing basic first steps for redstone and others that go a step beyond to incorporate signal repeaters, power supplies, and programmed dispensers.

If you really want to hone computer-science skills, try incorporating coding and redstone at the same time. I have used the mod ComputerCraftEdu and combined it with pressure plates, pistons, signal neutralizers, and dispensers full of goodies.

Figure 17. ComputerCraftEdu mod: Minecraft gone Logo.

Mods

A "mod," or modification, is an alteration of the program code that causes the game to operate in a way different from its original version. Mods vary in what they can do—from changing the look of all your blocks to pulling in new items, abilities, and game scenarios. Chances are that kids will ask for mods immediately, but really, you don't need mods to get started. However, mods are something to look into after a while. Mods offer more options, and more options mean more possibilities.

Importing mods is easy using *MinecraftEdu.* With a few clicks, the mods can be downloaded and installed. A favorite mod I use is ComputerCraftEdu (see Figure 17). The mod finds its roots back in the days of the Logo turtle, but it blends this logic-based programming into the learning-friendly medium of *Minecraft.* With this turtle mod, students use drag-and-drop coding to program the turtle to move, dig, drop, build, and more.

Students can build stairways into the sky or dig a series of holes, only to have the turtle turn around and fill them back in. Students can program a hide-and-go-seek turtle, house-building turtles, or even sync up their turtle to drop materials onto a pressure plate—activating redstone circuits to launch fireworks into the air.

Figure 18. Fifth-grade boys team up on their semester-long building project.

Backing Up and Importing Worlds

You are bound to run into hurdles, obstacles, and unexpected events when teaching with *Minecraft,* but you can ensure your worlds and creations are safe with just a few clicks. It's always wise to back up (or save and store) your worlds. As mentioned above, I have tutorial videos showing you how to do this. The tutorial videos walk through how to save your worlds and how to load previously saved or imported worlds.

If you're using *MinecraftEdu,* there is an alternative way to import worlds. *MinecraftEdu* hosts a large collection of worlds to use in your classroom, absolutely free. Within its World Library, there are worlds for coding, programming, puzzles, and problem solving, and worlds for historical and cultural exploration. The library continues to grow as more users load more educational resources. I've created a tutorial on how to access and download worlds from the *MinecraftEdu* World Library.

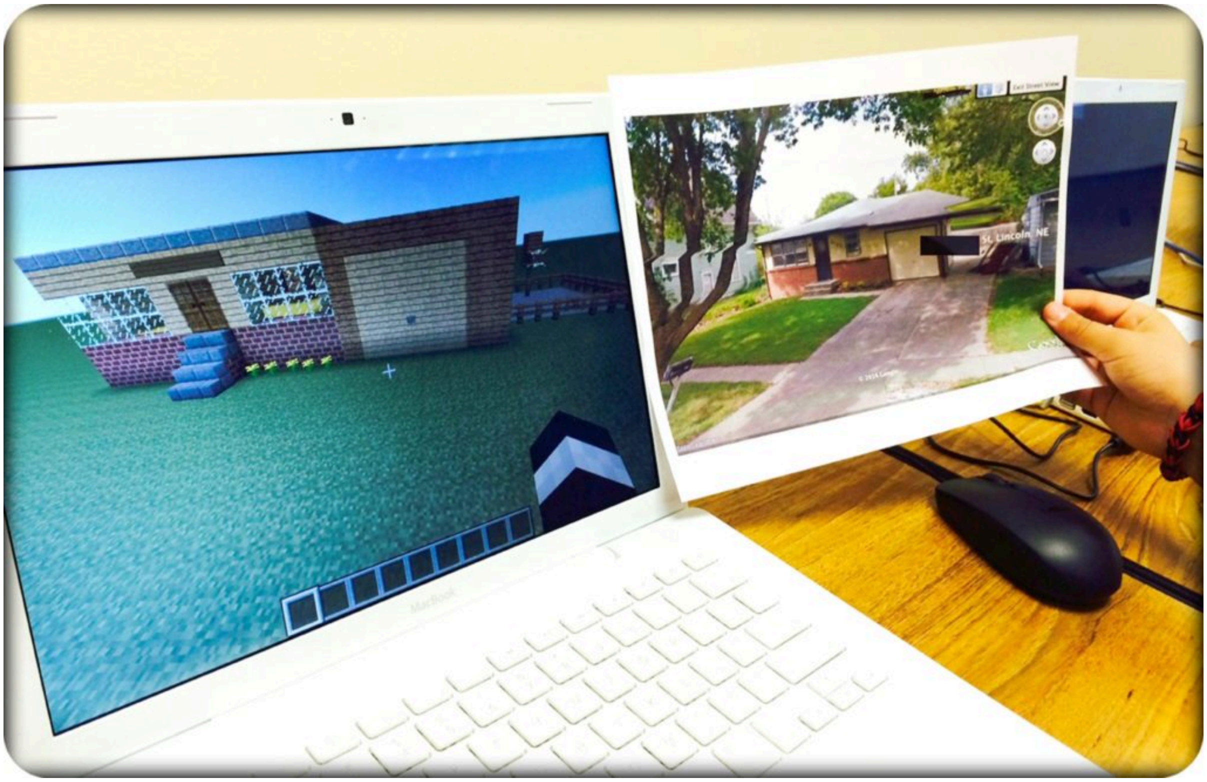


Figure 19. Google Earth and Minecraft: GR5 Nick builds his own house.

Your First Minecraft Lessons

One of the most common questions I get asked is what to do for the first lesson. Obviously, it depends on your goals and outcomes. However, there are a few things I would suggest. First, just let the kids play. The experts will naturally find leadership roles in mentoring the newcomers. Sometimes the best thing you can do is just to let the kids learn from one another.

Another idea would be to have students build a house (or any structure) in Creative mode. This will help students to explore the inventory and learn the blocks. This will also allow them to fly around and explore the game controls.

The last idea for a first lesson would be to use *MinecraftEdu* Tutorial World. This tutorial world guides users through the controls, basic mining and crafting, and has some really cool elements to explore. Best of all, this world is free. Simply press the *MinecraftEdu* “Server Launcher,” and then select the option that reads “Start Server with Tutorial World.”

Figure 20. Kindergarten coaster time!

Collaboration

Collaborative Projects

There is no written rule on how to best go about collaborative projects, but I want to throw some more unsolicited advice your way. I have found whole-class environments are hard to facilitate day in and day out. Granted, we have created some pretty amazing projects, but I don't make whole-group projects a routine thing. It obviously depends on your objectives and learning outcomes. Do what seems right for you.

The space where I have found most success for collaboration and digital citizenship is within small-group LAN worlds. When kids are grouped or self-group into teams of three to four, you see some pretty amazing things. You'll hear dialogue of planning, problem solving, delegating, and goal setting. All in all, if you want to get started feeling successful, stick with small groups at first.

Minecraft *Mentoring*

One of the things I love most about teaching with *Minecraft* is seeing students mentor one another. If at all possible, try to get kids teaching one another. I regularly have students spending time in my room mentoring players younger than they are. It makes for amazing learning opportunities, student leadership, and self-discovery. Last, it makes the kids feel like pros. And who doesn't like feeling like a pro?

Figure 21. Kindergarten Chris builds an entire theme park for his classmates.

Connect

Teachers should collaborate, too. With the ability to connect over servers, your classroom just grew worldwide. With *Minecraft,* we can collaborate with other classrooms, schools, and teachers across the globe. Ask around and look for opportunities to connect with schools regardless of their geographical location.

How Can I Connect With Others Teaching Minecraft?

The best spot to start is on *MinecraftEdu's* community page,[2] or in the Minecraft Teachers Google group.[3]

Twitter

There are loads of teachers who tweet out regularly on the hashtag #MinecraftEdu. If you're looking for some quick advice or help, start there. My handle is @MrJasonWilmot.

Use Google Hangout

You can screen share, chat, and collaborate—and with so many built-in tools, you'll be amazed that it comes absolutely free.

Last Random Tips

YouTube Is Your New Best Friend

2. http://minecraftedu.com/community
3. https://groups.google.com/forum/#!forum/minecraft-teachers

YouTube is your absolute best resource for all things *Minecraft.* There are tutorials for building, for updating, for troubleshooting, and so forth. In fact, it is a great idea to have students start creating and producing their own videos and uploading them to the ever-growing community.

Learn the Controls

Learning the controls is one of the most fundamental aspects of *Minecraft.* It enables quicker play and gives a sense of mastery over the game. If you're right-handed, keep the movement buttons on W, A, S, and D—you will want to have left-hand control over the keyboard because the right hand is busy on the mouse.

Tip: You can grab a PDF of the controls from MinecraftEdu *or check out my QR code (see Figure 8), as I have a copy there as well.*

Do I Really Need a Three-Button Mouse?

Yes. Well, no, but yes. Why try to ride a three-legged horse just to prove you can do it? If you can't afford to buy any, ask around for people to donate them. A three-button mouse is absolutely worth it.

Learn the Lingo

Trolling. Griefing. Mobs. Mooshoom. A whole new lexicon awaits you, noob.

Your First In-Game Enemy: TNT

If you're using *MinecraftEdu,* you are in luck because you can disable TNT. On your *MinecraftEdu* server, select "World Settings" to discover your ability to enable or disable TNT. Lava and fire are still active but will not spread.

Water, Water Everywhere

Having problems with kids pouring water everywhere? Me too. Good luck with that.

Slow Gameplay?

Go to your video settings and turn "Fancy" to "Fast." This should speed up gameplay. There are a lot more things you can do to speed up your gameplay, so for an exhaustive list I would suggest the World Wide Web.

Screen Shots!

Teach your kids how to take screen shots. You can save them, print them, and send them home. You can also teach kids to upload their screen shots to Edmodo, Google Classroom, or online communities such as Creatubbles in order to share.[4]

What Age Range Can I Use With Minecraft?

4. https://www.creatubbles.com

I've used *Minecraft* with Grades K-5 with absolutely no trouble. You will obviously need to tailor the lessons or the learning objectives to the appropriate levels, but in my experience "too young" has never been a problem teaching with *Minecraft.*

Can I 3D-Print My Minecraft *Creations?*

Yes. In the age of 3D printers, even your *Minecraft* creations can become tangible objects. If you're interested in printing your projects, plenty of websites offer their services.[5]

5. http://www.printcraft.org and http://www.minecraftprint.com

CHAPTER 9.

TEACHING EARTH SCIENCE WITH MINECRAFT

BY MEGAN PUSEY

Minecraft is a video game extremely popular with children and teenagers. It is an open sandbox game that allows players the freedom to create anything they can imagine (see Figure 1). So far, more than 21.5 million people have bought the desktop version of the game.[1] I aimed to tap into the popularity and unique style of *Minecraft* to engage high school students in a series of lessons about earth science. *Minecraft* is a perfect fit for the Earth Science topic in the *Australian Curriculum* for Year 8, which covers rocks and the rock cycle. My two Year 8 classes used *Minecraft* alongside traditional teaching techniques to learn about earth science. The students were surveyed before and after the program on their attitude, motivation, and engagement toward earth science. I want to share my story with you to encourage you to see video games as a medium through which meaningful learning can occur. I hope this will also inspire other teachers to create engaging, transformational classroom experiences using video games.

1. Mojang. (2015). Home. Retrieved from Minecraft at https://minecraft.net/

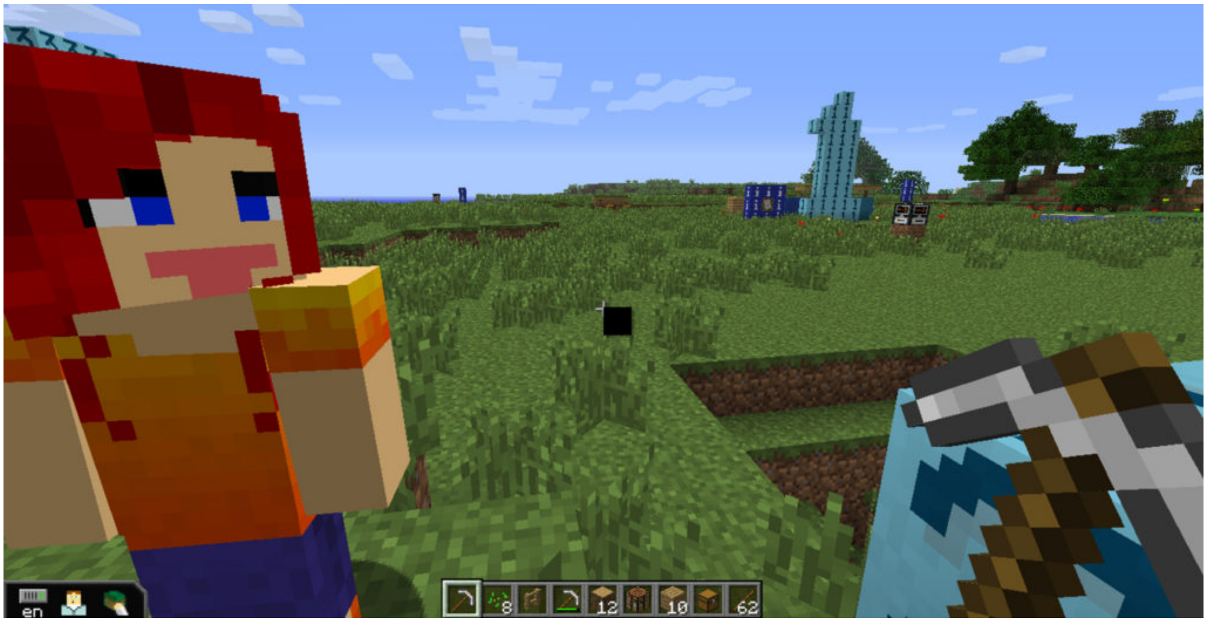


Figure 1. Screen shot from the game Minecraft.

BACKGROUND

I am an Australian high school science teacher and I enjoy playing video games in my spare time. Before becoming a teacher I worked in the field of science communication. This involved communicating complex ideas through exhibits, hands-on activities, written articles, and live-action science shows. Working in informal learning environments such as science museums and children's museums highlighted how powerful learning through play can be. Why does high school seem to lose that feeling of "play" and become boring, hard work? After reading online about other teachers' using video games in the classroom I decided to do some experiments myself. I am lucky enough to work at a great school that supports my "experiments." I am still testing the most effective ways of weaving video games into the classroom. What I have learned so far is shared in this chapter.

I work in a private, all-girls secondary school in an inner-city suburb in Australia. For this particular "experiment" I used my two Year 8 science classes as guinea pigs (12–13-year-olds). In Australia all students in both primary and secondary school follow the *Australian Curriculum*. The whole country follows the *Australian Curriculum* for all subjects, making sharing resources easy to do. The Year 8 Earth Science topic spans one school term (about 10 weeks) and looks at rocks, the rock cycle, and mining.

The general content description found in the *Australian Curriculum* is "Sedimentary, igneous and metamorphic rocks contain minerals and are formed by processes that occur within Earth over a variety of timescales."[2]

This content description is then expanded (click on "ACSSU153") into the following learning goals:

2. ACARA. (2014). Science. Retrieved from Australian Curriculum: http://www.australiancurriculum.edu.au/science/Curriculum/F-10?layout=1#level8

- representing the stages in the formation of igneous, metamorphic and sedimentary rocks, including indications of timescales involved
- identifying a range of common rock types using a key based on observable physical and chemical properties
- recognizing that rocks are a collection of different minerals
- considering the role of forces and energy in the formation of different types of rocks and minerals
- recognizing that some rocks and minerals, such as ores, provide valuable resources.[3]

At my school each student is required to "lease" a laptop computer from the school. The students are fairly tech savvy and use their laptops for schoolwork every day. The school Information Technology (IT) Department provides technical support for the laptops. Teachers are provided with a laptop by the school instead of a desktop. Teachers at the school are expected to use technology within their classrooms and provide learning materials online through the school intranet.

PREPARING FOR IMPLEMENTATION

While looking online for resources related to using video games in the classroom I found the *MinecraftEdu* website.[4] I had previously played *Minecraft* and loved the open-ended gameplay and possibility for creativity.

The school gave me permission to buy two class sets of *MinecraftEdu* (about US$14 per copy) and one copy of the server software (US$41). The school's IT Department was invaluable in setting up and testing the school server. *Minecraft* doesn't require a high-powered computer, which meant students could use their laptops instead of going to a computer lab. Booking in to use the computer labs at my school is a headache because of timetabling issues, as we have very few computer labs (since students have their own laptops) and they are often in use by technology classes. This severely restricts when other teachers can use the computer labs.

The benefit of using the student laptops was that I could use *Minecraft* in class at a moment's notice. We played on a local server hosted at school, which meant students could play together in the same *Minecraft* world. The *MinecraftEdu* software makes it really easy to set up a server even for first timers such as myself (see Figure 2), and there are many YouTube tutorials out there to step you through setting up your own server (also see Wilmot, this volume).

3. ACARA. (2014). Click on "ACSSU153."

4. www.minecraftedu.com

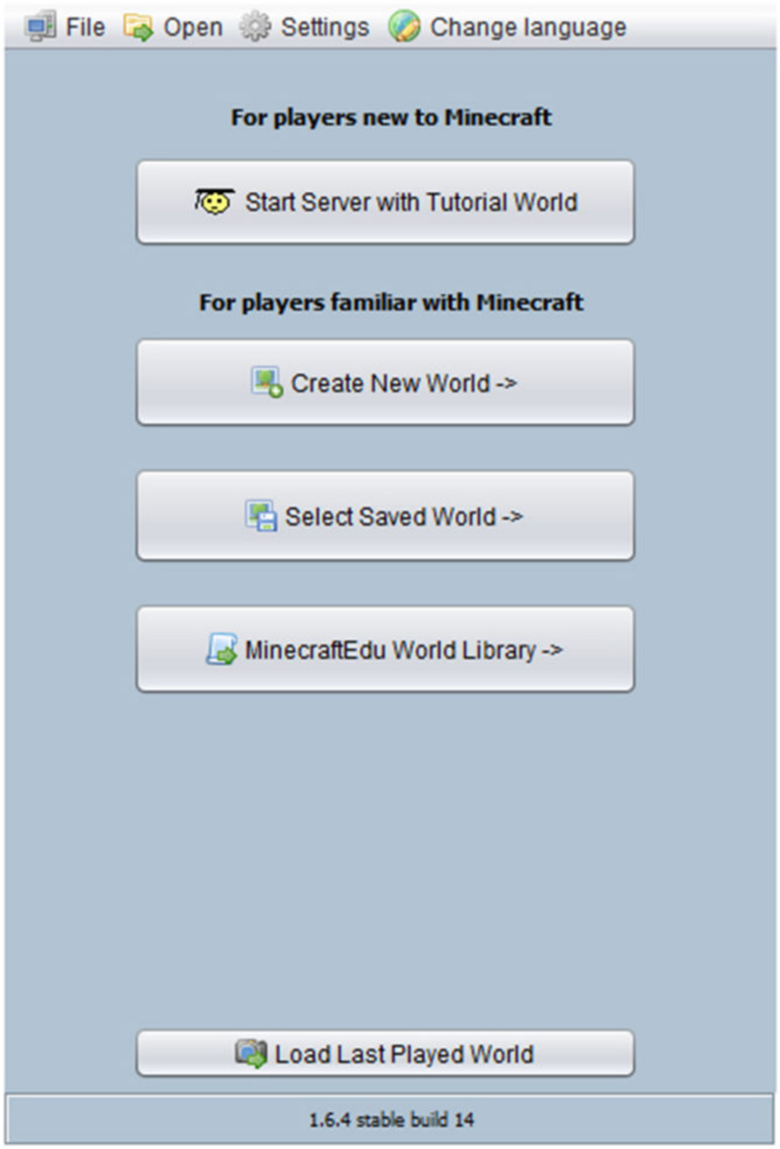


Figure 2. Screen shot of the MinecraftEdu server software.

I originally wanted students to be able to access the school server while at home. This would allow me to set homework to be completed in *Minecraft* so we could then build on concepts and discoveries in class. Unfortunately, because of potential security issues the IT Department did not allow students to log in from outside the school network, but students could still access the single-player version of the game at home.

Designing for Earth Science

I found designing quality science lessons to be the hardest part of the whole experience. Before beginning the "experiment" I was unsure of how familiar the students were with *Minecraft* and earth science. Consequently, I wasn't sure about what type of activities would run well, be engaging, and stimulate learning. I looked at the library of premade maps on the *MinecraftEdu* website. There are a lot of good quality resources there; unfortunately, only a few of them were about science. Out of the few resources that were actually about science, there was only one about earth science, which involved digging up a fossil. I struggled to find any premade worksheets or pre-prepared activities on the Internet as the use of *Minecraft* in the classroom is still relatively new. I believe this will improve through time as the use of *Minecraft* in schools grows and more teachers start sharing their resources.

I wanted to create worlds students could explore at their own pace while solving problems related to earth science. The tutorial map that comes with *MinecraftEdu* (and available as a download online) is a good example of what I wanted to achieve. However, creating Minecraft maps from scratch is very time intensive and unfortunately, the Earth Science topic coincided with important school reporting deadlines. This meant lesson planning for *Minecraft* took a back seat at times. Because of these time restrictions I tried to plan activities that could be done in any randomly generated map instead.

MinecraftEdu has been designed with teachers in mind and has some added features that make building maps and running lessons very straightforward (see Figure 3). The "freeze" and "mute" student's options were vital for controlling the flow of the lesson. Turning on "student respawning" was useful for allowing students who got lost or stuck to teleport themselves back to the spawn point. However, I found myself using the teleport function often to teleport students who were lost, or not where they were supposed to be.

Figure 3. Screen shot of the MinecraftEdu teacher menu.

The teacher menu also allows you to easily change what mode the game is in. I usually used "MinecraftEdu" mode when I wanted students to collect and craft resources without worrying about hunger and fighting off monsters (see Figure 4). For activities in which students had to build something substantial (say a model of a sedimentary rock) I used "Creative" mode so students could focus on building rather than collecting and crafting.

Figure 4. Screen shot of the MinecraftEdu teacher menu.

For most of my activities I would often give students the equipment they needed to start with. For example, with the "Classifying Blocks" activity, I gave students an iron pickaxe, four treasure chests, and four signs (see Figure 5). This was to avoid time wasted in collecting and crafting materials.

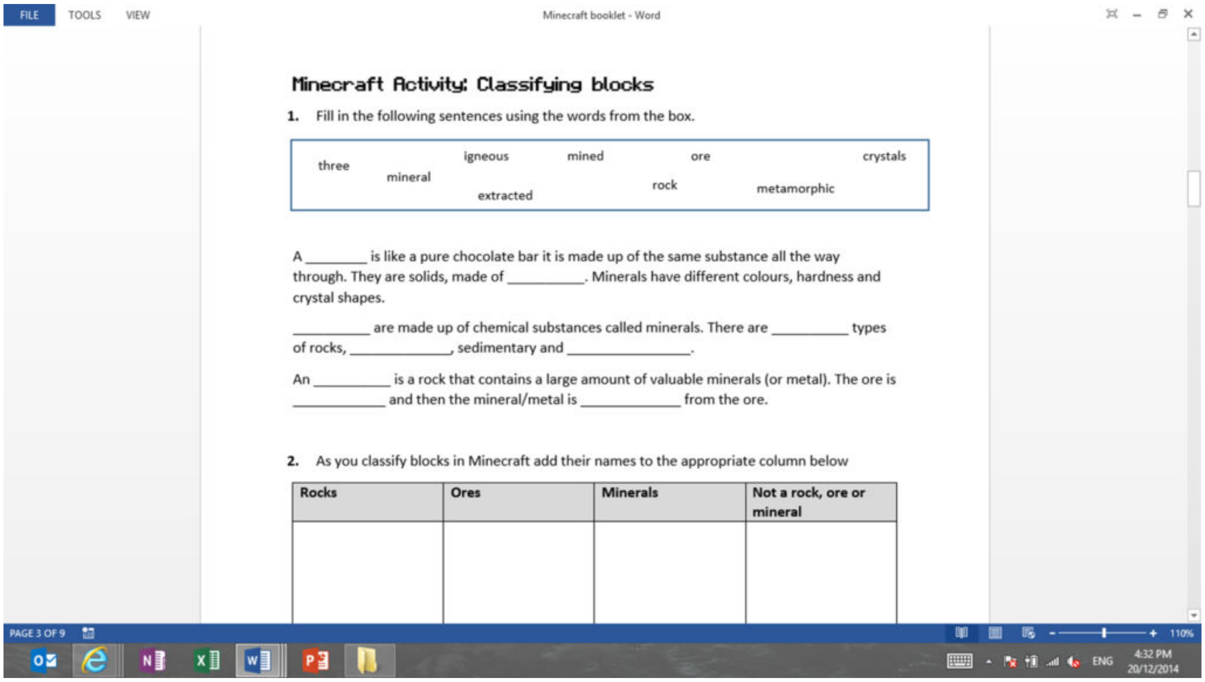
Figure 5. Screen shot of the MinecraftEdu teacher menu.

When I did set up a map I made only simple alterations, such as inserting a few strategically placed teleport blocks next to important landmarks (e.g., cave entrances) for students to use (see Figures 6 and 7). These blocks allow students to instantly teleport to any other teleport block on the map. This meant students didn't waste too much time exploring and trying to find ores or other equipment needed for the activity.

Figure 6. Screen shot from MinecraftEdu showing a teleport block.

Figure 7. Screen shot from MinecraftEdu showing the teleport menu (as it appears to teachers).

The "Classifying Blocks" activity assessed students' understanding of the terms *rock, mineral,* and *ore,* which addressed the learning goals of "identifying a range of common rock types using a key based on observable physical and chemical properties" and "recognising that rocks are a collection of different minerals."[5] For this activity students had to fill out a physical worksheet (see Figure 8) while completing the task in *Minecraft.*



Minecraft Activity: Classifying blocks

1. Fill in the following sentences using the words from the box.

three | mineral | igneous | extracted | mined | rock | ore | metamorphic | crystals

A ________ is like a pure chocolate bar it is made up of the same substance all the way through. They are solids, made of _________. Minerals have different colours, hardness and crystal shapes.

_________ are made up of chemical substances called minerals. There are _________ types of rocks, ____________, sedimentary and _______________.

An _________ is a rock that contains a large amount of valuable minerals (or metal). The ore is ___________ and then the mineral/metal is ____________ from the ore.

2. As you classify blocks in Minecraft add their names to the appropriate column below

Rocks	Ores	Minerals	Not a rock, ore or mineral

Figure 8. "Classifying Blocks" activity worksheet.

The "Rock Formation" activity required students to apply their knowledge of the three types of rock (igneous, sedimentary, and metamorphic) and how they are formed. This addresses the learning goals "representing the stages in the formation of igneous, metamorphic and sedimentary rocks, including indications of timescales involved" and "considering the role of forces and energy in the formation of different types of rocks and minerals."[6] For this activity students filled in a digital worksheet (see Figure 9) with screen shots from *MinecraftEdu*.

5. ACARA. (2014). Click on "ACSSU153."

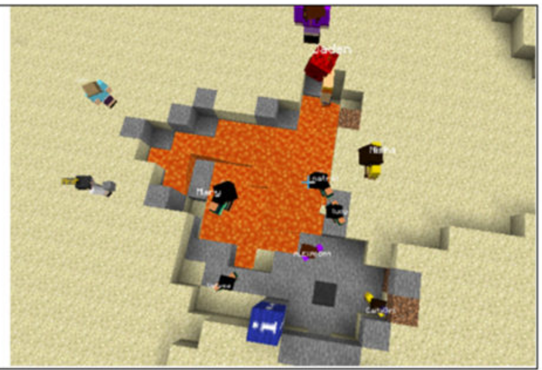
6. ACARA. (2014). Click on "ACSSU153."

Minecraft Activity: Rock Formation

1. **Igneous Rocks**
   a) Fill in the following blanks

   _Extrusive___________ igneous rocks are formed when lava cools down. __Intrusive__________ igneous rocks are formed when ____Magma______ cools down.
   __Intrusive_____________ igneous rocks cool down slowly so they contain __Large________ crystals.
   ___Extrusive____________ igneous rocks cool down __quickly______ so they contain small crystals.

   b) In Minecraft take a screenshot (by pressing Fn + Insert/Prt Sc) of a location where:

Extrusive igneous rocks form	

Describe why you chose this location?

We chose this location because it contains lava above the ground in the process of cooling down

Figure 9. "Rock Formation" activity worksheet.

Both physical and digital worksheets worked well, and I liked how students had to collect evidence from inside the game to prove that they had completed the activity. With the physical worksheet, however, it was easier to see how far along students were in the activity and who was having trouble. The worksheets helped keep students focused on the task at hand and gave them something to refer back to when studying.

IMPLEMENTING IN THE CLASSROOM

The first time I used *MinecraftEdu* in the classroom I dedicated the whole lesson to helping students learn how to play the game. This involved downloading and installing the software, logging into the local server, and playing through the tutorial world. Many students had not played many video games on the computer so they were quite new to using the keyboard and mouse at the same time. The tutorial world slowly steps students through how to move, how to collect resources, how to build, and finally how to craft objects.

The first earth science lesson in *Minecraft* was the "Classifying Blocks" activity, which required students to classify blocks into four categories—rock, ore, mineral, or none of the above. Working in pairs, students were required to sort blocks they had collected from around the map into four labeled treasure chests. Here you can see some examples of blocks students collected (see Figures 10 and 11).

Figure 10. Different types of blocks found in Minecraft, from left: Lapis luzuli ore, diamond, emerald ore, emerald, stone.

Figure 11. Screen shot of one student's labeled treasure chests in MinecraftEdu (from far left: not a rock, ore, rocks, mineral).

Students had to use the physical appearance, name of the block, and their prior knowledge from class to help them make a decision. The students had a physical worksheet in front of them to record their results and help keep them on track. After sorting their own blocks, students looked at another group's classification system and discussed whether they agreed with the classification or not. Sorting and discussing their reasoning helped students gain a deeper understanding of the meaning of the words *rock, ore,* and *mineral,* rather than just memorizing a definition.

Toward the end of the Earth Science topic I ran the "Rock Formation" activity in *MinecraftEdu*. This activity required students to fill in a digital worksheet by taking a series of screen shots of locations in *MinecraftEdu*. Students had to take screen shots of locations where different types of rock form. For example, intrusive igneous rocks are formed by cooling magma under the ground. Students had to find a location in *Minecraft* where there was magma under the ground, take a screen shot of it, and paste the screen shot into their worksheet (see Figure 12).

Figure 12. Screen shot from a student worksheet, showing where intrusive igneous rocks are found.

Students pressed either the "Print Screen" button on their keyboard or F2 to take a screen shot, and it is easy to switch between the worksheet and *MinecraftEdu* by using either the toolbar or Alt + Tab. This activity really tested the students' understanding of the rock cycle and how each type of rock is formed. The activity generated a lot of discussion, as when students were unsure of where to go they asked their friends for help. The act of explaining and justifying their choices through discussions and the worksheet helped to cement their understanding of how the rock cycle works.

Surprises

The biggest surprise for me was the increased collaboration among students. During class students would be talking about the task and how to complete it as well as helping each other. This was a big difference from the usual "social" chatter.

The other surprise for me was how popular *Minecraft* is! After our second *Minecraft* lesson the word had spread like wildfire through the Year 8 group. A few of my students had shown other students how to log into the school *MinecraftEdu* server. I found out about this when during our lesson three students from another class logged in. When I discovered they were imposters I "froze" and "muted" them so they couldn't play, and they quickly logged out.

A small group of students began to play on the local school server at lunchtime. I found out when the students who were playing at lunch had messed with an area I had set up for a lesson. I had to quickly reset the map before the class started. This involved loading a previously saved version of the map. Many students, both experienced and inexperienced *Minecraft* users, would come to school and show me amazing things they had built in their own time. Even as I write this chapter, many weeks after the earth science lessons, there are still students playing *Minecraft* together at lunchtime, building a replica of Hogwarts together on their own server.

RESULTS

The students who used *MinecraftEdu* were surveyed before and after the Earth Science topic. Out of the 44 students surveyed, 81% of students said they enjoyed using *MinecraftEdu*, 15% said the experience was OK, and 4% said they disliked it. In my short time as a teacher I haven't found any activity that absolutely every student enjoys, so taking into consideration that just under half of the students were first-time *Minecraft* users, I believe the activity was a success. As this was a trial run to see if using *Minecraft* increased student engagement in science, there were no set "deliverables." The students were not graded on any work they completed using *MinecraftEdu*; their learning was assessed through observation, worksheets, and questioning. I found that activities that required the students to apply their knowledge and had clear objectives resulted in the best learning.

The students who enjoyed the experience had this to say:

"I just liked that it was a more interactive way of learning and it was hard to get bored."

"I loved *Minecraft* because we were having fun on it while learning about all of the different rocks, minerals and ores."

"I liked the aspect that we could all participate at the same time."

Of the 18 students who said they had not played *Minecraft* before, 11 said they would play the game again. "I never played *Minecraft* until the day we played in class and now I love it! It is so much fun especially creative!"

I was interested in why some students didn't enjoy the experience or said it was just OK. The most common response was that students were not used to playing first-person video games and found the gameplay disorientating.

"It was really fun; I loved the activity where we had to find where different types of rocks were formed in the *Minecraft* land. But using *Minecraft* made me feel a bit motion sick, because of the weird movements."

In the presurvey many students reported playing video games regularly on their mobile phones/ tablets; however, fewer than half reported regularly playing video games on a PC or games console. Some students found having to learn how to play *Minecraft* hindered their learning of earth science.

"I didn't really like lessons that we used it because finding the different types of rocks and minerals was tricky for girls who don't usually use *[Minecraft].*"

"I liked it when we got to find rocks. I didn't like when I got lost and it took a long time to get back."

“I feel that using *Minecraft* was difficult to use and that we didn’t really use it that much to learn about it.”

One student in particular was an avid *Minecraft* fan and had some useful advice. “I love *Minecraft,* but I didn’t really see the educational advantage. It would be much more beneficial if more realistic ‘mods’ were used, like Terra Firma craft. I’m just saying unmodded *Minecraft* doesn’t really have much to do with real processing.”

I am interested in exploring the use of mods to make the gameplay more “scientific.” Using mods would allow a lot of customization and help teachers design worlds to meet a wide array of learning goals. *MinecraftEdu* shows a lot of promise as a teaching tool to be used alongside other teaching resources and methods.

PLANS FOR NEXT TIME

I didn’t achieve as much as I planned to, but it’s a starting step. I found my enthusiasm for the project waning in the face of all the hard groundwork and small setbacks experienced in class (e.g., maps being changed unexpectedly, students not having laptops in class). Things such as report writing and the other demands of teaching also kept creeping in. In the future I would love to spend more time developing quality maps like the tutorial map. I would also like to try using some mods to do more “accurate” and in-depth science. For example, the Technic mod has a lot of mining equipment and extra ores with different properties.

I am not a game designer but many principles of good learning align with good level design. I think that’s why the idea of learning through video games appeals to me so much. Even so, I found there was a lot for me to learn about how to create good *Minecraft* worlds/levels for learning. I found it useful to look at other maps designed by teachers, even if not in the same subject area, as they highlight aspects of good map design. Next time I want to try designing activities that require more problem-solving, collaboration, and creativity skills. I would also like to try teaching different areas of science, such as physics.

CONCLUSION

For teachers wanting to experiment with *Minecraft,* I recommend becoming familiar with the game before using it in the classroom. Knowing how to play will allow you to help students if they get stuck. It is worth setting up a map (even if it’s just adding teleport blocks) and testing your planned activity before using it in the classroom. This will help you pick up on little things that need to be fixed or improved before the lesson. By removing this friction you can help your students get on with learning. I recommend having access to the server so you can control things such as which map is selected. It is extremely difficult to plan and run classes without access to the server.

Check out the myriad of resources online to help you become familiar with *Minecraft.* Wilmot (this volume) has a good selection at the end of his chapter. A quick search on YouTube will also return countless helpful tutorials.

Give students time to become familiar with the game. Some of my students had never played a first-person video game before, so using a keyboard and mouse at the same time was very alien to them.

They needed time (one to two lessons) to get used to the game and how it works before genuine content learning could take place.

Direct the learning. You can't expect students to achieve your intended learning goals by just playing *Minecraft* without any support. Students aren't going to notice things such as lava cooling into obsidian (an igneous rock) unless you help them see it. Look at the *MinecraftEdu* collection of teacher-made maps; if you can find a map that suits your purposes it will save you a lot of time. A more "controlled" map where certain areas are restricted (such as the tutorial map) helps keep students focused. A worksheet also helps tie the activity to the learning goals and gives the students something for later study.

Minecraft is an extremely popular and widespread game with teenagers, so it seems silly not to tap into this popularity and take advantage of it to help engage students in learning. With added mods and a growing list of premade downloadable maps designed by teachers it is an extremely versatile and engaging tool. It doesn't require much "computing power" or high-tech equipment, or even an Internet connection once it's up and running. I believe *Minecraft* brings a sense of play into the classroom that can sometimes be missing.

APPENDIX

How to Load and Save Worlds Using *MinecraftEdu*

Google search "MinecraftEdu library." It will appear as a list like so (see Figure 13).

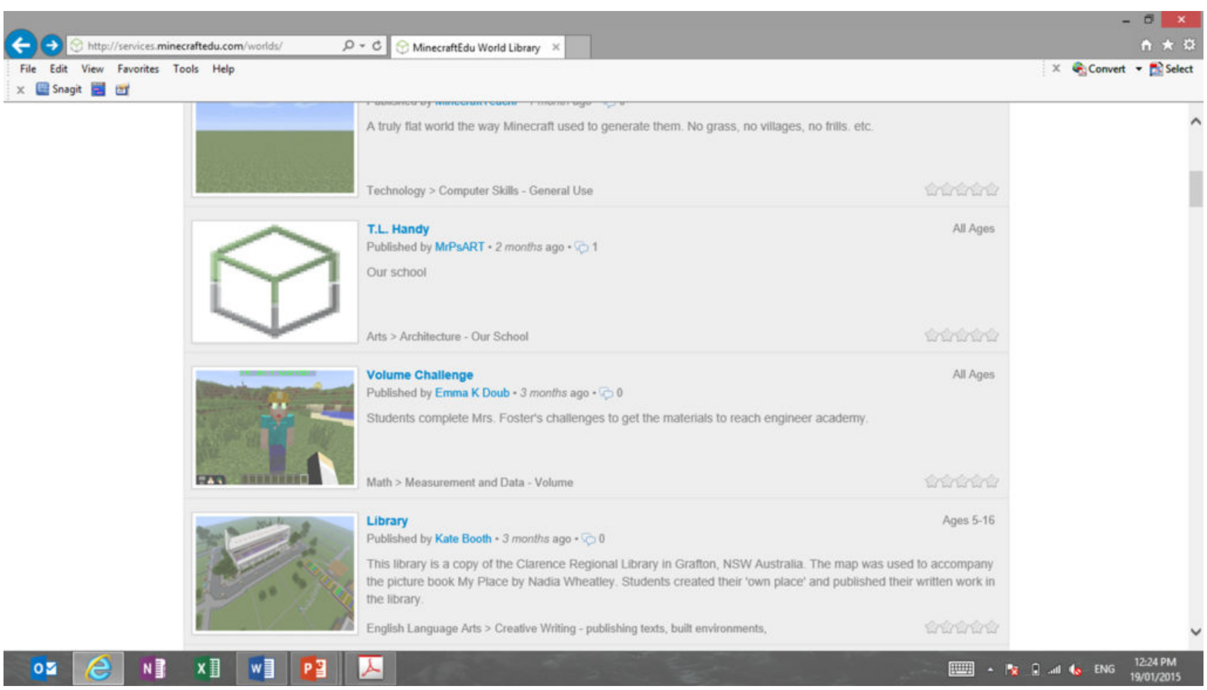


Figure 13. Screen shot of the MinecraftEdu library.

Click on the map you wish to download (see Figure 14).

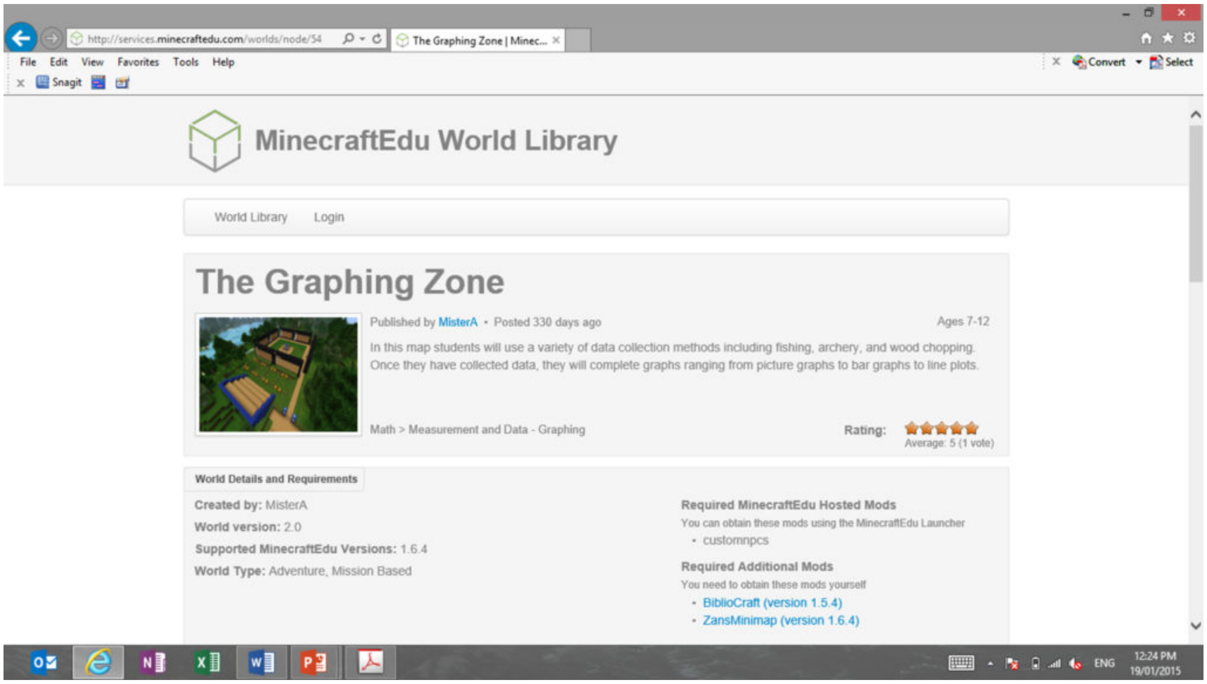


Figure 14. "The Graphing Zone" map information.

Option 1: Download With Server Launcher

Open the *Minecraft* server launcher and then return to the *MinecraftEdu* webpage. When on the map information page, scroll down and click on the link "Download with Server Launcher" (see Figure 15). It's as simple as that.

You should then be able to select the downloaded world from the server launcher by clicking on "Select Saved World" and selecting the world name from the list (see Figure 16). Click on "Start Server with Selected Saved World" and you're done!

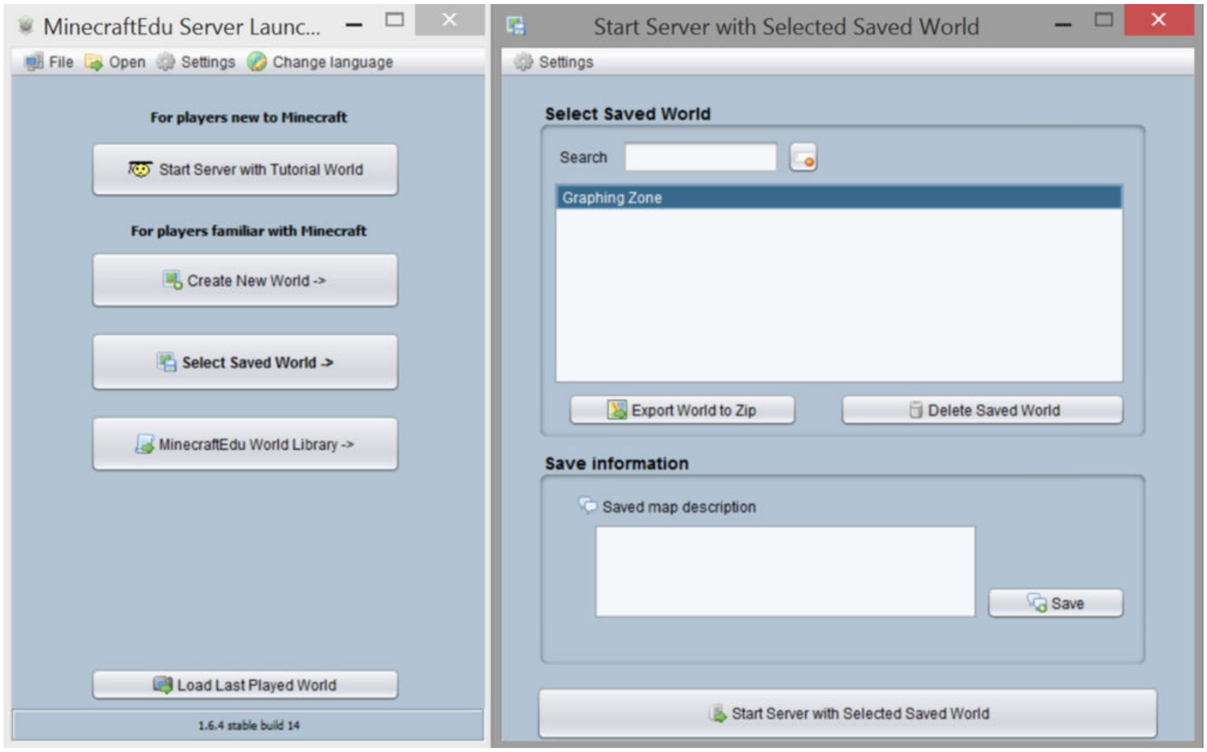


Figure 16. How to select a saved world on the MinecraftEdu server software.

Option 2: Download World Manually

If the "Download with Server Launcher" button doesn't work, you will have to do things manually (see Figure 17). This option is a little bit trickier.

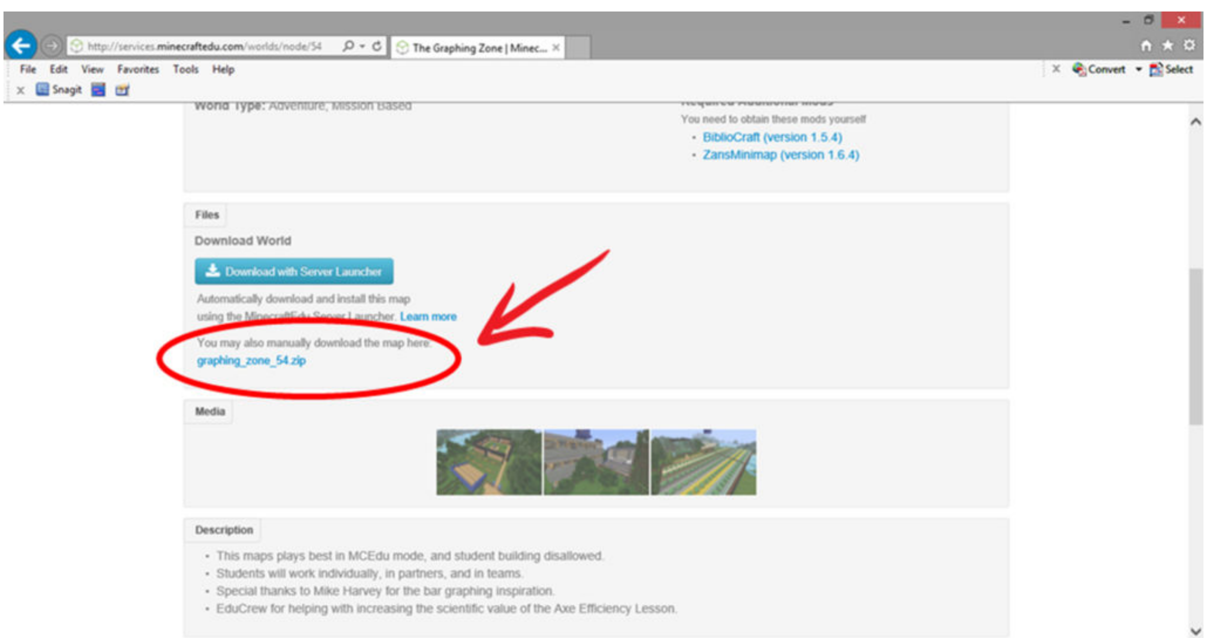


Figure 17. Where to find the manual download link on the MinecraftEdu library.

On the *MinecraftEdu* library website click on the link below the words "manually download the map here." This will save a zip file in your "Downloads" folder on your computer. You then need to open the zip folder (if your computer can't do this you will need some free software such as WinZip [http://www.winzip.com/] or CAM UnZip [http://www.camunzip.com/]).

Then you will need to find where the *MinecraftEdu* file is saved on your computer. If you can't find it, a quick search for "Minecraftedu" will help (Windows button + F will bring up the search function on PCs; use Command + F for Macs). Once you have found the folder open:

"Minecraftedu > servertool > worlds > saved worlds"

Once in the "saved worlds" folder, create a new folder with the name of the world you just downloaded (e.g., "Graphing Zone"). Click and drag the unzipped downloaded folder across to the "saved worlds" folder (see Figure 18).

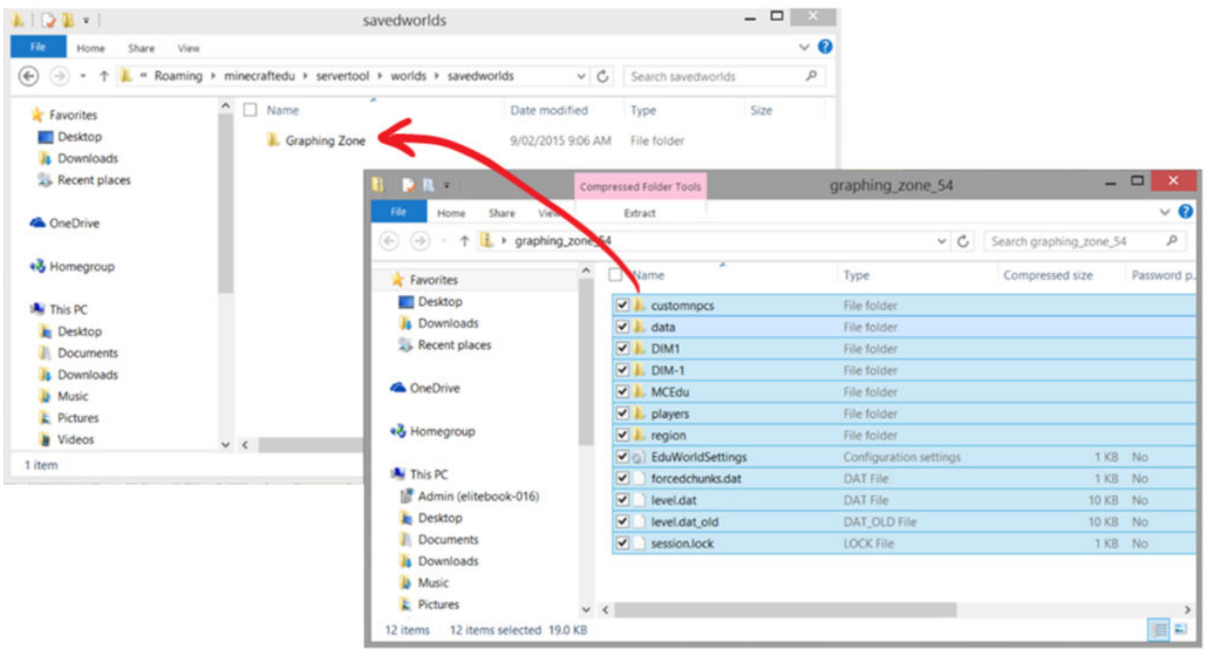


Figure 18. How to transfer unzipped world folders to the "saved worlds" folder.

Reopen the server launcher, go to "Select Saved World," and you will see the name of the downloaded world. Click on the name and then on "Start Server with Selected Saved World" and you're done!

Saving Worlds

If you have created a *MinecraftEdu* world or altered an existing world, you can save it and share it with others. While using the *MinecraftEdu* server software, click on the "Save map" button at the top right (see Figure 19).

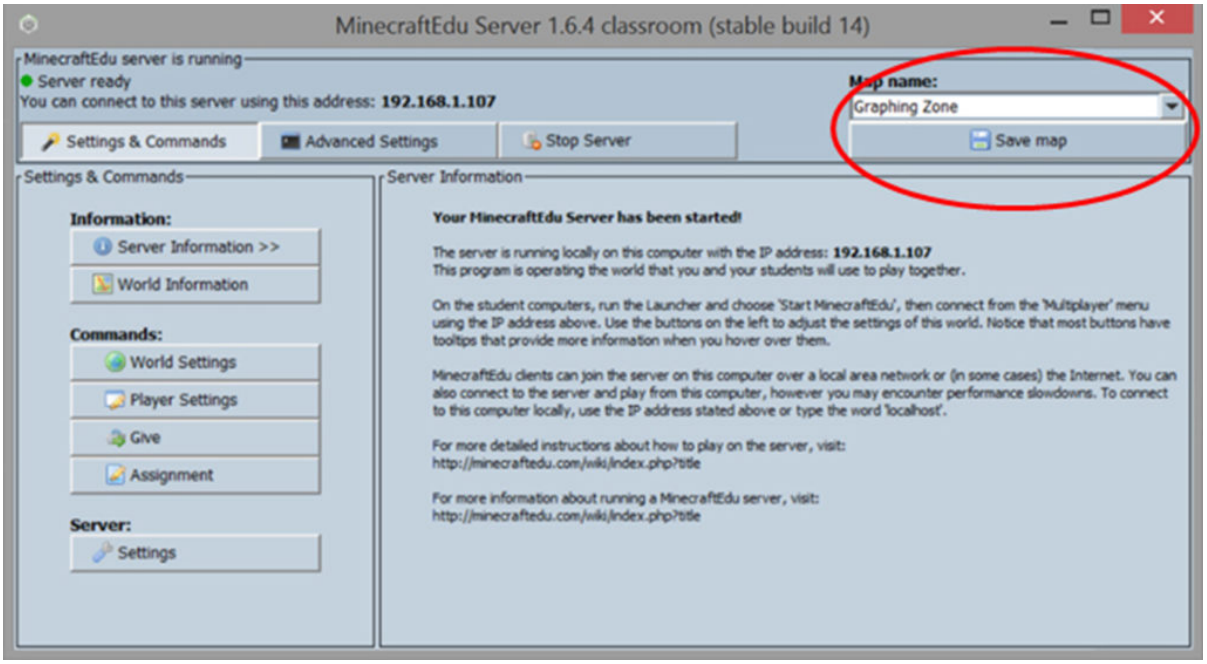


Figure 19. Where to find the "Save map" option on the MinecraftEdu server software.

Your world will then be saved in the same "saved worlds" folder described above. If you want to share your world with others you will need to zip the folder (using WinZip or CAM UnZip) and upload it on the *MinecraftEdu* library.

CHAPTER 10.

UNLOCKING A MYSTERY: DESIGNING A RESILIENT PLACE-BASED GAME

BY JOHN MARTIN

For 20 years I've spent the majority of my summers helping direct a rustic deep-woods camp for boys. No electric or phone lines run into the camp, the boys sleep under mosquito nets in platform tents or three-sided Adirondack shelters, we make our own wooden and canvas canoes and use them on trips, and every week every boy in camp goes on a four-day adventure. I design outdoor games, train counselors, and teach camping and canoeing skills—skills that often lean heavily on collaboration, improvisation, and adaptation that are learned through contextualized authentic experience. The contextualized experience provides an embodied urgency to learn. For example, holding a paddle in a canoe and needing to get from Point A to Point B provides a *situated learning* opportunity to gain canoeing skills.[1]

I was captivated, when I started working there in 1993, by men in their 70s and 80s who would wander into camp to visit and regale us with their memories of their time at camp. One particular line of stories about a set of defunct trips—the *Mystery Trip*—in particular delighted me, and I dreamed of resurrecting them. This chapter tells the story of resurrecting that trip with mobile technologies.

THE *MYSTERY TRIP*

Before I begin with the story of my game creation, however, we must understand the origin of the original *Mystery Trip.* As the old-timers described with such enthusiasm, between the 1920s and 1950s, a spat of heinous crimes took place in Maine that were nearly unsolvable but for a group of young campers whose woods skills and problem-solving ability were legendary. Though the crimes and stories often varied, all stories end with victorious boys. This is one of the sleuth stories of a 1927 crime, recounted by a camper, H. B. Price, who ended up buying and running the camp for about 50 years after he solved his first mystery:

> *Something terrible had happened; I am sure that I don't remember what. Plans had to be changed at the last moment, and all our energies were to be devoted to helping the local authorities, whoever they were, hunt down the criminals and*

1. Lave, J., & Wenger, E. (1991). Situated learning: Legitimate peripheral participation. Cambridge, England: Cambridge University Press.

bring them to justice. At the same time we would uphold the honor of the camp, and in all probability bring fame and fortune to ourselves and our counselors.

The villains, whoever they were, had left clues and trails as they challenged us to track them down. Coded messages were found and deciphered. The net was slowly tightening. In tracking those undesirables, we learned more than we at the moment wanted to know about following trails in the woods.

Somehow or other we were all led to a remote spot to dig for treasure two days later on the final day of the trip. There had been codes and more codes to the point that we felt that none would ever be too much for us in the future. I don't think that I had ever bothered very much about codes before that Mystery Trip, but now I fancied myself an expert. It was the next winter that I was to read my first real adult book, a long account of German codes in World War II was one of the select; I knew what they were talking about.

Digging at the suspected spot began with anxious campers standing about ... waiting for the moment when the smallest boy in camp would unearth the treasure ... a large iron pot ... not filled with common ordinary chocolate bars, but with chocolate wrapped in gold foil to resemble pieces of eight.[2]

In *Mobile Media Learning*,[3] I wrote about using mobile and GPS to create a story line that frames such an adventure. With GPS-triggering, one doesn't have to trudge around in the wilderness planting physical clues (if setting up the mystery), or searching for clues (if trying to solve the mystery) that may have blown away or dissolved in the rain. One can just place virtual clues on a map (though it's important to know the area well enough to not place them in water, on cliffs, or in other dangerous spots). However, the power of the game came from the boys who supplied endless additional elements, as Price notes:

As a counselor it later fell to my lot to establish the groundwork for additional mystery trips. It soon became quite obvious that not much was needed to get the juices running, so to speak. Boys do have fertile imaginations, and many a mystery trip started out with the barest of plot. It was never long before the much-needed details were supplied by the boys themselves. Some heard noises in the night. Others put together bits and pieces of what they had read in their comic books; and finally they made the short step between dream and reality, and all we needed to start another mystery trip was to say the word, "go." Once started, things unfolded on their own.[4]

Story: How We Built Our *Mystery Trip*

Let me just start with the understatement that in 2006 it was *quite a challenge* to create a mobile-technology–dependent game, at a camp with no Internet and no way to charge devices, for boys who think nothing of swimming with GPS units in their pockets. The technology included Windows Mobile devices with separate bluetooth GPS receivers, running an MIT-media-lab–developed software called *Outdoor AR* (for "Augmented Reality"). For 2006, it was an amazing setup.

Today, with smartphones that sport GPS and Internet connectivity, and lightweight DIY-augmented reality platforms such as arisgames.org, building an adventure such as this can be done in a matter of hours. But the software and hardware don't really matter—they change like the weather. What matters is the process.

2. Price, H. B. (1988). A bad case of moose pox. East Orland, ME: H. B Price.
3. Dikkers, S., Martin, J., & Coulter, B. (2012). Mobile media learning: Amazing uses of mobile devices for learning. Lulu.com.
4. Price, H. B. (1988).

While I was familiar with one version of the original *Mystery Trip,* I realized that it had often varied considerably from year to year. I also recognized that much of the camp's culture is grassroots, constructed by campers in odd moments on trips, full of inside jokes and popular culture references. It's a culture for the campers best created by them. My job, I figured, was simply to supply an experience or framework for them to fill.

Much like in an early *Mystery Trip,* I pulled a first group of campers aside as they headed out on their regular hiking trip and told them the story of the *Mystery Trip*. The boys carried a handheld GPS, notebook, and video camera, and they documented their progress as they explored the land with an eye toward designing an AR game. They created a rudimentary game narrative involving five characters (including Axman Sam, Pat the Pirate, and Harry the Hiker), and a few quests. The game narrative and map developed by this group provided a loose framework that the second design group was able to play off of, and design around, in their own attempt.

The boys in the second group, led by an energetic Australian counselor, played and critiqued the first game narrative, and they significantly changed the first game with a design based on the young-adult fiction series *Tomorrow, When the War Began* and the movie *Red Dawn*—in both a ragtag group of plucky rebels fight off much greater odds.[5] In the second group's narrative, a rival camp that caters to the very wealthy attacks and takes over their much more modest camp while the boys are away hiking in the area. The group is "contacted by videophone" (location triggers a video on the handheld computer) by a survivor of the attack and has to perform a number of quests in order to foil the rival camp's evil plan to construct a Grey Poupon mustard factory on the pristine lake. Quests include spylike activities designed by the kids to appeal to their peers, such as surreptitiously topping three nearby mountain peaks to triangulate and decode messages sent out by the fictional invading campers, setting up a low-impact campsite to avoid detection by the invading camp's scouts, and canoeing under cover of darkness to the center of the lake to broadcast a counter-message.

LEARNING BY PLAYING

Several themes and patterns emerged in my mobile *"Mystery Trip"* research, but some of the most unexpected speak to the above point of the power of fertile imaginations and allowances for participant agency.

Although the details of each experience are to a large extent filled in by the participants, in the final narrative experience, campers embark on a four-day "Trails" trip, for which they're told they'll be hiking some mountains in a local 5,000-acre wilderness. The narrative is a simple linear one with 13 parts/locations. As they hike, they get a message that the camp was invaded, and that the invaders are after them (see Figure 1). During the course of the four days, they get more information about what is happening at camp, and what they can do to help: Climb three mountains to triangulate a radio signal, decode the signal, and rebroadcast the decoded signal to the world to expose the invaders. The actions essentially require that they cover the same ground that their trip would typically cover, but the narrative opened opportunities for them to add their own details.

5. Marsden, J. (1993). Tomorrow, when the war began (Vol. 1). Australia: Pan MacMillan; and Beckerman, S., & Feitshans, B. (Producers), & Milius, J. (Director). (1984). Red dawn [Motion picture]. United States: United Artists.

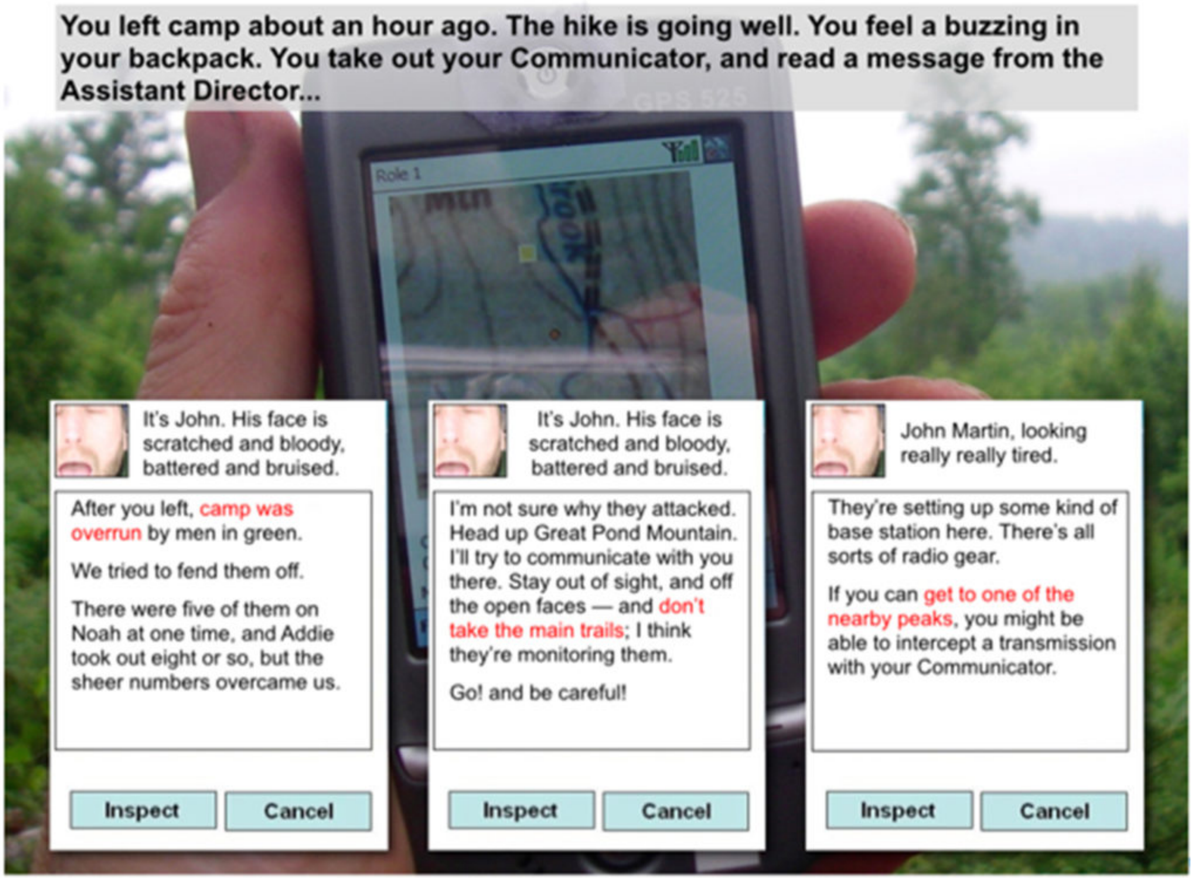


Figure 1. Preprogrammed "communications" that the players see to drive the narrative.

One example of narrative flexibility is that despite the linearity of the plot, the story line includes the idea that they are being followed by the as-of-yet-unknown "bad guys" who invaded the camp. This resulted in several groups' deciding that rather than blindly following the main trails, they should take alternative side trails, or bushwhack off-trail through the backcountry. In voluntarily choosing this plan, they discovered that they needed to improve their map-reading and orienteering skills, and without counselor intervention or prompting, they spent a tremendous amount of time discussing wayfinding, matching landmarks to the map, and choosing routes—something rarely done when the trail leads the way.

Because the story line was fragmentary—they received only short, vague messages about what was happening at camp; because in the story the sender himself wasn't really sure what was going on—they had plenty of space to fill in the details with their own musings and to apply their own experiences to the narrative plot. For example, on one trip, campers reported hearing other hikers on a trail and determined that these were the group of hostiles who were tracking them. In this case, they went into stealth mode and hid off the side of the trail as the other hikers passed. By moving off-trail and integrating with the woods (instead of staying separate from it on the trail), they increased their wilderness experience and knowledge and minimized their ecological impact for the rest of the trip. For the rest of the trip, tree stands built by local hunters became enemy lookout towers to avoid, every cabin they passed was potentially compromised, and they changed their group behavior from "obnoxious and loud boys" to "silent and efficient model hikers."

Other groups reported that the game narrative provided motivation to hike harder and endure more hardship in order to finish quests and further propel gameplay, providing a distraction from the physically demanding aspects of the hiking. One boy explained: "Instead of just walking around and going from one place to the next [on a regular trip], with the [game] you have an adventure, and you don't know what's going to happen next. That's really fun!" People like to play, and they willingly endure discomfort or boredom if motivated—in video games this is called *grinding.* This was also the case with these participants. When immersed in good games, kids often learn complex rules and structures of game systems, both to to better interact with and "play well" with other players and for cultural understanding of game narratives.[6]

LEARNING BY DESIGNING

One of the interesting elements in letting the campers design the game was that they began to view the terrain they passed through from multiple perspectives—both as low-impact hikers and as game designers. One said that instead of looking at a tree as something that a squirrel might use, he looked at groups of trees in terms of how the game could use them. Another commented that designing prompted them to alter reality: Rustling leaves became enemy spies, hunters' deer stands transformed into enemy sniper towers that players need to avoid, trails made easy targets for ambushes, and Leave No Trace—which the camp tries to instill into every outing—was common Ninja sense.

Participants also saw themselves as designers of an artifact for their peers, creating something larger than their own trip. Just as when we cook for others, we tend to step up our care and attention a notch; in designing for their peers they paid attention to details in the environment, looking for ways to surprise and delight their peers who would play it later. In some ways, as a designed tangible experience, it was an opportunity to leave a piece of their legacy on the trip.

DISCUSSION

Outdoor game playing has always been an American passion. Children grow up to be adults in the woods as they play and learn together. With the advancement in mobile technologies, we now have an opportunity to maximize the benefits from such activities. As Clifford Geertz argues, "No one lives in the world in general" (p. 262).[7] The creation of personalized narrative using mobile technologies can allow us to bridge the content and the space to shape the learning of the participants. To that end, I not only encourage you to create your own place-based adventure, but have your students get involved and make their own. The stories could be real, or they could be pure fiction—mixing reality and fiction leads to completely new ways of looking at one's world.

Making Your Own Experiential Narrative

Although the technology was considered novel when I first began, several software tools now exist for you to design your own outdoor light augmented-reality adventure: *ARIS, Taleblazer, FreshAiR,* and others.[8] As I mentioned above, I don't think the particular software is important—choose the one that feels best for you and that meets your needs. Or go old-school and create a Geo-cached

6. Gee, J. P. (2003). What video games have to teach us about learning and literacy. New York, NY: Palgrave/Macmillan.

7. Geertz, C. (1996). Afterword. In S. Feld & K. H. Basso (Eds.), Senses of place (pp. 259-262). Santa Fe, NM: School of American Research Press.

8. ARIS (arisgames.org); Taleblazer (taleblazer.org/); FreshAiR (playfreshair.com)

scavenger hunt–style adventure with real hidden paper clues. Whatever medium you choose, I have some suggestions for the design.

Use the Screen Minimally

There is a bit of irony in using mobile technology to help people connect more deeply with the wilderness places that they move through. But when I create these types of adventures, I try to minimize players' interactions with the devices (I also needed the batteries to last three days!). In the Mystery Trip, the device buzzed when the players reached their location. It was framed as a "communication device"—but it was partly "broken" and could only receive transmissions. The few "transmissions" players got were text based and very short. They conveyed very little information, but they prompted the players to be careful, watch for unusual activities (which really meant anything), and pointed out the next location on the map for them to head toward. The players were directed away from the screen into the environment that surrounded them. Because the screen offered them minimal information, they pulled out the map and compass, paid attention to the clues of the land around them, and looked to each other to solve problems.

Build Something for Different Player-Types

Bartle breaks down Multi-User Dungeon (MUD) game players into four types, based on how they act on and interact with other players and the world—Achievers, Explorers, Socializers, and Killers (see Figure 2)—but these four types apply to much more than MUDs or even video games.[9] The types are not pure, either; a player may have different levels of preference for more than one of these. I see myself, for example, as primarily an Explorer, but with strong secondary Socializer characteristics and some Achiever instincts.

As you design your narrative, try to address the different player interests in order to engage them. Do you have points or things for the Achievers to collect? Are there enough unknowns for the Explorers to discover? Will the Socializers have opportunities to play with someone? And do the Killers (people who like to cause distress for others) have an outlet for their aggression? In the *Mystery Trip,* the quest-narrative format (to save camp) prompted the Achievers to climb three mountains to triangulate the location of a radio signal. The narrative specified only locations, but it did not dictate any paths, which left plenty of exploring for the Explorers, as well as plenty of opportunities for the Socializers to engage with others. And by framing the group as a stealth group that was being chased, the Killers "won" their battles not by engaging, but rather by remaining unseen.

9. Bartle, R. (1996). Hearts, clubs, diamonds, spades: Players who suit MUDs. Journal of MUD Research, 1(1), 19.

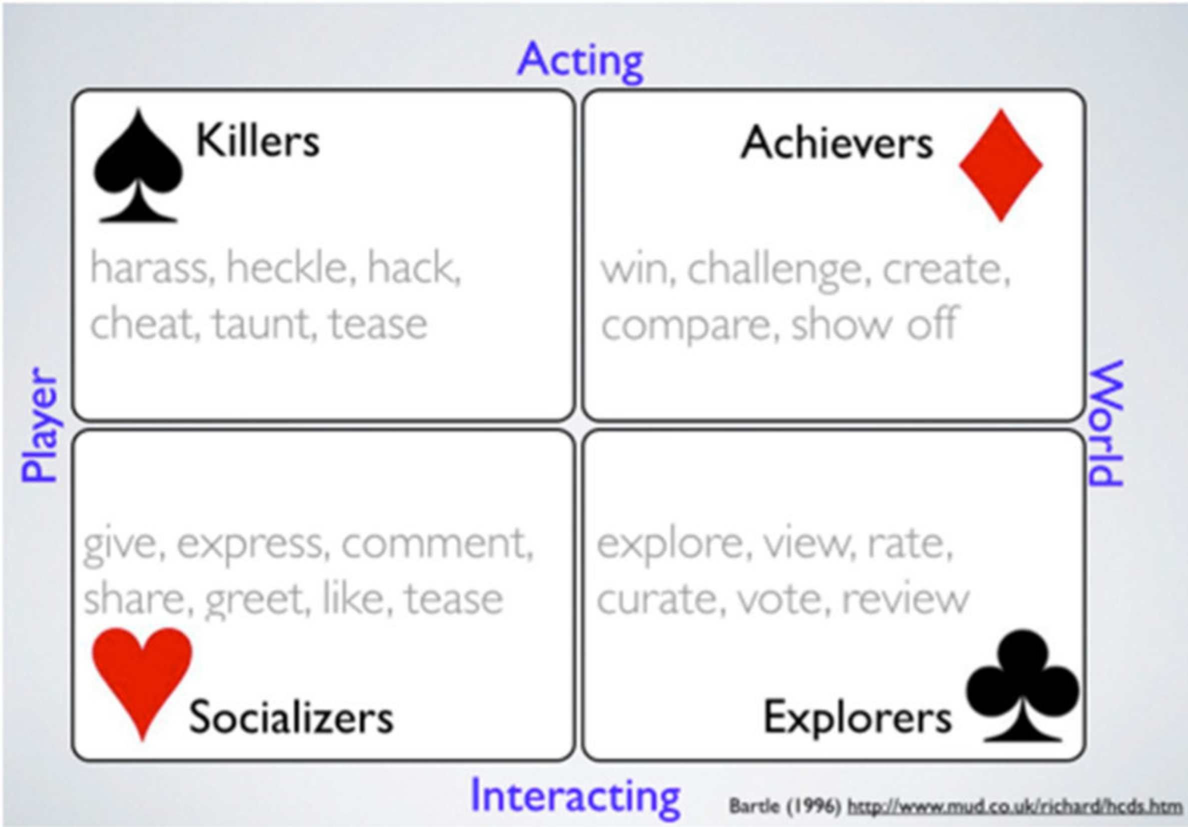


Figure 2. Bartle's four gamer types.

A game with just one of these elements—such as a game based only on collecting points—may risk being not very engaging for Explorers or Socializers or Killers. Even if you had only Achievers as players, adding the other dimensions rounds out a game and offers secondary options for players to fill their time while they wait for another round of the game elements that suit their primary interest.

Keep It Simple

By far the strongest outcome in the design of the second iteration (which eventually became the final iteration) of the Mystery Trip was a result of not having the time and energy to flesh out the story. For a four-day adventure, it contained relatively few details—only 13 transmissions. The story was a series of hints that left many gaps for the players to fill. And the players had great fun imagining the details, arguing and debating among themselves what was really happening—based largely on the particular, semi-random events that occurred as they were playing. Trust the imagination of your players and the randomness of the universe, and your narrative will fill in with a richness that J. R. R. Tolkien could not have envisioned and with plot twists that would make Agatha Christie envious.

Allow Improvisation

Building on the point about keeping it simple is the idea of allowing improvisation by players. Some of the best games we play in life are those in which we go off script and just use the game board for improvised play. We make up many of our own rules as we go along in life, but life offers us a game board and several constraints that shape our game. Remember to allow a certain amount of looseness in the experiences you design because the physical geography and players' own experiences and histories will bring in their own structures and constraints.

CONCLUSION

Wilderness experiences are, by themselves, exceptional learning opportunities. Anytime a child (or adult) can spend time in the wild observing and communing with nature is a time rich with reflection. Because of this, outdoor educators have been reluctant to bring in media and screens. It's important to note this, and to recognize that the technology is not—and should not be—the driver of this type of activity. In this case it offered an opportunity to add a game narrative to an otherwise perfectly fine trip. In this case it was sparse enough to add, rather than detract, from the wilderness experience. And this is my hope and prayer for technology—that its supporting role becomes invisible in the moments of awe that drive learning.

CHAPTER 11.

ADVENTURES IN ARIS: THE AFFORDANCES OF DESIGNING PLACE-BASED AUGMENTED REALITY GAMES IN THE UNIVERSITY CLASSROOM

BY LAINI KAVALOSKI

Mobile media are becoming the most pervasive technology on the planet. Most of our interactions with this media form are haphazard, often distracting us from our physical environments. How might designing purposeful, placed-based interactions/games on these platforms change the ways we think about our relation to the environment or the history of the place in which we live? How might it shift the ways we understand the constructedness of dominant cultural histories? Augmented reality (AR) platforms have the ability to allow humans to engage geographical space through bodily movement, intellectual thought, and emotional feeling. The potential of such platforms can be used to teach critical analysis and creative interventionist techniques in specific geographical locations. In the chapter that follows, I offer a story of my introduction to one such creative platform and the successes and challenges of teaching mobile media game design in an English course to university students in Madison, Wisconsin.

The majority of my experiences teaching in the humanities, until recently, have focused on hard-copy texts: novels in Dover editions, poetry collections in hardcover folios, plays in stapled copies. In 2011, I pushed myself out of my comfort zone—away from the smell and texture of old books and paper—and registered for the one graduate-level media course being offered in the English Department. That decision led to my increasing interest in the potential of media forms to spatialize cultural narratives and social problems in innovative ways and, in fact, influenced the direction of my dissertation project. My interest in emerging media bled into my classroom teaching and into my fascination with the ways that emerging media tools intersect with the humanities classroom.

AS a result of my interest in games in particular, I began teaching an exciting media platform called ARIS, or Augmented Reality Interactive Storytelling. ARIS is a free, open-source web-based tool that allows the designer to upload media to a mobile device in order to create situated documentaries, object quests, puzzle-based stories, and games. [1]

1. ARISgames.org

By placing text, sound, images, and video strategically onto an interactive global positioning system (GPS) map, students can build a wide variety of placed-based interactive projects. For example, one student group infused the UW-Madison campus with local stories of the feminist movement, while others created a tour of local effigy mounds. In addition to the deep historical affordances of GPS gaming, I discovered that ARIS allows students to reflect on the structure of narrative as they construct games, giving them a visceral sense of the architecture of stories through a tangible movement-based experience.

Experimentation with new media platforms almost inevitably involves risks and challenges. One of the major challenges of teaching ARIS is having technical support for students as well as access to software and laptops. Classes at the University of Wisconsin-Madison can be large; introductory-level English classes are often 350 students. This poses a challenge to instructors who want to incorporate digital tools and experimental media into their courses. While students can easily buy or borrow novels or literature collections to read for class, it is more challenging to support student access to and learning in digital platforms, especially in large lectures. Can students access the software on their own laptops? What if the students don't own laptops or tablets? What happens if students encounter technical difficulties along the way? Perhaps most important, do students really learn about writing and narrative structure from using experimental tools in a humanities classroom?

My adventures in ARIS began in the fall of 2013, when I was the lead teaching assistant in a undergraduate English course at UW-Madison titled *Stories, Maps, and Media: Designing Wisconsin Experiences.* Taught by English Professor Jon McKenzie, the course asks students to explore the past, present, and future of Wisconsin through the intersection of historical archives and emerging media forms. Learning goals for the students included:

1. Understanding digital communication skills through design frameworks;
2. Learning analytic and synthetic methods for thinking and living in the 21st century, while contributing to the Wisconsin experience.[2]

Early in the semester the students became familiar with design concepts and principles of experimental historiography by analyzing maps, graphic novels, and university spaces through the lens of user experience, experience design, information architecture, and information design. They also learned about varied approaches to telling/creating histories of a place. For example, a preservationist approach to history freezes the dominant cultural narratives of a place, "preserving" these stories. A critical approach to history asks more questions about the events and the perspectives through which they are told, often questioning pervasive cultural narratives such as Manifest Destiny or Columbus's discovery of America. In this particular class, we asked our students to remediate five Wisconsin events into games. The five Wisconsin history events that the students could choose to transmediate, or retell in a game format, were: Black Hawk Wars, the history of the Native American Effigy Mounds, the Pail and Shovel Party, Earth Day, and Wisconsin Idea. During this six-week project, students were required to build experiences in the form of an ARIS game, create a demonstration video of their game, and build a website that explained the design choice, creative process, and historical approach to their game. By doing so, students learned to think about the ways that historical events are curated, mediated, and designed for historical and educational purposes. In

2. McKenzie, J. (2001). Towards a Sociopoetics of Interface Design. *Strategies, 14*(1), 121-138.

particular, by creating stories that are situated in space (on a GPS map that pops up as the user gets near the "object"), the designer sees the component parts of the narrative arc and understands the effect of the story design on the user.[3]

PLATFORM DESCRIPTION

Though partly serendipitous, ARIS was a good choice for this class project for several reasons. ARIS is a user-friendly, community-supported tool that has advanced possibilities for both game-design experience and gameplay. ARIS is a free, open-source platform, which makes it a feasible tool in a large classroom setting. Students can easily access and build in ARIS on their own laptops (PC or Apple) or use computers in the university media labs as long as they have access to Wi-Fi. In order to play the game, students must have access to an iOS device, that is, an iPhone, iPad, or iTouch. By using a combination of story elements and GPS mapping, students can create a locative, augmented reality experience. Fictional, historical, or theoretical content can be dragged onto a specific location on a map (an image or video of an Indian mound placed on the map in Madison, Wisconsin, for example). This content then appears to the user/player on her iOS device when she is within about 30 feet of the mapped content (distance is adjustable). The text, image, and animation on the screen project layers of meaning onto a particular space, thus transforming a seemingly static spatial environment into a kind of palimpsest. This makes abstract ideas or histories immediately experiential and relevant to the user. One student game based on the Black Hawk Wars allows the user to play the game from multiple perspectives (see Figure 1). These new learning outcomes create an absorbing and dynamic classroom experience that inspires students to become active producers of knowledge.

3. ARIS was, and continues to be, developed at UW-Madison by the GLS and Mobile Learning Incubator led by David Gagnon.

Figure 1. Screen and description of game about Black Hawk Wars.

The first screen of the game or documentary often gives the player a task. For example, in one of the student games a native "guide" pops up and tells the user about the history of destroyed Indian mounds at the university. The guide then asks the player to gather information from other characters about the effigy mounds that lie underneath many of the university buildings. As the player moves around the physical campus gathering information, he or she can save information in an inventory or backpack. These objects may be historical documents, food, or information "found" along the way. The information or objects gathered can then be traded for points or for other information to end the game, or the information can be used to create a larger project outside of ARIS (e.g., a research presentation on mounds culture).

WHY GAMES IN THE HUMANITIES?

English as a field has long struggled with ways to make writing more engaging and relevant for students who are not inclined to write traditional academic essays. Hands-on building and game design provide new ways for students to think about story structure and historical perspective in an interactive learning environment. Student designers can create linear experiences in which a user must go from A to B to C and so on, or they can create a more random or chaotic experience, so that the player might encounter various events or characters simultaneously as he or she wanders around a designated location. The malleability of experience design in ARIS, or the overall look and feel, structure, and goals of the game, gives students creative jurisdiction over several aspects of the game that they build. The possibilities or affordances of the platform allow designers/students to pay detailed attention to the ways that cultural narratives are created, implemented, and sustained, as well as to the learning outcomes for the players (end user). Likewise, the writing in this project is directly relevant to the outcome of the game: in addition to writing the game instructions and dialogue, students craft a lengthy proposal in which they must convince their "client" that the game they create is pedagogically relevant to their users (this could be elementary school students, city tourists, university students, etc.).

Stories, Maps, and Media, a college-level English course, asked students to explore intersections of visual, textual, technical, and conceptual elements in various story genres. Through the reading of designers and media theorists such as Edward Tufte, David McCandless, Marshall McLuhan, Jon McKenzie, and Ralph Appelbaum, students were able to practice media analysis as well as apply design concepts in small weekly assignments.[4] The aim of the design framework was to get students learning analytic and synthetic methods for thinking and building media in the 21st century while contributing to the future archives of Wisconsin history. While this project might seem primarily like a historical design project, it incorporates media and design paradigms from graphic novels, experimental theory, performance studies, and media activism. The students collaborate on the experience design of their project, deciding whether it will preserve, critique, or inspire alternate Wisconsin histories.

In order to create a systematic and consistent framework through which to engage the media, students were taught the design framework of experience design, information design, and information architecture to both critique and produce media. Experience design is a field used to create audience or user-centered interfaces or experiences in order to facilitate the building of specialized environments.[5] A tangible example of the results of experience design is The Wizarding World of Harry Potter in Florida. Designers from around the world created streets that mimic those described in J. K. Rowling's novels to give the visitor a visual and kinesthetic experience of Hogwarts and its environs. This includes the look and feel of the spaces, the sounds, the smells, as well as the navigability of the museum itself. These frames in the context of our English course gave students the ability to think about the structure and hierarchy of information in their project, the look and feel (or tone) of their game, and the user's moment-to-moment experience. In short, the course sought to push students to use media design tools to think outside of traditional historiographical tactics and to use innovative transmedia storytelling techniques in order to intervene in larger social and educational problems.

I decided to use ARIS as an experimental media form through which to imagine an alternative history for the future archives of Wisconsin (through the five historical events listed earlier) for several reasons. First, as far as I knew, the ARIS platform had never been used in a college English

4. Other titles among these works include Norman's The Psychology of Everyday Things and Wurman's Information Architects. Tufte, E. (1997). Visual explanations: Images and quantities, evidence and narrative. Cheshire, CT: Graphics Press; McCandless, D. (2009). The visual miscellaneum: A colorful guide to the world's most consequential trivia. New York, NY: Harpers; McLuhan, M. (1967). The medium is the message. London, England: Penguin Books; McKenzie, J. (2001). Towards a sociopoetics of interface design. Strategies, 14(1), 121-138; Appelbaum, R. (1997). Untitled essay. In R. S. Wurman (Ed.), Information architecture (pp. 150-161). New York, NY: Graphis; Norman, D. (2002). The psychology of everyday things. New York, NY: Basic Books; Wurman, R. S. (Ed.). (1997). Information architects. New York, NY: Graphic.

5. Within the experience design framework (developed, in part, by Donald Norman), information architecture focuses on the hierarchy of information (usually attributed to Saul Wurman) and information design focuses on the look and feel or aesthetic experience of the user.

classroom and held untapped possibilities for narrative design with which I was eager to experiment. In addition, though ARIS is used all over the world, it was first developed at UW-Madison; thus, we had exceptional resources, including close contact with the game designers. Third, gaming has become a more visible pedagogical tool in the humanities, and we were eager to think about the ways that we could expand game affordances for literary purposes.

GAME PROJECT AND DELIVERABLES

As the syllabus was already set, I had about six weeks to implement the ARIS project. The course was structured so that there were two 50-minute lectures a week along with small discussion-section meetings once a week. Because not all of the students in the class were creating games, lectures did not cover the game interface or ARIS design process. This meant that my students had only six 50-minute classes in which to complete all of the components of the ARIS game project. I also expected students to spend a fair amount of time outside of the classroom researching, compiling information, and producing materials with their groups.

The ARIS project has several component parts (these components could be scaled down for younger students). The five deliverables were: 1) a team website; 2) the ARIS game; 3) a three-minute demonstration video of the game; 4) a formal 2,000-word project proposal explicating the intended audience, the user for the game, the overall user experience, information architecture, information design, and conceptual intervention of the game (way that the game remediated history); and 5) a five-minute formal presentation of the game. The student teams were assessed and graded on each of these deliverables.

In order to produce these assignment deliverables, students were first required to visit a local archive (Wisconsin Historical Society) and gather historical materials related to their topic. Second, they were expected to research and identify a problem within their topic; for example, one team asked: How can we make visible the destroyed and hidden Indian mounds on the university campus? Third, students brainstormed game ideas that might intervene in the problem or issue they identified (also known as ideation). They usually did this by storyboarding on a large sheet of blank paper. Fourth, they built the ARIS game using both found and custom-designed media pieces (short videos, music, dialogues, etc.). Fifth, students wrote and illustrated a robust 2,000-word proposal document explaining their game, the historical problem they were addressing, and their design approaches. Sixth, they made a short video of their game for presentation purposes. All of these materials were housed in a website that was created by the group or “design firm.” Though this chapter focuses primarily on the game design, it is important to know that each of these assignments complemented and built upon one another.

To begin the process, my section of 20 students broke into five teams that would role-play as design firms. Students divided themselves into groups according to topic interest. For example, one group coalesced around its members’ interest in Pail and Shovel, the UW-Madison absurdist student government party from the 1970s (see Figure 2). By creating a mini-community within the classroom, students took responsibility for the project in a way that rarely happens in the literature or writing classroom. The process of community building happened, in part, through the group’s creation of a team name, website, logo, and design scheme.

Figure 2. Red Flamingo's team introduction.

The design framework was crucial to the building process as groups thought through the conceptual and aesthetics of their group site and game. This process allowed students to use the design concepts they learned earlier in the course.

They were asked to create a consistent look and feel across their five deliverables so that the site and proposal would coalesce with the ARIS game they would produce. To do this, the teams were asked to articulate the kind of historical narrative they wanted to tell: Would a team choose a fun and light presentation for their historical event? Or might they create a postmodern, monumentalist mashup game in order to overturn the very concept of a fixed history?

To facilitate a smoother group process, each team member was asked to take on a specific role. In our case, the roles included:

1. A producer to keep a schedule and hold the other members accountable for deadlines,
2. A copywriter to generate and edit proposal materials,
3. A designer who would be responsible for the design of the game and the visuals, logos, color scheme, images for the website, proposal, and game
4. A software "specialist" or website creator/game builder/video maker.

Sometimes students decided to share roles or create new categories that better fit their needs. All group members were expected to work together on writing the proposal and conceptualizing the game.

TIMELINE FOR BUILDING

The game-implementation process took about four weeks (meeting once a week for 50 minutes).

We asked the UW-Madison Software Training for Students (STS) organization to give students "just in time" training, which means that a small amount of immediately relevant information about the platform is given to the students in each class period. More information is given to students as required to take the next steps in the game-design process. This approach ensures that as students learn about the game editor, or back end, they also practice the steps that they are taught along the way and thus are better able to retain the information within a kinesthetic practice.

For the first ARIS training class, the software trainer taught the students how to log into the ARIS site, how to begin a new game, and how to create and drag characters, items, and plaques onto a GPS map in the Editor or authoring tool.[6] Before training began, I asked students to play some of the existing ARIS games, so that they became familiar with the platform and its affordances. This first week, we asked each student to create a "throwaway game." This sample game was a way to get students working inside the platform with low stakes. For this exercise, students mapped five or six significant people and places onto a map of their hometown in the ARIS platform. Some students mapped significant events and people from their childhoods; others mapped short fictional stories onto their hometowns.

The second week in ARIS, teams were asked to come to class with a list of characters, items, and plaques that they thought they might use to create their game narrative. During this class, groups were given note cards on which they wrote the names and descriptions of these characters, items, and plaques. They then used the cards to create a storyboard by placing the cards on a large sheet of paper. The storyboarding exercise allowed them to draw pathways, create alternate routes, and experiment with narrative trajectories for the game they wanted to create (see Figure 3). Ideally, students would create three different storyboards in each group, and then discuss or workshop the ideas with the whole class, getting feedback and suggestions, and finally choose the most viable or exciting sequence for their game. During this exercise, students were asked to think about the user experience of the game and the overall experience design. Could the user/player easily navigate from one step to the next? Was the learning outcome being leveraged within the game narrative? How would this narrative game intervene in the issue or problem that the group had identified earlier?

6. The first time I taught ARIS, I had David Gagnon and John Martin two of the game designers, and a university technical support trainer in my class helping the students. Not everyone has access to these resources, obviously. But there are other ways to get robust support while learning or teaching the game. For example, students used the ARIS Google Community Group on the ARIS.org website for live support, tips, and problem solving as they advanced in the game-design process. These resources are growing all the time and have become more refined even in the last year.

Figure 3. Storyboarding with narrative elements.

For the third class (their third week building in ARIS), students came to class with the game already partially built according to the narrative trajectory of the storyboards they had created the week before. The elements (items, characters, plaques) had all been placed on the map, and teams began to bring in media files (videos, music, images, etc.) to supplement the experience design of their games. During this session, the software trainer introduced the students to requirements, which allows them to sequence their game elements in a specific order. The teams spent about 25 minutes of class time working on requirements within their newly minted games—with technical support nearby in case they needed assistance with advanced requirements.

The fourth and fifth classes were spent in a combination of building and critique or peer review. These classes were extremely important to the quality and depth of concept in the games. By the fifth class, first drafts of the games were due. At this point, each group was asked to present its game to other groups for feedback on concept, structure, and design. Students spent about five minutes demonstrating the game to another group on an iPad and then received five minutes of feedback based on the experience design framework (see Figure 4).[7] We asked the reviewers to write their comments on note cards in the last two minutes of each 10-minute peer-review session for the designers. This way, by the end of the peer-review class, each group had several concrete suggestions for game editing. Teams then made final revisions for the last class period. Each group was able to play the other teams' games during the final class period and write assessments of the games using the CAT (conceptual, aesthetic, and technical) or UX (user experience, experience design, information architecture, and information design)frames to guide their critiques.

7. The designer can activate a quick travel function in ARIS so that the players can choose to "travel" to a location without actually moving around in real space.

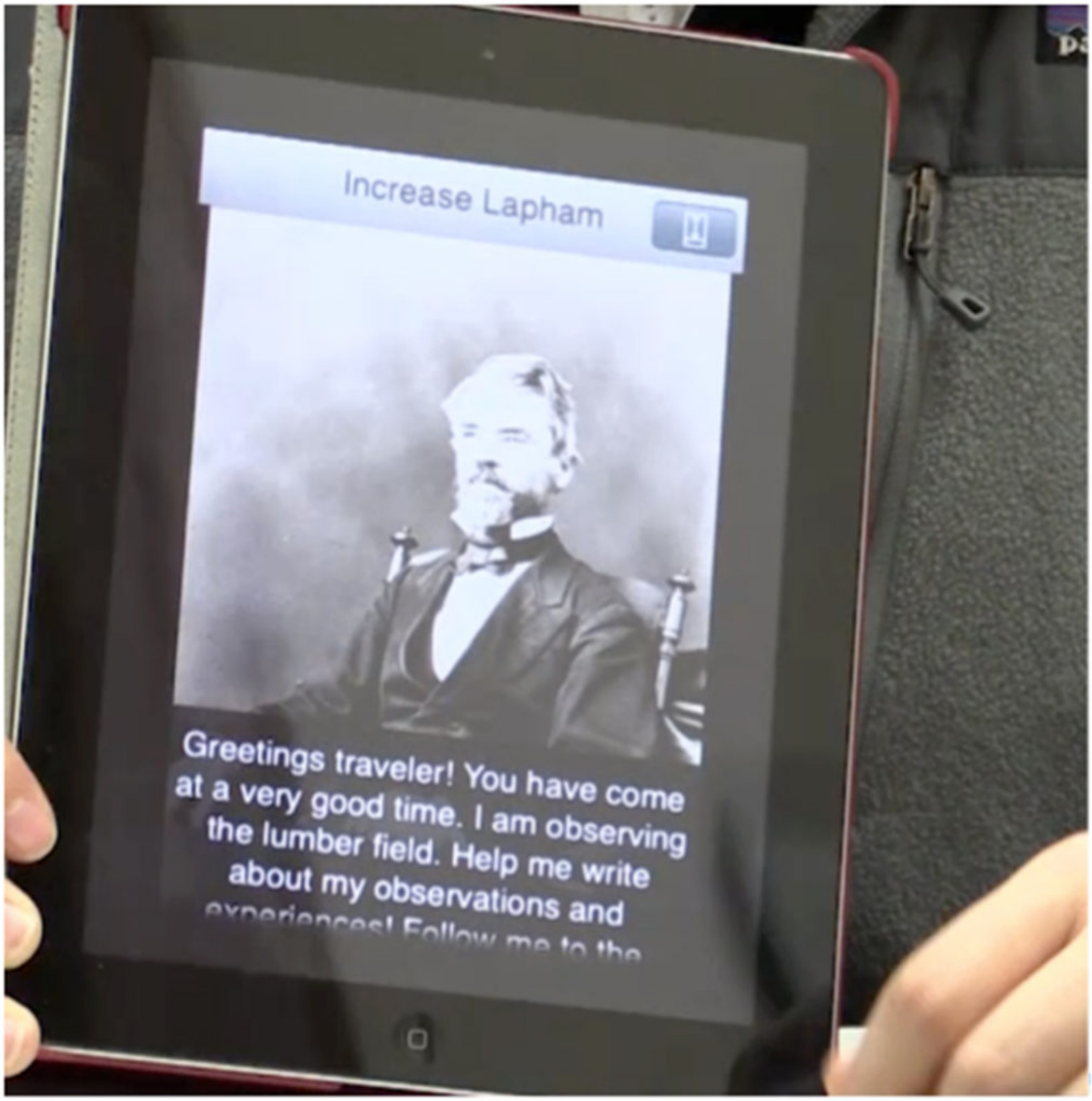


Figure 4. Student demonstrates a game based on Earth Day.

The importance of the design framework in this project cannot be overstated. Though it is possible to build games without using the design frame, we found that the design vocabulary, attention to aesthetic details, and conceptual foundations of the games were greatly enhanced when using the user experience lens. By thinking about the experience of gameplay from the users' point of view, students were able to analyze the ways in which the interaction of text, image, ease of play, and narrative arc worked to create an overall learning experience for the user. The designers became especially attuned to the impact of the visual elements or the look-and-feel of the game. For example, the team that created a situated documentary game about Wisconsin effigy mounds decided on a color palette that would reflect the natural environment of the mounds (see Figure 5). In contrast, the Pail and Shovel group chose a much lighter aesthetic design for their game and proposal, communicating the parodic or comic tone of their topic (see Figure 6).

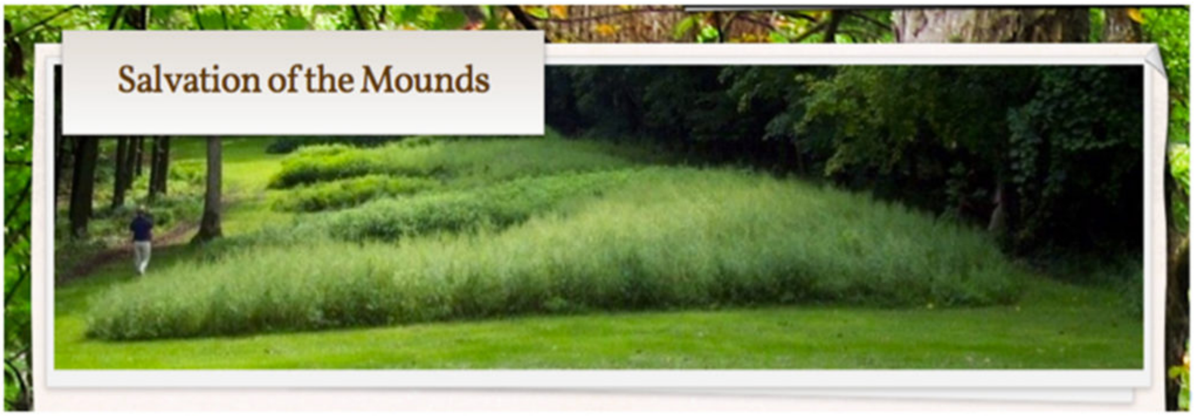


Figure 5. The natural environment of the effigy mounds is reflected in the design choices of the Salvation of the Mounds team.

Figure 6. Front page of Red Flamingo's proposal, showing a lighter tone.

REFLECTIONS ON TEACHING ARIS

Overall, the game-building exercise was a success, assisting students to identify structural narrative elements, learn software skills, create products for their growing portfolios, and learn the skills of creating and pitching ideas to a specific audience. The cultural cache of game building and the added bonus of inviting friends and family to play and "review" the game on the ARIS platform created a buzz around the game both at the university and at home. Students tended to get excited about game building in general, whether they were avid gamers or new to the field. Several things could have been improved in the planning process, however.

First, the schedule for the game was too tight. According to the ARIS designers, this was the first time instructors had tried to teach ARIS in five short 50-minute blocks of time. Because game building requires tinkering, collaboration, and reiteration, this short time period (essentially about four hours of class time) was not conducive to these rhythms. As a result, several students were overwhelmed by the amount of work that went into this project. In retrospect, we would have benefited from more in-class time to play, experience, and build games. Ideally, students would have had time to play and assess ready-made ARIS games for at least a week before the design process began. In addition, students would have benefited from longer blocks of time for game designing and building (1.5 to 3 hours at a time).

Probably the most daunting aspect of teaching ARIS in the classroom—whether it be in an elementary school or in a university—is the fear of technical complications or lack of technical ability. However, a robust ARIS support system exists online to assist institutions without technical support staff. The ARIS site has accessible online user guides, how-to videos, a sharing forum, and an online support community (Authors Forum) for fielding questions, making ARIS a viable tool to teach in the classroom. Because the Authors Forum support group consists of international users, questions are often answered within an hour or two of the posting—even late at night or early in the morning. The most comprehensive user guide on the ARIS site is *Creating Narratives With ARIS,* a PDF manuscript that can be downloaded or viewed online at the ARIS site. This document walks through the basic layout of the back end, or Editor, of ARIS and explains how to place items, plaques, and characters on the GPS map. If you prefer to watch videos or want to give an introduction to getting started in ARIS to your class, you can watch the video *Authoring Basic Objects* or *Using Requirements.* New learning and teaching tools are constantly being created and reworked for a friendlier user experience, so names and video may change slightly. More recently (as of Fall 2014) the Beta version of ARIS has become available, along with several excellent how-to videos posted on the site by Chris Holden (University of New Mexico). More and more educators are learning ARIS and thus making the teaching networks more closely connected (and making it more likely that you may be near an experienced ARIS builder), these online support tools are extremely useful for a first-time user/teacher.

OUTLINE: STEPS FOR GAME FAMILIARIZATION, DESIGN, AND IMPLEMENTATION

1. **Familiarization**. Give students an introduction to games/place-based learning and let them play some ARIS games. Allow class time to discuss the games and their perceived successes and failures.
2. **Teams**. Create design teams around a predetermined topic. (This could be a historical event, a person, a critical theory, or a research question.) In the upcoming weeks, teams can create websites, logos, and design-team statements.
3. **Research Group Topic.** (This can be done during class time or outside of class). Depending on the subject matter, students can do research in books, online, or in local archives.
4. **Technical Proficiency**. Introduce basic ARIS process: editor, map, objects. Ask students to create a "throwaway" game by mapping some characters and items onto their local area. Be sure to encourage students to use support networks on the website.[8]
5. **Storyboard**. Ask each team to bring in or make 10-15 note cards describing characters, items, and plaques that they would like to incorporate into the game. Students can use these cards to experiment with various narrative sequences on a large sheet of paper. When they agree on a sequence, they can glue the cards in place and write notes on the paper.
6. **Implementation**. Students can use their storyboards as models to build their game. At this

8. ARISgames.org

point, more software training may be required. Several short how-to videos and guides are available on the ARIS site to help with this process.

7. **Redesign**. Have students play the other teams' games and give feedback about the interface, user experience, look and feel, and end goal of the games. Teams should redesign their game using peer and teacher feedback (as useful).
8. **Assessment**. Have students assess both their own games and other teams' games using the experience design framework. You may also ask them to assess the work of each of their team members at this point.
9. **Publicity**. Have students ask parents, family members, friends, and other teachers to play and rate their games (ARIS allows players to rate and comment on games).

Note: The above outline does not include the design frameworks, which were taught before the ARIS project was introduced to the students. These design concepts—experience design, user experience, information architecture, and information design—were central to the success of our projects.

CONCLUSION

Because of student enthusiasm for ARIS and for its exciting possibilities for classroom teaching, I taught ARIS in four subsequent courses and even introduced it as a classroom tool to regional high school English teachers. Not only is game building and designing exciting for students and teacher alike, but it also facilitates community building in the classroom, teaches media skills, design confidence, an understanding of narrative structure, critical thinking, and writing skills. Perhaps most important, it gives students a rare opportunity to participate in the process of knowledge production. As they create these mini-knowledge machines (games), students are cognizant of the learning outcomes for the game users/players. We found that student designers pay particular attention to the ways that the story structure (the narrative development/divergence, the pathways of the game, the conceptual architecture) and the design elements of the game (sounds, images, colors) affect the structures of knowledge within the game, the story arc, the affective augmented environment of the player, and the learning outcomes that result from these combination of choices. As students craft stories and experiences for other users, they are able to reflect on the historical and narrative processes that affect the ways they think about and perceive the world around them.

PART III.

BROADENING THE GENRE

CHAPTER 12.

A FIRST-YEAR TEACHER'S EXPERIENCE WITH PBL AND LEGO ROBOTICS

BY WILLIAM VANN

PBL, *MINDSTORMS,* AND FIRST-YEAR TEACHING

I began my first year of teaching in the fall of 2013 at Immanuel Lutheran School in Missouri, working with the middle school. At the time I had noticed a few buzzwords flying around my Twitter feed. Phrases such as "project-based learning" (PBL) and "flipped classroom" were becoming hot topics in education. That, combined with the big STEM push at my school, piqued my curiosity. I kept looking into how I might integrate these ideas into my computer classroom. I had spent a unit in Google SketchUp and Scratch programming in which I dabbled in flipping the classroom and came away with mixed success. I had no idea how valuable this would later become.

Fast-forward to December, when while cleaning out some closets in the computer lab I came across four complete Lego *Mindstorms* kits—the original *Mindstorms,* with the yellow brick, IR receiver, and, of course, the original nine-pin COM cable (see Figures 1, 2, and 3). I knew when I first laid eyes on these nostalgic pieces of educational hardware that I had to find a way to use them in my class. That day I took one home to start playing with it … or at the very least to see if I could do a little research on how to make these dinosaurs move. I knew that with these kits I could help my students make the connection that programs created on the computer can have real-world implications, allowing them to bridge the gap from the digital realm to the physical world.

Figure 1. Lego RCX brick and IR transceiver.

Figure 2. Still with original packaging!

Figure 3. The COM port on the left-hand side of the VGA cable.

After playing around with the brick, reading some obscure resources, and a few failed programming attempts, I was finally able to get my original *Mindstorms* robot operational! This great success pointed me in the direction of how I would teach this unit—project-based learning. I realized that through my initial "playtime" with *Mindstorms,* I had taught myself programming, engineering, a little science, and math. I had hit every letter of the STEM acronym in an environment that perpetuated the need to learn through inquiry-based tactics, or in essence, as one of my education professors said, "Fail forward," or learn through inquiry.

I knew this "fail-forward" technique would be one of the most beneficial pieces of advice I would leave with my students. I had to incorporate this idea into every lesson for the unit. This would, I hoped, end the stress associated with their product not working and instead cause them to retool their creation and make it work for their needs. So, after I finished having my robot terrorize my cats for a few hours, I began working on how my unit would look.

I went in with the goal that all my lessons be short, teach them the critical components they needed to get going, and allow them the chance for self-discovery. Essentially, I wanted that "ah-ha" moment in every class from every student. The hardest part, though, would be to keep them motivated even through their failures and to teach ingenuity. My outline was to have a pretest building, followed by structural design, gear systems, programming, and environmentalism (the project part). The unit objective would be to create a preprogrammed vehicle that would be able to:

- locate,
- pick up, and
- transport a discarded aluminum can to a designated recycling area.

DAY 1: EXPLANATION OF PBL AND PRETEST

I kicked off the unit with my sixth-grade class by first explaining to my students how project-based learning works. The very first day I modeled how the class would look with a 10-minute explanation of PBL. To save you some time, here are the highlights:

1. We will learn by focusing on our project. Everything you do will be to build your vehicle. In fact, take the time to start building your actual vehicle during our class time.
2. Focus on our unit objective.
3. Don't be discouraged when it doesn't work the first time. In life things rarely work exactly how you want them to on the first try (fail forward).
4. Don't be afraid to think big!
5. Remember sometimes the best solution is the simplest.

This was a totally new concept and a way to approach class that all of the students were very unfamiliar with. I directed their attention toward the projector. I had my iPad working as a document camera. Displaying a live feed of the crazy mess of Lego RCX kits in front of me. We first looked at the basics: Turn the RCX unit on and off, how to run program "1," and how to combine gears to power an axle and make it move. The kids seemed very interested but slightly nervous, and there was an air of whispers and grins. The students had to create their own groups of four. The boys went with the boys and the girls went with the girls. We could now start the pretest. Their objective: to make a vehicle that moves forward. Besides all the Lego parts, they could use anything they could find in the room to help complete their assignment.

The clock began to count down on the board. Forty minutes was all they had. Every second counted. I spent my time walking to each group, questioning the students about their design. A few groups tried using every part they could find in order to make their designs as stable as possible. The only problem was that by the time they finished, their robots were so heavy they couldn't move. Other groups spent their time arguing about which design was the best possible and failed to add a single part to their RCX blocks. One group had the brilliant idea to ask the "expert," aka the teacher. Although they were clever, I believe they were looking for a detailed schematic of how to build the perfect unit. To their disappointment, I handed them only one part, a connector piece to bridge two axles together. Finally there were some groups that made such a minimalist design that even though they could get it to go, it would break after only a few seconds of use.

The pretest produced a mixed result between my two sixth-grade classes. However, two very distinct traits were found in both classes. Their understanding of structural design was minimal, and groups that comprised all boys failed to complete the goal, whereas their female counterparts were able to create and make a robot move. Why this might happen intrigued me. The only reasonable answer (that I observed) was that the boys spent too much time on conceptualizing as opposed to hands-on engineering (see Figure 4). Upon reading their reflections, I noticed that most groups found that the build-and-try method was what helped them succeed.

Figure 4. The boys hard at work discussing their ideas.

DAY 2: TEAMWORK, COLLABORATION, AND STRUCTURAL DESIGN

In the next class, we discussed what some of our pitfalls were in terms of working. Almost unanimously, everyone answered *teamwork*. Looking at that, we, as a class, devised some ways we could collaborate in an effort to achieve a higher goal. The students thought that it would be best to all create individual plans, evaluate those plans, find similarities and differences, and then build from the combined plans. We also began looking at the idea of basic structural integrity.

- What makes a stable base?
- How can pieces be cut to make it light without compromising structure?
- How do we combine other objects with *Mindstorms* RCX pieces? (Understanding that you can't keep piling on brick—although stable, this would make the unit too heavy and unable to achieve any goal.)

The original plan was to have them only to make something that could support five pounds of weight, but the students had a better idea. That was to take what we just learned about structure and collaboration and redo the pretest. This was an amazing idea. I placed 40 minutes on the clock again and the groups were off again. Hard at work, every team completed its bot with 10 minutes to spare. After all the groups showed that they could make theirs run down the hallway, we decided to race them with the little time we had left. It sparked a sense of competition that really started to fuel their desire to want more.

DAY 3: GEARS, GEARS, AND A FEW MORE GEARS

After having all the groups successfully make their robots move (and not disintegrate into a thousand Lego pieces), we had to move on to our next concept, gears. Gears would be one of the most valuable lessons for them. We looked at how to connect gears to create gear trains. This class I approached a little differently. I allowed them to create a structure to test different combinations. To my surprise, most of my students had little to no prior knowledge of how gears work. We looked at gear ratios and tested our different ratios on a model wheel (see Figures 5, 6, and 7). Students were excited to make a wheel go superfast; however, they soon learned that high speed but little torque would not be able to accomplish any task in the future. The lightbulb moment had gone off for them that they could make the perfect gear train and play with the ratios to find what combination had the optimum speed and power to accomplish their goals. Students would later write in their journals that this was one of their favorite lessons.

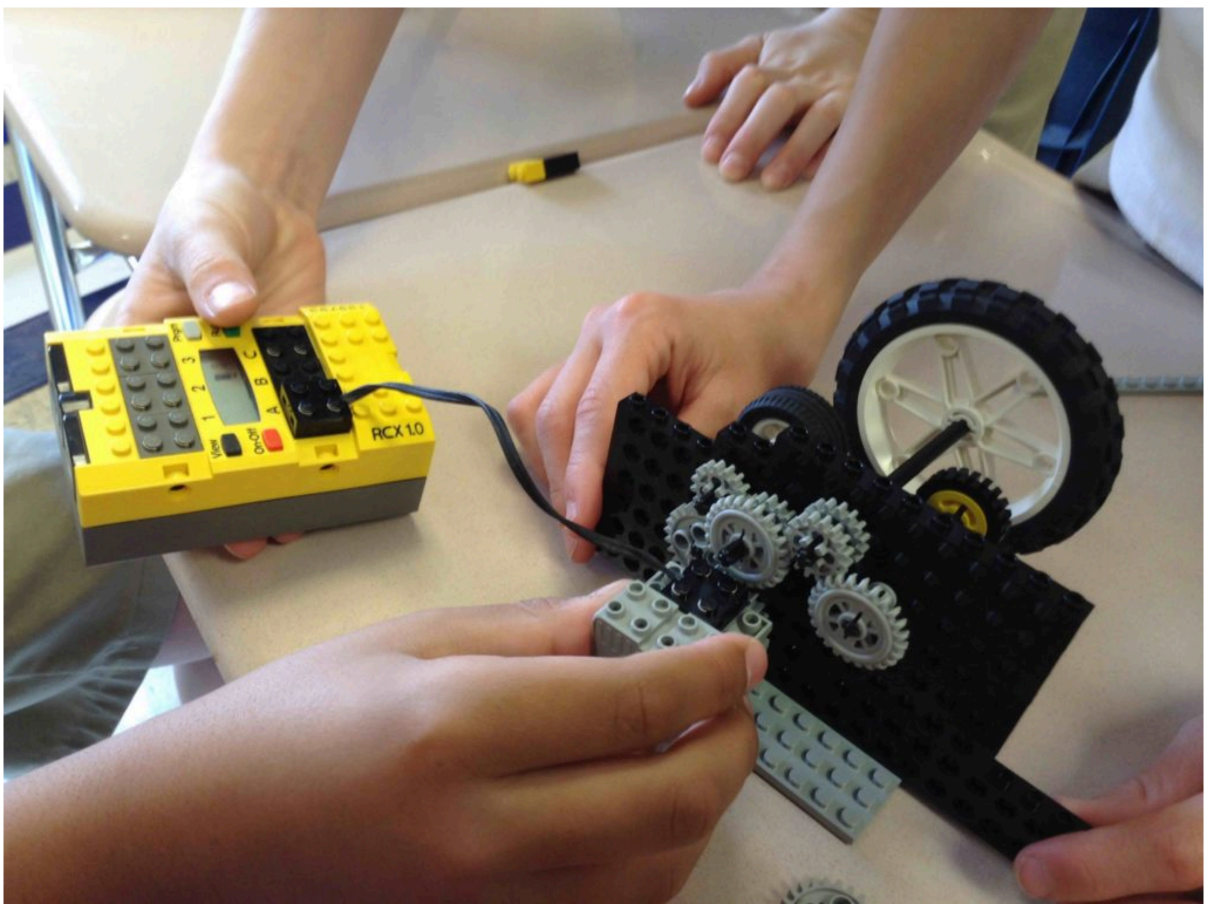


Figure 5. A complicated, multilevel gear train.

Figure 6. A simple gear train to achieve maximum speed.

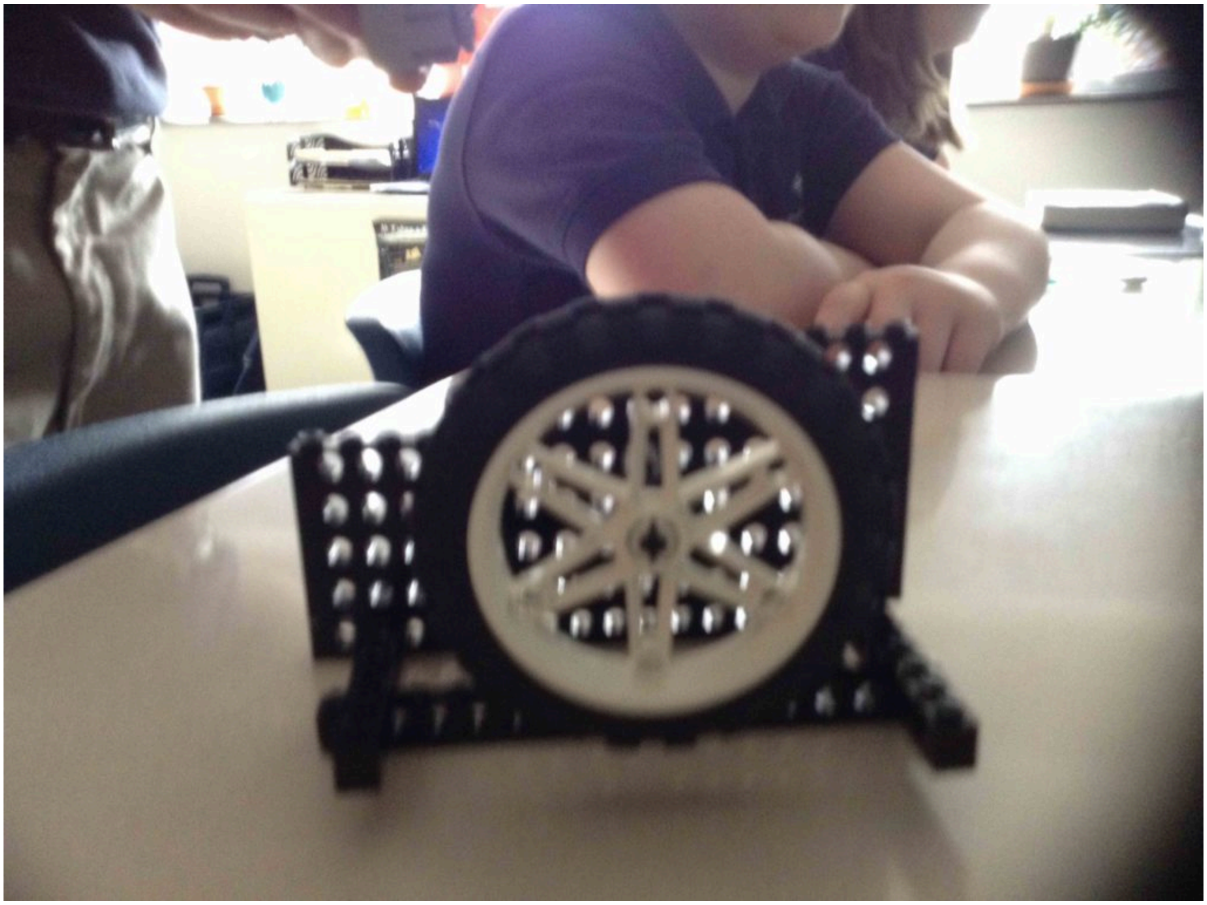


Figure 7. The old Lego RCX wheel.

DAY 4: PROGRAMMING—8-BIT STYLE

One of the first problems with the original *Mindstorms* software is the incompatibility with anything new. To upload any code to a *Mindstorms* brick, you need to have the IR sensor connected through that nine-pin com port (see Figure 8). In other words, you need to find a PC from 1995. The software itself runs on the old 8-bit color format. This, on newer machines, leads to frequent crashes (all because we have advanced so much in the computer world). Thankfully, the computers found in our computer lab had a nine-pin com port yet were running Windows 7. After a few failed attempts after school to load the software on the computers, I managed to get only two computers to remain stable enough to use the coding software (see Figure 9). At first I thought this would be problematic, but I realized I needed to break my class into two groups of 10. This would allow my two sixth-grade classes to make their robots and not destroy them every time.

The next day came and I was ready to teach my students basic *Mindstorms* programming. Of course both computers crashed a few times while we tried to start the program. So we had an impromptu lesson on how specificity is key in terms of making a robot move. The kids had to select one person to move a foot at a time to reach the door of the lab. The rest of the group would have to write out the code in terms of "move forward," "move right," "move left." Once that was completed, we introduced loops and loop interrupts so they could create a more condensed version that would run the same "program." The kids seemed to enjoy this more kinesthetic activity than if they had sat at the computer. Halfway through class, the *Mindstorms* software started. We gathered and went over some basics, movement, loops, motors, and dabbled in sensors.

Their goal for the next class was to be able to make a robot that could navigate a simple maze (forward five feet, turn right, forward two feet, turn left, forward five feet). I believe that their use of the kinesthetic learning greatly improved their ability to figure out the code to this because both groups were finished in 10 minutes and completed the activity after only a few tries.

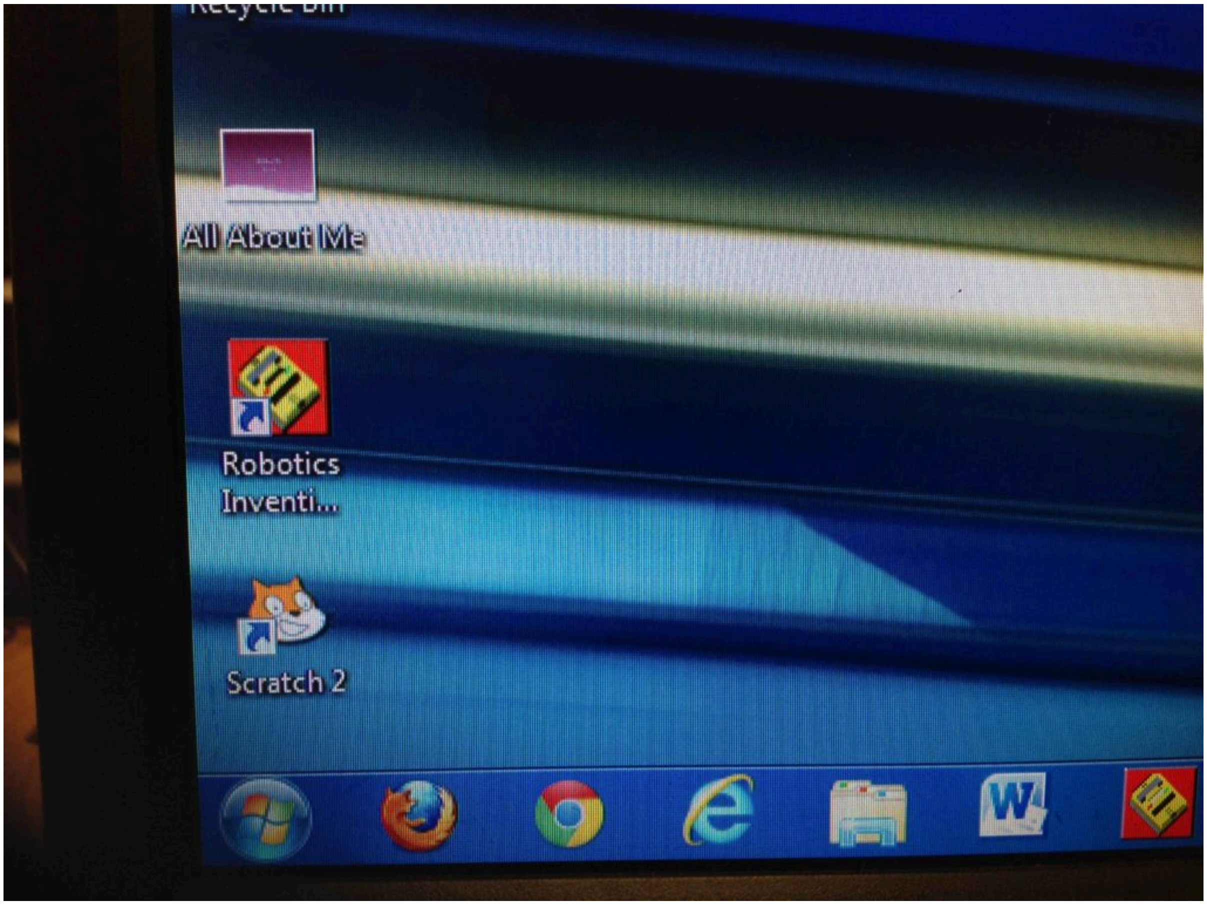


Figure 8. The original Lego Mindstorms program running on Windows 7.

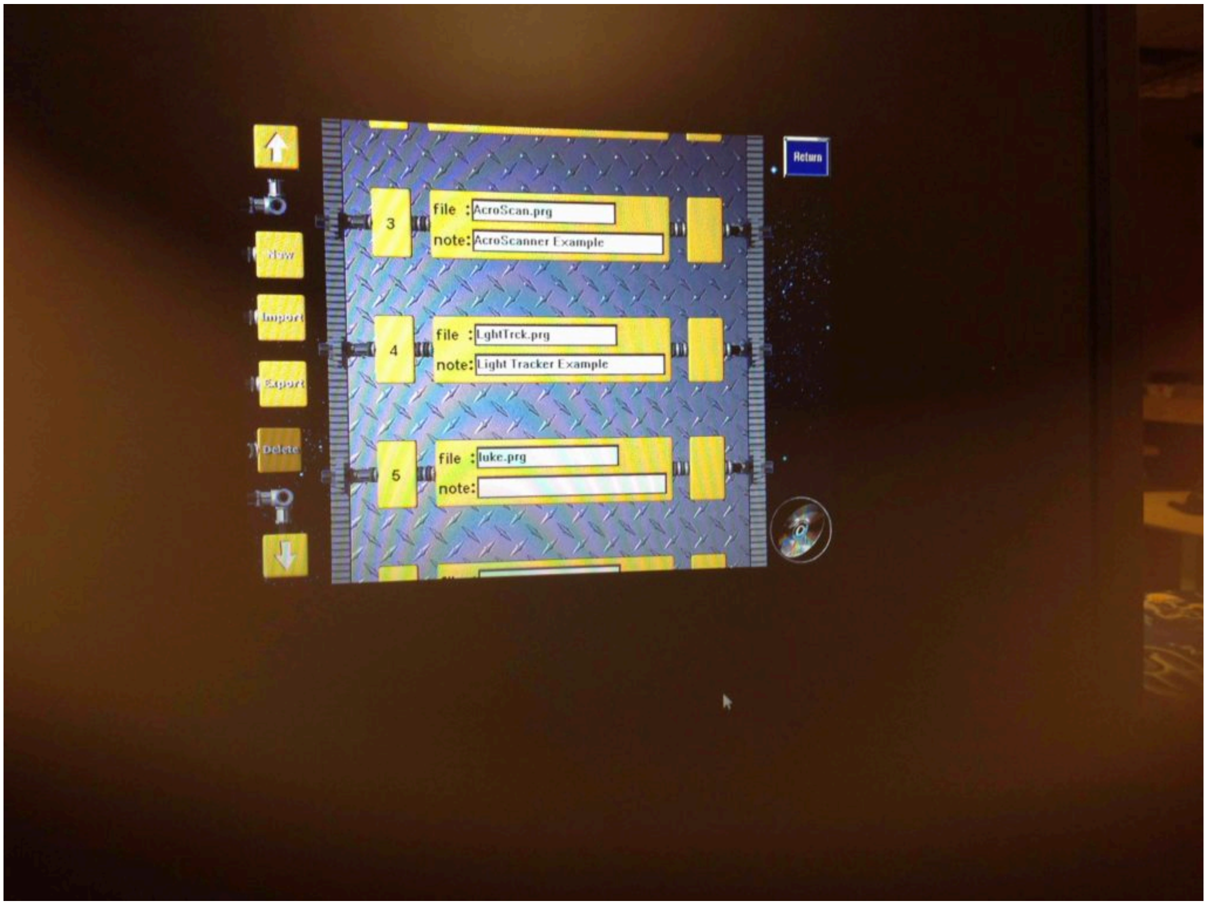


Figure 9. The original program required a lower resolution to remain stable; otherwise it would crash.

CALLED AWAY—HOW THE CLASS HANDLES FLIPPED AND VIRTUAL LEARNING

During the last year my mother-in-law had been diagnosed with pancreatic cancer and was rapidly declining in her health. Nearly every weekend my wife (also a teacher) and I would drive five hours to visit her and stay at their home. The first week in May we received a call around 1 a.m. that things were not looking good. We rushed off to Indiana. We both missed that day of school, which in this case was the environmentalism lesson. This lesson was to be a more interactive lesson and mini-field trip around the school as we talked about aluminum and recycling. This lesson changed as a quick substitute plan was needed. Instead, a short documentary on recycling and aluminum and worksheet would suffice. My wife and I took turns driving so we could develop sub plans and use my mobile hotspot. Thankfully, I had set up Google Apps for Education for sixth through eighth grades. The worksheet would be turned in electronically and I could at least grade everything. When we got to Indiana we were told she had stabilized and would probably be fine for the rest of the week. My wife told me to go back to Missouri, take care of things, and wait to return till the weekend.

After I came back and although we missed the last "lesson" day, we were set to begin on focusing fully on the project itself. With such a large group of kids on each kit, I needed to make sure that everyone was participating and working with little downtime. To ensure this, I had the idea to create each group into essentially a business team. The jobs included:

- One project manager

This student would oversee the other groups, make sure they are on task, and provide "daily" reports on the status of each group.

- Two programmers

These students would program the robot to complete the task. They would work with the engineers for the design and work with the business team to inform what the robot actually does.

- Two documentary crew members

These students would create a step-by-step guide on how the robot was built and programmed (see Figure 10). This was to ensure that the robot could be replicated by anyone else.

- Three business team members

These students focus on trying to sell me the robot. They would have to highlight everything the robot does, looks like, and how it would be useful for any environment. They would then create a presentation and pitch it to the class.

- Two engineers/builders

These two students would design and build the robot; they would work extensively with the programmers to make sure their design could accomplish the program (see Figure 11).

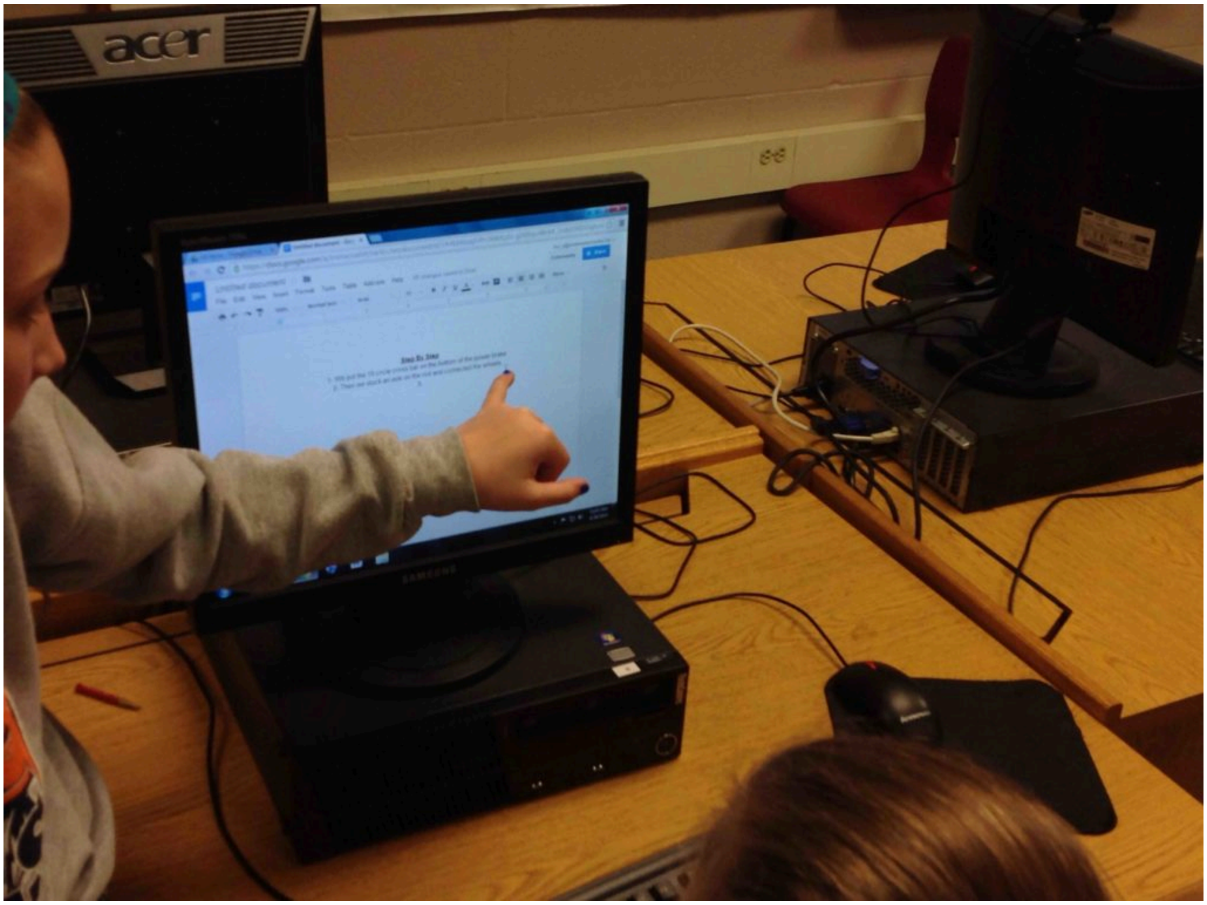


Figure 10. Several students beginning to work on their documentation process.

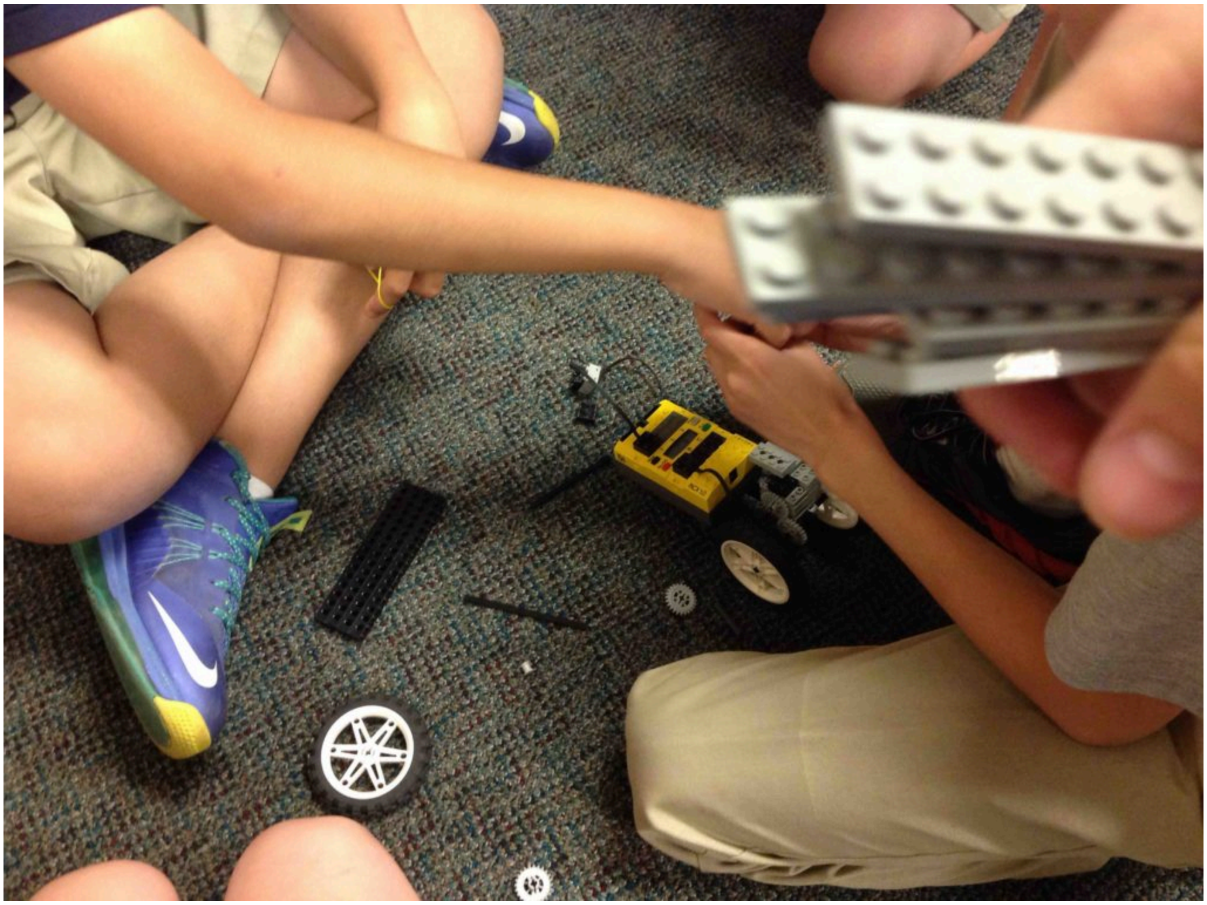


Figure 11. Working to add support on their final robot design.

I found setting this up like a business was a practical real-world simulation but it also allowed for a hierarchical system to be in place if I had to leave for Indiana. This would allow me to be informed not only by the sub but also by the students so I could see how class was running in my inevitable absence.

In hindsight, I see that sometimes things line up all too well. Have a self-guided unit, set up a hierarchy, and be ready for the full project because that weekend my mother-in-law passed away. I would be pulled away for nearly two weeks as we had a viewing and funeral in Indiana and then another viewing and funeral in northern Wisconsin.

During this absence, I was able to make full use of 21st-century tools. I created numerous videos of encouragement for my students to continue their hard work, answered email questions with a quick video tutorial, and much more. At one point my students were near completion of their task of finding the aluminum can, collecting it, and depositing it in a designated recycling area. I decided that in order not to miss this, I would videoconference in. This was by far the coolest experience of teaching. The “project managers” gave me a report of that class time and then the groups decided to show me what their robots could do so far. Incredibly, all the groups were nearing completion and I could be a part of that success while sitting in the passenger seat driving from Wisconsin. This greatly impressed on me the idea of how valuable our new forms of communication are!

By the time I returned, we were at the end of the school year and my classes were nearly over. Our last day of class was spent on testing the programs, the presentation, and celebratory doughnuts. The students had accomplished so much, both when I was there and in my absence. Only two groups, out of two classes, were not able to fully complete the project.

In regard to grading, I found that actual completion of the task was worth the bonus points. Everything else was graded based on reflections, mini-quizzes at the start of the day, and an overall understanding of how the *Mindstorms* kits work (engineering/ programming).

REFLECTIONS

At first I thought this would be insurmountable—outdated robotics kits, project-based learning, and first-year teaching. Now that I look back I see it wasn't hard at all. If I expect my students to learn through failures, I should as well. Just because things do not always work as planned doesn't mean I should disregard the plan. I encourage every teacher at my school to try PBL. Kids get genuinely interested and excited for class every time, which combats that roadblock of apathy. I also love PBL because it encourages the use of "understanding by design" lesson planning; otherwise PBL can seem as if you are randomly doing things. I wouldn't change the basic outline of this unit but I would change or incorporate a few of these ideas for next time:

1. Add an economics aspect to this. Provide students with a basic kit of materials, enough to make it barely work. Set up a form of currency and then pricing on different parts. This could allow students to buy up different parts and then sell to their competing team at a higher rate (supply and demand).
2. This project, and many other projects, would work well with a badge system. This would create an easily defined system for students to choose which jobs they would work best in.
3. More time!! My schedule now is set up of just two class periods a week with this sixth-grade computer class.
4. I would like to incorporate more flipped learning for the unit, primarily using Dr. Lodge McCammon's style of flipped learning.
    1. Incorporate the flipped video as the beginning part of the lesson so all students have a chance to review the content without classroom interruptions.
    2. Check out Dr. McCammon on Twitter @pocketlodge
5. Connect an expert in the field of robotics to my classroom through either in-person or videoconferencing.
6. Don't be afraid to fail! We learn through our adversities.

Overall, I thought this was an excellent experience even through the adversity. I also believe that project-based learning worked so well because it engaged the students on a real and more personal level. Project-based learning engages students on their level and keeps your curriculum from being outdated.

CHAPTER 13.

E-TEXTILES TO TEACH ELECTRICITY: AN EXPERIENTIAL, AESTHETIC, HANDCRAFTED APPROACH TO SCIENCE

BY JAMES HOWELL, COLBY TOFEL-GREHL, DEBORAH A. FIELDS, AND GABRIELLA J. DUCAMP

On a national level, one of the big challenges facing education is diversifying the kinds of students who pursue science, technology, engineering, and mathematics (STEM) (see Resources at the end of the chapter). Too many students do not see a place for themselves in STEM fields, and what may begin as an initial interest in these areas in elementary school frequently drops off in middle school. Often this is most true of students who do not represent the traditional STEM workforce, especially girls and other nondominant students who are more likely to bring expertise and language (discourse) practices not valued in traditional school classrooms or tests. While this may be a national trend, many of us feel this challenge on a local scale in our own schools and classrooms. How do we reach out to kids to help them see the relevance of science in their own lives? What can we do to interest more diverse students in STEM?

A science teacher with 12 years' experience, James Howell teaches middle school science at an economically diverse rural town in the western United States. In a town best known for its world-class skiing, James teaches a very divergent population of students with equally divergent needs. On the one side, he teaches students from affluent homes with high expectations and resources regarding learning and college preparation. On the other side are the students from significantly lower socioeconomic backgrounds, most often from homes where English is not the primary language spoken. These students require the additional supports needed for English language learners (ELLs). Notably, James has noticed that his ELL students are the ones who are hardest for him to reach in science class. The Latino population, from which many of the ELL students come, makes up approximately 30% of the middle school student body. The rest of the school's population consists of mainly affluent Caucasian students. With an increasing Latino population, expectations are that the middle school will shortly exceed a 50% Latino population, making the issues facing teachers more robust. Thus the need to break down boundaries between students and science is felt at classroom, school, and national levels.

Enter e-textiles. Electronic textiles (aka e-textiles) are part of a growing group of "Maker" activities for learning that are part of an increasingly popular do-it-yourself (DIY) movement around the world.

The Maker movement has encompassed everything from woodworking and auto repair to cooking and knitting, but the most celebrated projects generally feature computational tools that have become increasingly affordable and accessible to the general public (see Resources). While being part of this larger DIY Maker movement, e-textiles also challenge it by using "soft" textile materials that are sewn and embroidered with conductive thread, integrating tiny computers (microcontrollers) and lights (LEDs) with traditional crafts, typically seen with women as the creators.

Some readers may be interested in why we chose e-textiles for a science unit and what they have to offer. We turn here to some earlier research by Deborah Fields and colleagues that points to what e-textiles have to offer in terms of learning.[1] First, uninsulated wiring: Using uninsulated copper tape or conductive thread in projects allows students to come face-to-face with short circuits in ways that insulated wiring does not. If they misconnect things or leave sloppy threads in the back of their project, these touching leads connect positively and negatively charged lines, shorting their project (i.e., it doesn't work!). Second, polarity of LEDs on a laid-out circuit: Unlike traditional light bulbs, LEDs (i.e., light-emitting diodes) have specific positive and negative ends. If one mixes up the two ends, the lights will not come on. We've found that this encourages discussion of electron flow and careful planning of circuits. Third, conductive connections: Because thread is not quite as conductive as wire, students have to learn to sew each electrical component quite thoroughly ("three times through" is a common motto for this). Often new sewers don't think to do this and have LEDs and snaps hanging loosely off their projects. They soon discover that these work only when the circuits are held just right, and they have to go back and resew them more thoroughly, leading to very solid remembering of what makes an electrical connection.

These are just a few ways that e-textiles offer unique opportunities to think about and experience electricity. Perhaps most important, throughout their projects students constantly troubleshoot and debug their work, as they inevitably make mistakes while they learn in this new area of design. But as we will share below, this seemed only to increase the level of ownership they felt in their designs and they learned a lot in the process. Further, some prior studies with e-textiles have shown that because of the integration of crafting into circuitry and computing, they indeed disrupt boundaries for students with technology and engineering, especially girls. We wanted to see whether they could break down barriers to interest in science as well.

THE ORIGINS OF OUR E-TEXTILES PROJECT

In the summer of 2013 James' school district provided a weeklong Science Engineering Technology and Math (STEM) conference for any interested teachers in the county. As part of this workshop, James met Dr. Deborah Fields as she led a small group of teachers in an intense mini-workshop (10 hours) learning to design with e-textiles. Beginning by creating a light-up bracelet, teachers were introduced to the basics of e-textiles: how to sew, how to design circuits, how to integrate sewable computers to make the lights on their clothes blink. As part of the workshop, James remade an existing university hoodie by adding several lights that blinked and twinkled more and more intensely the harder he squeezed two patches in the pockets—which became a silent signal to his students that they needed to pay attention (see Figure 1). James' hoodie is an example of the personal expressiveness

1. For more resources on what students learn by using e-textiles, see these articles: Peppler and Glosson (2013); Kafai, Fields, and Searle (2012); Kafai, Fields, and Searle (2014); Kafai et al. (2014).

and the challenging science and engineering work that can take place together in e-textiles projects. James was very excited by his creation and immediately began to discuss with Deborah the ways in which this work was directly applicable to what he taught in eighth-grade physical science.

Figure 1. James Howell's programmable human sensor hoodie.

Putting Together a Team

James' initial interest in using e-textiles in his eighth-grade science classes led to a discussion with Deborah and other members of Utah State University (USU) about developing a specific curriculum and set of projects designed to meet the curricular and motivational needs of his diverse students. E-textiles had never been applied in a formal science class, so there were no existing models on how to accomplish this. Deborah had mostly led e-textiles projects in elective courses or workshops and did not have a background in formal science education. How could we justify doing these crafty projects in science class? What standards would they meet? Where could we get the money for supplies? How would we know if the unit "worked" compared to more traditional instruction?

To move the project forward we got together a team of people with different expertise, with James as the teacher at the core. Deborah sought out help from two colleagues at Utah State University. Dr. Colby Tofel-Grehl was a science teacher and new assistant professor focusing on science education. She would help create the science units, making sure they met standards and that the appropriate science content was integrated into the units. Dr. David Feldon, the new STEM director at USU, helped us think about how to design the circuitry units and how to measure whether e-textiles actually helped students learn concepts about electricity as well as whether the project made a difference in their attitudes toward science. Of course this project couldn't happen without the support of the middle school administration—James approached his principal and after a couple of team meetings we had the go-ahead to move forward. Not only that, but the principal earmarked $5,000 for supplies for the project, seeking funding from a local foundation for the special money needed.

In discussions as a team, we realized that we had an opportunity to teach eight full science classes—the entire eighth grade of the school. James and the other eighth-grade science teacher switched classes toward the end of every school year, allowing him to teach electricity to his four eighth-grade classes as well as to the other teacher's four eighth-grade classes. This allowed us to explore the potential benefits of the e-textiles approach compared to other approaches. We decided as a team that James would teach half of the classes the way he had always done, using alligator clips and lightbulbs, and the other half of the classes using e-textile–based projects. To ensure that all students were exposed to the same content material, Colby constructed specific content lessons that would ensure that all students were taught the same information while leaving the differences in materials separate. David developed assessment materials to best explore the learning outcomes of students. James, Deborah, and graduate student Gabriella Ducamp chose the specific e-textiles projects, using resources developed for Deborah's class by some of her former students and samples created by a current student (Janell Amely).

Creating an E-Textiles Unit for Science Class

All classes had approximately 20 days for the electricity unit. For all eight of the classes, regardless of whether they were offered e-textile or traditional projects, James taught content lessons at the beginning of the unit as overviews and throughout as standard mini-lessons. On the first two days of the unit all classes explored energy, electron transfer, and conductivity. James taught additional lessons on circuits, types of circuits, and what causes short circuits throughout the units. As this information was introduced to the students, so were different projects and activities. Both groups participated in the same activities for the first two weeks of the unit. Tasks during the first week included using balloons to model charge, making use of the periodic table and digital multimeters to predict the conductivity of various materials, drawing simple and parallel circuits with appropriate schematic symbols, and assembling circuits using bulbs, 9V batteries, and alligator clips. During the second week, students in both groups completed one project using nontraditional materials—paper circuits—in which students adhered copper tape to card stock and added LEDs and a battery to complete series and parallel circuits in a decorative fashion.[2] Moving forward, while the traditional classes used alligator clips and lightbulbs to explore how to make circuits, the e-textiles students used conductive thread and LED lights to sew circuitry-based jewelry and fashion items.

The e-textiles classes constructed three designs using e-textiles materials while the control group performed activities covering the same content using traditional materials. During the third week, e-textiles students designed a light-up bracelet using felt, LEDs, and coin-cell batteries while the traditional students researched batteries, tested the voltage of batteries using multimeters, and practiced assembling various circuit configurations with alligator clips, lightbulbs, and 9V batteries. During the final week of the unit, students in the e-textiles classes created wearable technology by sewing circuits using a LilyTiny—a preprogrammed mini-computer (i.e., a microcontroller) that has different outputs for blink, fade, twinkle, and "heartbeat" lighting effects.[3] Meanwhile, the students in the traditional classes troubleshot short circuits and continued to practice assembling circuits made of traditional materials. See Table 1 for an outline of the e-textiles activities and the kinds of concepts they were intended to teach. To show the range of personal styles and expressiveness students showed in their e-textiles work, even with identical design challenges, we include pictures of some of their projects (see Figures 2, 3, and 4).

Table 1. **Outline of the e-textiles activities.**

Project	**Targeted Skills and Knowledge**
Paper circuit (see Figure 2)	*Electricity*: Conductivity, simple circuits, polarization *Conductive Materials:* Copper tape, LEDs *Crafting*: Taping, cutting, folding
Bracelet (see Figure 3)	*Electricity*: Parallel circuits, switches, polarization, short circuits *Conductive Materials:* Conductive thread, metal snaps *Crafting*: Basic sewing, running stitch, knots
LilyTiny project	*Electricity:* Computational circuits, resistance, common ground *Programming:* Preprogrammed microcontroller supports knowledge of the capabilities of computing

2. We strongly recommend starting with paper circuits. They are relatively simple and the resources are cheap (paper clip for a battery holder!). Then you can move on to soft circuits that use simple or parallel circuits, and finally to computational circuits (something we did not tackle in this project but have elsewhere) that use sewable microcontrollers to make lights blink, twinkle, and fade. You could add sensors to these projects so that squeezing some conductive aluminum foil patches make the lights change brightness or using a light sensor to make lights turn on when it gets dark. Some of the resources we've used are listed below

3. The LilyTiny microcontroller is available on Sparkfun.com for about $4. It has four preprogrammed outputs: fade, blink, heartbeat, twinkle. The LilyTwinkle is nearly identical—it has four different preprogrammed twinkling effects. If you want to program your own lights, try the LilyPad Arduino (Sparkfun.com) or the Adafruit Flora (adafruit.com) or the Adafruit Gemma (adafruit.com).

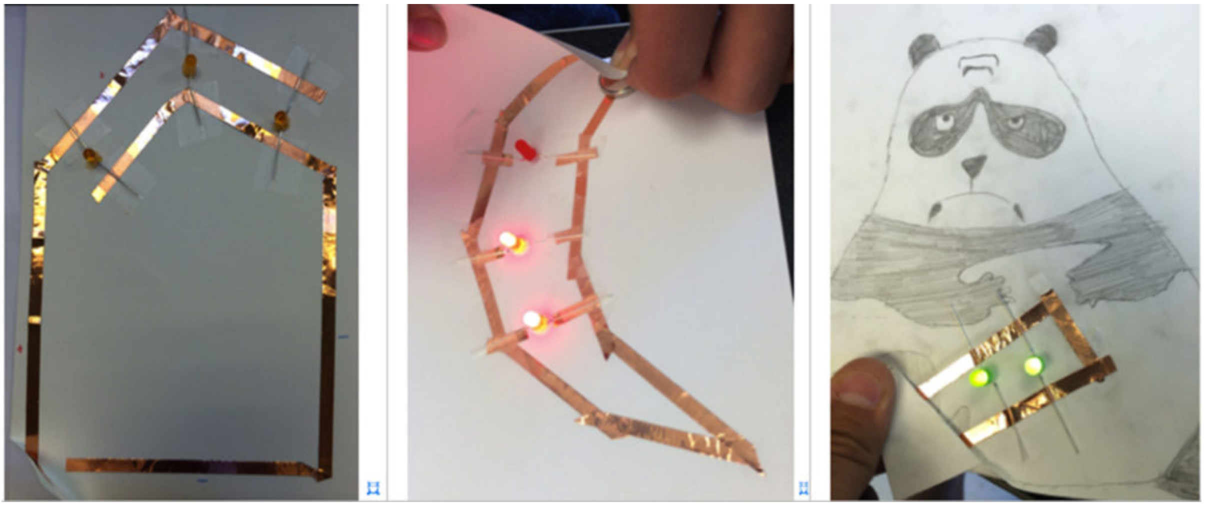


Figure 2. Examples of students' paper circuits.

Figure 3. Examples of students' bracelet projects.

Figure 4. Examples of students' LilyTiny projects.

HOW IT WENT

If you would have taught this way the whole year, I would have been way more interested in science.~Phillip

Overall, everyone learned regardless of which class students were in. We noted improvements across all classes in their understanding of how electricity works and how circuits function. Yet almost immediately, James reported seeing a difference in the attitude of his e-textile class students, particularly his ELL students. Students such as Phillip, who noted his new interests in the sentence above, turned in completed assignments for the first time all year long. Noting their eagerness to work and take projects home over the weekends for additional time, James found himself eager to understand what this new engagement signified and why it was so different from normal: "Quite frankly, the change was beyond my predictions!" He reported that for the first time all year he got completed work from nearly an entire class of ELL students. While these students may not have gained *more* than other groups in terms of learning, for the first time that year they kept pace with the other classes.

In the next sections we share some stories of individual students and some themes of *why* we think e-textiles made a difference to students, especially ELL students. Where we can we refer to some other research that has been done on e-textiles, especially as it helps us understand this particular set of classroom experiences. The stories, though, are unique to this first integration of e-textiles into a science classroom.

Connecting Across Boundaries

One thing we found encouraging was that e-textiles allowed students to draw on a range of different kinds of expertise, and that some of this expertise came from families who before this unit had not been framed as helpful for science. Others have noted that e-textiles are a special combination of circuitry, computing, and crafting.[4] The crafting component in particular disrupts what people think about science, especially because it is intricately related to all of the other aspects of a successful e-textile design. Sewing circuits is very different from creating them with alligator clips. Notably,

4. Kafai, Y. B., Fields, D. A., & Searle, K. A. (2012). Making learning visible: Connecting crafts, circuitry & coding in e-textile designs. In J. van Aalst, K. Thompson, M. J. Jacobson, & P. Reimann (Eds.), The Future of Learning: Proceedings of the 10th International Conference of the Learning Sciences (ICLS 2012), Vol. 1, Full Papers (pp. 188-195). International Society of the Learning Sciences: Sydney, NSW, Australia.

working with one's hands, something often not recognized as a legitimate form of expertise in schools though it is cognitively sophisticated (see Mike Rose's book, *The Mind at Work: Valuing the Intelligence of the American Worker*),[5] becomes relevant in the context of e-textiles. Many of James' ELL (and other) students have parents and relatives who are expert sewers and expert sewing teachers.

A prime example of this trend is Jose, a young man who failed science consistently in eighth grade before the e-textiles unit. A nonnative English speaker, Jose gravitated toward art to express his ideas, avoiding academic engagement, perhaps in part because his family members do not have a lot of academic, school-based expertise. When it came to the first e-textiles project, Jose had a design idea for his bracelet that he could draw, but he didn't know how to sew, so he sat with his grandmother (a seamstress at a local dry cleaner) nightly as she suggested and demonstrated sewing techniques. Though his bracelet was not functional, it looked great. Before long, friends came to Jose for advice—offering to explain science concepts or help with his circuit design in exchange for recommendations as to how to improve their sewing techniques. Jose's LilyTiny hanging was one of the most balanced final pieces in terms of circuit and sewing design as well as functionality (see Figure 5). Like Jose, for the first time in their academic careers many of James' ELL students received instruction and help with their homework from their parents or family members. E-textiles helped generate interest in students' schoolwork because family expertise was finally framed as relevant to science education, breaking down some boundaries between home and school.

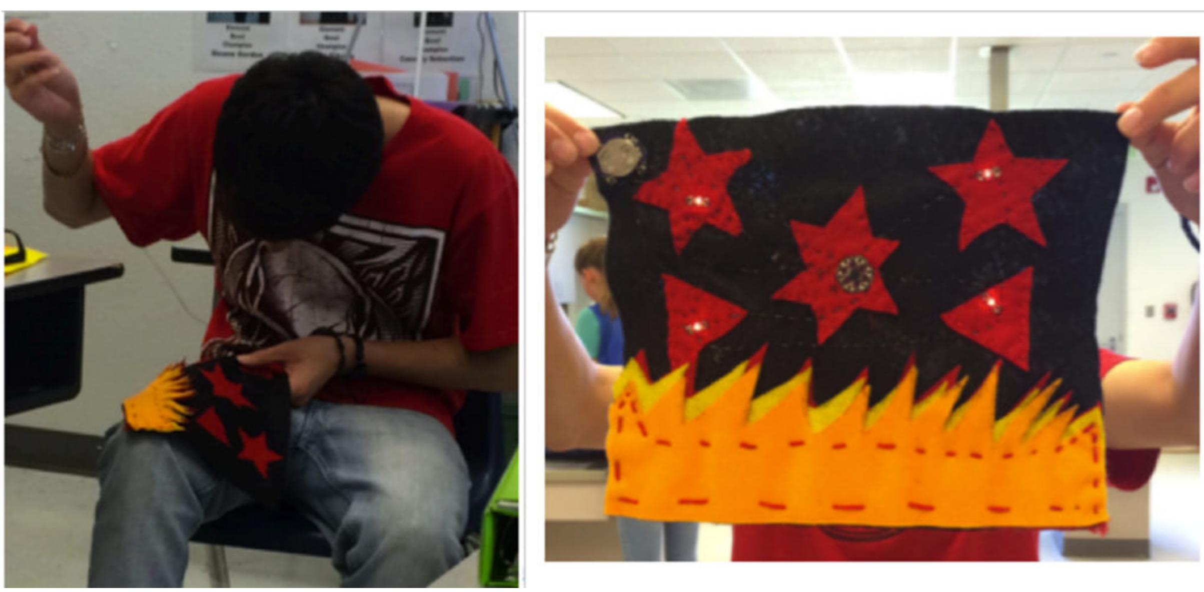


Figure 5. Jose working on his project (left) and Jose's finished project, complete with decorative sewing of the flames.

Personal Ownership

Another thing we found important in the e-textiles unit is the idea of ownership. Since the completion of the e-textiles unit, several students have asked James for more batteries to power their projects, pointing to the continued ownership they have over their projects. They continue to wear, display, and use their e-textile projects! Maria, a studious bilingual student with a strong work ethic encouraged by her parents, took her LilyTiny project to the library after school every afternoon

5. Rose, M. (2005). The mind at work: Valuing the intelligence of the American worker. New York, NY: Penguin.

until her parents came home from work. Using her "nerdy" skills, she upgraded her worn high-tops into something more fashionable (see Figure 6). This actually helped her connect with her classmates and gain social status as she answered their questions about the unique project. Her project simultaneously displayed her knowledge of science while also being a cool fashionable item that could connect her with friends. Notably, e-textiles are generally transportable, easily displayed in many places. This promotes a wide audience for viewing and asking about e-textiles, allowing them to act as boundary-crossing objects that are relevant to friends and family as well as to science teachers. Actually taking something home and being proud of a creation was a significant factor in students' success in e-textiles.

Figure 6. Maria's project from planning stages (left) to circuit diagrams (middle) to final completion (right).

Persevering Through Struggle

Students need to struggle and learn from mistakes; it's one big part of how people learn. James, like many teachers, often has to remind paraprofessionals and aides in his classroom not to give students answers. One of the lessons we learned from this unit was to allow *more* time for students to make mistakes and troubleshoot their projects. Recommendation: If you decide to infuse e-textiles into your electricity unit, set a project completion date and save two days after that completion date for troubleshooting! As James put it, "I underestimated the value of this troubleshooting period with our first study group. Letting students struggle solidified learning and allowed students to teach others based on their new understanding."

In the context of the e-textiles class, student struggle often became a collaborative event, encouraging peers to teach each other. Consider Sofia, who possessed a strong presence among her mostly male group of Latino friends, often clarifying meaning as they code-switched between English and Spanish, helping each other understand instructions and content. While making her bracelet, she struggled to understand how snapping the bracelet would close the circuit (i.e., creating a switch), but after examining the *Bracelet Guide* with Mr. Howell, she understood the concept and passed this understanding along to her friends. Allowing the time for students to struggle and overcome the bugs in their projects created a new dynamic in which they could also share their expertise (and their trials) with each other in getting things to light up.

Choice and Personal Aesthetics

Allowing the students to decorate, choose, and design their e-textiles awakened that sense of ownership that normally does not come up in science for all students. Art and aesthetic suddenly become relevant to science, allowing for students to connect with science in ways they may not have before. Like those of most other students, each of Annie's designs was personal (see Figure 7). In her paper circuit, she used a basic schematic drawing to envision making a complex paper circuit maze, which she was able to use to explain electron flow. This went far beyond the basic instructions for completing the paper circuit, encouraging her deeper learning about circuitry. For her bracelet, she made the aesthetic design choice to show something that naturally lights up—stars. With her final project she made a T-shirt depicting a planet with glowing rings to match the bracelet, taking the extra step of sewing a pocket into it and hiding the LilyTiny microcontroller, so that her image would be the focus of her project rather than the tools used to make it. Annie thought that she grasped electrical concepts at a deeper level when crafting e-textiles than she was able to express during the traditional lessons and worksheets in the unit. Something about drawing out and constructing the design so carefully helped her to get inside of it.

Figure 7. Annie's three e-textile projects from left to right: paper circuit (maze), starry bracelet, and glowing planet with hidden microcontroller (lower left of picture).

Many of the extra steps taken to personalize a project can actually lead students to revise their circuit diagrams in sophisticated ways, providing the double bonus of learning alongside motivation.[6] What makes e-textiles special is that the science of electricity and circuits becomes interwoven with the style of the person designing them. The science aspects aren't just slapped on top of an otherwise purely decorative project. Sewing the circuits actually promotes learning about short circuits, electrical polarity, and conductivity. The physical structure of the very personalized circuits ensures that each student had his or her own particular challenges in keeping the positive and negatives sides from touching, discovering the relevance of a "common ground," and so on.

Beyond that, the act of sewing e-textiles led to a calm and concentrated classroom atmosphere. As James commented,

> *Take a room of 25 middle school students and put a needle and thread in their hand, and the only sound you will hear is that of utter concentration. I can't explain it, but during this sewing time my students had higher levels of concentration and focus than many of the other hands-on activities in my classroom.*

The tactility, individuality, and displayability of the e-textiles really lent themselves to hard, concentrated work. In addition, students knew they would be able to keep their projects, and we think this encouraged deeper effort and ownership.

6. Kafai, Y. B., Fields, D. A., & Searle, K. A. (2012).

FINAL THOUGHTS

Do you need to partner with university researchers to implement e-textiles into your electricity unit? Absolutely not. However, we found a wonderful synergy between a science teacher (Howell) eager to reach out to students not engaged in his science classes, a former science teacher-now-researcher (Tofel-Grehl) willing to dig in and figure out the science behind e-textiles, and a researcher-crafter (Fields) who had a lot of expertise in teaching e-textiles in school workshops, clubs, and even computing classes (but notably not science!). Add to this a school administration willing to try something new as well as to find and commit funding for supplies, some undergraduate and graduate students who helped to design some instructional guides and sample projects (former students of Fields), and a graduate student willing to regularly observe the class (Ducamp). Parallel to the ways that e-textiles bridge many forms of expertise across school, family, and friends, we too brought different expertise and were all willing to work across our normal boundaries to make this project work. It was unique and atypical for each of us.

What were the key things that made this project a success? First, James actually became engaged with e-textiles through his own intensive designs. We cannot emphasize enough how important it is to *make something yourself* before figuring out how you might teach it to students. Second, we saw the potential in e-textiles to connect to science education. All of the elements that worked about the units—perseverance, ownership, choice, and aesthetics—worked because they were also part and parcel of constructing scientific objects. Third, we were able to do everything a second time through tag-team leadership structure of this electricity unit. Like the students doing their e-textiles, we had the chance to debug the unit a bit. For instance, James set aside more time for construction and troubleshooting projects in the second round.

Where can we find resources for doing this? We have listed some resources we have used at the end of the chapter, including the e-textile guides that we developed for this unit (see Resources for Getting Started with E-Textiles). Many resources are online, and if you're looking for a place to start we recommend Jie Qi's paper circuit activities (also in Resources). Additional project ideas can be found on sparkfun.com (our main go-to supplier)—check the LilyPad e-textile tutorials developed by Leah Buechley: https://learn.sparkfun.com/tutorials/introducing-the-lilypad-design-kit; also apply for an educational discount). Adafruit (another of our main suppliers) has some other e-textile tutorials using some different sewable hardware, mainly the Flora and the Gemma. Ecrafting.org and Instructables.com also have ideas for projects. Just search for "LilyPad," "e-textiles," or "Flora." Most important, consider the social resources available to you. Many students and parents have crafting experience and others may have Maker, science, or technological expertise. It was through combining our own expertise and resources that we were able to make this unit happen. One of the great things about e-textiles and similar craft-based technology projects is that parents and students can bring their own expertise from home into school. We think this is one of the areas where we could grow: finding ways to better draw on and leverage family expertise.

These materials are expensive. Are e-textiles worth the cost? Absolutely! Depending on what components and specific subprojects are included, e-textiles curricula can range from modest to very expensive. For the projects selected in James' room, the materials cost approximately $50 per student. As Mr. Howell said, "Expensive? Yes, but well worth it." However, you could complete this project inexpensively by collecting and reusing materials or putting students in pairs. To keep costs down, students in Mr. Howell's class reused materials when they could across projects, such as batteries, and had their design plans approved before making their projects to prevent waste. Everything from expensive sports-team shirts to materials found in the lost-and-found bin at school were incorporated in students' e-textiles. In an example of the latter, Ben was so enamored of the hat he found in the school's lost-and-found bin, which reminded him of a favorite cartoon character, that he took his work home and completed it using wires, since he did not have conductive thread there. He paraded into class the next day wearing it. Reusing materials or using alternative materials doesn't seem to deter student ownership. Plus, using and adapting found or alternative materials such as Ben's wires can encourage innovation and learning!

RESOURCES

Resources on Engaging Students in Science and Engineering

Atwater, M., Wiggins, J., & Gardner, C. (1995). A study of urban middle school students with high and low attitudes toward science. *Journal of Research in Science Teaching, 32,* 665-677.

Barton, A., Tan, E., & Rivet, A. (2008). Creating hybrid spaces for engaging school science: How urban girls position themselves with authority by merging their social worlds with the world of school science. *American Education Research Journal*, *45*(1), 68-103.

Brickhouse, N. W. (2001). Embodying science: A feminist perspective on learning. *Journal of Research in Science Teaching, 38*(3), 282-295.

Minner, D. D., Levy, A. J., & Century, J. (2010). Inquiry-based science instruction—What is it and does it matter? Results from a research synthesis years 1984 to 2002. *Journal of Research in Science Teaching, 47*, 474-496. doi:10.1002/tea.20347

Nasir, N. S., & Hand, V. (2008). From the court to the classroom: Opportunities for engagement, learning, and identity in basketball and classroom mathematics. *Journal of the Learning Sciences*, *17*(1), 143-179.

President's Council of Advisors on Science and Technology. (2011). *Prepare and inspire: K-12 education in science, technology, engineering, and math (STEM) for America's future*. Washington, DC: Office of Science and Technology Policy, Executive Office of the President.

Swarat, S., Ortony, A., & Revelle, W. (2012). Activity matters: Understanding student interest in school science. *Journal of Research in Science Teaching, 49,* 515-537. doi:10.1002/tea.21010

U.S. Government Accountability Office. (2005). *Higher education: Federal science, technology, engineering, and mathematics programs and related trends* [Report to the Chairman, Committee on Rules, House of Representatives (GAO-06-114)]. Washington, DC: Government Accountability Office.

Resources on Research on the Maker Movement and E-Textiles

Buechley, L., & Hill, B. M. (2010, August). LilyPad in the wild: How hardware's long tail is supporting new engineering and design communities. *Proceedings of the Conference on Designing Interactive Systems (DIS)* (pp. 199-207). Denmark: Aarhus.

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Kafai, Y. B., Fields, D. A., & Searle, K. A. (2012). Making learning visible: Connecting crafts, circuitry & coding in e-textile designs. In J. van Aalst, K. Thompson, M. J. Jacobson, & P. Reimann (Eds.), *The Future of Learning: Proceedings of the 10th International Conference of the Learning Sciences (ICLS 2012), Vol. 1, Full Papers* (pp. 188-195). International Society of the Learning Sciences: Sydney, NSW, Australia.

Kafai, Y. B., Fields, D. A., & Searle, K. A. (2014). Electronic textiles as disruptive designs in schools: Supporting and challenging maker activities for learning. *Harvard Educational Review, 84*(4), 532-556.

Kafai, Y. B., Lee, E., Searle, K. S., Fields, D. A., Kaplan, E., & Lui, D. (2014). A crafts-oriented approach to computing in high school. *ACM Transactions of Computing Education, 14*(1). 1-20.

Peppler, K., & Glosson, D. (2013). Stitching circuits: Learning about circuitry through e-textile materials. *Journal of Science Education and Technology, 22*(5), 751-763.

Resources for Getting Started With E-Textiles

- Our own guides are available freely online.
- o Bracelet project:

http://itls.usu.edu/files/projects/ETextiles_Bracelet_Guide.pdf

- o LilyTiny project:

http://itls.usu.edu/files/projects/ETextiles_LilyTiny_Guide.pdf

- Jie Qi developed the basic projects we used for paper circuits: http://technolojie.com/circuit-sticker-sketchbook/. Note: She has developed circuit stickers to use (peel and stick LEDs with conductive adhesive) but you can also use normal LEDs. Just bend the wires out horizonally and use tape to connect metal to metal (i.e., LED leads to the copper tape).
- o She also hosts a Google group for educators working on new versions of paper circuits: https://plus.google.com/u/0/communities/106297899247135466221
- Leah Buechley (developer of the LilyPad Arduino) has created tutorials in several venues:
- o Sparkfun tutorial on soft circuits: https://learn.sparkfun.com/tutorials/introducing-the-lilypad-design-kit.

- o *Sew Electric* book by Leah Buechly (excellent resource for learning to compute with e-textiles). Available on Amazon. Plus several sections are available free online: http://sewelectric.org.
- Instructables.com has tutorials on everything under the sun, including e-textiles! Just search for "LilyPad" or "e-textiles" and you will find projects and instructions created by users.
- Ecrafting.org is another resource for specifically educational e-textiles projects. At the time of this writing the site was relatively new, but it regularly puts up design challenges used by schools and libraries around the United States.

CHAPTER 14.

KINGDOMS OF ADARYA: CONSIDERING THE ETHICS OF A GAME FOR SCHOOLING

BY LUCAS COOK AND SEAN C. DUNCAN

Games and learning research is no longer novel and no longer new. We have experienced a solid decade of work on better understanding the forms of situated learning found in games,[1] exploring their nature as designed experiences,[2] and applying games to numerous instructional contexts (e.g., McCall's use of games in a high school history class).[3] While there is still value in advocating for advantageous approaches to the implementation of games within instructional contexts, there is also much room for the critical and reflective analysis of what games are actually good for in these settings, at what times and in what places they are appropriate, and how the details of their implementation can support and conflict with the daily work lives of teachers. That is, while advocacy *for* games in classrooms is the emphasis of many of the chapters in this book, perhaps what we need most at this juncture is a critical exploration of the limits of games in formal instructional environments. What can games do beyond affecting learning outcomes? Can they be implemented as classroom-management systems? Could games be a way to moderate or deescalate tensions in the classroom?

One of the key legacies of early games and learning scholarship (such as the foundational work of Gee and Squire) is that games are often promoted as means to challenge existing models of "traditional schooling,"[4] implying their utility as primarily critical devices to illustrate situated, designed forms of learning that can be aligned to the teaching of many forms of instructional content. But the realities of how games can be and are implemented within schools are where the rubber hits the road, so to speak, for many teacher practitioners. As an additional complication, the realities of contemporary "traditional schooling" leave many open questions about the ways that games for learning may privilege particular instructional environments and imply specific work environments for teachers.

1. Gee, J. P. (2003). What video games have to teach us about learning and literacy. New York, NY: Palgrave Macmillan.
2. Squire, K. (2006). From content to context: Videogames as designed experience. Educational Researcher, 35(8), 19-29.
3. McCall, J. (2012). Gaming the past: Using video games to teach secondary history. New York, NY: Routledge.
4. Gee, J. P. (2004). Situated language and learning: A critique of traditional schooling. New York, NY: Routledge.

We need a further advocacy of not just "good games for learning,"[5] but a frank critical discussion of the forces and concerns that lead us to implement games in certain ways in instructional contexts.

In this chapter, we begin to explore this alternate path, discussing a challenging recent case of games for learning, which approaches a set of questions about core assumptions of games-for-learning practitioners while raising new questions about the means by which games may give rise to valuable learning experiences. In particular, through a look at this illustrative case—the tabletop game *Kingdoms of Adarya*, co-designed and co-implemented by one of us (Lucas Cook)—we wish to complicate the discussion of when and where in a school games can be applied, and who may benefit from their application. In advocacy-oriented discourses on games and learning, games are often cast as valuable tools for addressing specific forms of content within classroom environments (cf. Gee, 2004, railing against the "content fetish" that pervades much of schooling).[6] Through a look at the design of *Kingdoms of Adarya*, we ask: Games may serve as valuable tools, but to whom are they valuable, and valuable in *what contexts*? What are games *for* in learning environments, and who exactly are they for?

We explore several of these questions in this chapter by focusing on a game designed not for the delivery of content knowledge or professional practices, but toward the goal of *behavioral management* in a challenging, inner-city school. The use of a game for this purpose is certainly controversial, and clearly not unproblematic, but one that allows us to explore some of these prevailing questions. In the following sections, we will attempt to do so, first by discussing the ways that one of us (Cook) co-designed and implemented *Kingdoms*, and by describing the game's goals and mechanics in detail. Next, we will outline the ways in which specific elements of the game tied into school-mandated behavior-management systems, and issues we faced through using a game for this purpose. Finally, we will step back and reflect on ethical considerations of using games for the quotidian tasks of managing student behavior and motivating social pressure toward maintaining the activity of schooling; we will do this through reflections on the game design, the nature of implementing games in challenging schooling environments, and ultimately the role of teacher vis-à-vis the task of designing games for learning in these environments, as well as the vis-à-vis labor and employment.

A note for the reader: The description of the design and implementation of *Kingdoms* necessarily involves the individual reflection of the coauthor who was directly involved in the design of this game (Lucas Cook), and so we will switch between singular and plural first-person voice when appropriate throughout this chapter. Sections written in the plural first-person indicate either the group of teacher/designers who created and implemented *Kingdoms*, or, later, indicate the reflections of both authors (Cook and Duncan) on the significance of the game.

DESIGNING *KINGDOMS OF ADARYA*

The first year of teaching is a well-known and documented challenge. I (Cook) took on my first year of teaching in a school that was in a last-chance turnaround year, in which the school has a year to make major improvements in student learning, as measured by standardized tests, reenrollment, and finances, else the school may face closure. Before I joined this school in Southeast Washington,

5. Gee, J. P. (2007). Good video games and good learning: Collected essays on video games, learning, and literacy. New York, NY: Peter Lang.

6. Gee, J. P. (2004). Situated language and learning: A critique of traditional schooling. New York, NY: Routledge.

DC, it had been threatened with closure because of low student performance as well as several administration issues, such as holes in attendance tracking down to the minutiae of not holding enough fire drills. I knew it was going to be a challenge, but I went into it viewing it as a challenge to be tackled, and a space in which I, a new teacher, could learn.

Very quickly, however, the school brought in new administration as well as a mostly new staff of teachers. Many of us were from alternative certification programs and were relatively inexperienced. The staff was told that, based on test scores from the previous year, the school might be shut down at the end of the year regardless of any progress we made this year. Ultimately, it was, but at the time, all we could do was to strive to help maintain the school environment, teach what we needed to teach, and make sure we kept student learning at the forefront of our efforts. It was a challenging environment, but one that I still saw as an opportunity to promote innovative instruction within.

I was assigned to teach sixth-grade English Language Arts, with a homeroom class of 15 sixth-grade girls. There was a shifting group of teachers in the classroom during the course of the year, as well as many changes of schedule as the administration and the teachers tried many different schedules and teaching methods to try to help the students succeed. Amid these issues, there was inconsistency between what I, as a new teacher at this school, was told do in terms of behavior management in my classroom, and what the administration did in terms of discipline and consequences. I was told to use Positive Behavior Intervention Supports (PBIS),[7] a system in which the goal is to focus on the positive behaviors that students show and to reward those instead of punishing negative behaviors. These rewards were tangible and served, essentially, as a form of in-school *currency*—dollars to use at the school store, among other rewards. While we tried to implement this system with fidelity in my classroom, the administration's response to reported behaviors was either to give out suspensions, or to do nothing. In general, I struggled with classroom management, not simply talking and out-of-seat behaviors but fights between students and other inappropriate physical contact between students, among my students, and among the students in the school in general.

I found this disconnect a challenge to deal with, and, on several occasions, I chose to not report behaviors of students for fear that the student would get suspended, operating under the belief that having the students in my classroom (and thus potentially *learning*) was better than their missing school. This fit my training at other schools, wherein I was supported in an approach to classroom management based on mutually agreed-upon rules and discussion as well as time to reflect upon behavior and why it was the right or wrong behavior for the situation. This was either through Responsive Classroom or Developmental Designs.[8] At this school, though, I had my classroom rules posted before students arrived, was to directly instruct them on the expected behaviors as defined by the school administration, and I was not able to construct classroom rules *with* my students, nor was I able to use any of the training I had received before joining this school as part of my classroom management.

I was an inexperienced teacher, in a challenging environment, faced with a series of classroom tasks

7. Sailor, W., Dunlap, G., Sugai, G., & Horner, R. (2008). Handbook of positive behavior support. Berlin, Germany: Springer.

8. Wood, C. (2007). Yardsticks: Children in the Classroom, ages 4-14. Turner Falls, MA: Northeast Foundation for Children; Crawford, L. (2012). The advisory book: Building a community of learners grades 5–9. Minneapolis, MN: The Origins Program; Denton, P., & Kriete, R. (2000). The first six weeks of school. Turner Falls, MA: Northeast Foundation for Children; Kriete, R. (2002). The morning meeting book. Turner Falls, MA: Northeast Foundation for Children.

in which I was not able to fall back on most of the training for classroom management that I had had during my career working with students. I certainly struggled in a context in which every day was a challenge in which I felt unsuccessful in managing behavior and, more important, I knew my students were not learning as much as they could. I asked colleagues, family, and administration for ideas and help and tried many things, most of them with limited, if any, success. Though my interest in teaching was not originally driven by a desire to manage classroom behavior—and whose interest ever is?—I found myself in a situation in which I needed to better motivate students to not just learn, but to participate in the project of *participating in school itself*, regardless of my own problems with the way the school operated.

The behavior-management issues in the classroom led to consequences for my teaching. The administration was unhappy with how my classroom was managed and, as a result, my classroom was combined with the other sixth-grade teacher's class, which changed the dynamic of the class in several ways, including creating a newly co-ed classroom. For the rest of year, another teacher (Mr. Marsh) and I shared a classroom with a combined class of about 25 students. Mr. Marsh was a more experienced teacher than I was, and he was one of the few teachers in the school who had been very successful in both managing his classroom and in getting his students to learn, at least as measured by mandated standardized assessments. He was assigned to me as a mentor and helped manage the classroom while I taught English Language Arts (ELA) content, and I would pull a small group to do targeted math instruction during his classes.

Though we were put together because of some of the pervasive classroom-management issues faced in the school, Mr. Marsh and I both discussed and experimented with innovative techniques for teaching and management. Through our discussion, we decided to incorporate a game into the daily class activity—initially this was as a means to motivate students, pulling in the athletic director (Mr. Collins), who had, with Mr. Marsh, also worked on an earlier version of the game. One of the many challenges we faced was motivating students after standardized tests were completed, and we devised a competitive game that we'd hoped would give students a degree of agency, motivation, and excitement over participating in the class activities. Put in charge of managing small, student teams, we hoped that this might be an exciting way to give some students leadership opportunities as well as something fun that could motivate them in other areas of school. (Note: Other than that of the coauthor, Cook, all teacher names presented in this chapter are pseudonyms).

Goals and Mechanics

To understand the impact and some of the issues around our implementation of *Kingdoms of Adarya*, we first need to address the ways in which the game was structured, how the students participated with one another in the game activities, and how our design process evolved during the course of the two months that the game was run. The challenges we faced with the design of *Kingdoms* illustrate the potential interaction between a game's design and the contextual factors in a school that guided the design.

After the three of us (Cook, Marsh, and Collins) decided to go forward with *Kingdoms*, we spent about a month and a half with weekly design meetings and much more frequent emails discussing the logistics, mechanics, and implementation details. At first, Mr. Marsh and Mr. Collins brought me up to date on what they had done in the past in earlier iterations of the game, and then we focused on what would be changed with my involvement as a co-designer. The biggest change was that *Kingdoms* would now be implemented over the course of, at most, two months whereas before it was a semester- or yearlong project, and thus the design cycle was necessarily truncated. We were under the gun to make significant progress with a game that could have an impact on our students' learning and classroom behavior.

The first key element of *Kingdoms* was that it was a game that was intended to be run not as a means of teaching curricular content, but as a game that could, through its play, facilitate the rest of the classroom instruction. That is, *Kingdoms*, in this implementation, was considered as a means of addressing the classroom-management issues that had plagued the school and my classroom, while connecting to the behavioral-management mechanisms ("behavior sheets"; see Figure 1 for a sample behavior sheet structure) that were approved by the school. This was an unusual implementation of a game for learning, we knew—rather than inculcate students into a set of content or professional practices, we intended to guide them through play into practices that supported nondisruptive and engaged behavior in school in general. After several weeks of redesigning the game with Mr. Marsh and Mr. Collins, we introduced the behavior sheets, general idea, and concept to the students on a Thursday and started the game the following Monday.

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Period	Behavior	Work	Teacher Initials
1 (ELA)	3	4	ldc
2 (Reading Huddles)	3	3	ldc
3 (Math Clinic)	4	2	ldc
4 (A&A)	4	4	ldc
5 (L&R)	4	3	ldc
6 (Math)	1	2	ldc

Figure 1. An example of a completed sample behavior sheet. Behavior and work in each class for each student would be graded on a simple 1-4 scale and then signed off by the teacher. Clinics and huddles were targeted small-group instruction. ELA indicates English Language Arts, while A&A refers to Arts and Athletics, and L&R refers to Lunch and Recess.

In *Kingdoms*, students were organized into several competitive teams, or "kingdoms," that included student participants who adopted different roles. Each kingdom/team had six students, one per role: *Leader* (who was empowered to make final decisions); *Treasurer* (who managed money and resources within the game); *General* (who was in charge of conflict between kingdoms); *Ambassador* (who made trade deals and alliances); *Scribe* (who kept historical records of the kingdom's actions); and *Scout* (who spied on other kingdoms). We picked the leader and the treasurer for each team, and then let the students draft the rest of their teams and assign roles to their teammates.

We initially believed (perhaps naively) that we had no direct role in the game and were available as advisors for each kingdom, but in retrospect, it is clear that our decisions had key consequences. First, on the choice(s) of the leader and the treasurer for each group, and most important, through our daily assessments of student behavior, we were the engine that drove the game. After all, the game was based around student behavior sheets, which were a common tactic used by the school and which we were determined to reframe from something punitive into something that could afford students a degree of agency. The behavior-management goals of the game were simultaneously intended to help improve the aggregate behavior for the classroom while also giving students an additional reason for good behavior.

Behavior sheets were a common tactic that the school counselor used with students, so they were a familiar tool to the students and not a new imposition on their daily school lives. Regardless of our comfort with these forms of behavior assessment, behavior sheets were going to be in the classroom; we attempted to develop them into a more engaging, fun incentive structure for the students. Also, because behavior sheets had been tied to rewards for students, many students had actively *sought them out*, and we attempted to cater somewhat to that desire of students. We incorporated them into the game as a main mechanic without much reservation, choosing to track two elements of student behavior on our sheets: behavior in class and work completion. We defined good behavior in class as following directions the first time they were given and not distracting other students, choosing these two elements of classroom activity as they were areas that we had trouble with in the past with many of our students.

At the end of each class, each of the teachers would give ratings to students, rating from 1 to 4 for each student based upon the desired classroom behaviors. If there were multiple teachers in the room, each teacher would take care of the groups of students he worked most closely with in an effort to keep the ratings as fair and as accurate as possible. This was the ideal, at least—unsurprisingly, however, I often had to rate students with whom I had little interaction during a given class, and I felt pressure to rate certain students highly so that I wouldn't have to deal with a meltdown or tantrum. Behavior sheets were not intended to be shared among students, but it was done, and each team leader and treasurer would see the sheets at the end of the day. They were thus *not* private assessments, but nor were they completely public, as there was a great deal of score sharing and bragging as well as many protestations that a score was not fair. While improving upon the use of behavior sheets was one of our goals with the game, it became quickly apparent that there were many issues around using this approach to classroom management as the consequential engine that drove *Kingdoms.*

In terms of classroom structure, during the last period of the day, students would break into their kingdoms. They would then give their behavior sheets for the day to their team's treasurer, who then translated the behavior sheet marks into two forms of in-game currency—money and resources (one resource type per kingdom). While the treasurer was tallying the behavior sheets and converting them for use in the game, the leader would inform the scout where to go, the ambassador which team he or she needed to try to make a deal with, and the general if there were going to be any battles with other kingdoms. If there were any students whose roles were not used that day, they would go onto the classroom computers and use educational software, either Lexia Reading or TenMarks Math, to earn more “money” and “resources” for their team. We had conceived of other uses of educational software as, essentially, consequential “side quests” to grind up a bit more gold for one’s kingdom that day.

Each team was given a mission card at the beginning of the first game period, and then again after it completed each mission. These cards would help direct them to building up their kingdom. The first eight missions were the same for each team, and after those eight were completed, the missions were randomly chosen by the leader each time the team completed a mission. The game featured a common, overarching goal embedded in a fantasy-themed narrative: to find the “ring of power” by solving a riddle that became clearer through time. Kingdoms earned a line at a time by completing missions, and mirroring the narrative of J. R. R. Tolkien’s *The Lord of the Rings*, the team that solved the riddle and acquired the ring could then take it to be destroyed in the volcano, or use its power to take over the world of the game. Once a team decided to put on the ring and use its power to fight the other teams, it had committed to that path; in essence it became corrupted by the power of the ring.

Once the leader sent his or her other team members to do their jobs, he or she convened with the scribe and treasurer to decide upon their team’s army movement and build actions for the day. If two armies moved into the same space, or an army moved into an opposing town or castle, a battle would ensue. The leader was welcome to solicit advice from the other team members but was not obliged to take their advice, giving the leader an unusual degree of power within the game. Teams would have 20 minutes to make their choices and could consult the map (see Figure 2) that was on the wall and doubled as the game board. After the time was up, each team had five minutes to make its moves on the board.

Figure 2. A reconstructed map of the fictional world of Kingdoms of Adarya. Each “starting point” represents the starting location for a different kingdom. The map in the classroom was painted by Mr. Collins on four trifold poster boards.

Turn order was based on which teams had earned the most money and resources during the day, with the teams that had behaved the best in class and completed the most work going first in the game. We would then resolve any battles that happened through the generals of the opposing teams, calculating their army size and rolling a number of six-sided dice equal to their army size divided by five. The generals would then order their results highest to lowest and compare. Any ties were removed and then for each pair of dice the higher result won and killed five soldiers of the opposing army. This would repeat until either an army was destroyed or one or both armies retreated. By the time they had all taken their moves it was time to clean up and dismiss the students for the day. These combat mechanics were at the heart of the conflict within the game, but they ultimately had only an ancillary relationship to behavior; the "game" elements of *Kingdoms* served, in this fashion, as a "carrot on a stick" to draw players into the game.

Many of the other rules were left intentionally vague and did not cover every eventuality, with the explicit purpose of letting students have as much freedom of action as possible. We said that if the rules did not expressly forbid a game action, then it could be taken. This led to many interesting interactions, including, at one point, a team's banding together to overthrow a leader who was not performing his duties. Though we were not able to bring students in as co-designers of classroom behavior assessment, we brought them in as co-designers and co-constructors of the game, letting them surprise us with how they interacted through the course of the game's play.

Overall, the design of the game reflected a genuine desire to incentivize particular behaviors among the students throughout the day, while incorporating a behavioral assessment and incentive structure that was already in existence (and desired by students) at the school. While the game featured numerous moments of conflict and collaboration, the roles of several of the designed elements of the game bear more attention and need to be discussed in detail. In the following section, we will discuss:

1. the game's use of behavior sheets to guide the player and kingdom actions throughout the day;
2. our desire to leverage social pressures and social supports to push students toward our desired behavioral goals; and
3. the use of a fantasy-themed, combat-oriented gaming structure at all, and the ways that such framings provided an escape from the day-to-day of a difficult schooling environment.

KEY DESIGNED SYSTEMS

It is worthwhile to step back a bit from the game's details and think about the ways that our implementation of *Kingdoms of Adarya* connected to and augmented elements of the classroom experience that we sought to foster. Looking at behavior sheets, team structure, and the choice of a game framing, we will show in the following section how *Kingdoms* raised new issues and questions about the ways one can and should implement games to foster desired forms of school behavior.

Behavior Sheets

The behavior sheets were, clearly, the linchpin of *Kingdoms of Adarya*'s game system. These in-class assessments were the engine that drove the game forward as well as serving as a way for students to track their own accountability throughout the school day. These were based off similar sheets that had been implemented by the school counselor to assist some students who had a history of behavior challenges. As other students noticed that a few students had these sheets, and in particular, were getting rewards for their performance on them, more and more students asked for them. The three co-designers of the game decided that we had a perfect opportunity to give the students something that they wanted, a behavior sheet linked with a reward, while using it as a part of the game we wanted to implement. We realized that if we linked the kingdom's ability to function to the behavior sheets we could use them without linking them to a tangible reward.

Reflecting on the behavior sheets' use within the school, I was uncomfortable with linking in-class behavior with tangible rewards and expressed that I would like to seek out alternatives. All of us were uncomfortable linking behavior to tangible rewards, but we were much happier with the meager distance of linking them to rewards that supported the collective ability of a team to play a game. The fictional and narrative distance of a game such as *Kingdoms* served to remove the consequences of behavior sheets a step away from the accrual of tangible, material rewards (as many of the students in the school desired), and allowed us to give some kind of consequence to the desired behaviors that might motivate students to participate more fully in school.

As seen in Figure 1, we chose to separate out work completion and behavior because we noticed two different issues. We had challenges with disruptions in the classroom (such as talking, walking out of the class, and throwing objects) as well as a lack of work being done in the class. We made it so that if students sat silently and did not disrupt themselves or others they would get credit for that, but to get their team's resource they also had to complete the work. For these purposes it was less about how correct the work was, as that would be impossible to determine by the end of every class every day, but if the effort were made to try to complete it.

The game's co-designers thought about how best to incentivize both behavior and work completion and realized that we could make each one give a different in-game reward. Gold was required for every in-game action, and because we were more concerned with behavior we decided to link behavior and gold. We hoped that as students saw the rules and the costs for each action in the game, they would realize how important gold was to their kingdom's success and, consequently, would behave in a fashion during school to earn gold to keep their kingdom competitive. On the other hand, each team had a different unique resource (wood, stone, or iron) that was used in smaller amounts for each action. The basic buildings and actions used whatever resource the team had, but the more advanced buildings (such as hospitals that healed soldiers after battle and the ability to recruit a champion) took all three resources in combination. To get other teams' resources they had to either trade with the other team or conquer their armies in battle, thus pushing kingdoms to interact with one another either peacefully or through meaningful conflict.

We were generally pleased with the design choice here, connecting behavior and work to gold and kingdom resources, respectively. Clearly, this is one of the most controversial elements of this game's design, and we will reflect upon this further in the final section of the chapter. We took attitudes and dispositions toward school itself and essentially "commodified behavior" as a means of incentivizing participation in a troubled school. But, suffice it to say, we were experimenting and made our choices on what to focus on based on our specific needs at the time, and then we stuck with them throughout the game to see if they made a difference in the class atmosphere.

Team Structure

Distributed expertise and distributed roles in games were key elements of good games that I wanted to make sure we leveraged in the design of *Kingdoms*. I was well aware that my students cared far more about what their peers thought of them than what I thought or said, and that if I could leverage that to help make my classroom a better and safer learning environment it would benefit everyone. With the team structure and competition between teams I hoped to encourage students to encourage each other and help keep each other on track.

For instance, the three co-designers intentionally told kingdom leaders that part of their job as leader was to help their team do as well as possible, not only during last period when we played, but also during the day. If one or two people on a team didn't pull through that could mean the difference between building a castle, successfully waging a battle against another kingdom, or not doing anything that day. Leaders were thus given extra responsibility and social pressure (by us, as teachers) to continue to motivate their kingdoms, and to work toward the goals set out by us through the game activities. Additionally, this spread the reach of the game from a single period at the end of the day toward a structuring activity for the *entire day* that elevated certain students to positions of power, at least vis-à-vis the game.

We were careful about whom we picked as kingdom leaders. We tried to pick students we perceived as generally well liked and affable and who would take the role seriously; this is clearly a moment in which the power positions of the teachers shaped a key structure of the game, and within which we were attempting to use other students' activities within the game to drive students toward a particular kind of attitude toward schooling. We also chose the leaders we chose because we wanted to use the leadership roles as a chance to give some students, who otherwise would not get the chance, the opportunity at a leadership role. We gave, in some cases, leadership roles to the students we had identified as having the *most* behavioral challenges in school as a means to empower them and give them additional responsibility with managing other students.

Finally, we decided on a competitive team structure because we had noticed how much our students enjoyed competition with each other. We reasoned that if we could engage them with the game, we could then reduce behaviors that were disruptive to the classroom and learning as well as increase on-task behavior. I hoped that tasking the leaders with this role would lead to students' helping each other to stay on track or to bounce back from a rough class. Again, though, this reified a particular approach to schooling within which collaboration between students (within each kingdom) was in service of a larger, competitive structure. Behavior in school was, ultimately, in service of helping some students to "beat" other students at a fictional task, and we will return to considerations of these choices by the end of this chapter.

Why Use a Game at All?

Though this is not a designed element of a game per se, the framing of the activity as a "game" was important to us and deserves some discussion. Why did Mr. Marsh, Mr. Collins, and I choose to take behavior and work and translate them into the play of a multiplayer, collaborative, and competitive game in our classroom? First, we wanted to capitalize somewhat on novelty—we were interested in trying something different that we thought our students had not experienced before. Second, Mr.

Marsh and Mr. Collins had experimented previously with games in their classrooms, and that seemed a natural next step for me, a new teacher who was eager to adapt my knowledge of games into instructional contexts. Third—and this is not insignificant—it was near the end of the year and we wanted to do something fun with our students that genuinely excited us.

As we have discussed, behavior management was a yearlong struggle throughout the school. After trying several different iterations of PBIS implementation, along with many other methods of incentives and disincentives for behavior, I (Cook) was at the point in my employment at which I was willing to try anything that might engage students and to address our behavior problems. Rather than approach a game from a situated learning (e.g., Gee) perspective,[9] wherein mechanics and structures of games were leveraged to situate learners in a new, meaningful environment, we chose to implement *Kingdoms* for pragmatic reasons. It seemed to be a way to get students to buy into a new behavior-management system at this late point in the year, I had not found the token economies to be very effective, and I thought that getting to play a game for an hour at the end of every day would be a fun, interesting, and effective incentive for my students.

Additionally, I note that *Kingdoms* was also something that I was able to help design and deploy without a backbreaking amount of effort. We had older variants of the game that my two coteachers had used at another school in the past to work from as a base, and which we modified to fit the time constraints and the particular needs of these classrooms. If we had to design a game from the ground up without a base to work from I doubt it would have been able to happen, given our time constraints atop the work constraints. I was empowered to experiment with such instructional experiments, but *only* after mandated testing was complete and with the support of the other teachers.

The timing here has interesting relationships to my role as a teacher in this environment. I fully recognized that after the high-stakes testing was over that we had more of a chance to try new and different instructional experiments; with the pressures of the testing passed, we had both the need to address behavioral issues as well as (a limited amount of) time to do it. I also knew that my students would be ready and willing to try something other than the same basic lesson format we had been using all year. After high-stakes testing, the lower-stakes months of the school year provided us opportunities to experiment and play with games for learning.

Perhaps most important, as the three of us discussed the idea we were all simply excited by a game, not just as a means to fill time but as a way to provide students who had just completed high-stakes testing with an alternative classroom experience. This means we were willing to put in the not small amount of work needed to get the game off the ground and to maintain it through the months that it ran. This included using a game as an experience to bring fellow teachers together through brainstorming ideas for changes to the game, as well as tie-in lessons we could implement with our students. The excitement of playing a game with our students that might actually help them was a major motivating force for us.

This, of course, focuses again on our goals as teachers and on our experience as employees of the school. From behavior sheets to the structure and management of the kingdoms to the very notion of using a game itself, we were, as teacher practitioners, focused on our professional tasks and on

9. Gee, J. P. (2003). What video games have to teach us about learning and literacy. New York, NY: Palgrave Macmillan.

experiments that would support our continuing to create an equitable and safe learning environment for all students. We (Cook and Duncan) view this experience as one that is not unproblematic, at least in the ways that the uses of games here differ significantly from those used in other instructional environments. But they also reveal ways in which teachers as employees are empowered in certain ways and disempowered in certain ways, perhaps challenging how we consider games and learning in formal instructional environments. In the final section, we will briefly explore some of the ethical considerations of *Kingdoms* that have, so far, been implicit in our discussion, and we will propose a number of insights about the design of the game that reveal potential tensions in the field.

ETHICAL CONSIDERATIONS

As can be expected, a game such as *Kingdoms of Adarya* might raise a number of conflicting feelings among readers of a volume such as this. For some, including Cook and the other teachers, the game served a pragmatic and useful purpose: to bring a sense of order to an otherwise chaotic learning environment. For others, the game violates one of the central precepts of the recent games and learning movement: that games can provide emancipatory learning spaces for students who are otherwise disenfranchised by the systems of contemporary schooling. And with yet another, more distanced view of the instructional activity, there are questions here about the application of games to this particular classroom, involving the agency of Cook and his fellow teachers, the locus of the instructional task, and inherent labor issues that suffuse the use of *Kingdoms* to reify the behavioral norms of schooling in schooling environments such as these.

In the following sections, we tackle these issues in turn, addressing ethical considerations on the application of *Kingdoms* to the school, labor implications regarding the role(s) of Cook and his fellow teachers, and general conclusions about the ways that the application of games for learning may require different considerations for radically different schooling environments.

Games to Learn Schooling

First off, we need to address the big question head-on: Was it appropriate to use a game as a form of classroom management? A reading of the games and learning literature, especially the literatures focused on explicit advocacy of games for schools (such as many of the chapters in this volume), reveals a clear intent to use games to challenge, not help prop up, the problematic power relationships within school. That is, games are positioned as tools or inspirational examples of situated learning (à la Gee),[10] with which teachers can address problems with standard-space schooling through the adoption of interactional structures drawn from games, or from the applications of games themselves. Games are "things" that are used to upend or provoke traditional approaches to school, to help teachers work toward the betterment of learners, and to provide learners with forms of engagement and motivation that are rarely found in schools such as the one Cook taught in.

From this perspective, of course *Kingdoms of Adarya* is somewhat problematic. One of the reviews of the proposal for this chapter provided strong criticism for the very idea of *Kingdoms*, as if the very idea of the management of classroom behavior was a problem that a new, working teacher should strive to upend. This led to a number of ancillary questions: Was any of the management and discipline at the school ethical in design and conduct? How much of the discipline and management was implemented

10. Gee, J. P. (2003). What video games have to teach us about learning and literacy. New York, NY: Palgrave Macmillan.

with students' best interests in mind? Isn't every system that manages behavior a way to institute control, order, and a certain set of behaviors upon a group of students? Any ethical questions about the design of *Kingdoms of Adarya* necessarily leads to a number of questions about the *context* in which it was applied.

Cook has been wrestling with these questions both during and since his time teaching, and they arise not necessarily because of the implementation of a game to incentivize these forms of behavior, but because of the necessity of implementing *some* form of behavior management because of the challenges in the school. It is important to look at the context in which Cook was working and to consider its complexity and his positionality as both a teacher and employee. Between August and the middle of May, his classroom of fewer than 30 students had either earned or been given more than *200* days of suspensions—behaviors that led to suspensions included physical fighting, harassment, patterns of disrespect toward the teacher and other students, cutting class, and repeated refusal to follow directions. This was high for the school, but as they were the oldest students and entering adolescence, not unexpectedly so; the school environment within which Cook and his co-designers worked had pervasive challenges to the project of school itself.

The root causes of these behavior issues are complex and involve much more than this specific classroom, and a full discussion requires much more space than this short chapter can afford. Suffice it to say, however, that means to address these behavioral issues were simultaneously necessary to maintain an equitable classroom for all and problematically positioned the teacher's goals in learning above all others. The conundrum here is that while these behavioral challenges may be endemic to the kinds of teaching contexts where new teachers have little power to change or even affect the systemic problems that come in from outside the classroom, they are still left at the feet of the teacher to handle. Left to these three teachers to solve, they developed an approach that successfully moved problematic behaviors from inside the classroom to elsewhere. It was a marginal success, but a success nevertheless with respect to the teachers' in-class goals.

So, with the reality that suspensions, as a method of discipline, were the alternative, and that suspensions would literally remove students from the class activities, we argue that it was a necessity that behavior management entered the picture in some form. In light of these considerations, using a game as a form of motivation was making the best of a challenging situation, and one that Cook, as a young teacher, was forced to bear the brunt of. In terms of employment as a teacher in the *workplace* that is a school, Cook (and his colleagues) opted to address behavior management using interactional structures from games that might actually be … fun? *Kingdoms* is a sort of token economy that rewards teacher-defined behavior with the ability to play a game (though in future cases Cook would be curious to implement this with behavioral norms agreed upon by teachers *and* students). We (Cook and Duncan) find the game's existing token economy much less problematic than one that gives out dollars to be spent at a school store for candy or trinkets, because it encouraged teamwork instead of everyone's acting primarily for his or her individual gain. *Kingdoms* immersed students in powerful structures for learning that ran parallel to the other schooling activities—it's just that what they learned was that their activities in school could benefit them in ways that were paradoxically less tangible than others, but that were also more socially connected.

As we three teachers redesigned the game, we operationally defined good behavior quite simply—as following directions from the teacher the first time they were given, and not distracting other students. Of course, it was not a lack of intelligence or inherent ability that was holding these students back from performing well on state and national measures, but a lack of effective adaptation to *school itself* that got in the way of their being able to learn in a traditional schooling environment. We saw it as not only our job, but our responsibility, to equip them as well as possible to be successful within the public education system, despite its flaws. Our students were perfectly capable of behaving to the standards that we, and the school, set forth but they often chose not to do so. We wanted to give them a reason to choose the behaviors that we believe would help them in the future, beyond school, and we could use the structures of a game to help motivate them to do this.

Reflecting on the design of *Kingdoms* and about games for behavior management in general, we are thus conflicted. On one hand, after a year of struggle, Cook was happy to find a system that could help his classroom function better than it had all year long. That system was wrapped in a game, but in the end it was a game that clearly worked as *a different form of token economy* that rewarded students for "toeing the line" that we, as teachers, put into place. On the other hand, the teachers were taking something that can be inherently motivating—gameplay and competition—and co-opted it for use in the classroom to change student behavior. Cook firmly believes that the changes in behavior were ultimately positive, but in the end, Duncan argues that *the teachers* were dictating what those changes would be and were the arbiters of how much reward each student got each day.

If we were to try this again, Cook would involve students more deeply in the decision-making process and have them help define parameters by which they would be assessed. With increased student agency, which we believe should be an integral part of any behavior-management system, many concerns would be allayed. None of the students were given the choice to play the game or not, nor given a voice in how their behavior was to be gauged. It was a teacher-mandated, whole-class activity, which defeats most of the purpose of games as an activity that participants *willingly* enter (e.g., Suits's "lusory attitude").[11] One of the attractions of games is that they are an activity of choice, and we did not give the students a choice of playing the game. We did not have the opportunity to redesign the game because of time constraints, but it is an area ripe for exploration and, upon reflection, is one that is necessary for a system that incorporates student goals and perspectives.

Managing student behavior can be a daily and full-year concern for an entire school and an individual classroom. Cook tried many methods and in the end the teachers found one that worked. By using the *Kingdoms* game, we were able to accomplish much more during the rest of the day, and in that way we saw the game as a success. With the pressures from the administration around behavior management, in this difficult work environment, ultimately Cook would run this game again, taking into account concerns around choice and student agency, and redesigning the game to better accommodate student voices and student goals.

Teaching and Game-Based Learning

Naturally, then, the role of the school as a work environment must be addressed. Cook and his colleagues worked in a challenging environment, one in which they were empowered and tasked with changing classroom instruction, but not empowered to address systemic issues with the school, its administrative policies, or the social context of the part of Washington, DC, where the school

11. Suits, B. (2014). The grasshopper: Games, life and utopia. Peterborough, ON: Broadview Press.

operated. Cook and his colleagues were not just teachers and designers, but also *employees* within the school, and some reflections on their positions with regard to the school reveal other tensions regarding game-based learning and game-based behavioral management. This is perhaps a new spin on a very old problem with regard to teaching—what are teachers given the power to do, and how do the constraints of their *jobs* help us to understand the pressures upon their instructional innovation?

While teaching is often a labor of love, it is, at the end of the day, also a *job*. Cook was no different from many other teachers in this regard; like many new teachers, he relied on the income from teaching, and as such keeping his job was an underlying concern throughout the year. His challenges with classroom management did not go unnoticed by his administration, and his job security was directly questioned on more than one occasion. In a situation where he had to "toe a line" himself and unable to run his classroom in the ways he would have liked to, Cook was eager to try to combine both the behavior-management needs of his classroom with innovative game-based learning approaches. Cook's agency within this workplace was contingent upon a number of factors, not the least being financial and job security itself.

Behavior management, and specifically reducing the degree of problematic behaviors identified by the school's administration, was one of the contingencies for Cook's keeping his job, and it served to focus some of his efforts near the end of the academic year. Cook did not have the social capital within the school to try a game such as *Kingdoms* on his own, but with the support of the other teachers he was able to try something new. Through this process, Cook gained mentorship (from Mr. Marsh, a more experienced teacher), as well as experience in managing behavioral issues in the classroom in creative ways. The work environment was such that the pressures from the school were alleviated through *the collaborative game design process with other teachers*, and the creative solution to behavior management that *Kingdoms* represented was, at least in part, a means for Cook to develop stronger bonds with other teachers at the school.

And we should not forget that Cook was also working in a school that was in transition, and that ultimately closed at the end of the year. By the time *Kingdoms* was a possibility in his classroom, the school had been informed that it would be taken over by another organization. By the end of the year, the school was not only preparing for the end of classes but also was hosting visitors from the new operator. *Kingdoms* can be seen as a tool for the *administration*—a way to show the new operator how innovative the school was, and how, even in the transitional period that the school was in, teachers were still trying new and innovative methods. Before the high-stakes testing there was a laserlike focus on how to improve test scores, but afterward there was time and willingness to try new things, which also served not just the students, nor the teachers, but the *school* itself.

Though we began this section discussing ethical considerations of a game to promote "good behavior" in a specific classroom, we quickly come to considering *teaching as labor*, as well as, in this case, innovative game-based learning in service of school itself. These are not inconsequential factors in understanding the impact of *Kingdoms*, we argue, and while pronounced in this case, are likely not unique to this particular games and learning implementation. Schools are mandated systems of instruction, teachers have affordances and constraints regarding how they instruct, and games can often be used for multiple purposes in a schooling environment. While many of the chapters in this volume focus on the role of the teacher as one who can provide new learning opportunities to students through games—and we certainly argue that Cook engaged meaningfully and seriously in this practice—it is the ancillary workplace concerns that rarely get discussed in this literature. We consider the impact of the workplace not just as affordances that might allow a dedicated teacher to bring new learning opportunities to students through games, but offer a nuanced view in which the workplace context serves to both afford *and* constrain the implementation of games in the classroom.

Research on games and schooling has, for at least a decade, focused largely on advocacy of games for schools. But we argue that while a focus on workplace context issues (and concomitant issues that we do not have the space to fully explore, including issues of labor and power) may be uncomfortable for us to wrestle with, they are necessary to garner a full understanding of *instruction in context*. As the next decade of games and learning research evolves, we wish to see a wider consideration of the application of games to schools: foci on economic pressures around the implementation of games in schools, the ways that games and learning experiments can serve as professional-development experiences, and, as in the case of *Kingdoms*, how they can be used to reestablish a sort of status quo for a schooling environment.

The Future of Games and Learning

This is all to say that the future of games and learning must move beyond advocacy and toward approaches that value games as more than just educational tools, and teachers as more than the implementers of "interactive learning environments." If the case of *Kingdoms of Adarya* has taught us anything, it is that there are complexities involved in the interactions of game systems, social systems within schools, and even economic/labor systems among the teachers. While the games industry and hobbyist communities are continuing to adapt interesting and exciting games to implement in schooling environments, be they a *Minecraft* or a *Papers, Please* or a *Pandemic* or a *Fiasco*, our task should not be to simply identify interesting games that can be imported into existing educational systems. If we take the early recommendations of Gee seriously,[12] games should provide us with *critical* opportunities to remake and retool the project of school itself.

And yet, these are certainly difficult tasks to conceive of and to implement for teachers "on the ground." With limited social capital, limited resources, limited time, and limited support, it is unsurprising if most teachers thus have limited scope for their game-based learning innovations, advocating for games themselves (to skeptical colleagues, administrators, or parents) rather than advocating for changing school. The acknowledgment that *teaching as labor* has relevance for understanding game-based learning seems long overdue, and it is one that should be wrestled with by the field in a more principled and serious manner than has been conducted to date. We know how systems of power instantiate in schooling environments, but yet we still saddle those with the least power within those systems with the most burden of game-based educational innovation.

Was *Kingdoms* problematic, and did it reify the power of the teacher to shape and control a classroom environment? Certainly, as a "game for schooling," there are issues with whom the game supported and why it was deemed necessary. Regardless, we argue that its application was needed in the specific teaching environment that Cook was working within. And for these reasons, we suggest that *Kingdoms* is a useful case to unpack—as a window into the nexus of design, social, and labor challenges that face

12. Gee, J. P. (2003). What video games have to teach us about learning and literacy. New York, NY: Palgrave Macmillan.

teachers who seek to innovate with games in their classrooms. *Kingdoms* and Cook's involvement with its design and implementation reveal that we still have much to study when it comes to game-based learning and so-called "gamification" of schools. While this case reveals that there were challenges in designing such a game to fit the needs of his students and his colleagues, it became clear that a focus on design is only part of the picture.

Researchers and practitioners of game-based learning need to better acknowledge the many reasons for implementing games in schools, the many factors that influence those designs, and the many ways different stakeholders interact with these instructional approaches. As a field, we have painted many rosy pictures about the power of games to provide new opportunities for students, and it is time to muddy up these pictures with real stories of the difficulties in designing for some environments, and of the challenges faced by teachers who seek to innovate. If we truly wish for games and learning to move beyond advocacy toward creating the kinds of radical reimaginings of schooling that Gee and others have envisioned, we need a better understanding of games not in terms of just their design, but in terms of their *implementation*. The needs, challenges, and power position of the teacher must become a greater part of our discourse.

CHAPTER 15.

FROM IMPROVISATIONAL PUZZLE TO INTEREST-DRIVEN INQUIRY

BY TIM SAUNDERS AND JEREMIAH KALIR

TIM'S STORY

I have a very vivid memory of my entry into teaching with gameful learning.

The night before I introduced *Matter Quest*—a gameful iteration of a states-of-matter unit for my fourth-grade students—I was still struggling to craft a story line. I had some broad outlines for where the story would go; a galactic threat would put the game's story line in motion, I would play a character, and the story would unfold over different levels. But I was still struggling with this main character, who would launch the adventure. I knew that I wanted to use my old Jedi Knight robe as a costume piece, and I knew that my character would be a villain.

The content was set. All of the labs were waiting online for my students to complete. The materials were set out and ready to go. The nitty-gritty of gameplay was ready for my students to start working, but the story was still in need of major depth.

The answer to that did not come overnight in a dream, and the minutes leading up to my science lesson that morning grew more tense. Because of my constant hype, my students knew that the game was starting today and they had many questions about what playing—and learning—would entail.

I decided it was time to force the issue. Hoping for the best, I handed a video camera to one of my students, leaned over, and said quietly, "Start taping as soon as I walk in the room."

"What are you going to do?" she asked.

"We'll see," I replied softly.

The kids continued to read. I walked across the hall and into the teachers lounge, where I had the robe hidden. Once I was in there I put on the robe, pulling the hood across my face, hiding it. I drew in a deep breath, still not sure what I was going to do.

I walked back into the room, turned off the lights, grabbed the classroom microphone, and started to speak to my students in a playfully menacing voice.

It wasn't smooth, and it took a few revisions as the day went along, but by 3:30 that afternoon, Creepor the Emissary was alive, and my teaching would never be the same.

Background

I came to embrace a game-based learning approach to teaching in the winter of 2012 while working toward my master's at the University of Michigan-Flint. It was actually a pair of assignments from Remi, my instructor, that laid the seed for my embrace of this method, along with the support of another professor in the program, Jeff Kupperman. I have to admit that initially I felt very cold toward the idea of working with games in the classroom, particularly with video games. I thought that the games themselves were too constraining, and that their outcomes were limited.

So who am I as an educator? And what are some of my core beliefs and tenets? First, I believe strongly in an inquiry-based approach with my students. I want them to develop a sense of wonder about the world and to have the space to follow up on that wonder to learn. I believe that all students love to learn, and I feel strongly that school should be a place of learning, and not only a place of schooling. When students have the chance to create a space for learning, they dive in. I want my students to experience their learning through direct action, not by sitting and listening to me explain something to them. I am very much a "guide on the side" teacher, even though I believe that I am good "on the stage," too. I think the best examples of those who have influenced me the most with inquiry-based learning are Neil Postman and Michael Wesch.

I also want my students to be autonomous. With much of human knowledge at our fingertips through wireless devices, I encourage my students to become self-directed learners. As Wesch argues, "This new media environment can be enormously disruptive to our current teaching methods and philosophies. As we increasingly move toward an environment of instant and infinite information, it becomes less important for students to know, memorize, or recall information, and more important for them to be able to find, sort, analyze, share, discuss, critique, and create information. They need to move from being simply knowledgeable to being knowledge-*able*" (para. 2).[1] I want them to have a desire to know something new and have the ability to discover that information themselves. I don't see my role as a gatekeeper of knowledge, but as a facilitator, helping my students become critical thinkers who can sift through the endless knowledge at their fingertips.

Finally, I want my students to work within a community of learners. Naturally, this means with their fellow classmates, but I see this expanding like a ripple to other groups within our school, community, town, state, country, and globe.

TIM'S GAMEFUL LEARNING

For the past six years, I've taught fourth grade at Wealthy Elementary in East Grand Rapids Public Schools. Before that I taught third grade in Kentwood, Michigan, fifth grade at Arrowhead Elementary in Aurora, Colorado, and second grade in Coopersville, Michigan. My classroom averages

1. Wesch, M. (2009). From knowledgable to knowledge-able: Learning in new media environments. Academic Commons, 7. Retrieved from http://www.academiccommons.org/2014/09/09/from-knowledgable-to-knowledge-able-learning-in-new-media-environments/

24 students, and in addition to teaching math and language arts in my homeroom, I also teach three sections of science. Within the science grade-level standards, I teach four units: adaptations and ecosystems; the relationship among Earth, the moon, and sun; states of matter; and energy transfer. This chapter is about how I've worked to transform my teaching of science—and, more important, my students' engagement with scientific inquiry—through gameful learning.

Defining and Designing "Gameful Learning"

When creating *Matter Quest (MQ)* and *Intergalactic Jury (IJ),* my emphasis was on designing gameful learning experiences through which my students could engender playful attitudes, experiment with different selves and ways of being, and pursue questions and curiosities. What do I mean by "gameful" learning, and how might my approach be different from other game-based learning efforts described in this book? The two learning experiences featured in this chapter were not video games produced by a company, designed for some imagined or prototypical elementary science class, and then adopted into my teaching. And did you notice I called *MQ* and *IJ* "learning experiences?" That's because despite having many gamelike features, from the tools students used, to their problem-solving processes, to the "mechanics" of play, neither one is a video game like *Portal* (a popular video game that can be used to teach physics; see Cameron Pittman's chapter) nor a tabletop board game such as *Pandemic.* That's why I call my approach "gameful learning." I believe that designing for learning practices, such as inquiry, can be accomplished using a variety of media and methods.

So what made *MQ* and *IJ* gamelike? First, both featured teams collaboratively solving problems. Problems were grouped based on difficulty, and they were designed to introduce complex content knowledge for students to engage in shared inquiry procedures. Because the process was highly scaffolded, students were able to learn through trial-and-error methods, helping them compromise as they thought flexibly. Second, both required that students deftly use a variety of digital and physical tools, from lab materials such as graduated cylinders and pipettes to digitally mediated processes such as recording podcasts and authoring in our class wiki. Third, character role-play was an important way to introduce and sustain creative activity, and our role-play included me and my students; we all experimented with new selves and identities. I played the main character in *MQ,* while in the *IJ,* the students had the opportunity to adopt different identities during presentations.

My ability to design *MQ* and *IJ,* and my students' willingness to "play along," also required something familiar to any game player, a particular kind of gameful attitude. Whether in *World of Warcraft* or dominoes, playing a game means voluntarily accepting a certain set of rules that are meaningful within that particular "world" of activity. Golf wouldn't be golf, for example, if players raced down the fairway dribbling golf balls to see who slam-dunked his or her ball into the hole first. Agreeing to use tools such as golf clubs in particular ways, and to follow rules about sand traps and tee order, might appear absurd to an outsider, but to the golfer, these rules are voluntarily agreed upon to enact gameplay. This attitude—of accepting what might appear to be absurd rules in order to play—not only characterizes any game (see Suits's "lusory attitude"),[2] but it also certainly characterizes how my students agreed to play *MQ* and *IJ.*

I also understand gameful learning to be more than the sum of its parts. Let me explain.

2. Suits, B. (1978/2005). The Grasshopper: Games, life and utopia. Ontario, Canada: Broadview Press.

Yes—collaborative structures for problem solving, a diversity of material objects and digital tools, role-play, and a playful attitude are all important features of *MQ* and *IJ.* However, what is most important to me—and what I hope to illustrate in this chapter—is that creating and enacting gameful learning fundamentally changes how I *think* and what I *do* as a teacher, and so too how my students *think* and what they *do* as they learn. This "gamefulness" is also possible, albeit to a much lesser degree, when I adapt "off-the-shelf" video games. After all, my science students do like *Food Fight,* and there is a time and place for that type of play, too. But here, I'd like to describe a more robust vision of gameful learning that accompanies students' interest-driven inquiry, something that doesn't happen when creating "game guides" for *Food Fight*.

Gameful learning is something that requires more than individual play in a shared setting (i.e., my students sitting side-by-side at computers), or coplay in a shared virtual world. For my students and me, gameful learning is most dramatically—and effectively—evident when our shared curiosity and improvisation emerge. In what ways are my students (and me too, for that matter!) asking questions and pursuing information that reflects genuine curiosities? If our classroom is loud and messy, and the expression of any group's insight unpredictable, how might that be both acceptable and productive to learning about matter or the solar system? When different pathways to different representations of expertise emerge, how do I help my students, their families, and my colleagues understand that this breadth of *doing* and *knowing* reflects both state standards and the "state" of authentic scientific inquiry? These are the types of questions and opportunities that characterize my design of—and my own professional growth from— "gameful learning."

III. FIRST TAKES

In this chapter I describe my experiences designing, implementing, reflecting upon, and iterating the games *Matter Quest (MQ)* and *Intergalactic Jury (IJ)*. My story is unique for a number of reasons; here, I describe two learning experiences, created and enacted across multiple school years, with nine classes of fourth graders (more than 225 total students!), aligned with varied disciplinary content and curricula, and as influenced by a number of people and resources. To help clarify the elements of my narrative, Table 1 summarizes my gameful learning and design timeline, noting key units, related science content, design phases related to *MQ* and *IJ,* and key design events. Classroom teachers and administrators will be pleased to learn that each unit aligned with various Common Core and Michigan Grade Level Content standards, including: comparing and contrasting the characteristics of the sun, moon, and Earth, including relative distances and abilities to support life (Earth, moon, and sun); comparing and contrasting the states of matter, including solids, liquids, and gases *(MQ);* and writing opinion pieces on topics or texts, and supporting a point of view with reasons and information *(IJ).*

Table 1. **Tim's gameful learning and design timeline.**

Time Period	Unit	Design Phases	Design Events
Nov 2011 – Jan 2012	Earth, Moon, and Sun	First "I Wonder" questions and student research	Conversation with Michael Wesch
Feb 2012 – April 2012	*Matter Quest* (Take 1)	Creation and first implementation; Gathering student feedback; Ongoing reflection; Conversations with colleagues	Conversation with Amanda Pratt; Read Lee Sheldon's *The Multiplayer Classroom* (2012)
Nov 2012 – Jan 2013	Earth, Moon, and Sun	—	Co-designed *Intergalactic Jury* with building principal Anthony Morey
Jan 2013	*Intergalactic Jury* (Take 1)	Creation & first implementation; Gathering student feedback; Ongoing reflection; Conversations with colleagues	Initial implementation "on-the-fly"
Feb 2013 – April 2013	*Matter Quest* (Take 2)	Second iteration	Introduction of riddles, student-crafted story finale
Nov 2013 – Jan 2014	Earth, Moon, and Sun	—	—
Jan 2014	*Intergalactic Jury* (Take 2)	Second iteration	Great number of students contact living scientists, "set" calendar introduced at outset of game

Prelude to Gameful Learning

Before *Matter Quest* and the States of Matter unit, I attempted to significantly revamp the Earth, Moon, and Sun unit from the Battle Creek Math and Science Center (BCMSC)[3] by moving away from students' use of paper-based workbooks to authoring in Google Docs, before changing again to a wiki-based platform. A wiki-based platform, such as Wikispaces.com,[4] allowed my students the opportunity to create text and data tables, add pictures and links, create and share videos and podcasts, and share their work more easily with their classmates. Students maintained weather observations for the month of December and used tables to document their data, and then they logged daily moon observations in the month of January. Developing the skills and comfort to author in online environments, such as wikis, proved invaluable when implementing both *MQ* and, later, *IJ.*

At the beginning of the Earth, Moon, and Sun unit, I encouraged my students to write "I Wonder" poems concerning what they wondered about space and the cosmos. This was designed as a means for the students to delve into their own questions and wonderings about the universe and their place in it, as well as a way for me to gauge the students' broader interests. Students then posted their poems to their individual wiki pages, with the vague promise of an opportunity to explore and research some of these questions on their own. See Figure 1 for an example of how a student attempted to format and

3. https://www.bcamsc.org/

4. http://www.wikispaces.com/

answer some of her selected questions. Although I didn't know it at the time, these "I Wonder" poems became the seeds for *IJ* the following year.

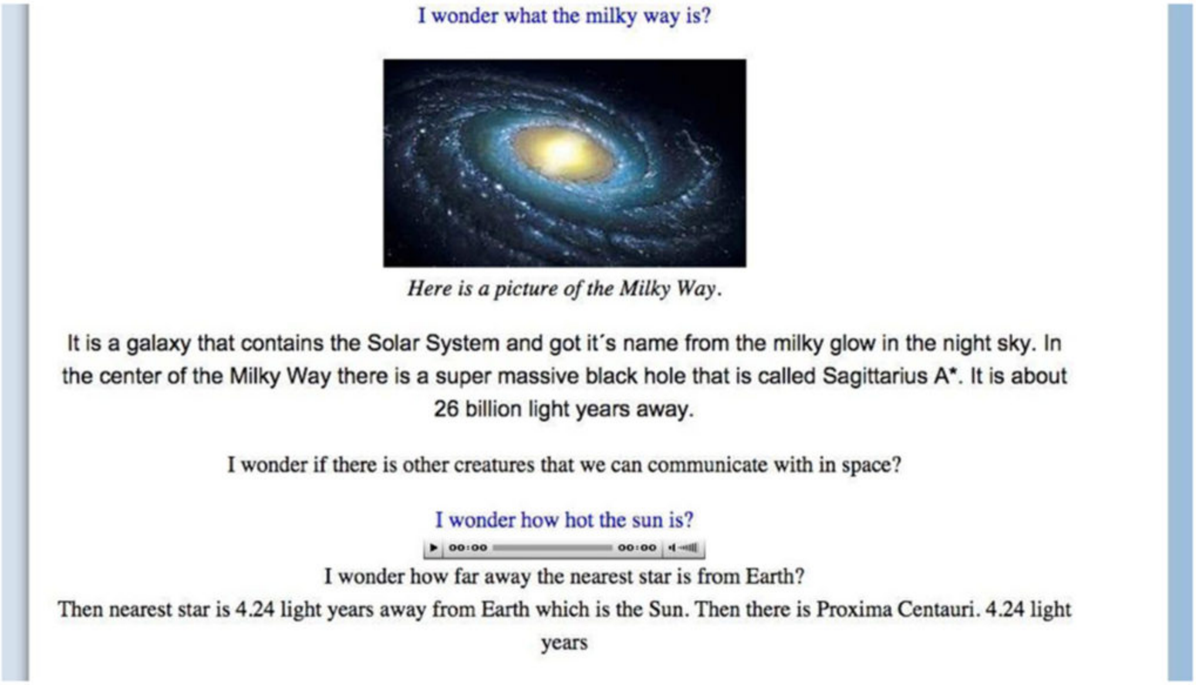

Figure 1. An early example of students' sharing text, pictures, questions, and audio on a wiki.

The inspiration for greater student-driven inquiry came from a conversation with Dr. Michael Wesch, anthropology professor at Kansas State University. Wesch cites Neil Postman and Charles Weingartner's 1969 book *Teaching as a Subversive Activity* as inspiration for his work,[5] particularly in asking students to be deeper, more critically minded inquirers into the world. Wesch has developed these ideas further—first, by engaging the ubiquity of information available through wireless and mobile devices, and second, in considering the implications of access for education. Wesch states, "We just have to stop pretending that the walls separate us from the world, and begin working with students in the pursuit of answers to real and relevant questions" (para. 19).[6] In our conversation in December of 2011, Wesch expressed his curiosity about the Earth, Moon, and Sun unit that I had just completed, particularly the "I Wonder" poems collected on student wiki pages and some hands-on activities demonstrating the orbital relationship of Earth, the moon, and the sun. This led to a deeper discussion about mixing analog and digital pedagogies, and I began to consider ways to make that happen in my next unit.

Matter Quest

My Earth, Moon, and Sun unit had concluded, and I was eager to design new ways for my students to engage in learning about states of matter. I also wanted to incorporate more analog and hands-on experiences. Whereas Earth, Moon, and Sun was predominantly abstract and conceptual in nature, the States of Matter unit provided a chance to blend analog and digital experiences for the students.

5. Wesch, M. (2008). Anti-teaching: Confronting the crisis of significance. Education Canada, 48(2), 4-7.

6. Wesch, M. (2008). A vision of students today (& what teachers must do). Encyclopedia Britannica Online. Retrieved from http://blogs.britannica.com/2008/10/a-vision-of-students-today-what-teachers-must-do

After all, it's difficult to experience the birth and death of the universe in comparison to the length of time it takes ice to change from a solid into a liquid. With their developing skills on the wiki platform, I thought that my students would continue to be engaged sharing their work online. At the same time, Earth, Moon, and Sun featured a lot of teacher-driven instruction, as opposed to student-driven exploration. I was looking to spend more of my time as a learning facilitator, rather than a direct instructor, so I considered what I could use that would provide a framework for more autonomous exploration.

The answer came, in part, from Amanda Pratt, a North Carolina educator and my research and writing partner in the University of Michigan-Flint's Global Program (a design-focused educational technology graduate program with international residencies and partnerships). She recommended Lee Sheldon's book *The Multiplayer Classroom*.[7] In his book, Sheldon examines how his teaching of video game design classes improved once he adapted the process of gamification to his courses. The implementation of points, quests and side quests, badges, bosses, guilds, and other "mechanics" parsed from board and video games were wrapped around a story line specific to his classroom. After reading the book and discussing these ideas with Amanda, I was excited about incorporating aspects of Sheldon's approach in my States of Matter unit.

What came next was *Matter Quest,* a 12-level "game" whereby students worked in guilds (groups) to help Creepor. As the antagonist of *MQ,* Creepor serves as an intergalactic emissary heralding a planetary invasion of Earth. (While I initially thought *MQ* was a game, as I discuss in my reflection below, the experience was more an "improvisational puzzle"; now I consider both *MQ* and *IJ* designed "learning experiences.") In *MQ,* students were "forced" to work for Creepor as he had abducted their grades. My role-play of Creepor is captured in Figure 2.

7. Sheldon, L. (2012). The multiplayer classroom: Designing coursework as a game. Boston, MA: Cengage Learning.

Figure 2. Tim as Creepor the emissary introducing students to Matter Quest.

Playing the Matter Quest—Creepor's Demand

As *MQ* began, students quickly formed groups and set to work on experiments. Directions for laboratory experiments, such as Gases Quest, an exploration of whether gases have volume and take up space, were posted on the class wiki. Each of the 12 levels corresponded with a different experiment. Advancing from one level to the next was not possible until all students in a guild shared their wiki updates with me, as each level was also password protected. Students would receive the next password once they had successfully demonstrated their knowledge and understanding, or mastery, of each level. The unit took almost three months to complete. Table 2 summarizes *MQ*'s 12 levels, the learning objectives I adapted from BCMSC, a brief description of the lab, lab materials and digital tools that featured prominently in that level, and—for fun—the password or riddle that contributed to Creepor's story.

Table 2. *Matter Quest* levels, curricular objectives, lab descriptions, tools, and either the password or riddle for a level.

Level	BCMSC Objectives	Brief Lab Description	Materials and Digital tools	Password/Rddle (Take 2)
1 – Matter Quest	Classify the three states of matter	Students classified 7 items under 6 categories (texture, color, etc.)	Materials: golf ball, jar with air, jar with water, wooden cube, bean bag, rock Digital tools: netbook, wiki page, tables	Password: pogo Creepor video*
2 – Mass Quest	Construct a simple balance to measure the mass of various objects	Students build a balance to measure the amount of mass in a variety of objects	Materials: paper cups, ruler, paper clips, masking tape, large nail, 1-gram cubes Digital tools: netbook, table	Password: Skywalker Riddle 2**
3 – Solids Quest	Identify and give examples of matter as a solid, and describe the properties of solids	Students observe displacement of water to find the volume of solid objects	Materials: graduated cylinder, clay, marble, screw, dowel Digital tools: netbook, wiki page, tables	Password: Mordor Riddle: At night they come without being fetched, and by day they are lost without being stolen.
4 – Liquids Quest	Describe the properties of a liquid	Students explore the properties of liquids, and understand the metric connection between water, mass, and volume	Materials: graduated cylinder, containers, water, pipette, cup Digital tools: netbook, wiki page, tables	Password: Wilco Riddle: I'm the part of the bird that's not in the sky. I can swim in the ocean and yet remain dry. What am I?
5 – Gases Quest	Describe the properties of gases; compare and contrast the states of matter	Students attempt to add water through a funnel to a 1-liter bottle with a rubber stopper	Materials: 1-liter bottles, water, rubber stopper, funnel Digital tools: netbook, wiki page, tables	Password: Spock Riddle: My tines be long, My tines be short, My tines end ere My first report. What am I?

6 – Air Quest	Observe that air takes up space	Students explore how air takes up space by submerging a plastic cup full of tissues underwater without getting the tissues wet. Students also use straws to blow water out of a cup and demonstrate that air takes up space	Materials: water basin, water, straw, plastic cup, tissue Digital tools: netbook, wiki page, tables	Password: woookiee Riddle: I will die if you give me water, but if you give me food I will live.
7 – Volume Quest	Compare and contrast the states (solid and liquid) of water	Students investigate how the volume of an ice cube changes as it phase changes into a liquid	Materials: graduated cylinder, water, pipette, ice cube Digital tools: netbook, wiki page, tables	Password: volume Riddle: Before I'm counted, I'm not known. Boy, will you miss me, When I'm all flown! What can I be?
8 – Phase Change Quest	Explain how the arrangement of the small particles in substances differ in solids, liquids, and gases	Students observe the phase change from solid to liquid	Materials: plastic plate, hand lens, pipette, water Digital tools: netbook, wiki page, tables	Password: Bowie Riddle: What do people love more than living? What do they fear more than dying? What do poor people own, and what do affluent people need? What do all people take to their coffins?
9 – Melting and Massing Quest	Describe how the mass of a solid object remains the same after a phase change	Students place an ice cube in a plastic bag and measure its mass as a solid and again as a liquid	Materials: resealable plastic bag, balance, gram cubes, ice cube Digital tools: netbook, wiki page, tables	Password: melt Riddle: I have a lot in my belly, Wood on my back, Nails in my ribs, For feet I have nothing. What am I?
10 – Physical Changes Quest	Observe changes of a liquid to a gas, and gas to a liquid	Students taped a resealable plastic bag with a cup of water to a window in the classroom to observe condensation	Materials: plastic cup, resealable bag, water, tape Digital tools: netbook, wiki page, tables	Password: bag Riddle: I am a wingless bird, flying even to the clouds. I give birth to tears of mourning in pupils that meet me, even though there is no cause for grief, and at once on my birth I am dissolved into air. What am I?

11 – Combining Solids and Liquids Quest	Investigate the freezing point of different liquids	Students filled baby food jars with dish soap, water, rubbing alcohol, and vegetable oil to investigate if there would be a difference in the time it would take for the liquids to freeze	Materials: baby food jars, dish soap, rubbing alcohol, water, vegetable oil, freezer Digital tools: netbook, wiki page, tables	Password: cold Riddle: My thunder comes before the lightning; My lightning comes before the clouds; My rain dries all the land it touches. What am I?
12 – Escape!	End-of-unit assessment	Students individually complete district standardized unit test	Materials: test	*MQ* take 2: Students use riddle answers to guess what Creepor's intentions are on last page of assessment

*Creepor video: https://vimeo.com/59710772
**Riddle 2 video: https://vimeo.com/59964733

A Day in the Life of* Matter Quest*ors

What did a typical day look like when my students were playing *MQ?* I teach three sections of science a day, all of them after lunchtime. Students in my first class walk through the door at 12:20, and they come from my colleague Winona Tinholt. Winona also studied with Amanda and me in the University of Michigan-Flint Education in Technology Global Program, and her students regularly play around with new ways of learning. The following are interesting events that happened as we moved through the unit.

Death by an overzealous janitor. As they line up outside my room, the 27 nine- and 10-year-olds lean against the lockers making small conversation with each other. Their enthusiasm is evident.

"Is Creepor coming today?" asks Andrea. "He hasn't been here in forever."

"Ah." I stall for the right words to explain Creepor's disappearance. "Creepor's had some … difficulties lately."

Creepor's disappearance from class stems from an innocuous enough reason. A fifth-grade teacher in my building was retiring. I was hiding the Creepor costume in the staff lounge across the hall from my classroom. While my room is spacious by most standards, it's smaller by half than the other classrooms in my school, and cabinet space is at a premium. To preserve the thin illusion that I may not be Creepor, I decided to keep the costume hidden outside of my classroom.

The problem arose when the retiring teacher placed her Valentine's Day materials in the lounge after the holiday party. She typically did this after each holiday party or change in season. More often than not, these materials and knickknacks would lie unclaimed for weeks on the lounge tables. Another colleague, however, decided to dispose of the unclaimed material after a few weeks, and despite the costume's being hidden under a table in an adjoining room, it too was tossed with the holiday junk.

"I know he's really you," Andrea said, giving me an out from her line of questioning.

"I don't know what you're talking about," I said with a grin.

Creepor's identity was an open secret at this point, but the reason for his disappearance was not. Despite the "death" of Creepor, his presence in the class left a definite footprint, and his return was not yet out of the question. As my homeroom students left for Language Arts, I continued to field questions from the students.

"Are we playing Matter Quest today?" asked Jeff.

"Dude, what else would we do?" David laughs back at him. "There's no sub here today." (Sub days are a mixed bag in fourth-grade science. Most kids are bummed that Mr. Saunders is gone, but watching a Bill Nye video is a solid consolation prize.)

"Will you check our level?" asked Edith. "I think we're done."

"Sure," I answered. "Catch me once we begin. You guys can head in."

Creating a class of interdependent learners. Kids stream into the room. Some take a seat, set their netbooks up on their desks, and turn themselves in the seats toward me. Others stand over their seats with one hand on their desk and the other on the backrest, rocking toward the two large gray tubs that hold all of the beakers, graduated cylinders, and other materials they'll need for the unit. There's a low chatter as the students wait for the totality of my whole-class direct instruction for the day.

"If you can hear my voice clap once," I say into my microphone. A handful of kids, but not all, return the single clap. It sounds rough, with more than a few kids clapping earlier or later than the bulk of responders. While not everyone claps, all voices either stop or grow silent.

I milk the silence and their anticipation for a moment or two, surveying who is here today and who isn't. All the seats are filled.

Drawing a short breath before delivering the entirety of the whole-class instruction, I finally utter a single word: "Go."

The silent room explodes into a blur of movement, activity, and purpose. Some flip open their netbooks to check over lab materials for their level that day. Others spring from their seats to open the tubs and gather materials. Edith's group reviews its work from the previous day before checking in with me about moving up to the next level. A few walk over to the bookshelf to work on some reading. Members of one group chat and laugh for a minute before one of them calls them back on task, at which point they all get to work setting up jobs for the day. Another group walks straight out of the room and heads to the teacher's lounge to check if its liquids froze in the freezer overnight. Students in the last group walk into the hallway with their netbooks to set up shop for the next 45 minutes and get some space from the other groups and the hum of noise. They have a podcast to rehearse and record. No one asks me what he or she needs to be doing right now.

Edith and the Science Girl Guild. Instead of sitting back and savoring the scene, I immediately jump from group to group, checking in on what they're doing. Edith's group, the Science Girl Guild, is ready to share its level. As with all the guilds in all three classes, the students name their own guilds, and Edith's group of three was no exception. The three of them stand across from me, netbooks in hand, wiki page cued and ready to share. They've just finished a level on volume and water displacement.

Scanning their pages, I note that each has created a data table showing the volume of several objects (see Tables 3, 4, and 5).

***Table 3.* Edith's volume data table.**

Object	Volume of water without object	Volume of water with object	Volume of Object Volume of water with object -Volume of water without object Volume of object
Marble	50 ml	51 ml	1 ml
Screw	50 ml	51 ml	1 ml
Clay	50 ml	67 ml	17 ml
Dowel	50 ml	59 ml	9 ml it floats

***Table 4.* Anna's volume data table.**

Object	Volume of water without object	Volume of water with object	Volume of object
Marble	50 ml	51ml	1ml
Screw	50 ml	51ml	1ml
Clay	50	67ml	17ml
Dowel	50 ml	60	10ml **It Flouts!**

Table 5. Erin's data table

Object	Volume of water without object	Volume of water with object	Volume of Object Volume of water with object -Volume of water without object Volume of object
clay	50 ml	67 ml	17 ml
marble	50 ml	51 ml	1 ml
screw	50 ml	51 ml	1 ml
dowel	50 ml	59 ml	9 ml

"How come Anna has a different mass for her dowel than you and Erin?" I ask Edith.

"Um, I don't really know," Edith answers.

"Well, when I measured it they both thought that it was closer to 59, and I thought it was closer to 60," Anna answers.

"I see," I said. "I guess that makes sense. Your pages don't have to be identical, and it's OK to disagree about results as long as they aren't really, really different."

The girls stand and nod quietly, waiting as I scan their work to see if anything else needs attention.

"How were you able to determine the volume? How were you able to figure it out?" I question them.

"Well, first we filled a graduated cylinder with 50 ml of water," Anna answers.

"Then we dropped in one of the things, like the screw. After that we looked to see how much the water went up."

"Yeah, then we subtracted it," Edith added.

"Subtracted what?" I ask.

"We subtracted it from 50," Anna answers.

"From 50?" I ask.

"No, I mean," Anna hesitates. "We subtracted 50 from how much the screw was."

"Why did you do that?" I ask.

"Well, the water goes up by how much the screw is," said Edith. "There was already 50 in there, so we subtracted it to find out how much it went up."

"I see," I replied, nodding. "What is volume, then?"

"It's how much space something takes up," Edith says as Anna and Edith both nod in agreement.

The girls wait again quietly as I scan their summaries.

"OK," I finally say. "This looks good. Do you want the next password?"

All three girls grin and nod their heads quickly. I lower my voice to barely a whisper and give them the new password. Each of the girls clicks the link to the next level and adds the password. They then scurry off and start reading what is to come in the next level.

This interaction highlights my new role as a science teacher. While the rest of the class is engaged working on their labs together, I have the opportunity to speak with a small group of students to gain a better sense of their understanding. For example, during their lab time I was able to visit with the Science Girl Guild while they were working on their lab exercise and question them directly on what it was that they were doing. These informal assessments allowed me multiple opportunities to check for understanding, offer feedback, and redirect if needed well before they approached me with a final draft of their wiki information.

Becoming the Ultimate Guide on the Side

This is what my science class is now: a cycle of overlapping evaluation, observation, questioning, and engagement. It's not altogether different from what the students experience, although my cycles are overlapping with six different groups of students.

In addition to the challenges of mastering the content, there are a host of interpersonal and social skills that the students engage. They are learning to organize, compromise, and collaborate in ways that they haven't done in my science class before. These challenges affect students and groups differently. Some groups thrive in this environment, and some struggle; accordingly, my instruction is as much about scientific content as it is new ways of doing schooling, teaching collaboration, and listening to and learning differing ways that students understand and make sense of what's happening around them.

Reflecting on the First Matter Quest Iteration

While there was engagement in *Matter Quest*—and sure, my students enjoyed the "improvisational play" I performed as Creepor—I still thought that I didn't quite hit the mark. That is, when originally redesigning the unit, I envisioned students' demonstrating robust means of inquiry: being more productively confused, asking more questions about their interests, and creating new ways to shape their learning. They weren't there yet. While they were constructing science knowledge from the hands-on activities in the labs, *Matter Quest* wasn't providing a place for them to move beyond the curriculum. Contrast this with the simple activity the students did at the start of the Earth, Moon, and Sun unit, when they wrote and posted "I Wonder" poems detailing their questions about space and the universe. The simpler "I Wonder" writings immediately pushed the students to question their interests beyond the Earth, moon, and sun.

In addition to my observed concern, I was starting to wonder if *Matter Quest* were even a game. In reflecting upon my first implementation of *MQ,* I thought about a distinction my former Global Program graduate instructors Jeff Kupperman and Gary Weisserman made about gameplay; a game is something that can be replayed over and over again with uncertain outcomes. A puzzle, however, has a set outcome and does not have as high (or any!) replay value once solved. Think of a crossword. Once you've finished it, you don't erase it and start over again. You might want to find a different crossword to complete, but the one you've completed doesn't have any meaningful replay value.

MQ felt similar to a crossword. My students enjoyed it thoroughly; however, they had no interest or intention to complete it again from the beginning. And there was no need to; they had finished it. I'm sure they would have jumped on the chance to complete, say, "Energy Quest," if I had continued the same format with the next unit. However, I held off on creating another iteration in the same style without first reflecting on the practices and learning I share with my students. I did have some ideas for ways to improve *MQ,* but as the calendar cycled around toward the start of the next Earth, Moon, and Sun unit, a new idea began to take shape. It turned out that those "I Wonder" poems were going to be pretty important.

Intergalactic Jury

I'm fortunate to work in a building with a very supportive principal, Anthony Morey, especially when it comes to taking risks pedagogically. Not only is he supportive of the ideas of his staff, but he is also a wonderful partner in developing ideas to bring them to life. During a meeting in late 2012, I expressed some of my frustrations with the qualities of student inquiry in *MQ.* He described an activity that his former middle school social studies class did with the controversy related to President Andrew Jackson's involvement in the Cherokee Trail of Tears. In Anthony's teaching, half of the class argued against President Jackson (and even called for his impeachment!), while the other half argued in favor of Jackson's decisions. As a part of their inquiry, his students examined multiple historical documents and perspectives, constructed arguments either for and against impeachment, conducted a trial, and then voted on whether or not to impeach the president.

As Anthony was describing this format, my mind kept coming back to the "I Wonder" poems that the students had written at the start of the Earth, Moon, and Sun unit. What if the students had an opportunity to research one of their "I Wonder" questions? What if instead of researching Andrew Jackson, the students researched one of their "I Wonder" questions? At this point the questions were coming fast and furious in my mind, and I began to hash out some ideas with Anthony. Eventually, we settled on an idea for the game *Intergalactic Jury.*

Forming an Intergalactic Jury

The students would form interest-driven groups based off their "I Wonder" questions from the start of the unit, and I would then look for common themes that appeared in a large number of poems. I found a strong number of students who had an interest in Mars colonies, Moon colonies, exploring life on other planets, black holes, or asteroid shields. Once I formed their groups, I explained the learning experience to them, along with the twists and constraints.

I delivered the story line role-playing Carl Sagan, the famed astrophysicist. As Sagan, I told my students that NASA was looking for a new decade-long mission, and that it needed a goal. The purpose of this mission was decided by an intergalactic jury. Coincidentally, NASA had chosen students in each section of fourth-grade science at Wealthy Elementary to serve with distinction on the jury.

Students were placed in their interest-driven groups and then had two weeks to research their topics. As they delved deeper into their topic, they began to craft a mission proposal to share with the jury. One of the areas that I tried to encourage the students to develop in their research and presentations was a sense of wonder and awe that their mission could inspire among jury members. This proposal could be no longer than 10 minutes, and students could use any visual aids or relevant materials to help sway the jury. Finally, on the last day and after much critical consideration, students would vote for their favorite proposal.

While this initial structure was good, a few twists were needed to connect the students to their research personally, as well as to include deeper critical reasoning. Students would have an opportunity to "fantasy draft" a famous astronomer or explorer to give "expert testimony" during their presentations. Another twist would be to have each group give a short rebuttal presentation against another group; that is, a second group would argue against a first group's proposal, articulating reasons why the original proposal should be viewed skeptically. Before the presentations, each group would have an "evidence exchange" that would allow each group to see the presentations of the opposing group in advance. And at the end of *IJ,* on the day of the vote, all groups would be given no more than five minutes to give a "final word" on their topics, synthesizing and rebutting criticisms faced in the counterarguments from other groups and from the jury of their peers. Figure 3 shows the complete calendar for *Intergalactic Jury* that students could access through the class wiki. Wednesdays were days that the classes didn't meet for science, as the students attended their "specials" classes of art, music, and gym.

Monday	Tuesday	Wednesday	Thursday	Friday
20 Research	21 Specials	22 Research	23 Research	24 Research
27 Snow Day	28 Specials	29 Research/Rehearsal	30 Research/Rehearsal Writing	31 Research/Rehearsal **EVIDENCE EXCHANGE**
3 Research/Rehearsal	4 Specials	5 Presentation Day **Mars Colony** **Black Hole 2**	6 Presentation Day **Solar System Exploration** **Space Animals**	7 Presentation Day **Asteroid Shield** **Black Hole**
10 **"Spiff Up" Day** This is your day to work on responding to what other groups said	11 Specials	12 Last Day Final Word Vote	13 Review	14 **Test**

Figure 3. Intergalactic Jury calendar found on class wiki.

Connecting to Outside Experts—An Activity of Intergalactic Proportion Within Our Solar System

This was my initial plan for *IJ*. And, as with much of teaching, I revised *IJ* as it was first implemented with my students. For example, the fantasy draft was a bit of a bust. That is, until one of my students—Elizabeth, who was studying interstellar travel with the hopes of exploring extrasolar planets for signs of life—asked if she could email Dr. Debra Fischer of Yale University. And we were both surprised to hear back from Dr. Fisher with a quick and detailed reply, as you can see in Figures 4 and 5.

Mail | Properties

From: [redacted] Sunday - October 12, 2014 4:05 PM
To: [redacted]
Subject: Fwd: My School Project On Space

On Tue, Jan 29, 2013 at 4:48 PM, [redacted] wrote:
Dear Mrs. Debra Fischer,
Hi! My name is [redacted] and I'm in 4th grade at Wealthy Elementary, in East Grand Rapids, Michigan. In my Science class we are doing an activity called Intergalactic Jury. We are split up into groups and make presentations about our subject. We are competing against the other groups in my class for a blank check from NASA (fake). My group is doing a project on Interstellar Travel. Everyone had to pick an astronomer to study and I chose you! I was wondering if you have an opinion or information on Interstellar Travel? If you do, could you please share it with me? My teacher would be really pumped to hear that I emailed you. Thank you in advance for trying to help me!
Sincerely,
[redacted]

P.S.
Your email might possibly be shown with my presentation to my class.

Figure 4. Elizabeth's email to Dr. Fischer.

Mail | Properties

From: [redacted] Sunday - October 12, 2014 4:05 PM
To:
Subject: Fwd: My School Project On Space

Dear [redacted]

It's great to hear about your exciting project! Intergalactic jury, eh?

I think it's a big mistake to try to send human beings for interstellar travel. The distances between the stars are enormous! If we sent a crew at 10% the speed of light, it would still take 40 years to get to the nearest star system. We'd have to pack in 4th graders - you guys would be adults when you arrived at alpha Centauri.
If we tried to send humans even faster, there are two problems: (1) we don't know how to accelerate space craft to those speeds and (2) the radiation fields become blue-shifted to wavelengths that are hazardous to our health.

We really should travel to the nearest star system, but we should send little nanobots. Once they arrive, they can phone home and send us pictures. I think that this may well happen one day!

With best Regards,
Professor Debra Fischer
Yale University

Figure 5. Dr. Fischer's reply to Elizabeth.

How great was this? I'm well aware of the cultural and institutional challenges women confront when pursuing STEM-related interests and careers. And I've seen the negative effects of stigma and stereotype manifest as early as the fourth grade. For varied reasons, I know Elizabeth and I were thrilled to receive a response from one of the world's leading experts on extrasolar planets.

As an educator, I found it was a powerful experience to witness. This was a moment that I had not anticipated nor planned for, and it highlights a need for being open to student input and action while implementing these sorts of learning experiences. Indeed, the unpredictability of receiving contributions from leading disciplinary experts—and having experts "play along"—is part of what distinguishes, and deepens, inquiry in gameful learning.

Final Jury Presentation

Another aspect of *IJ* that changed during play was the final juried presentations. There were only a few constraints about the form of students' presentations, such as time. During the course of the presentations, I was excited to see how students would argue their points. With the classes split into six different groups with four students in each group, it was time to see what the groups had to argue. Topics consistently presented across all three classes included interstellar travel, extrasolar planets, asteroid shields, and black holes, among a few others.

Mars and moon colonies were also popular in each of the classes, and they were among the first groups to present. Figure 6 shows a sample slide from one of the presentations, highlighting a mix of practical considerations and an appeal for glory.

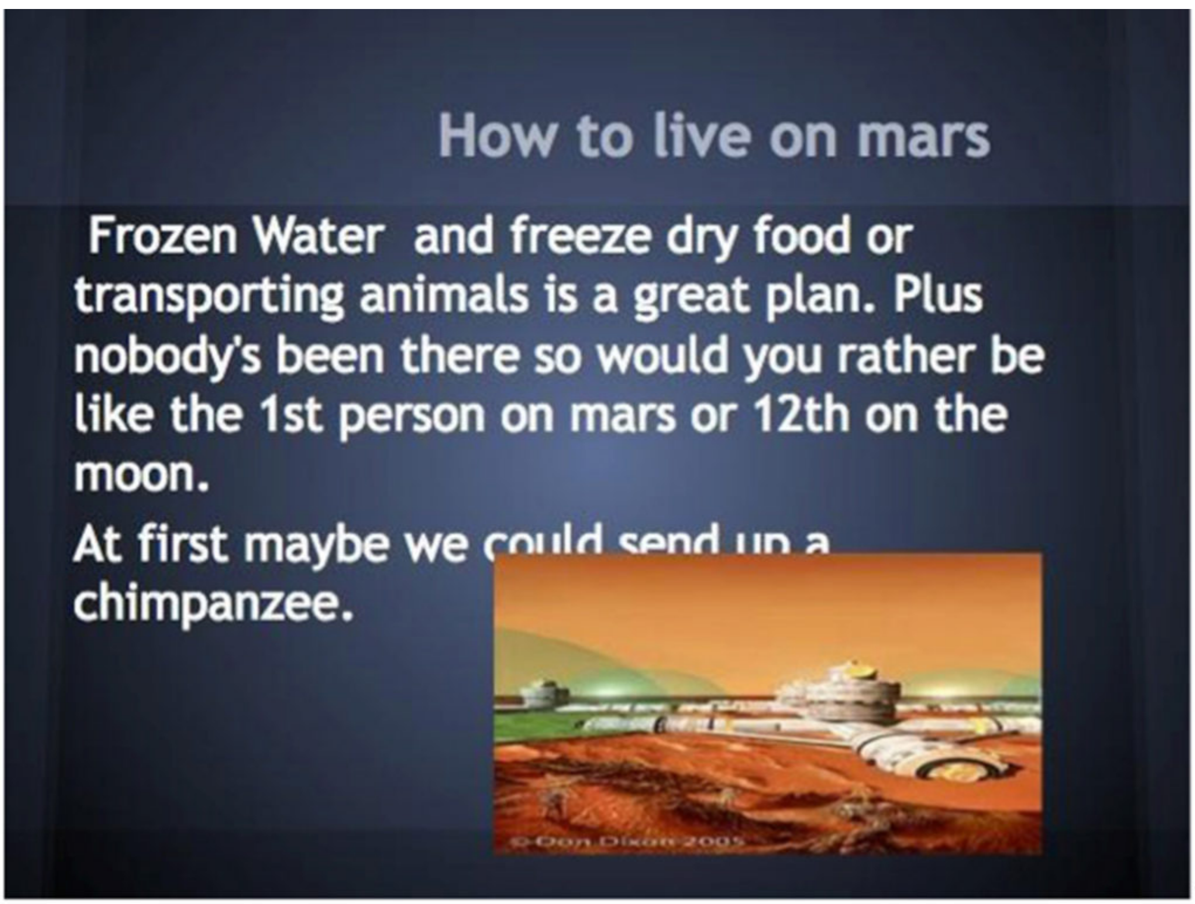

Figure 6. Student slide in support of a Mars colony.

Without exception, students used Google's Slides application to share their presentations, although some used additional models and drawings to help make their case. Some models were made from

Legos, while others were made from Styrofoam. Others took advantage of the Google Drawing feature and created a digital rendering, as seen in Figure 7.

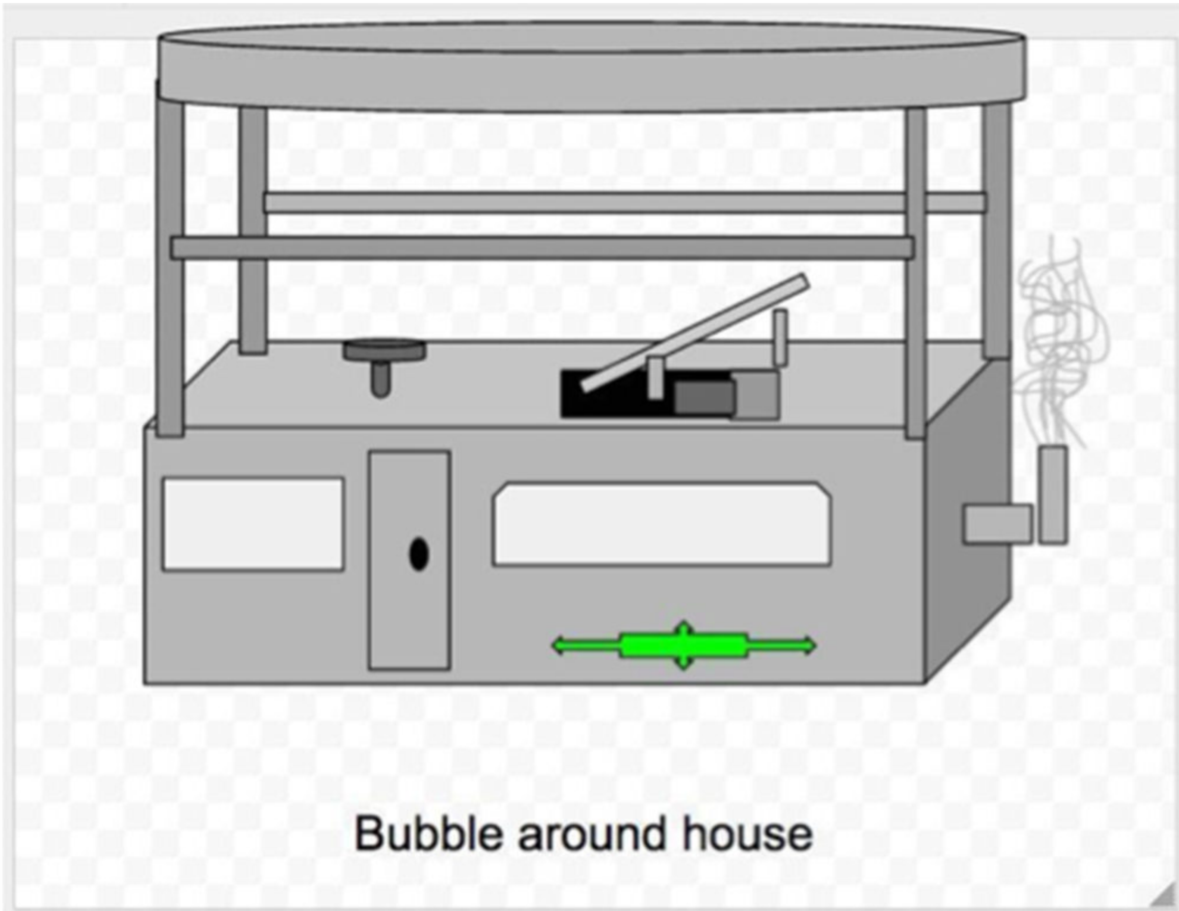

Figure 7. Digital rendering of a Mars colony house.

A Case of Cosmic Intervention

I had to be careful not to give into my own biases in helping students lock down their research and hone their presentations. While there were some fantastic and wonderful ideas that the students presented, my heart was set on one of the three classes voting for an asteroid shield for the Earth. Unfortunately, not one class selected the asteroid shield as the winning idea. One class selected a project based around sending animals into space, another class voted for interstellar travel, and the final class voted for a Mars colony. The great coincidence was that a day after the final votes, the Chelyabinsk meteor exploded over Russia quite unexpectedly. In a show of hands, asteroid shield was a unanimous winner in all three classes in a short revote.

Reflecting on the First Intergalactic Jury Iteration

What was surprising among the first rounds of presentation was the level of questioning by the jury members. In most classes and with most students, the questions from the jury were focused on clarifying specific details from the presentations. The students were demonstrating that they were listening carefully to their peers and were thinking critically about what groups were presenting.

The jury members, for the most part, were genuinely interested in knowing more about what was shown. The outliers to this were few and far between, but I recall intervening when one student asked, "Did you really think this idea through? I mean it's not like this is even possible." While there was some gamesmanship involved in torpedoing other groups' presentations (and thus making your own presentation look better by comparison), I still had to be on guard to keep tone and attitude polite and scholarly. While there were a few students who had their knives sharpened and who were out to ask pointedly mean questions, the overall tone of the questions was nuanced and intuitive regarding what was presented. For most students, this was the first time they had an opportunity to argue and defend their ideas. Most questions were specifically focused on the topic being presented, as, for example, during the Mars colony presentation when one of the students asked about the process of sending a chimpanzee to Mars ahead of humans, or what kinds of animals would be sent to Mars to assist with colonization.

TAKE 2: A SET OF SECOND GAMEFUL LEARNING ITERATIONS

A Second Matter Quest Iteration

Immediately after the first implementation of *IJ,* my students started the second iteration of *MQ.* While I spent significant time working to create a more inquiry-driven model with *IJ,* my revision of *MQ* was primarily centered on refining more of the story line. I thought that the meaning of the *MQ* storyline wasn't as strong as it could be. Why was Creepor the emissary interested in my students, and for what reason did he need them to complete the levels and labs? To strengthen *MQ*'s narrative, I added more layers to Creepor's involvement by having him (me!) leave a riddle at the beginning of each lab level for groups to solve. Together, all the riddles explained that Creepor's ultimate intent was world domination!

The first level to feature this narrative flourish was Level 2, Mass Quest. In Mass Quest, Creepor makes a video appearance and asks students, "What is once spoken, then broken?" Creepor performs as his usual self, a cross between the emperor from *Star Wars* and Strong Bad from *Homestar Runner.* Working together in their guilds, students attempted to solve the riddle. For the first three or four riddles the students worked hard in their groups to solve them. Eventually, students in one of the groups figured out that if they "Googled" the riddle that they could solve it much more easily (I had, after all, "borrowed" the riddles straight from a website!). After that, I changed the wording of the riddles to make them more difficult.

During the course of *Matter Quest,* the students would save riddle answers to try to discover what it was exactly that Creepor intended to do with the students. At the end of the *MQ* unit, during the district-mandated standardized postassessment, I added a page to the test that listed all of the riddle answers, and I asked for the students to guess what Creepor's plans were. By "mashing up" a standardized test with *MQ*'s narrative, I provided my students with an additional creative outlet. Including a more free-form *MQ* ending within a summative assessment supported my students' voice and demonstration of knowledge as the unit concluded.

Undoubtedly, adding riddles to the *MQ* levels and allowing students to interpret Creepor's message were wins. Yet even these positive steps forward appeared too narrow given curricular boundaries. Was this the unintended consequence of a more traditional gamification model? Or perhaps I wasn't going far enough adapting gamification to my specific circumstances? I'll admit to owning a PlayStation 3, but interest in it lies purely with playing football games. I don't play current quest-based video games. Was I at a disadvantage not knowing the finer features of narrative, plot development, and play mechanics? While I could start playing these sorts of games to support my own design efforts, I must admit to finding little time or interest in doing so.

Another unexpected development in *MQ* concerned grading. In the end, I completely dropped the idea that students' grades had been captured by Creepor. I didn't feel comfortable pairing students' motivation to earn points with their grades. While I did tell students playing the first *MQ* iteration that Creepor had abducted their grades, I walked away from that throughout the unit. Instead, I wanted the inherent engagement and enjoyment of the labs to be students' biggest motivator. Also, once it became apparent that every student would finish *MQ,* most students lost interest in the points as a motivator. Reflecting upon the first iteration, I recognized *MQ* as an improvisational puzzle. Now, having taught the unit twice, I recognized that interest-driven learning—even within the guise of an improv puzzle—is most effective when students are inherently motivated. The external rewards promoted by gamification, such as points, didn't appear to be a meaningful catalyst for inquiry-driven learning in my science classroom.

A Second Intergalactic Jury Iteration

The second round of *IJ* extended the ways in which my students helped codesign the first iteration. For example, the fantasy draft of astronomers and explorers was refocused after our communication with Dr. Deborah Fisher the year before. Now, many students began contacting leading experts in their respective research areas. We found—to our delight!—that some scientists were very happy writing to fourth-grade students. Along with Dr. Fisher, Dr. Jill Tarter at the SETI Institute also provided a similarly detailed, appropriate, and encouraging reply to students who wrote to her. Some students continued to research historical figures, but there was a general shift toward living experts once the allure of sending and receiving an email spread through the classes.

Students were assessed in a variety of ways during the second *IJ* iteration. One notable change was how I observed students during their research and presentation days. Well before the first presentation, I gave each student a rubric from the National Council of Teachers of English (NCTE) that highlighted Common Core–aligned standards for fourth-grade oral presentations.[8] I scored each student during his or her first presentation as a trial run and handed the rubrics back to the students for feedback. This allowed them the opportunity to learn and grow from their initial presentation, and it gave them specific feedback while rehearsing for their final presentation to the class on vote day.

In addition to new assessment methods, I greatly improved my ability to pace the second *IJ* iteration. I had developed, in other words, more clarity about how, and for how long, students would play. Practically, I included a calendar for the students on our class wiki pages that outlined when presentations would happen and the end date. That was very different from my first time implementing *IJ,* when pacing was open-ended and I made up our schedule as we progressed. The first time, for example, I could tell that the research phase was dragging on too long, and only then

8. http://www.readwritethink.org/files/resources/printouts/30700_rubric.pdf

did I establish time for the final presentations. Ultimately, my attention to pacing was important for student learning; I was better able to attend to their needs just-in-time, I knew when and for how long they should engage particular activities, and we both managed our time inquiring more effectively.

Having some of the older *IJ* presentations to use as examples during the second iteration also helped hone students' expectations for what presentations could look like. The drawback from those examples, however, was that they also limited the scope of what a presentation could be for some of the students. Looking toward my third *IJ* iteration, I will encourage originality and creativity when it comes to the presentations and what they can look like. I'd like to avoid a future regret whereby my students' representations of inquiry-based learning relies exclusively upon didactic, slide-show presentation.

Reflecting on the Second MQ and IJ Iterations

As I look back at second iterations of both *MQ* and *IJ,* I see that the difference between the two learning experiences is best explained through the distinction between games and puzzles. *MQ* was a puzzle, though certainly a puzzle with an improvisational enactment. *IJ,* on the other hand, was more like a game. How do I understand this difference?

MQ was, undoubtedly, teaching as improvisation. What would Creepor say to my students, and how would he act? As is evidenced in Edith, Anna, and Erin's data tables, our class wiki was used in a variety of authoring capacities, some of which were unpredictable. Podcasting was, literally and figuratively, unscripted. From the engaging lab structure, to the autonomy of self-guided learning, my students were improvising in their learning, just as I, too, was improvising in my teaching. Nevertheless, my students had no interest in playing *MQ* again. There was no replay value, absolutely zilch. As they would with a completed crossword, my students had no inherent desire to play a second time. And, as with all puzzles, the answers were predetermined. Each level had one right answer. Creepor's riddles were revealed when my students answered a problem with an answer I already knew. While there was some room to navigate a different pathway toward the answer—again, some room for improvisation—the end was determined in advance. Once they understood that air took up space, they were done with it. There was no need to repeat it. Some of them expressed an interest in doing the next unit, energy transfer, in a style similar to *MQ,* but no one wanted to go through *MQ* again.

My students' responses to *IJ,* on the other hand, reveal a more inherently engaged commitment to play, questioning, and—most important—inquiry-based learning. Upon completing *IJ,* many students asked to play again; they wanted to select new topics (such as black holes—a tremendously popular idea among my students), new groups, and new presentation opportunities. Not only did *IJ* have greater replay value, my students were also eager to explore new questions in new ways. And, most important, I had not preselected the questions; thus, there were no predetermined answers. I believe my students found *IJ* so engaging because, in some ways, they knew we both didn't know the answer. I could support their inquiry, but we'd be journeying on a pathway toward an unknown outcome. Could I have predicted that my students would not only communicate with actual scientists, but that they also would incorporate expert testimony into their final presentations? Through multiple iterations, *IJ* transformed our shared learning from an improvisational puzzle to a new method of inquiry-based learning. In the process, gameful learning became a means of students' defining, pursuing, and valuing their own learning objectives and experiences. This was a style of learning that kept the best parts of *MQ*, but that gave the students the room to set their own learning objectives.

Ultimately, by adopting a gameful design attitude in my teaching, I revisited an initial desire to dramatically change the experience of *doing* science class. Now, I was better able to support my students' deep dives into scientific inquiry. I gave myself space to create on the fly, improvise reflectively, and yield to the creativity of my students as codesigners. Together, our learning produced the types of positive results that I hadn't achieved through traditional methods. My students left our classroom demonstrating an ability to engage and explore the world (and beyond!) with a level of autonomy and mastery that they did not have only a few months earlier. Part of that growth was due to my facilitation of a space where students could explore and practice like scientists, with authentic tools, and pursuing genuine curiosities. Nevertheless, our growth was mostly fueled by my students and their desire to play.

ADVICE FOR TEACHERS LOOKING TO CRAFT GAMEFUL LEARNING EXPERIENCES

With this complete narrative in mind, educators interested in starting gameful learning activities may want to consider these four ideas as they begin crafting experiences for their students. First, play games. It may sound simple, but play some games. While playing board games, video games, and card games, I've been inspired to either play those games with my students or adapt them for my classroom. I've found that the more games I play, the more I'm inspired to bring games into my classroom.

Second, start small. Rather than jump in with a gameful (or "gamification") unit, look to start with a small lesson, or even an attention-getting activity at the beginning of a lesson. Give yourself, and your students, a chance to enjoy a gameful experience in the classroom that has a beginning, middle, and end, without the pressure of sustaining it for a marking period or semester. I think this is especially true if teachers are attempting these experiences without a colleague with whom to share, reflect, and critique.

Third, find support. I was incredibly lucky to begin working on a gameful classroom with the support of my research partner, Amanda Pratt. Her help, along with that of my teaching partner Winona Tinholt, gave me a lot of direction and feedback. Your most important supporters, aside from students, will be your fellow educators with whom you interact daily. Share your experiences with them, and see if you can find someone you work with who would be interested in trying it as well. Having that type of support down the hall is going to be your biggest touchstone and encouragement to experiment.

Finally, revise and edit along the way. If I had waited to launch *Matter Quest* or *Intergalactic Jury* until I thought they were perfect I would never have launched them. I'm comfortable using my classroom as a lab for new experimentation and inquiry about my own teaching, and I'm not afraid to make changes if a better path becomes clear. This attitude, along with being open to input and suggestions from my students, allows me to make the revisions needed to improve the games we play.

CODA: A REFLECTION BY REMI **KALIR**

I met Tim in 2011 when he was my graduate student in the University of Michigan-Flint's Global Program. The program attracted many teachers, like Tim, who were as interested in educational technologies and app development as they were in international partnerships and prosocial design thinking.[9] The collaborative trajectory he and I have crafted in the past few years extends from the early stages of classroom practitioner inquiry, when Tim first piloted game-based approaches to learning across subject areas,[10] to our examination of identity, ignorance, and "lusory attitudes" (see Suits)[11] in approaches to gameful learning,[12] to our ongoing involvement in the national Playful Learning movement. Much of what informs our partnership is evident in the narrative presented in this chapter: a pedagogical commitment to curiosity-driven learning, a desire to tinker (whether with media or our habits of mind), and a willingness to identify the qualities of our ignorance so as to more fully explore and engage our work as educators.

Reading about *Matter Quest* and *Intergalactic Jury,* I am reminded that Tim and his students are unique (this is, after all, a book about "pioneers"!). Yet this distinctiveness notwithstanding, Tim's case studies are buoyed by unresolved questions pertinent to many other educators, across grade levels and disciplines. Tim, his students, *MQ* and *IJ,* and this narrative are *pioneering* because they surface questions that demand the concerted attention of classroom teachers, policymakers, and parents alike. In what ways—and to what degree—are teachers encouraged to design their own stance toward inquiry *in* and *of* learning?[13] How do teachers play, and why is this consequential for their students' learning? The intellectualism of teachers' play—whether as a reflection of inquiry or as an indicator of professional learning—is well represented across the philosophies and pedagogies of Dewey,[14] Paley,[15] Greene,[16] and Montessori.[17] Unfortunately, it often appears as though these possibilities for playful pedagogy are lost on teachers and administrators who search for and buy some highest-rated video game. Shouldn't they create and play their own? And how is gameful learning an educational technology, and why does this matter? *MQ* and *IJ* provoke questions such as these, questions that suggest more critical reflection about the qualities of inquiry *in* inquiry-based learning and *as* relevant to teachers' ongoing professional learning.

From a student's perspective, it is important that children and youth ask and pursue their own questions during scientific inquiry—to question as a means of developing "higher quality ignorance" (as Firestein puts it),[18] rather than didactically consuming predetermined knowledge. Indeed, such an approach to inquiry aligns well with trends in K-12 science education.[19] From a teacher's perspective, a reflexive questioning of "inquiry-based learning"—as a pedagogical practice, as an oft-celebrated model—is also necessary in a political environment that delimits the improvisations of teaching and learning in favor of the audits and standardizations of schooling. In this respect, whatever the

9. Holden, J. (2013). Playful possibilities for assessment: Fluffy ducks and the queen's gambit. The Scholarship of Teaching, 6(1), 4-8.
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11. Suits, B. (1978/2005). The Grasshopper: Games, life and utopia. Ontario, Canada: Broadview Press.
12. Holden, J., Kupperman, J., Dorfman, A., Saunders, T., Pratt, A., & MacKay, P. (2014). Gameful learning as a way of being. International Journal of Learning Technology, 9(2), 181-201.
13. Cochran-Smith, M., & Lytle, S. (2009). Inquiry as stance: Practitioner research for the next generation. New York, NY: Teachers College Press.
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15. Paley, V. G. (1992/2009). You can't say you can't play. Cambridge, MA: Harvard University Press.
16. Greene, M. (1988). The dialectic of freedom. New York, NY: Teachers College Press.
17. Montessori, M. (1964). The Montessori method. New York, NY: Schocken Books.
18. Firestein, S. (2012). Ignorance: How it drives science. New York, NY: Oxford University Press.
19. National Research Council. (2011). A framework for K-12 science education: Practices, crosscutting concepts, and core ideas. Washington, DC: National Academies Press.

challenges or successes of *MQ* and *IJ,* Tim's approach to gameful learning is necessary if classroom teachers are to transform their "curriculum-as-planned" into the "curriculum-as-lived."[20] *MQ* and *IJ* show that inquiry-based learning is not a blindly adopted teaching method; the generative creativities of students must be matched by equally compelling experimentation on the part of their teachers.

Tim shows us how to transform the planning, implementation, and iteration of inquiry in an inquiry-based science classroom. Gameful learning describes the possibilities of this transformation, whether by remixing prepackaged curricula as improvisational puzzles, or by embracing the novel methods of research and presentation invented in the moment by his students. As Sawyer suggests, creative teaching occurs when "the rigid division between teacher and student is somewhat relaxed, creating an environment where teacher and students jointly construct the improvisational flow of the classroom" (p. 15).[21] From Tim's planned role-play as Creepor, to his students' precocious and interest-driven emails to leading scientists, this gameful approach to inquiry challenges bounded presumptions about the *where*, *how*, and *why* of inquiry in the science classroom.

In addition to broadening notions of inquiry, gameful learning also questions the device-centric technodeterminism of many pedagogical reform efforts. Consider, briefly, the notion that gameful learning is *an* education technology—in and of itself. The pioneer video-games researcher—and former classroom teacher—Kurt Squire has argued that educational technology is, by definition, a "creative" endeavor.[22] Squire suggests that teachers such as Tim and his fourth-grade students exemplify an approach that embraces the "desire to go out and *create* the future of learning rather than to simply study it" (original emphasis, p. 227). In other words, educational technology is not only about devices, using those devices, and then studying students' use (and such use, of course, might not reflect their learning!). Rather, gameful learning is one creative approach to iteratively envisioning and enacting a future of learning that coordinates many different practices, tools, expressions, setbacks, and curiosities. In this type of educational environment, students do learn relevant skills, dispositions, and disciplinary content; the evidence of such accomplishment is sprinkled throughout Tim's story.

Of course, Tim's classroom does feature "educational technology" in the guise of devices, such as laptops, voice recorders, and digital video. Access to such resources cannot be discounted. As important, however, is the fact that gameful learning afforded particular teaching and learning practices, or participatory norms. Iteratively enacting *MQ* and *IJ* meant that Tim's teaching became experimental, collaborative (whether with his principal or his students), and open-ended. For Tim's students, their participation in *MQ* and *IJ* changed their learning behaviors, too; they critically assessed learning experiences (recall that they didn't want to play another *MQ*-style "improvisational puzzle" again), they asked new types of questions (and to real astrophysicists, nonetheless!), and they pursued their own interests about complex disciplinary topics. Together, the educational technology of gameful learning usefully constrained shared practices so both Tim and his students could recurrently accomplish various scientific, pedagogical, and interest-driven inquiries.

20. eghetto, R. A., & Kaufman, J. C. (2011). Teaching for creativity with disciplined improvisation. In R. K. Sawyer (Ed.), Structure and improvisation in creative teaching (pp. 94-109). Cambridge, England: Cambridge University Press.

21. Sawyer, R. K. (Ed.). (2011). Structure and improvisation in creative teaching. Cambridge, England: Cambridge University Press.

22. Squire, K. (2011). Video games and learning: Teaching and participatory culture in the digital age. New York, NY: Teachers College Press.

Tim's story is a counternarrative to the fetishism of innovative product, a hopeful rejoinder that teachers can create their own educational technologies that powerfully and provocatively redesign the *doing* and *knowing* of inquiry-based learning.

CHAPTER 16.

TEACHING THE ITERATIVE PROCESS THROUGH GAME DESIGN AND DEVELOPMENT

BY STEVE ISAACS

Imagine the scenario. You are a middle-school student who has just developed the first levels of a game based on your design plan or sketch. Your classmate sits down to play your game. You expect him to travel upward toward the rat-infested area that clearly leads to the goal. He chooses a different path, which leads to his demise. The level restarts. He chooses the same path, trying to jump over a pit, once again leading to his death. You are standing over his shoulder watching. You want to scream and guide him in the right direction. You have been told you must quietly observe without influencing his gameplay experience. Obviously he should go up (or so you think). It makes perfect sense to you. After all, you designed the game. He continues to proceed in a manner far different from your original intention. After five failed attempts he "rage quits" and expresses his frustration. As you watch three other classmates experience the same fate you can hardly believe your eyes. You are (were) certain your game was appropriately challenging and reasonably easy to complete. Your peers provide valuable feedback (should you be open to it). You return to working on your game and make one minor change in the story as it is presented to the player. This seems to make a big difference as the next attempt has the player taking a different path and completing the level. Now it's time to test Level 2.

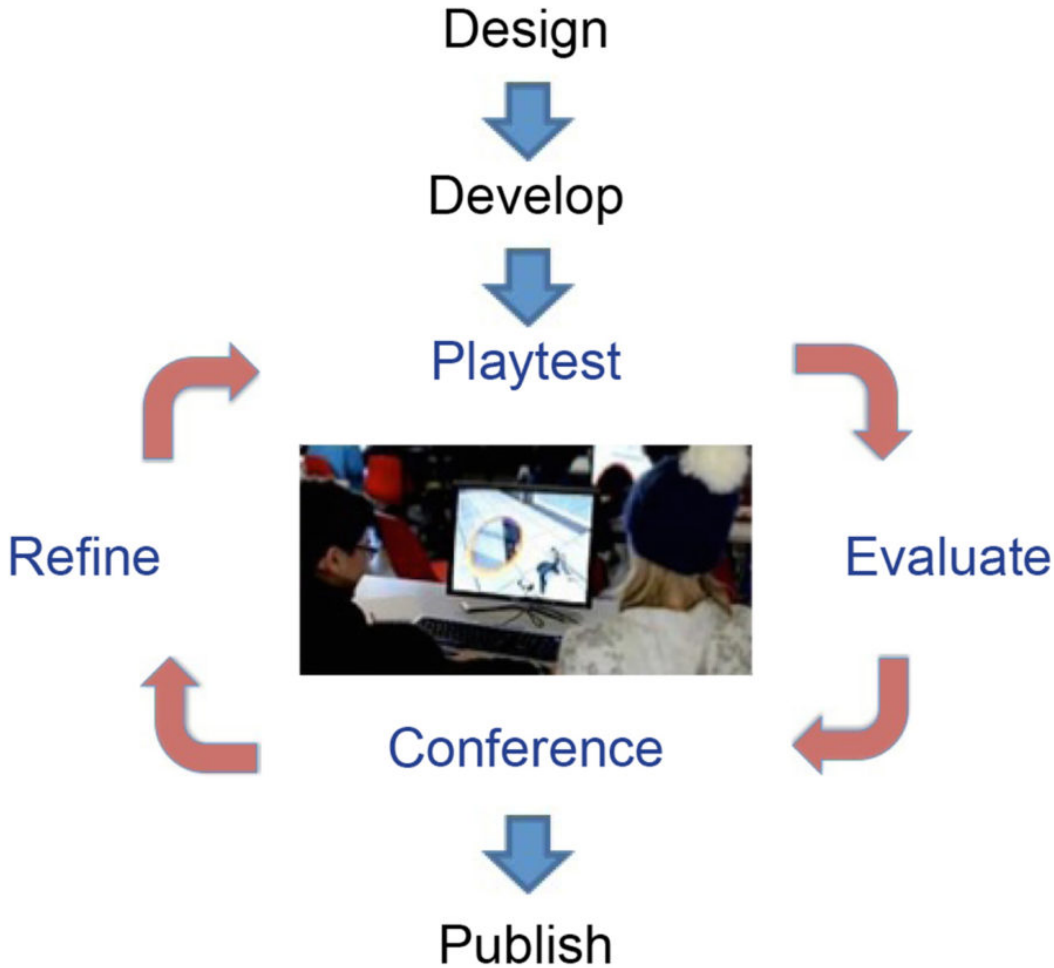

Figure 1. The iterative design process: Engaging in process from conceptualization to finished product.

Iteration is an essential life skill. It involves the process of following an idea through from conception to completion in a systematic and meaningful way. Iterative design puts students in the role of designer as they conceptualize an idea, develop a product based on their idea, recruit feedback in order to improve upon the idea, implement changes based on feedback, and continue cycling through this process until their product is complete (see Figure 1). Iterative design in school is nothing new; writing teachers have been using it for years. The process of writing a paper involves students in brainstorming, developing a draft of their writing, receiving peer and teacher feedback, and improving on the draft until a final paper has been completed. While this process exists in some areas of education, the process in terms of design thinking can be implemented in other areas, most certainly game design and development. Through the iterative design process, students receive feedback and observe others playing their games. This encourages reflection on the distinction between player and designer in an authentic manner.

Using an iterative process in the teaching of game design and development provides an opportunity for students to experience design thinking, problem solving, computational thinking, and many other skills in context. Additionally, it enables the teaching of a number of valuable soft skills and 21st-century proficiencies including collaboration, communication, empathy, and time management.

Collaboration is a worthwhile life skill. Most situations our students will find themselves in will require collaboration and communication skills. These skills are necessary in social settings as well as in the workplace. In the iterative process, students must employ these skills in order to provide worthwhile feedback and in turn students learn to accept feedback.

Middle-school students struggle with the idea of creating for an audience. They often see things through their personal filters and assume everyone else would as well. Game development taps into this idea in a powerful way. Essentially their peers are their customers who will be playing their games. I will touch on this further with concrete examples later, but in a nutshell, students are often completely surprised to see that someone else plays their game differently from how they assumed it would be played. This is incredibly valuable information as it indicates to the developer that his or her audience may not see something the way it was initially conceived.

Time management is another humdinger for middle-school students. There is often a huge disconnect between the designer's initial vision and what is realistic. Students must learn to manage their expectations in order to be realistic in terms of time management. Developing a game takes a lot of time and long-term projects that appear somewhat open-ended provide a challenge for students. In terms of the iterative process, this fact comes into play as students must meet checkpoints at which their games will be tested to help guide the process. Often, students lose track of time in fixating on certain aspects of the project and do not feel prepared to share their games at these checkpoints. This can thwart the development process. This situation provides for a great learning process as my students are quick to say that they are not finished with their games when it comes time for one of the peer-review cycles. They quickly learn that they need to share their work throughout the process in order to receive feedback that will help shape further development. This also provides a valuable opportunity for self-reflection as students see the progress of their peers and consider where they are in the process.

To put these ideas in context I will take you through several projects in my class and provide the general structure for the iterative design loop.

GAMESTAR MECHANIC: SEVENTH-GRADE CYCLE PROJECT

My seventh-grade class is a six-week exploratory course in Game Design and Digital Storytelling. The main tool we use is *Gamestar Mechanic* (see Figure 2), published by E-Line Media.[1]

1. http://www.gamestarmechanic.com

Figure 2. Screen shot of the Gamestar Mechanic logo.

After learning the basics of designing a game with this tool, students create a comprehensive design document to develop the story line, describe the characters, brainstorm the look and feel of the different levels, and consider the scoring mechanisms and winning/losing scenario. Generally speaking, as the instructor I provide feedback on their documents and in the spirit of iteration guide the students as to what may be missing and provide them with questions for further consideration. Students are expected to improve upon the document until it is considered a solid road map for development of the game.

Next, students develop the first two levels of their game based on their design document. This involves incorporation of the story line throughout the two levels as well as the general game mechanics. Upon completing this part of the game they are ready for the first round of peer testing and feedback. For this part, they must publish their game to the *Gamestar Mechanic* online community,[2] and students each play a minimum of three games created by their peers. *Gamestar Mechanic* has a built-in mechanism for feedback that has other community members comment on the games based on gameplay, visuals, story line, and general game notes. In addition, community members can provide a rating and evaluate the level of difficulty. This format works well for guiding the feedback and it is moderated by the *Gamestar Mechanic* online community in order to maintain a safe and supportive online community (see Figure 3).

2. http://www.gamestarmechanic.com

Figure 3. Student evaluation in Gamestar Mechanic online community (game alley).

After receiving feedback, students make notes of suggestions for changes and get back to developing their game. At this point, they adapt their existing levels to account for the feedback and then continue to develop the next levels of their game based on having a better understanding of the user experience. This leads to the next phase of testing, in which students evaluate the same games they evaluated previously in order to provide updated feedback. This is important as the testers should remain consistent to help shape the development of the game and provide iterative feedback to continue to support their peers.

Figure 4. Developer gaining valuable insight by observing students playtesting his game.

In addition to the written feedback provided, students conference with their peers so that any questions can be answered and ideas clarified to ensure that the communication regarding the feedback is effective. Furthermore, on several occasions, students engage in watching a peer play their game (see Figure 4). This part is always interesting as the developer is instructed to do nothing but watch as his or her peer plays the game. As the teacher, I explain that the developer cannot provide any guidance or discuss the game at this phase with the tester. This is a challenge for middle-school children and pretty amazing revelations result. Students quickly learn that the player may not play the game as the developer expected. The game developer often notices that something that might appear obvious to him or her is anything but obvious to the player. As a result, students gain understanding of someone else's point of view and can adjust their games based on the player experience (see Figure 5). I find myself constantly repeating the importance of simply observing another person playing your game and not providing feedback. Students squirm as they desperately want to guide their peers in how they "should" complete the level. The same applies when I am playing a game created by one of my students. There is tremendous value in observing someone testing your game.

Figure 5. The peer evaluation and feedback process.

When the games are completed, we celebrate our accomplishments and devote a class period to playing and evaluating the final versions of the games. Student evaluations account for a good part of the grade as the students complete a rubric for each game they play in this final phase.

GAMEMAKER: STUDIO: EIGHTH-GRADE GAME DESIGN AND DEVELOPMENT ELECTIVE

Figure 6. Screen shot of the GameMaker: Studio logo.

In my eighth-grade course the same process is put in place during all major projects. *GameMaker: Studio* (see Figure 6) is one of the tools we use.[3] It involves students in a deeper exploration of game development as they are creating their games from scratch and all objects must be programmed to respond to events within their games. Once again, students begin with the creation of a comprehensive design document before they start developing their games. Once again, students have checkpoints at which they stop working on their games to engage in peer testing and feedback. Suggestions are taken into account during this stage of development and the iterative design process continues until the games are complete. Games created in *GameMaker* are more open-ended than in *Gamestar Mechanic* and as a result there are even more opportunities for disparity between the idea of what makes sense to the developer compared to the end user. Another factor that comes into play

3. http://www.yoyogames.com

with the *GameMaker* unit relates to time management, as it is easy for students to get caught up in certain aspects of development, including graphic design, game mechanics, and so forth. This makes the checkpoints for peer evaluation even more important as they serve as good points for assessment of progress. Game development can be tricky and oftentimes students spend days troubleshooting an issue. Furthermore, during testing, peers often find bugs and glitches that the designer was not aware of (see Figure 7). This is very valuable in terms of the iterative process.

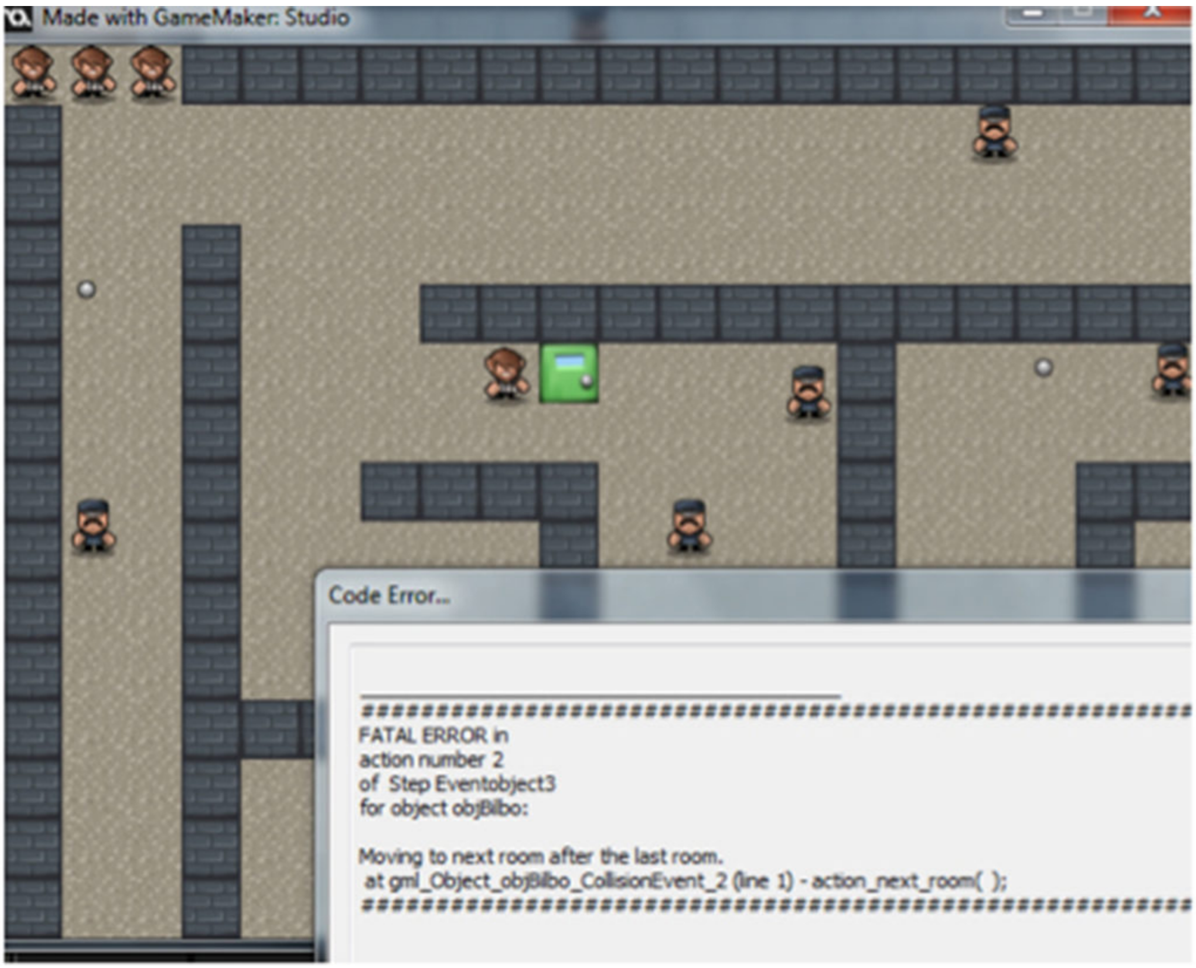

Figure 7. Example of an error discovered during game testing.

In addition to peer testing, students submit their games in progress for my feedback and guidance as the instructor. This begins another iterative feedback loop, as I will often return the project with suggestions and await the next submission to provide further guidance. This takes place through an online submission process and through conferencing with students and student teams. Once again, it is important for them to interact with testers to ensure that they understand the feedback provided and can engage in a dialogue. This contributes to the constructivist learning environment as students learn from their peers as well as from the instructor.

Figure 8. Screen shot of the Portal 2 logo.

One of the eighth-grade units involves creating levels for the commercially popular game *Portal 2* (see Figure 8) using the built-in level editor. *Portal 2* is a puzzle game. The player is equipped with a portal gun that shoots blue and orange portals. Players can shoot portals on "portalable" surfaces. When the player walks through one portal, he or she reemerges through the other portal. This provides an interesting paradox in terms of the time/space continuum. (See Cameron Pittman (this volume) for more about using *Portal 2*'s Puzzle Maker.) The idea of placement of portalable surfaces and other devices within the level is what leads to the challenge of the puzzle. For this activity, students begin with a sketch of a level based on their vision (see Figure 9).

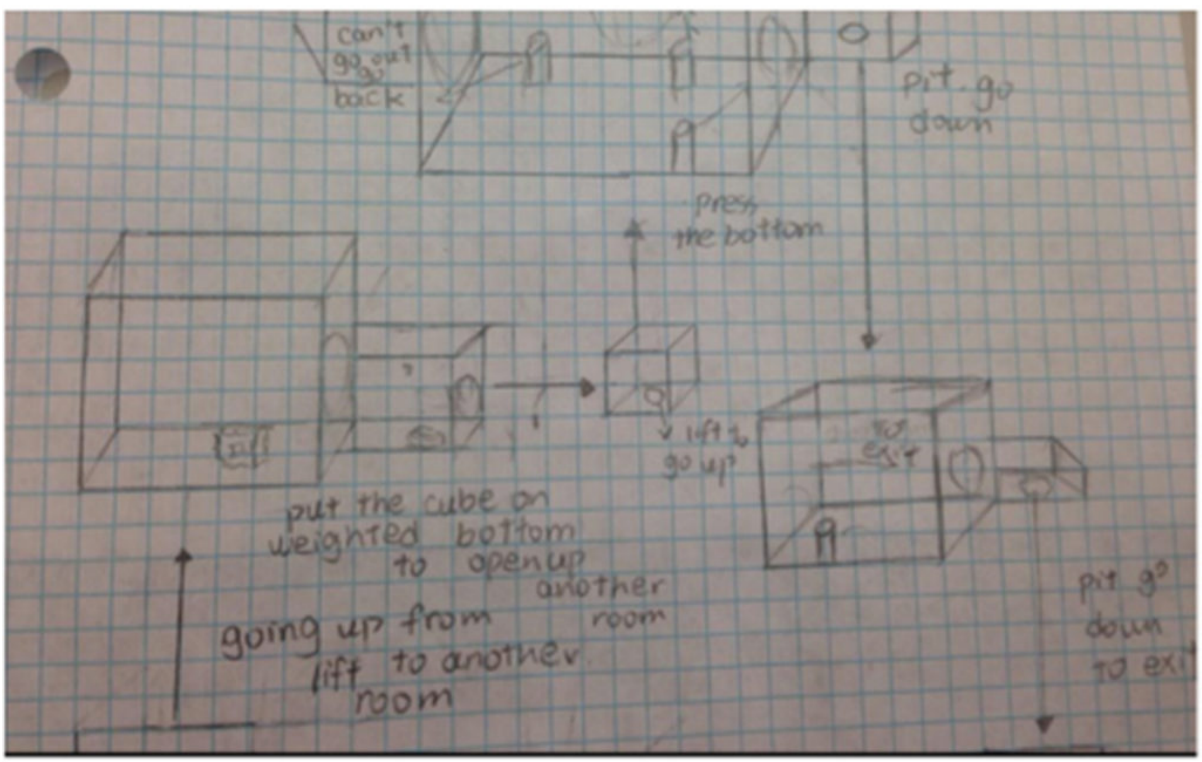

Figure 9. Student sketch of envisioned level in Portal 2.

Next, the designer builds the level in the level editor. The Puzzle Maker is very intuitive and easy to use. The challenge for the designer, however, is to create a level that is appropriately challenging. Of all the projects, the *Portal 2* levels really emphasize the idea of the disparity between what the designer believes makes sense or is challenging compared to the player's perception.

Here's Valve Corporation (maker of *Portal 2*) on playtesting:

> *Sometimes playtesting unearths simple problems, such as a player discovering a solution the [development] team didn't expect. ... Ultimately, it's the playtesters' perception and enjoyment that dictates what goes into a final map. ... (http://www.gameinformer.com, March 17, 2010)*

This lends beautifully to the peer-evaluation process. It is quite entertaining to watch students observe as a peer plays their game. Students are astonished at the approach the player may take to their puzzle. Sometimes this results in the player's solving the puzzle in a matter of seconds by exploiting something the designer overlooked. On the flip side, puzzles often are much too complicated despite the designer's believing otherwise. The designer truly learns to view his or her work through the eyes of another person (see Figure 10). This provides great insight into the process of designing for an audience.

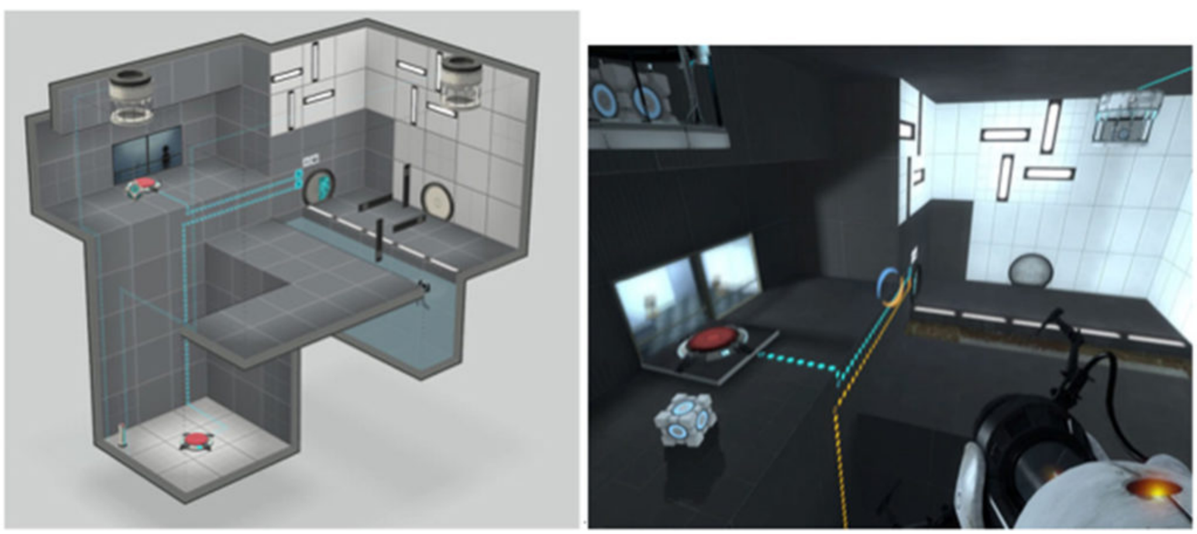

Figure 10. The images show a side-by-side view of a project during the development phase in the Puzzle Maker (left) and the 3D-rendered playable level (right).

During the *Portal 2* unit I really emphasize the importance of collaboration and students engage in this process through a number of iterations. Once they start working with a partner, they are considered to be a design team through the process. Each partner participates in two formal (written) evaluations. You can see the evaluation form included in the lesson plan below (see the Appendix). Beyond the formal evaluations, conferencing and continued testing continue until both partners are happy with the final iteration and believe the level is ready to be published to the Steam workshop for the rest of the world. Upon completion of each level, students reflect on the experience. Following are a number of quotes from students related to the peer-review process:

> *We both benifited from the evaluator. Jack helped make my level much better. And I did the smae for him. I feel as though the peer evaluation was a great idea. It helped a lot to hear someones else's opinion.*

I have created a fun solution using tractor beams and a timed light bridge. When my peer played it he was able to complete it similarly to my expectations. My peer doesn't like the concept of muiltiple tractor beams in the level, but he was able to figure out what he needed to do, he thought it was not the best level because of the tractor beams though. Here a picture of the level [see Figure 11].

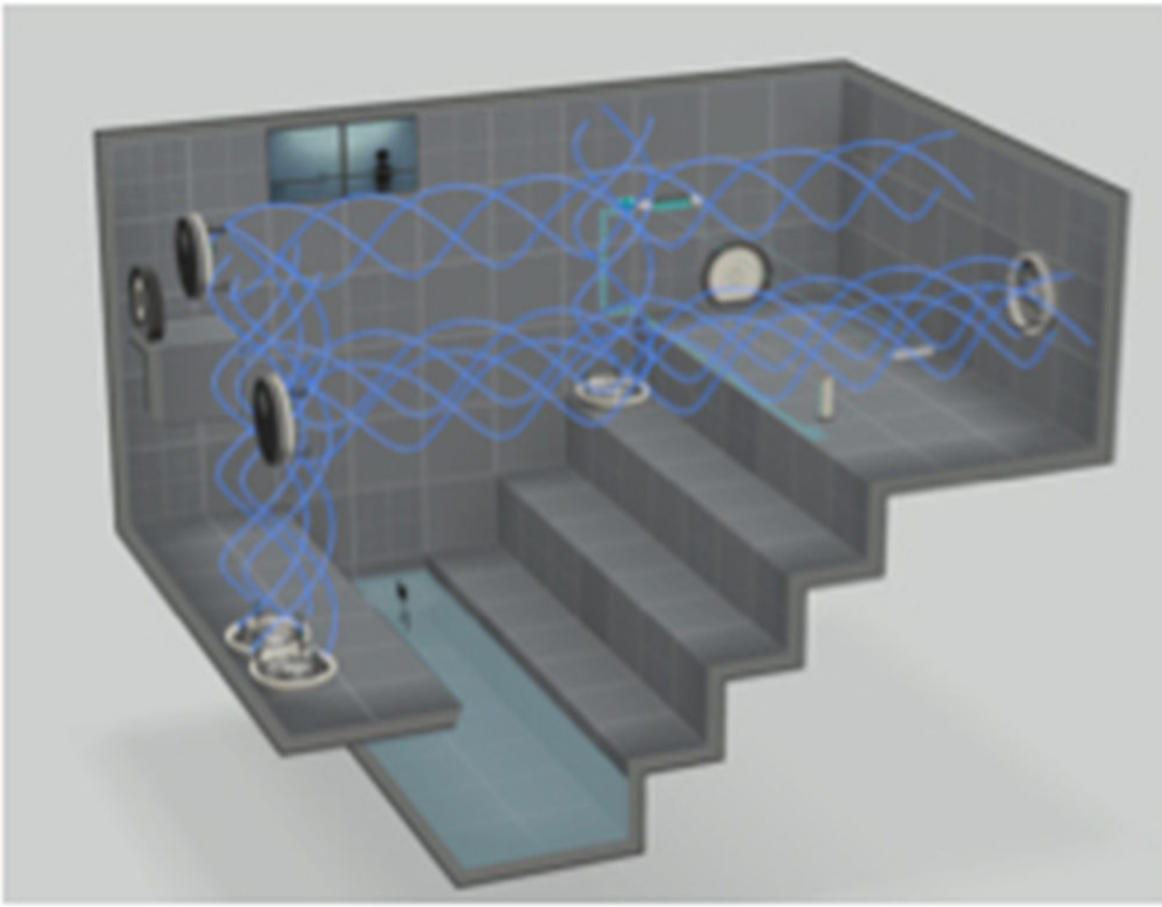

Figure 11. Student's level with multiple tractor beams.

I had the challenge of transporting the character across the gap. Based on my peer player, it was difficult and fun. Will played it and he did solve it the way it was supposed to be. I recieved the feedback to make it a litttle more difficult.

I tried jump up a block but it was too high. But I was able to create a solution that also presents a fun challenge to the players. When I peer played my level they did solve it the way I anticipated. My peer said that my game was great and creative.

She told me that I should add more time for the flip panel, so I did and then she played it again and it worked.

I learned that there are many different ways to solve a problem, not just one.

I learned that for a person to learn from a game, the game can't be too easy or too hard.

I learned how to find the most efficient solution (to a puzzle).~Alex

IN CLOSING …

If it hasn't been abundantly clear, I am a huge fan of the iterative design process and believe that it lends itself to tremendous learning opportunities for students. In a time when we are talking about 21st-century skills, the importance of collaboration, and ultimately preparing students for the real world, the iterative design process gets at these and many more skills in an authentic and engaging manner.

APPENDIX

Iterative Game Design: Creating *Portal 2* Puzzle Levels

Figure 12. Screen shot from part of Portal 2 logo.

Subject: Game Design

Title: Iterative Game Design: Creating *Portal 2* Levels (see Figure 12)

Author: Steve Isaacs

School/Organization, City and State/Province

Steven Isaacs (sisaacs@bernardsboe.com, @mr_isaacs)

William Annin Middle School, Basking Ridge, NJ

Grade Level: 8

NETS Standards

1. **Creativity and Innovation**

Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. Students:

1. apply existing knowledge to generate new ideas, products, or processes.
2. use models and simulations to explore complex systems and issues.
3. **Communication and Collaboration**

Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others. Students:

1. contribute to project teams to produce original works or solve problems.
2. **Research and Information Fluency**

Students apply digital tools to gather, evaluate, and use information. Students:

1. plan strategies to guide inquiry.
2. **Critical Thinking, Problem Solving, and Decision Making**

Students use critical-thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. Students:

1. identify and define authentic problems and significant questions for investigations.
2. plan and manage activities to develop a solution or complete a project.
3. use multiple processes and diverse perspectives to explore alternative solutions.
4. **Technology Operations and Concepts**

Students demonstrate a sound understanding of technology concepts, systems, and operations. Students:

1. understand and use technology systems.
2. troubleshoot systems and applications.
3. transfer current knowledge to learning of new technologies.

Time Needed

Ten 40-minute periods

Summary

The *Portal 2* level editor provides a sandbox environment for students to build their own *Portal 2* levels. Students will learn how the puzzle elements work by playing through select test chambers as the provided test chambers demonstrate a number of the Puzzle Maker tools in isolation. Students will design, create, troubleshoot, and improve upon their own puzzle levels as they engage in the process of iterative design by collaborating through a number of phases of peer evaluation and feedback.

Objectives

- The learner will be able to play and reflect on levels featuring Puzzle Maker tools.
- The learner will be able to build game levels by using a variety of elements provided with the Puzzle Maker level designer tool.
- The learner will engage in the iterative design process through several stages of the peer-evaluation feedback loop.
- The learner will engage in critical thinking, problem solving, and troubleshooting through play as well as the design process.

Vocabulary

Iterative design, troubleshooting, feedback, level editor

Student Prerequisites

None

Teacher Materials Needed

Portal 2 accounts for Steam, accompanying lesson plan

Student Materials Needed

Portal 2 and Puzzle Maker software, test chambers*

*available with Steam for Schools version of Puzzle Maker

(The *Portal 2* Education Version and Steam for Schools are no longer supported.)

Lesson Plan

Objectives:

- The learner will be able to play and reflect on levels featuring Puzzle Maker tools.
- The learner will be able to build game levels by using a variety of elements provided with the Puzzle Maker level designer tool.

- The learner will engage in the iterative design process through several stages of the peer-evaluation feedback loop.
- The learner will engage in critical thinking, problem solving, and troubleshooting through play as well as the design process.

Activities:

Students will be paired up with a "buddy" for purposes of collaboration at checkpoints throughout the project. The buddy will test created chambers, provide feedback, and help with the iterative process. Later in the process, the two partners can work together to create levels.

Before the following activities, the teacher will present the Puzzle Maker and demonstrate the basics of using it, including:

- changing the dimensions of the chamber (height, width, depth);
- adding ledges, hallways, pits, and so forth;
- adding tools from the Puzzle Maker tool bar;
- testing levels.

Days 1-3: PLAY *Portal 2* single player to gain an understanding of:

- *Portal 2* gameplay,
- Game mechanics,
- Puzzles,
- Items.

These levels will help get students oriented with the Puzzle Maker and the use of buttons (see Figures 13 and 14).

Activity #1: Buttons (Days 4-6)

Figure 13. Screen shot of the Portal 2: Education Version Weighted Button example. (The Portal 2 Education Version and Steam for Schools are no longer supported.)

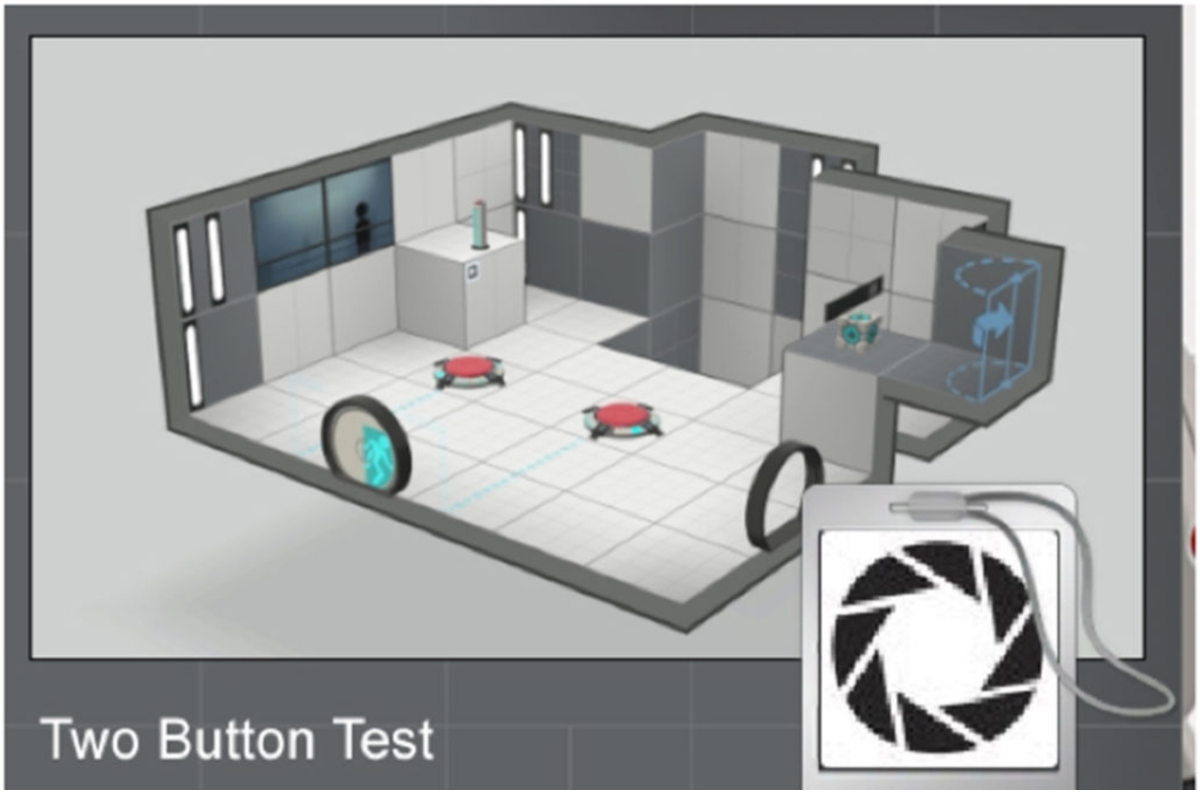

Figure 14. Screen shot of the Portal 2: Education Version Two Button Test example.

1. Students will play through the weighted button intro and the two button test level to complete the puzzles.
2. After completing the puzzles, students will create a test chamber with only the following tools:

    1. pedestal button(s),
    2. button(s),
    3. weighted cube(s).

Student (level designer) can modify the shape of the room, location of entrance and exit, and so forth to create a unique and challenging puzzle. Level designer should test his or her own level and make adjustments as needed.

1. Peer buddy should play the level and complete a level-evaluation form (see below) reflecting on the level playability, functionality, aesthetic appearance, and challenge. Students will conference to elaborate on ideas in evaluation form.
2. Level designer will edit level to account for feedback.
3. Level designer will test level and make adjustments as needed.
4. Peer buddy will play the level and complete a second evaluation form. Buddies will conference once again to plan for final edits.
5. Level designer will make final edits to account for second round of feedback (additional feedback can be recruited from other students as well).
6. Level designer and peer evaluator will test level and collaborate to make final adjustments.

Activity #2: Aerial Faith Plates … and Beyond (Days 7-10)

These levels will guide students through using additional elements—the aerial faith plates (see Figures 15 and 16) and optionally the various types of "gel" (propulsion and expulsion gel; see Figures 17 and 18).

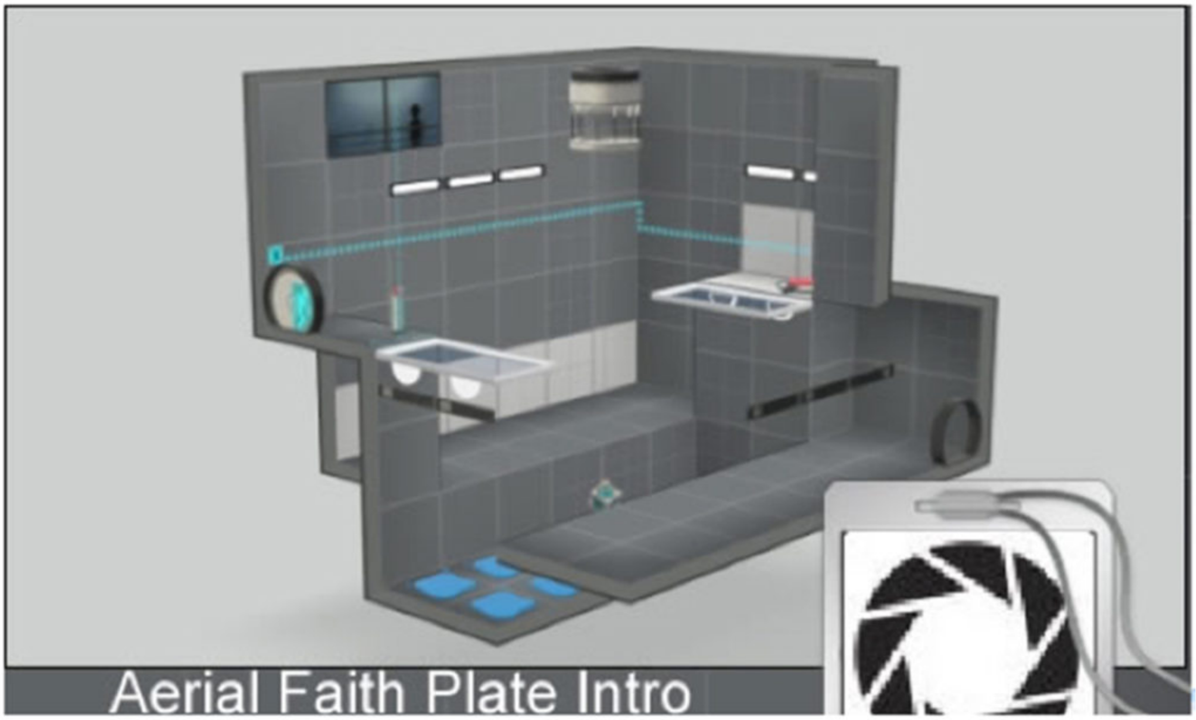

Figure 15. Screen shot of the Portal 2: Education Version Faith Plate Intro example.

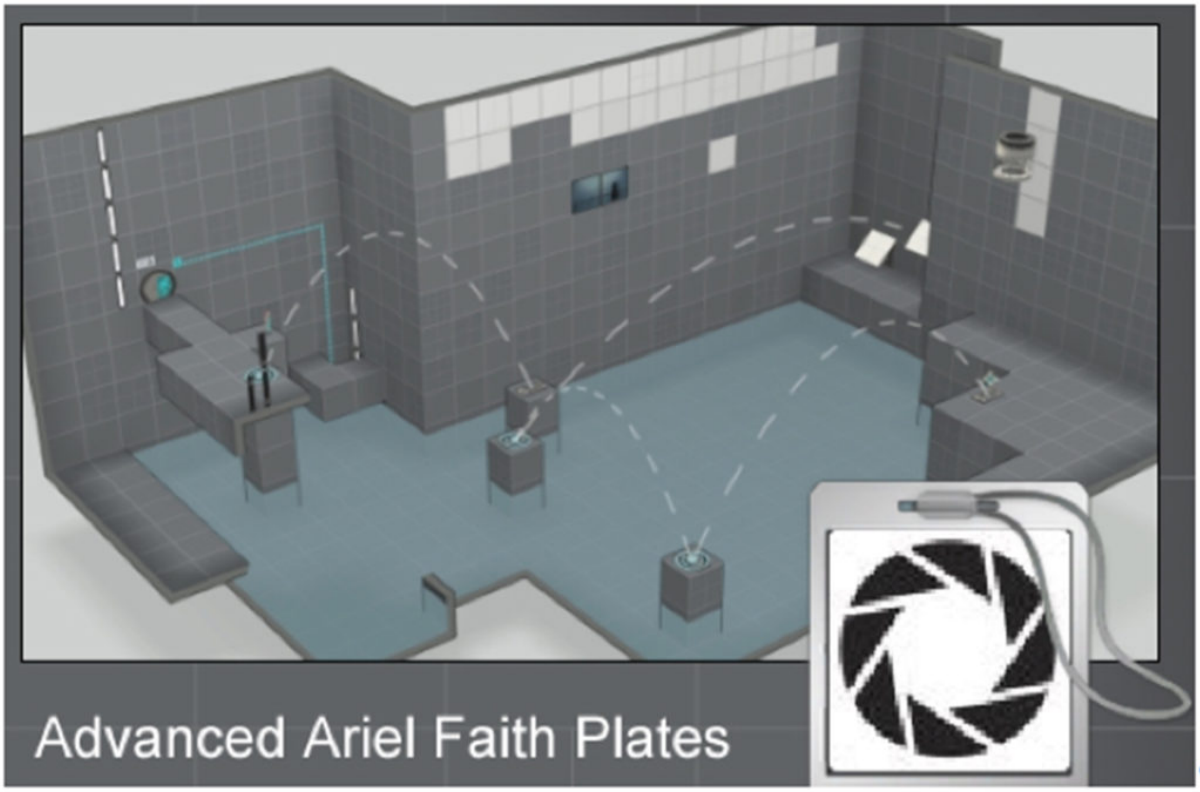

Figure 16. Screen shot of the Portal 2: Education Version Ariel Faith Plate example.

1. Students will play through the aerial faith plate and advanced aerial faith plate levels in order to complete the puzzles and familiarize themselves with how aerial faith plates are used in *Portal 2* puzzles.
2. After completing the puzzles, students will create a test chamber with at least the following elements:

    1. pedestal button,
    2. cube button,
    3. cube,
    4. aerial faith plate(s),
    5. optional: laser, light bridge, propulsion gel,* expulsion gel.*

Student (level designer) can modify the shape of the room, location of entrance and exit, and so forth to create a unique and challenging puzzle. This can include tunnels and so on to provide an adventure component to the puzzles.

1. Level designer should test his or her own level and make adjustments as needed.
2. Peer buddy should play the level and complete a level-evaluation form (see below) reflecting on the level playability, functionality, aesthetic appearance, and challenge. Students will conference to elaborate on ideas in evaluation form.
3. Level designer will edit level to account for feedback.
4. Level designer will test level and make adjustments as needed.

5. Peer buddy will play the level and complete a second evaluation form. Buddies will conference once again to plan for final edits.
6. Level designer will make final edits to account for second round of feedback (additional feedback can be recruited from other students as well).
7. Level designer and peer evaluator will test level and collaborate to make final adjustments.

*If students choose to include “gels” they need to complete the propulsion and expulsion gel levels in the community test chambers.

Note: Students may work with a partner in creating this level if they choose. If so, each member of the group will work with a different peer buddy. Thus, students will receive more peer feedback overall.

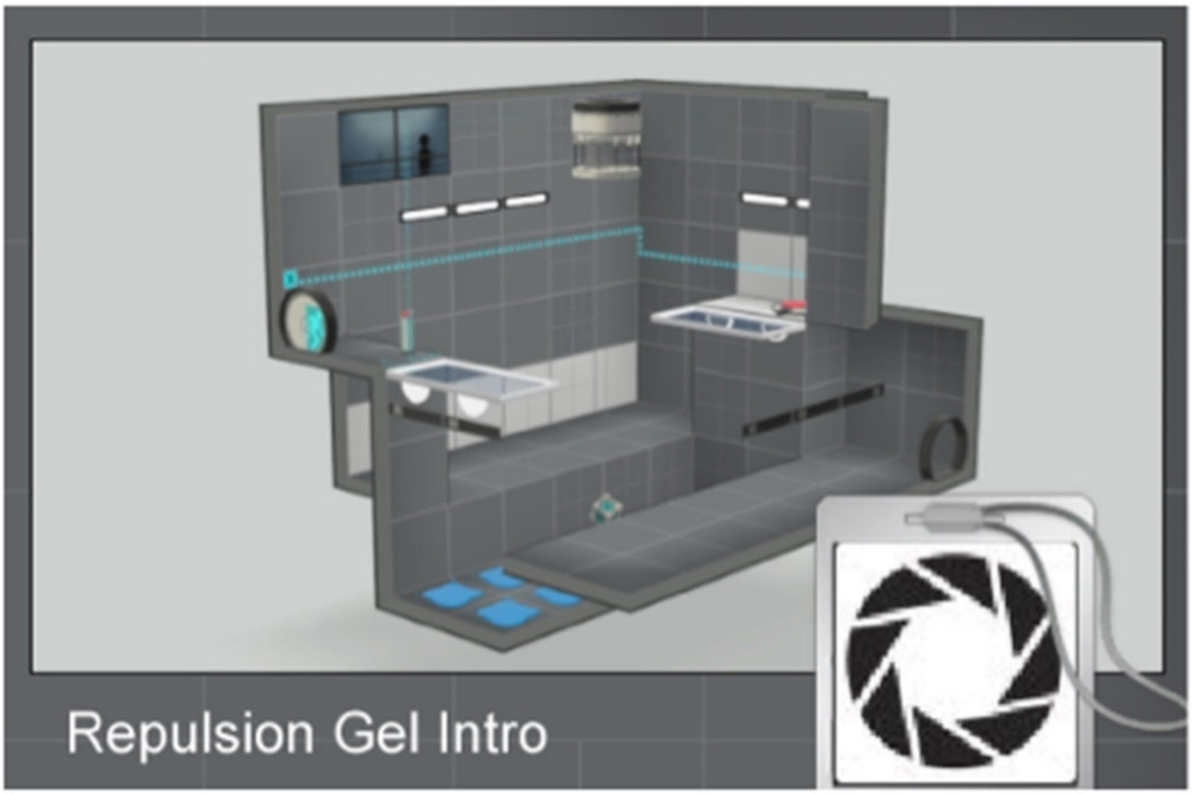

Figure 17. Screen shot of the Portal 2: Education Version Repulsion Gel example.

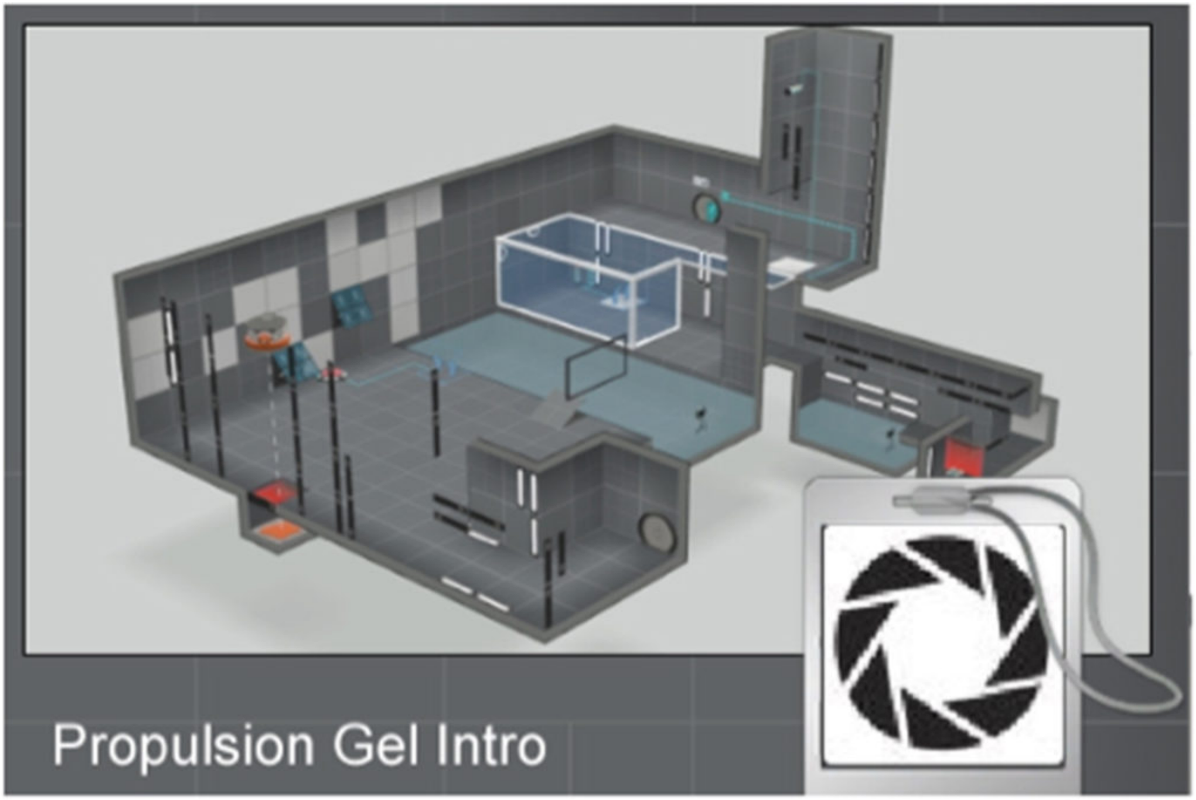

Figure 18. Screen shot of the Portal 2: Education Version Propulsion Gel example.

Evaluation Form

Name of peer evaluator:	
Name of designer:	
Grading:	
peer eval	____/10
partner game	____/10
designer game	____/10
Intended level of difficulty (completed by designer): 1-5	
Challenge level (completed by reviewer): 1-5	

Category	Comments
General puzzle idea: Does the puzzle seem interesting? Is it clear what the player is expected to do?	
Aesthetics: Does the level look good? Are the items well placed within the level? Is the level design interesting or too bland?	
Gameplay/mechanics: Does the level play well? Is the level of challenge appropriate? Do you want to keep playing to overcome challenges and beat the level? Are there an appropriate number of elements for the game?	
Overall comments: How could the game be improved? What suggestions do you have to assist the game designer in making the game even better? Please make detailed suggestions and be specific.	

2d eval – refer back to original game to indicate which changes were noticeable/helpful (or not)

Challenge level (completed by reviewer): 1 2 3 4 5

Category	Comments
General puzzle idea: Does the puzzle seem interesting? Is it clear what the player is expected to do? Compare/contrast with eval #1	
Aesthetics: Does the level look good? Are the items well placed within the level? Is the level design interesting? Compare/contrast w/ eval #1	
Gameplay/mechanics: Does the level play well? Is the level of challenge appropriate? Do you want to keep playing to overcome challenges and beat the level? Compare/contrast with eval #1	
Overall comments: How could the game be improved? Cite examples where improvement has been made. What suggestions do you have to assist the game designer in making the game even better? Please make detailed suggestions and be specific. Compare/contrast with eval #1	

Portal 2 Puzzle Maker/Iterative Design Rubric

Evaluation criteria: Students are evaluated on their peer-evaluation form (feedback during two levels of iteration) as well as their game and their partner's game (as they are instrumental in collaborating on their game).

Criteria	Advanced Proficient	Proficient	Needs Work	Score (1-10)
Peer Evaluation	Comments to peer are specific, insightful, and helpful; 2d evaluation refers directly to suggestions from 1st evaluation and ability to improve game accordingly.	Comments provide some direction, but could be more specific and guide designer.	Comments are simply one- or two-word comments providing praise or feedback, but not providing specific direction.	
Designer Game	Game is engaging and encourages replayability. Challenge level is appropriate and matches designer intention.	Game is fun but could be a little more challenging or might include aspects that are unclear for the player.	Game is difficult to understand or far too easy based on the intended challenge. Game may be unwinnable.	
Peer Game	Game is engaging and encourages replayability. Challenge level is appropriate and matches designer intention.	Game is fun but could be a little more challenging or might include aspects that are unclear for the player.	Game is difficult to understand or far too easy based on the intended challenge. Game may be unwinnable.	
Total				

CHAPTER 17.

TEACHERS AS HACKERS: A NEW APPROACH TO TEACHER PROFESSIONAL DEVELOPMENT USING A HACKATHON MODEL

BY KIP GLAZER AND DAVID NG

A TRAGIC AND IRONIC INTRODUCTION

This is you: a teacher keen to hone your craft, to better your skills, and to provide enlightened instruction to the students in your charge. And because you care deeply about this, you take full advantage of the fact that your school district encourages you to attend professional-development (PD) workshops. You do this because you know that these are meant to be guided and dedicated spaces for you to reflect on your prior knowledge and experience and also represent a great opportunity to learn about new innovative practices. However, you show up to a workshop and can't get past the nagging feeling that your time could have been better spent. And then it hits you: You are experiencing a living embodiment of *tragic irony*. Part of you wants to scream, but another part realizes that this is sadly par for course.

In fact, you would not be at all surprised that if you looked up the term *tragic irony,* you would be met with a picture of yourself (a teacher), slightly hunched in that familiar "I could be listening/I could be daydreaming" pose, while someone else (an expert) is lecturing at length, remarkably on the dangers of lecturing at length. Furthermore, it would also not surprise you to see that same sad picture under the term *teacher professional development* and tellingly under *teachers as students.*

The above, of course, is an exaggeration of sorts. We are certainly not here to pick on our education colleagues. There are obviously many fine examples of great PD experiences, ones that are highly innovative, interactive, and contextualized.[1] Despite this, the above picture still sounds eerily too familiar, and nowhere is this made more clear than in the long-standing, ever-present, and heated debates over the effectiveness of most professional-development opportunities.

None are so prone to dullness as those activities that follow the *apprenticeship of observation* model, a

1. Such a phenomenon has been well documented by various researchers. For more information, read Borko, H. (2004). Professional development and teacher learning: Mapping the terrain. Educational Researcher, 33(8), 3-15; or Penuel, W. R., Fishman, B. J., Yamaguchi, R., & Gallagher, L. P. (2007). What makes professional development effective? Strategies that foster curriculum implementation. American Educational Research Journal, 44(4), 921-958.

term coined by Dan C. Lortie (1975) in his book *Schoolteacher: A Sociological Study*.[2] This is arguably one of the most common forms of teacher training and is more or less a fancy way of saying that a teacher can learn his or her craft by listening to or watching someone else *do stuff*, usually with the acknowledgement that this someone else is in the know. Or to put it another way, these are PD experiences in which an "opinion" or "demonstration" on best practices is shown—often by a more senior educator. Unfortunately, this is usually less than inspirational; there are few masterful, enlightening Yoda-like experiences here. In fact, Lortie laments that a teacher's worldview is summarily informed by an average of 13,000 hours of such schooling experiences, and therefore perpetuating a stagnant norm—so is it any wonder that a teacher may be heavily influenced by the time he or she stands in front of students? If anything, one can intuit that such practices may inadvertently prime a teacher to become a formidable expert at lecturing, or worse—a formidable expert at being dull. Basically, the apprenticeship model of PD creates situations where teachers are more or less forced to be "end users" as opposed to experiences that encourage them to be "creators." And it's not exactly rocket science to say that this is not ideal, a premise that has been explored in depth by others, including Henry Jenkins's work on participatory culture and Jim Gee's conceptualization of teacher roles in terms of being learning designers versus instructional executors.[3] In general, being stuck in this "end user" category inadvertently takes away chances to encourage iteration (it's OK if it's not perfect right off the bat); downplays the likelihood of evidence-based assessment (Science, it works!); and perhaps most important, represents a lost opportunity to strengthen teacher community dynamics (in which the collected expertise in the room will always dwarf the expertise of the person at the front of the room). Which is why we return to our friend, Tragic Irony, made all the more troubling when one realizes that this apprenticeship model possibly leads to a circular and self-fulfilling prophecy of apprenticeship modeling our poor students to death.

SO HOW ABOUT THIS THING CALLED *INSTRUCTIONAL DESIGN?*

One way to address this problem is to argue that the best PD experiences involve something known as *instructional design*. Here, we use the term not as that thing that happens when you fret over building your IKEA shelves, but more in reference to the formal academic field, one that happens to examine the creation of "instructional experiences which make the acquisition of knowledge and skill more efficient, effective, and appealing" (pp. 2-3).[4] Instructional design is commonly seen in educational activities aimed at students acquiring new content in various professional communities, and it mostly works well because when done well, it benefits from being an academic field that emphasizes evidence-based assessment such as standardized tests. This, unsurprisingly, can lead to observable improvement of various teaching practices, which in the best circumstances would be largely driven by the teaching practitioners themselves. Unfortunately, it's not all rainbows and ponies. The field does appear to place an emphasis on content acquisition as opposed to the more challenging objectives concerning the nurturing of learning identities and processes. Furthermore, like many academic endeavors, the act of incorporating potential instructional-design practices can be logistically impractical (both in terms of resources and timing) and, frankly, mentally taxing because

2. Lortie, D. C. (1975). Schoolteacher: A sociological study. Chicago, IL: University of Chicago Press.

3. Jenkins, H., Puroshotma, R., Clinton, K., Weigel, M., & Robison, A. J. (2005). Confronting the challenges of participatory culture: Media education for the 21st century. Cambridge, MA: The MIT Press; Gee, J. P. (2007). What video games have to teach us about learning and literacy. (Revised and updated ed.) New York, NY: Palgrave Macmillan.

4. Merrill, M. D., Drake, L., Lacy, M. J., Pratt, J., & ID2 Research Group. (1996). Reclaiming instructional design. Educational Technology, 36(5), 5-7.

of the nature of pursuing and adhering to the often complex theoretical elements in this process. Maybe just as important, taking this overly academic route might miss out on the teachers' own valuable, practical, and classroom contextualized expertise.

And herein lies the point: We believe that teachers are more likely to embrace a PD experience if it is something in which they are actively asked to provide their own expertise. This way, the experience is augmented not only because it is interactive, but also because the teachers inadvertently guide the process so that it is *relevant in their own classrooms*. Which is to say that what we really need are PD experiences that not only teach them useful things (for instance, some of the evidence-based principles behind instructional design), but that also actively involve teachers in the creation and assessment of new and usable practices. In other words, teachers should embrace their professional development as opportunities to "do *stuff"* themselves. In a way, teachers get to be in charge of their own destinies, which already sounds oodles more epic than your average PD workshop.[5]

Because everyone likes lists, let's make a list in which we consider all of the above. We believe that an ideal PD experience would have the following goals:

1. Programming that results in the achievable outcome of a "tangible something" (a lesson plan version 1, for instance) being created, shared, collected, and (this is important) with room for further iteration and possible assessment.
2. Content that is primarily teacher driven, if not critically dependent on teacher input, both in terms of their own pedagogical expertise and with the goal that the "tangible something" works well within the nuances of their own specific classrooms.
3. Provision of some instruction and guidance whereby elements of formal instructional-design expertise can be provided and shared with the teacher participants. In other words, someone (perhaps a less wrinkly Yoda type) should have devised a clever framework that guides the creation process so as to maximize the awesomeness of those "tangible somethings" being produced.

And taken together. … Guess what, folks? This sounds an awful lot like a "hackathon."

TOO GOOD TO BE TRUE? SWEATPANTS AND CAFFEINE AT A "PROFESSIONAL" EVENT

So what exactly are "hackathons?"[6] Well, they are a phenomenon that typically describes an event at which a group of experts converge and collaborate intensively. Furthermore, these events are explicitly goal oriented in that there is a "tangible something" to deliver. Also (and this is where it gets fun), hackathons largely thrive on doing all of this in an insanely short time, with lots of juggling of various things and with full realization that you have to make do with limited or no resources. Culturally, this is more about sweatpants and copious amounts of caffeine rather than looking important and taking the expert out for dinner. It's especially common in the technology

5. This isn't a new idea: that learned knowledge in itself is not a useful predictor of success. In fact, this idea has surfaced in many forms, notably in the business and technology sectors. One well-known example comes from Stanford University Business Professors Jeffrey Pfeffer and Robert I. Sutton, authors of The Knowing-Doing Gap: How Smart Companies Turn Knowledge Into Action. In essence, through careful analysis of management practices, they provide evidence that the best way to close the "knowing-doing" gap is to allow people to generate, store, explain, and coach others.

6. Briscoe, G., & Mulligan, C. (2014). Digital innovation: The hackathon phenomenon. London, England: Creative Works London.

sectors, notably in the culture of computer programming, where the term *hack* originated, but these days hackathons are widely used in a variety of forms and involving a diverse range of different disciplines. If you can hack computer software, science, policy, and artistry, why not teaching?

To be fair, we must say that hackathons are not always effective, primarily because it appears that outcomes are greatly dependent on the investment of the participants. However, there have been a number of recent attempts to suggest best practices around the model, all with the hope of teasing out greater chances of success. Regardless of the utility of the end products being created, a number of other benefits are associated with the form that would be of great value to the teacher, especially because they may be perceived of initially as burdens: (a) the significance and value of prototyping (in which failure is not discouraged but presented as a sometimes useful and beneficial step); (b) the inclination for iteration (where progress is open and subject to review and change from *others*, thereby promoting inclusion of outside perspectives); and (c) the hackathon's reliance on intense but usually enjoyable networking as a means to better catalyze community building.

All of this is beneficial because, at its heart, a hackathon requires participants to remain flexible and open to the issues and problems that arise while seeking the best outcome and answers. Success is achieved when all participants collaborate effectively to create a just-in-time solution to the problems by leveraging all accessible resources (intellectual and physical). Indeed, structuring a teacher PD as a hackathon will likely require teachers to interact with their colleagues in unfamiliar and potentially uncomfortable ways. We think that it's not an accident that these last three grand-sounding sentences happen to mirror the general challenges associated with any classroom setting. And we think that a hackathon might be just the thing to produce that lovely feeling of intellectual excitement associated with being challenged, which in turn might lead to an innovative mind-set.

Overall, we believe that the hackathon model has good potential to invigorate many possible teacher professional-development opportunities and in many different subjects. However, given that this publication focuses on game-based learning, the remainder of this chapter will describe a case study of PD via a hackathon model and specifically one that aimed for teachers to include more game-based learning in their curricula. We think that a hackathon model is particularly well suited for this endeavor. Despite their recent rise in popularity, immersive games—"the kind that lend themselves to deep exploration and participation" (p. 5)—in the classroom are still rare.[7] And even when there is the desire to bring games into the classroom, teachers are often overwhelmed and unsure how to effectively use them for student learning. Overall, we believe game-based learning is a great topic for exploring the merits of hackathons in the teacher professional-development setting as it: (a) focuses teachers on relatively novel content, that is, game-based learning; and (b) revolves around a topic that is naturally familiar and comfortable within hackathon culture, thereby allowing organizers to work from past workshop iterations. From this case study experience, we will provide some preliminary thoughts on the process and argue for its being a viable, if not superior, model for teacher professional development and lesson-plan creation. Furthermore, we'll include a next-step tool kit for further investigation.

Interestingly, it is not lost on us that our adoption of the hackathon model is cheekily analogous to

7. Takeuchi, L. M., & Vaala, S. (2014). Level up learning. A national survey on teaching with digital games. New York, NY: The Joan Ganz Cooney Center at Sesame Workshop.

a "hack" that provides teachers with instructional design and game-based learning practices but in a more practical and faster setting. This may be ironic, but it's certainly not tragic.

HACKATHON—CRACKING THE CODE FOR AUTHENTIC PROFESSIONAL DEVELOPMENT

In July of 2014, a 10-day summer workshop that focused on creating digital games was hosted by Pepperdine University and funded by the National Science Foundation in collaboration with Independence High School, a public high school in Bakersfield, California, with approximately 1,900 students in Grades 9-12.[8] The participants created digital games that could teach mathematics and science. The workshop also provided the participants information on how to use games in schools. The workshop was intended to engage teachers who were unfamiliar with game-based learning in a series of activities and conversations about using games in schools. Unlike our proposed hackathon in which teachers and researchers work together, three researchers, 10 teachers, and 10 students collaborated during the summer workshop. Although it was held for two weeks with three follow-up sessions during the school year, we believe that the knowledge gained from the experience provides a strong foundation for our suggestions to host a two-day hackathon for teachers. Brief descriptions of the workshop have been added when they were deemed useful. We also emphasize that the following steps are meant to be a basic framework for teachers to modify and iterate.

Six Steps for Hosting a Game-Based Hackathon for Teacher Professional Development (HACK-IT)

We envision the workshop to have six steps. It begins with participants' self-reflection inventory, which leads to forming functioning groups. After forming groups, the participants engage in group discussions and lesson-planning activities that incorporate friendly competitions into the process. It concludes with an extension plan beyond the hackathon. Please note that a sample agenda for a two-day hackathon appears in Appendix A.

Step 1: "H" Is for Harness the Resources

> The first step of the 2014 summer workshop to create digital games for mathematics and science education involved students and teachers alike sharing their experiences and knowledge about games, which was done before the participants created their own digital games. From this, it became clear that the students had much more game-creation knowledge than did the teachers. As a result, teachers soon began to rely on students to provide additional technical support. During a post-workshop debrief, one student reflected, "The best part of about this is that I got to see myself as my teachers' equal in some things. I knew stuff that some of my teachers didn't know. I liked that I could help my teachers."

In this digitally saturated world, many conventional professional-development providers often neglect the most powerful resource: the expertise possessed by the people in the room. A hackathon model is predicated upon the notion that we as a group, sharing our knowledge through authentic interactions, are smarter than each one of us in isolation. This is true even with the overabundance of online resources. As many social-learning theorists have suggested, social interactions can magnify the impact of learning activities for all participants. That is why teacher professional development should be focused on maximizing the impact from the meaningful interactions among the

8. The workshop was facilitated by one of the authors, Kip Glazer.

participants. Such interactions should be a starting point that can lead to continuous support for the participants.

At the beginning of the workshop, the participants should take a thorough inventory (see Appendix B for the Self-Reflection Inventory form—note that these forms should be considered as only a launching point for further meditation and iteration) of their own skills, knowledge about games, and proficiency in creating lessons plans using game-based learning (this may include digital or tabletop outcomes). In particular, because hackathons thrive on aggregated activity, an inventory on knowledge around various technology and computer tools can be useful, as would access to equipment that allows such use (at least one laptop per group, for instance).

This overall assessment step is crucial in constructing a successful workshop, as well as a great way to prime participants' metacognition skills, and should not be ignored. It also allows smaller groups to be defined by their diversity in expertise: For example, every team might want to include at least one individual who is comfortable using certain technological tools or games, and so forth. After everyone has had a chance to reflect on his or her own strengths and room for improvement, he or she should be given a chance to share that with the group. After the whole-group discussion that highlights the existing expertise among the participants, the workshop organizers should structure the workshop based on the resources in the room to enhance the existing skill sets or supplement any exposed gaps.

One might consider this step to be the toughest part for the organizers because the unknown nature of the knowledge base assumes the need for a workshop that requires continuous and responsive course corrections. However, one way to ensure a less frenetic process is to gather the information before the workshop; this would allow the organizers the option of preplanning the workshop format and of exploring the possibility of bringing in experts who could provide additional expertise and/or resources. Still, not knowing who and what will be in the room can also be one of the best experiences for all participants (including the organizers) because of its similarity to a real-life classroom (where many teachers will not know until the first day of class whom they will be teaching). Effective teachers know the importance of responding to the learners in the room. By creating an authentic experience for all participants, the organizers can model the importance of harnessing the resources in the room.

Step 2: "A" Is for Allow the Formation of Productive Groups

> Although each person was responsible for creating his or her own digital game, students and teachers alike often worked in pairs or in groups based on their skill levels and interests. Typically, a person needing a specific kind of information would seek help from another who possessed that specific knowledge. Once the person gained the necessary knowledge, new groups formed around a different problem. At the end of each day, the whole group met and discussed the progress, which allowed the participants to gain more knowledge from one another (see Figure 1).

Figure 1. A pair solving problems together.

Immediately after surveying and gauging the resources in the room, participants should group themselves around a single goal or task. For example, a group of elementary school teachers wanting to use a game such as *Minecraft* could form a group to create a vertically aligned lesson plan. Or a group of teachers could work on creating a different kind of vocabulary lesson for the same subject area. Regardless, the organizers need to exercise finesse and diplomacy for this step, organizing groups depending on the level of skills and interests of the participants because participants might be hesitant if they think that they must teach the same content area or grade level to be in the same group. Again, following the hackathon model, participants should self-organize to solve a challenge to focus on pedagogy beyond basic content. One suggestion, especially in the realm of digital games, is to consider the Technological Pedagogical Content Knowledge (TPACK) model for Educators.[9] This model posits that for successful incorporation of learning technologies in their classrooms, the teachers using these technologies need competency in their content area (what they teach), pedagogy specific to their content (how a teacher teaches writing can be different from how he or she teaches mathematics), and tools best suited (manipulatives versus games) to enhance their instruction (see Figure 2). The TPACK model asks teachers to consider how these areas intersect in every step of their teaching to create an optimal condition for incorporating technology.

9. A detailed explanation of this model can be found in Mishra and Koehler's 2006 article, "Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge," and Handbook of Technological Pedagogical Content Knowledge (TPCK) for Educators (2008), edited by the AACTE Committee on Innovation and Technology.

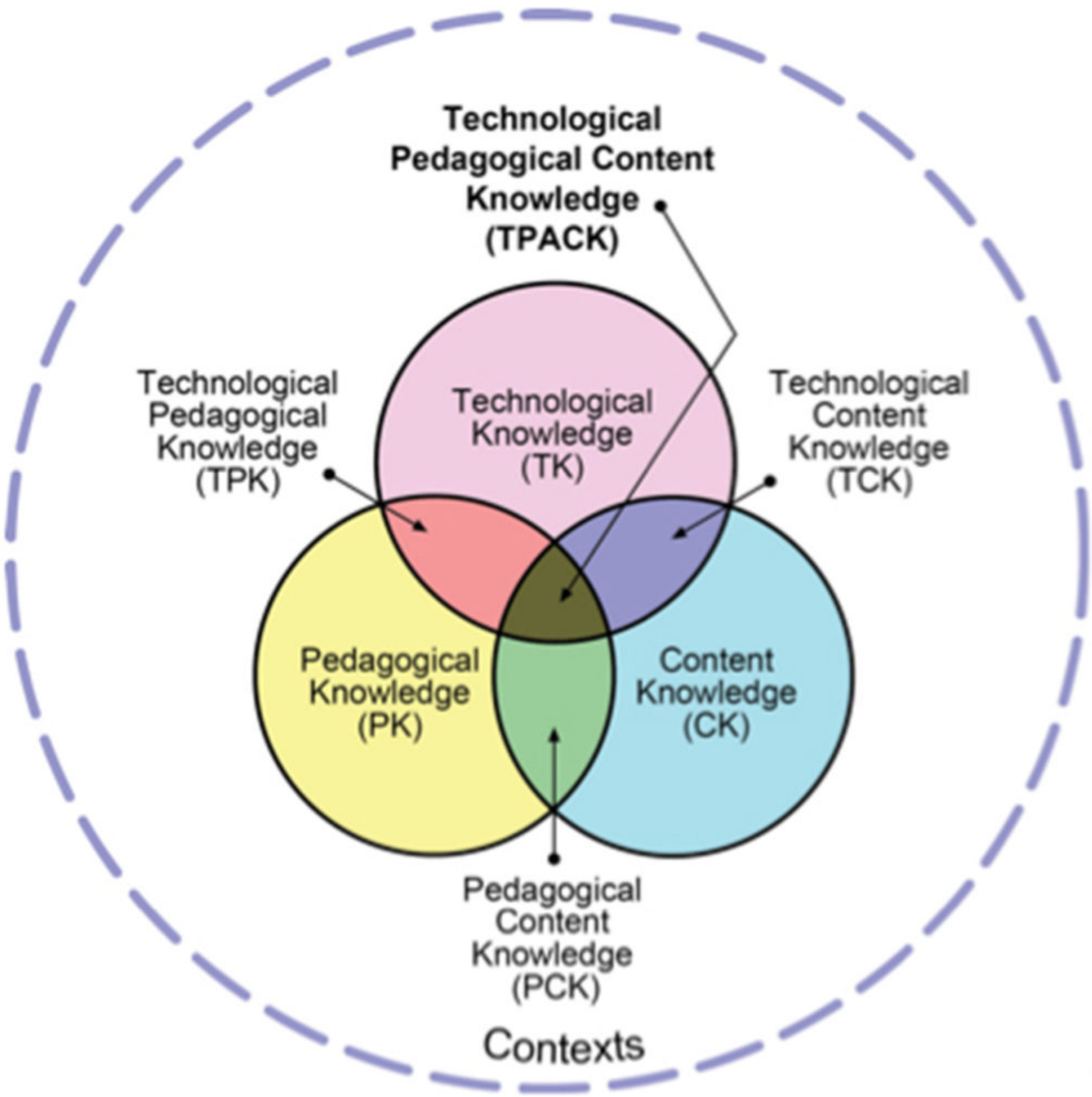

Figure 2. Technological Pedagogical Content Knowledge (TPACK) model for Educators reproduced by permission of the publisher, © 2012 by tpack.org.

First, organizers should ask the participants to identify each item independently. Participants should think about which game, what content, and how to teach a subject separately. Next, ask the participants to consider how two of the items interact with one another. For example, is a particular game useful for teaching math? If so, why? Or should the students play the game individually, in pairs, or in groups? Why? Finally, organizers should ask the participants to describe how all of the items interact in a real classroom. Do the teachers have the right classroom condition to allow their students to use games to learn something specific? If not, what other conditions needed to be met? Organizers should walk the participants through various areas and ask them to rank themselves in each area. Organizers should also encourage the participants to identify their area of need as well as their areas of expertise and strength. By capitalizing on the participants' self-identified strengths and needs, organizers should guide the participants to focus on a value-added approach to successful grouping. What is crucial is allowing the participants to organize themselves around a common goal or problem.

A group with participants who feel competent in technology can tackle a technical challenge while another group with participants who feel competent in content can focus on content-related issues.

Based on the experiences of our one aforementioned workshop, we suggest that each group has three to five participants. However, the participants should have the flexibility to work in pairs if it is agreeable to both participants. We do not recommend having a group with more than five participants.

Step 3: "C" Is for Cultivate Discussions and Planning

Immediately after they form, each group should establish its norms. This includes working out things such as who the reporter will be, and how the group will come to consensus. This step should be used to create social bonds among the group members and be considered a great opportunity to infuse playfulness. For instance, groups could come up with a team name after a game, or create a cheer that they can recite as they reach a milestone.

This should definitely be done with the full consent of the participants to avoid what many scholars have called the "creepy treehouse" phenomenon.[10] This describes a situation in which students are forced to interact on various social media platforms for a purely academic purpose, which creates many uncomfortable social situations among the participants. Many researchers have also argued that subjecting adults to forced social activities can potentially create an environment that violates the participants' basic rights such as privacy and creativity and therefore should be avoided. If any individuals do express reluctance to participate in the nonacademic activities, this could actually serve as an opportunity for everyone to devise various strategies that engage students or teachers who might themselves be reluctant to participate in different activities in the classroom. By privileging the existing context and the immediate and authentic concerns of the participants, organizers can truly empower all participants.

During the summer workshop hosted by Pepperdine University, a student suggested that everyone should dress up as a character from a movie or a game. Rather than requiring everyone to do so, the organizers brought various costumes and props for the participants and had them available. While working on creating digital games, students and teachers alike chose various items and dressed up as different characters to ease the stress and break up the monotony. Many of them took selfies and posted online voluntarily (see Figure 3.).

10. First described in the 2008 article "When Professors Create Social Network for Classes, Some Students See a 'Creepy Treehouse'" by Jeffrey R. Young, published by The Chronicles of Higher Education.

Figure 3. Selfie.

Once the group norms are established, each group should work to create a usable lesson plan using an existing game. At this point, some teachers might profess that they are not "gamers," and here, organizers should take this opportunity to inform educators of the expansive definition of game-based learning, especially by encouraging them to consider the game mechanics of their chosen game. Helping teachers to recognize that using any types of competitions or a reward system counts as game-based learning is important. Organizers can empower teachers by introducing a plethora of game genres and having them consider which games are best for their own classrooms in terms of skills development and content. Furthermore, even though the goal is to create a lesson plan for a teacher to implement in his or her classroom, organizers should always encourage the participants to reflect on the *process* of creating a lesson plan.

Key things in this step to highlight and consider are:

1. **Establishing learning objectives.** What do we want our students to learn and do as a result of being taught the lesson? What type of content standards will the lesson address and why?
2. **Content knowledge.** How much content knowledge will the game teach? Which content will be best taught using a particular game?
3. **Lesson steps.** What should each step be? How much time will it take to execute each step? In what order would you have to arrange each lesson step?
4. **Evaluation plan.** What tools will other teachers need to evaluate the effectiveness of the lesson?
5. **Critical resources.** What additional resources will the teacher need? Where and how would you help them get those? Which resources are critical? Which are not? Why?
6. **Technical skills.** What type of technical skills should the students possess before playing the games? How would a teacher learn and teach them? How well does the game address the acquisition of certain content knowledge? How would you demonstrate that?
7. **Iteration plan.** What will you do to ensure iteration when they return to the classroom? Who will monitor the lesson plan implementation and further iteration?
8. **Organizational culture.** What is the organizational culture for innovative approach? Whom can you collaborate with? What existing structural mechanism can you use or rely on? What innovative systemic mechanisms can you create if you were to continue the practice?

Step 4: "K" Is for Keep It Competitive to Include Playfulness in the Process

One staple element of the hackathon model that can encourage playfulness in the process is friendly competition. Here, specific tasks or benchmarks can be set—votes, badges, or publicity—all so that organizers can entice friendly yet fierce competition that also discourages passive spectatorship. Be sure to reward Bartle's four player types.[11] Once again, demonstrating these processes can help the teachers to think about how they can use their knowledge in their own classrooms. However, the competition must be genuine and authentic.

The competitive element may cause various groups to monitor the ideation and activities of others. This can even be facilitated by creating a public Facebook page or a Google site where participants can post their in-progress lesson plans and then solicit feedback from others. Organizers can also attempt to leverage social media to engage a wider audience. The bottom line is that introducing the spirit of authentic competition will benefit the participants.

Step 5: "I" Is for Iterate and Refine

After each group has created a lesson plan on using games, the organizers should then set aside some time to explore how feedback and iteration can inform the process. This includes discussions on the value of prototyping, in which an incomplete or flawed product is still considered valuable, as well as pointers that address situations in which participants may not be comfortable with publicly giving or receiving feedback. In general, things to consider include:

1. What are some ways to give more targeted feedback? What phrases can you choose to use?
2. What can everyone do to make sure the interactions are positive and productive for all?

11. Bartle identified killers, achievers, explorers, and socializers as four distinctive players. Read John Martin's chapter "Unlocking a Mystery: Designing a Resilient Place-Based Game" in this volume to learn more about Bartle's four player types and how each player type can be rewarded.

Thereafter, there should be a public pitch session for everyone to share his or her ideas and receive feedback. Such a public and interactive iteration is critical in making this hackathon experience successful and is an excellent opportunity to showcase to teachers the value of immediate feedback.

During the digital game-making workshop hosted by Pepperdine University, the participants created screen casts of their games (see Figures 4, 5, and 6). During one of the follow-up sessions, all the other participants viewed the videos and provided suggestions for improvement. Through a public feedback session, the participants were able to gain additional knowledge.

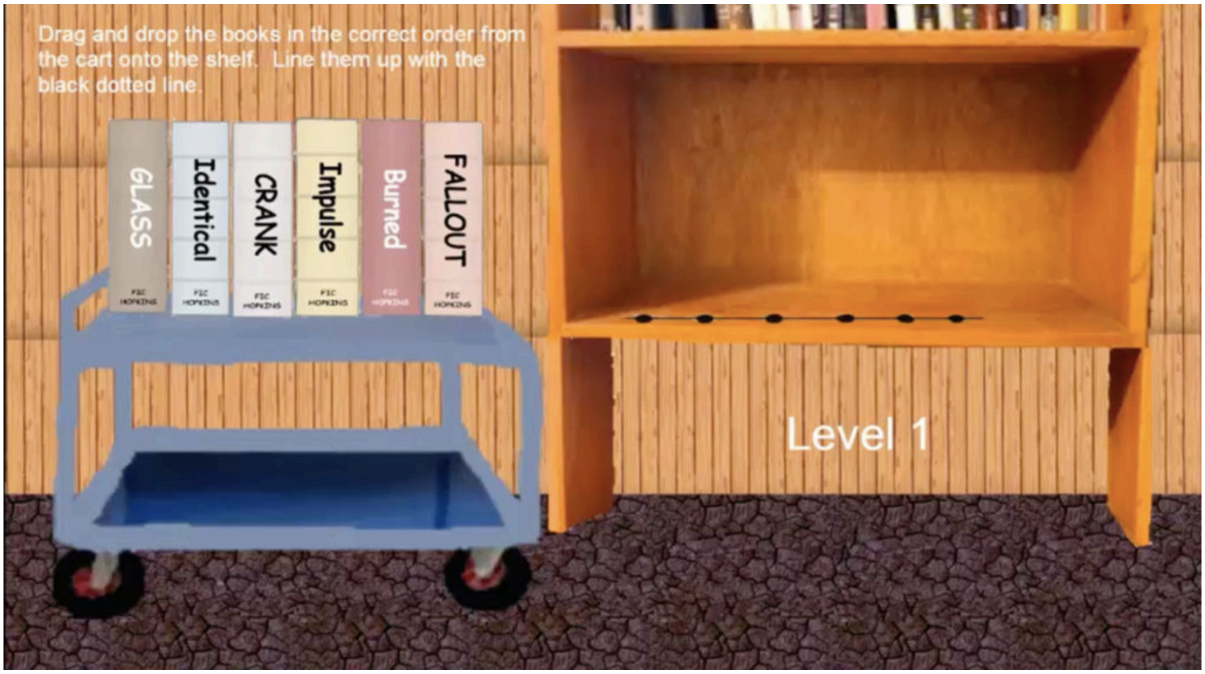

Figure 4. Library Shelving game.

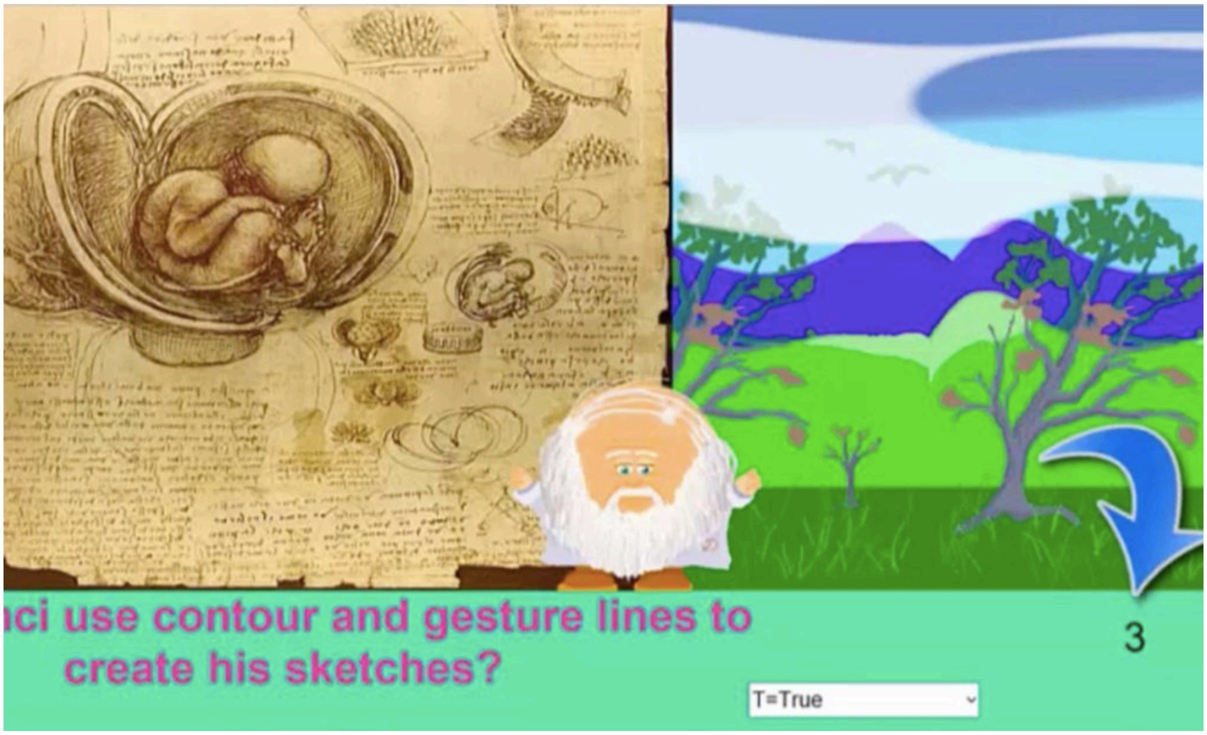

Figure 5. Da Vinci game.

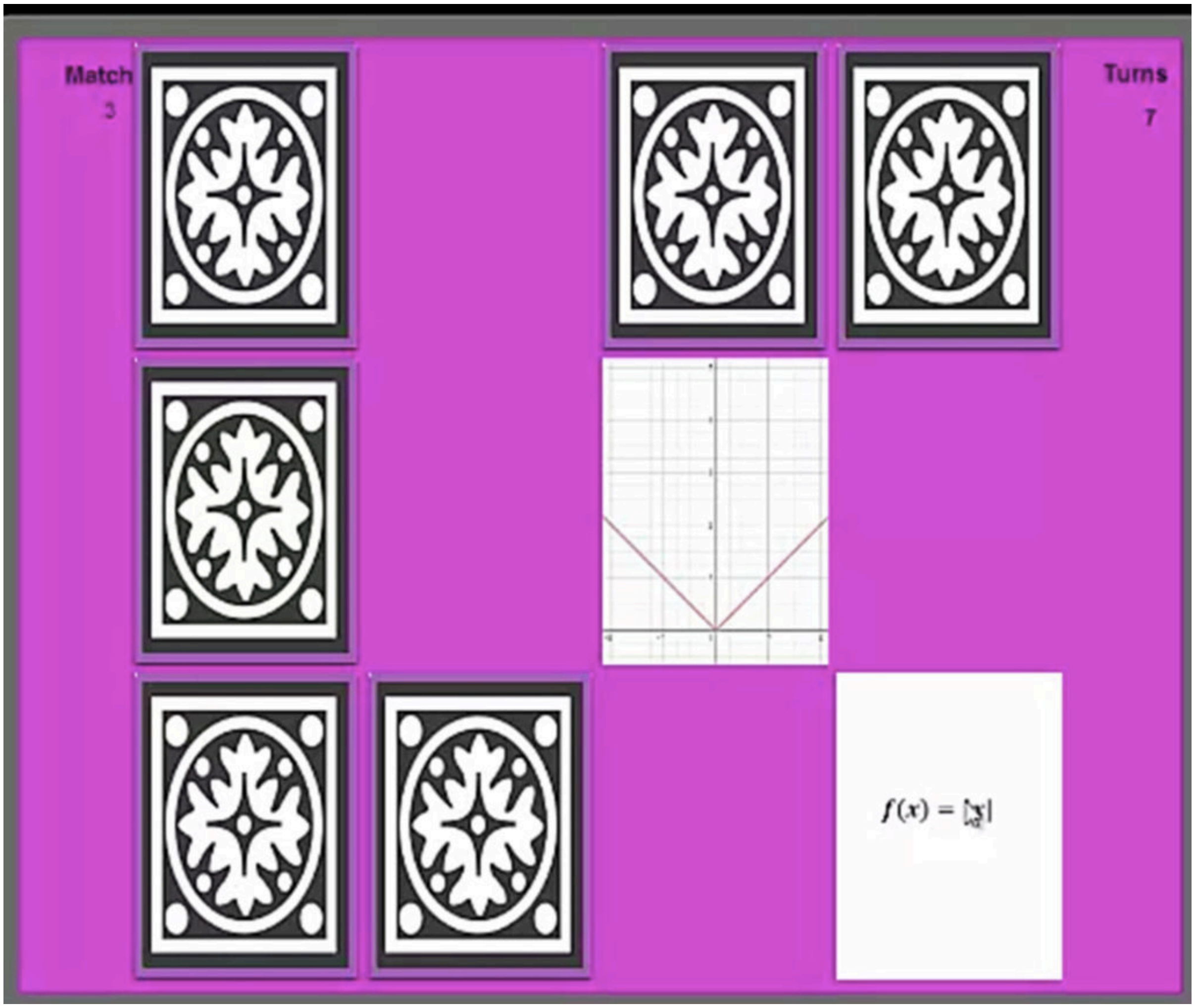

Figure 6. Mathematical Equations and Graphs Matching game.

Once everyone has had a chance to give and receive feedback, a discussion should ensue so that one lesson plan is chosen as a demonstration lesson, using the rest of the workshop participants as students. Note that this chosen lesson plan will be the primary resource material that participants will focus on for this step of the workshop, and so selection criteria could be based on the competitive element. This does not mean that the other prototype lesson plans are wasted, but rather that the subsequently shown demonstration and classroom iteration processes can be used in a less direct way at later stages.

If possible, someone who has not been part of the hackathon should be invited to teach the lesson. At a minimum, someone who didn't participate in creating the lesson should pilot it to ensure that the lesson steps are logical and easy to follow for any teacher. While the lesson is being piloted with the rest of the group as students, all participants should take notes on their impressions around the experience and especially see if such impressions can inform reiteration of their own lesson plans. In particular, members of the original design team should also take notes as to whether the lesson is being executed as they intended. Such a reflective process that is differentiated based on the roles can also demonstrate a way to differentiate a lesson in a real classroom.

Step 6: "T" Is for Teach and Train

Once the refinement of the winning lesson and other lessons based on multiple feedback and iteration has been completed, all lesson plans should be published on a website for others to use in the classroom. Using popular free web tools such as Versal, Haiku Learning, Edmodo, Blogger, or WordPress, the organizers and the participants can curate and publish lessons.[12] Simply collecting lesson plans using Google Docs or Dropbox and sharing with others are also recommended. Using various social media, the participants can publicize their own lessons for others to implement in their classrooms. Participants should also collect reflections after using the lessons in their own classrooms. In addition, the participants who are interested in hosting a hackathon of their own on their campus could use the process that they have experienced. Most important, teachers back in their classrooms should consider using the structure to encourage students to become engaged in problem-solving exercises using a hackathon model. Host a hackathon with the students and watch their creativity come to life!

CONCLUSION

John F. Kennedy once said, "Let us think of education as the means of developing our greatest abilities, because in each of us there is a private hope and dream which, fulfilled, can be translated into benefit for everyone and greater strength for our nation." Teachers who educate 21st-century students must acquire more refined skills for the development of our students. The National Education Association reports that, tragically, nearly 40%–50% of new teachers in the United States leave the profession within the first five years,[13] just when they begin to master their craft. High-quality professional development is not only useful but also crucial in retaining and supporting teachers. Such endeavors must provide highly situated experiences that can be replicated in every classroom. Using a hackathon model for teacher professional development can help teachers have meaningful interactions with their colleagues that can result in an effective professional-development experience.

APPENDIX A

A Sample Two-Day Hackathon Agenda*

Day 1

8 a.m.-9 a.m.: Introduction and sharing of the Interest Inventory

9 a.m.-9:15 a.m.: Break

9:15 a.m.-10 a.m.: Post strengths and needs and complete the chart for the creating groups

10 a.m.-10:15 a.m.: Break

10 a.m.-11 a.m.: Find your tribe

11 a.m.-11:15 a.m.: Break

12. Versal: https://versal.com/; Haiku Learning: http://www.haikulearning.com/; Edmodo: https://www.edmodo.com/; Blogger: https://www.blogger.com/; WordPress: https://wordpress.com/

13. Ingersoll, R. M. (2012, May). Beginning teacher induction: What the data tell us. Phi Delta Kappan, 93(8), 47-51.

11:15 a.m.-11:45 a.m.: Begin establishing group norms and set goals. Set up group laptop for “recorder” (if available).

11:45 a.m.-1:15 p.m.: Lunch (option to do so with your new groups)

1:15 p.m.-3 p.m.: Lesson creation with self-directed breaks

3 p.m.-3:15 p.m.: Break

3:15 p.m.-4 p.m.: Daily debrief

Day 2

8 a.m.-1:15 p.m.: Lesson creation with self-directed breaks and lunch

1:15 p.m.-1:30 p.m.: Overview of pitch and feedback session

1:30 p.m.-2:30 p.m.: Lesson pitch and selection

2:30 p.m.-2:45 p.m.: Break

2:45 p.m.-3:15 p.m.: Lesson demonstration

3:15 p.m.-3:30 p.m.: Break

3:30 p.m.-4 p.m.: Daily debrief

*Times are suggested; however, we insist on allowing the teachers to take lots of breaks.

APPENDIX B

Self-Reflection Inventory Form

1. Technological Skills

(Check one) When it comes to technology, I consider myself to be a:

- Novice – I can check my emails, type my essays, and create a PowerPoint presentation. I can use my smartphone to post pictures on a social media site.
- Competent user – My smartphone is linked to various productivity apps. I am familiar with multiple browser, platforms, and operating systems. I use various multimedia software and other online resources to learn and teach.
- Expert – In addition to using what’s available online, I have created and distributed materials on various online tools and platforms. I am familiar with programming languages. I am considered an expert by my institution.

Rate yourself on your level of expertise.

Items	Expert: Can teach a class on it	Advanced: Could learn a little more	Basic user	Heard of it, but use it infrequently	New to me	Other
Email Integration – Outlook and Gmail, etc.						
Cloud-Based Storage – Google Drive, Dropbox, and SharePoint, etc.						
Various Presentation Software – PowerPoint, Google Presentation, Prezi, etc.						
Browsers – Safari, Chrome, Firefox, and Internet Explorer, etc.						
Word Processing Software – Microsoft Word, Google Docs, and Pages, etc.						
Data Processing Software – Excel, Google Spreadsheet, and MS Access, etc.						
Operating System – iOS, Windows, and Linux, etc.						
Apps for Collaborative Publication – Evernote, Blogger, and Wiki, etc.						
Web Publishing Tools – Google Sites, WordPress, and Drupal, etc.						
Coding Languages – HTML, Java, and Python, etc.						
Familiarity With Hardware – Arduino boards, MakeyMake, and Raspberry Pie, etc.						
3-D Modeling and Printing						
Information Network Systems						

2. Learning Theories, Framework, Paradigm Knowledge

Items	Expert: I have fully embraced the concept. I have created lesson plans based on it, and I can teach a class to other teachers on it.	Advanced: I have used in the classroom, but I could learn a little more.	Basic: I have heard of it and attempted to use it in my classroom once or twice.	I heard of it but never attempted to use it in my classroom.	The term is completely new to me.	Other
Project-Based Learning						
Inquiry-Based Learning						
Universal Design for Learning Framework						
TPACK Model for Educators						
Cooperative Learning Framework						
Constructionism						
Situative Learning Theories						
Social Learning Theories						

Please tell us what other pedagogical frameworks or theory you are familiar with.

3. Content Knowledge

My content-area expertise is/are ____ (Please indicate what subjects you have taught/currently teaching.)

I have been teaching for __________________________ (years).

I consider myself to be:

- A beginning teacher. – I have been teaching less than 5 years.
- A midcareer teacher. – I have been teaching between 5 and 10 years.
- An experienced teacher. – I have been teaching for more than 10 years, but I have not had many opportunities to provide support for other teachers.
- A master teacher. – I have been a master teacher/mentor/coach to other teachers in my content area.

4. Knowledge on Games

1) Personal knowledge as a gamer.

- Noob – I play board games and mobile games infrequently, but I would never call myself a gamer.

1. Emerging gamer – I enjoy playing games and can carry a conversation with others who enjoy games. I own various game consoles and use them when I have time. But I wouldn't call myself a "gamer." I enjoy a variety of tabletop games.

1. Leet – I have dedicated a huge chunk of my life to playing games. I know the latest release dates of popular games.

Please tell us what types of games you enjoy playing and why.

2) Ability to use games in the classroom.

- Noob – I have not or rarely have used games in the classroom, and when I hear the term "game-based learning," I generally think of using digital games during computer time, or as using access to games as a classroom reward.
- Emerging game-based classroom teacher – I have incorporated games in my classroom to teach various lessons. I have used various types of games.
- Leet – I understand what game-based learning is, and I have turned my classroom into a laboratory for game-based learning. I have used games such as *Minecraft, Portal 2,* or other digital games to teach lessons. Sometimes a lesson may revolve around students being involved in the process of game design itself.

Please tell us what types of games you have used in your classroom and what you would like to learn more about it.

CHAPTER 18.

REWRITING THE RULES OF SCHOOL: A NEW GAME TO PLAY

BY SEANN DIKKERS

Our students were overcoming disabling realities and that gave them the unique opportunity to work harder, learn smarter, and "fail forward" with a level of character and effort that were worthy of our admiration and respect.[1] *We didn't have to pretend they were achieving; they were playing the new game and winning.*

INTRODUCTION AND PREVIEW

Imagine that you arrive at school as a high school student each day and see hallways full of strangers because you spend most of your day being "pulled out" of your classes for remedial math, reading, and because you had a history of getting into trouble in "regular ed" classrooms. Your total contact with other people during the day is reduced to your case manager and a handful of other students in your situation. Lessons are straight from a book, the special education teachers are kind, but not passionate about the curricular material, and when you ask why you need to learn "this," they say it is for "the test." As you spend a few hours of the entire school day in a single room, you get tired, bored, and you start to dream of your 16th birthday when you can drop out of this isolation and tedium …

Until you take a bit of time to see special education services through the eyes of our students, it is hard to fully capture what it was like for those students in a small Northern Minnesota town when I arrived as the new principal. Faculty were interpreting state laws and using "accommodations" without designing for motivation, engagement, and investment. Removal from class was a "solution" to disruptions and the extra attention that some students needed. The paradox was that the adults delivering the program were undoubtedly caring, thoughtful, compassionate, and hardworking educators. As I got to know them, I saw clearly that everyone thought he or she was doing what was best for children.

This well-intentioned dissonance is not uncommon. It reflects a nation of schools that present a set of "game rules" to students that actually do not play out very well. From the perspective of students, schools are a complex system that includes goals, strategies, social elements, and feedback loops. While "good" games draw players in with the chance to learn, play, or connect with other people, bad ones are often overly simple, controlling, and/or isolating. For most students, to play the game of

1. *Maxwell, J. C. (2007). Failing forward: Turning mistakes into stepping stones for success. Nashville, TN: Thomas Nelson.*

school, they need to show up, obey rules, and do work for six hours a day, invest energy and effort at home every night, and then take a test that tells them they are average or poor at the game. If they do what we tell them, do they "win"? If the work is difficult, attendance is tiresome, and the monotony of uninspired work is not connected to an appealing "win state," then why play? If you know you are "bad" at a game, or that you will not likely "win," do you continue to play it? If a game is too easy, or you'll "win" regardless of your effort, do you still enjoy it? The ugly side of this "game" is that it's required. When players choose not to play, we punish them. When schools do not perform for federal dollars, we punish the schools. We try to care, and then we offer a game with massive required effort and very little payoff for the player or the designers. Nationally, we have this growing suspicion that the "game" doesn't work.

In Minnesota, the problem was not how much we cared, nor how much we reduced student workload, but to what degree we, as a community, were communicating the "game" of school to students and what "rule set" we put in place. To do this we had to think differently. By understanding and using better game-like systems, we trusted that students actually thrived when challenged, responded to prompts appealing to their intrinsic motivation, and were capable of achieving at higher levels when we presented a better game. We just had to change the game and how we used words to communicate it: Why play this game? Because you'll be a better person, because effort is internally worthy, and because we are your audience waiting for champions.

I use the term *game* when I share this story. Game designers may not see this as a proper "game" or even cringe a bit when I use this term. Yet *game* is the term we used when we unveiled the new plan to students and other faculty. We asked them to be more "playful," to "play" the "game" of school, and if they provided the "want to," we would provide the "how to." This is a story of employing great gaming ideas for improving the school experience for our special education learners, but to design a better game, we had to expand our understanding of the current game, rewards, and the unique culture of our school.

Context mattered. I will provide an overview of the community, its strengths, its troubles, and the special education programming before our changes—to clarify our unique context. This type of design is translatable for your school, but not directly. In describing our culture and the questions we asked, this more appropriately serves as a *template* for systems change.

The process of redesign was central to setting up a new "game" for students and communicating that design to adults in the building. This meant:

1. purposefully outlining a new approach to special education service delivery;
2. communicating and sharing language that served our goals; and
3. assuming that we would need to adjust and modify as we encountered issues along the way.

The result was the topic of this chapter: a "quest-based learning" program that we implemented and how we rolled it out. The following anecdotal stories attempt to capture the process and thinking behind the story of our school and the transformation that occurred. These stories also capture a snapshot of the significant cultural and educational transformations resulting from only a few, small, largely semantic, changes in design that we applied to our special education programming.

CONTEXT

Decades before I arrived, the small-town life had a rich history of friendly rivalries with neighboring towns, generations of consistent family support, community volunteering and leadership from the community, active parent groups, a strong school board, and a school that was the primary center of activity in town. The maintenance team was outstanding. If a window was broken, or a tile was out of place, it was fixed within a day. In many ways this rich history was still evident in the annual rhythm of high school sports and concerts, fund-raisers and fairs, and the politics of everyone knowing everyone else. In a Norman Rockwell way, the county fair, football opener, and the high school music concert still marked the change of seasons. This culture, however, was and still is changing.

Small towns started shrinking dramatically in the 1980s and ’90s. This town had gone through a rough consolidation with two smaller neighboring towns. They were now part of the district but nearly exiled from active participation, or meaningful influence, with how the school would be run. The larger school mascot remained unchanged and friendly rivalries had become bitter. The consolidation process included socioeconomic overtones, too, as the two smaller towns were primarily farming communities and students from those communities were often immigrants (legal and illegal) who had come to do seasonal work on the farms. The newer families generally had longer bus rides (as the larger town kept all of its schools open and closed all of the smaller town schools) and had to swallow the idea of going to another school.

So the community was effectively split into camps: old and new, Anglo and Hispanic, rich and poor, established and transient. These divisions manifested in conflicts at the high school, including violent group fights, a suicide, and multiple weapons violations. In my first year, I confiscated two knives, one set of brass knuckles, a small box of bullets, and I had to deal with a student drawing a shotgun on another student over the weekend. Frankly, I was shocked at the level of animosity, fear, and warning signs of much more dramatic problems than confiscations. Many students were legitimately weary, and some of our special education students were terrified. When I arrived, I was the fifth principal in seven years to take the helm of what many felt was an embattled ship.

This is not to minimize that, overall, the community still had amazing traditions, values, and exceptional community participation. Parent conferences, for instance, were ironic to me because *most* teachers saw *most* parents every Friday night at *the game*. So if a student were missing work, the teacher could have the student sit on the bench next to the teacher while the JV team was on the field/court and the parent could make the student finish up on the car ride home. Parents would rally to bake sales, golf tournaments, or simply ask the generous local bar owner to ante up for new trophy cases, class supplies, and jackets for the debate team. This was, in fact, still a community that had all the advantages of the small town. It was just a community that was still sorting out how to include new members.

When the towns consolidated, those that had similar cultural conventions were, through time, eventually starting to work together and play together. The students (who fit in) were outstanding all around and effectively matured as well-rounded young adults: We had strong student leadership, athletes in the choir, singers shouting at games, and after-school and summer programming that led to a majority of students’ getting an exceptional education and well-rounded life lessons. Garrison

Keillor *must* have visited at some point! He still says that "… all the children are above average." I was entering a community that had much to be proud of, and it was.

Still, the school and community had belief and hope that their school could, and should, be better than these divisions. This hope, however, was confronted by challenges. The first and most glaring problem was the dropout rate.

WHY DID OUR STUDENTS DROP OUT OF SCHOOL?

The school board gave me the directive to address the dropout rate among special education students. First, I wanted a better understanding the "players" and current "game" that was in place at the school. All games are in place for a reason. So, how was the game perceived? Were there any winners? What rules were in place already? So, to better understand, I started with learning the game myself. I spoke with the school board, mainstream teachers and students, and special education teachers and staff.

The School Board

School Board/Community Reasons for the Dropout Rate

When I asked the school board and people in the community what was causing the problems, they summarized the issue as:

1. ineffective school policies;
2. the need for better teacher professional development;
3. lack of understanding why anyone would want to drop out; and
4. the principal's ability to manage the school … again.

Teachers

Mainstream teachers, some of whom were decades into their practice, really had a hard time dealing with students whom they thought were too tired to work, passive, or not willing to put in the effort that was, traditionally, a reasonable expectation for all students who walked in their doors. Students had the responsibility to bring their supplies, show up on time, and be ready to learn. When more and more students started to arrive to class without a pencil, a bit late, falling asleep, and/or not listening to the teacher, the reasonable (and age-old) solution was to simply send them to the principal's office, where they would get a "good talking to." Teachers were practiced at their jobs and couldn't imagine these practices wouldn't eventually work—because they had been so effective in the past.

Teacher Solutions for the Dropout Rate

So when I met the teachers, they consistently stated that we needed to:

1. coddle students less;
2. make fewer "accommodations" for students;
3. demand higher concern from students with clear, consistent consequences for deviant behavior;
4. get a principal who can keep better and more consistent discipline; and
5. improve the practice of the special education teachers.

Students

Mainstream students painted a correlating picture of themselves as "good kids" and those on Individual Education Plans (IEPs) as "those kids." Many were aware of a population of kids who were believed to be just choosing to not be involved. The mainstream students also believed the "spec'd" (short for special education) kids were the cause of most of the behavior issues at the school. In truth, a small number of students on IEPs *were* actually responsible for many of the schoolwide behavior issues, but only a small percentage of them. The danger in this was the attitude of "us/them" that pervaded school stereotypes both ways. Special education was not integrated; it was a social category and an active *identity* for those in it. The reality was a system and a culture in which some students wished others were not in the school and the other students "did not care" and believed the school would be better off without them.

I started by talking to the students with IEPs. Some of them had behavior problems, but most did not. Those students would often ask me to visit their town—as a test of my interest in them. They wanted me to see their world, and I noted that their world was far away from my building. Others complained that they had to look "at the same four walls all school day long!"—because they did. While most mainstream kids played in organized clubs or teams after school, these kids, regardless of ability or challenge, met at the park when they got off the bus and played there. They never really saw, or got to know, their fellow students, so they didn't get the same invitation/pressure to join the team or try out for the club. To them, the idea of "trying harder" meant more effort with the same results of not passing a class or getting kicked out of class for forgetting a pencil—even when they had their books.

Student Reasons for the Dropout Rate

They reported a very different set of potential causes for the dropout rate. They dropped out because:

1. some hated school;
2. some feared school because of bullying and fighting; and
3. some just wanted to start working and had found opportunities, but they were *all* leaving.

Student Solutions for the Dropout Rate

When asked, the students simply could not imagine that their actions and efforts might be part of what makes a day good or not; instead they pointed out some changes they would like to see:

1. better teachers;
2. more engaging topics;
3. consistent treatment of students (with suspicion of racism); and
4. fewer cliques at the school.

Ambitious students among these started to work on their GRE test prep during study halls, and some enrolled in online schools. Others were just developing exit plans for "When I turn 16 …" and comparing them as incidental conversations. Sadly, dropping out was becoming part of this student subculture. Students dropped out because they wanted *anything* other than their lives at school; the game was no longer worth playing because they "knew" they were the "losers."

Special Education Teachers and Staff

When I arrived, we had three special education rooms, one for each full-time teacher. The first room was for math "pullout" (removal from mainstream courses) and students "acting out" (managed by the only male special education teacher); the second was primarily language arts pullout classes; and the third room was for all-day pullouts of students who had one-to-one paraprofessional aides working with them, or "high-needs" students.

This last room had a small lunch table, a bathroom, and the higher-needs students who were generally joyful and fun to be around. A fourth room was not officially for special education, but the in-school suspension (ISS) room consistently had one or more IEP students in attendance. These rooms were, for many students in special ed, essentially a quiet place completely isolated from the rest of the school and its culture. The majority of IEP students were pulled out of class for three or more hours per day. So, whether special education students were or were not in trouble, they were rarely found in mainstream classes.

Finally, it is important to point out that the three special education teachers unquestionably cared for these students (loved them even) and did everything in their power and expertise to provide a safe, nurturing, and comfortable space for them. Meeting any of them made it clear that they were actively doing everything in their power to help these students. When asked about the school, they knew their own hearts and efforts and simply could not connect that their programming was part of the problem.

Special Education Teachers' Reasons for School Challenges

Instead they pointed to:

1. the mainstream teachers' "intolerance" of their students;
2. the lack of administrative support;
3. he community bias; and
4. disinterested parents' encouraging the older students (especially boys) to come work on the farms for extra money.

In addition, they believed that they knew the "law" because they had gone to in-service training sessions, taken classes, and were tuned into best practices, yet across the state other teachers interpreted that law very differently and hosted very different programs. The pattern of pullout was eschewed elsewhere but embraced here based on a mythos of what the law said or did not say. I could not help but think that they were mixing in as much hearsay as actual legal obligations, and that they were using their position to quiet any conversation about other options for the children. They were dominating the game of school with a set of arbitrary and unclear rules. Clarifying the rules was a good place to start making a playable game for all. We needed to commonly understand what experience we were currently offering students, and what we all wanted to offer them within the law.

Because of a system with stakeholders who all had reasons for the way they felt, the special education program had filled with students who were primarily members of poor immigrant families from the smaller towns and who were also tired of fighting with teachers who didn't understand them. It was easy to see that the problems leading to high dropout rates were deeply seated, cultural, economic, and sadly predictable.

Among students receiving special education services via an Individual Education Plan (IEP), *all* of them dropped out when they turned 16. All of them. This is an indicator of a system, or game, that is poorly designed. My interviews confirmed the primary challenge given to me by the school board and superintendent when I arrived. As a lifetime gamer, I saw this as a clear indicator that the "game" was broken. Next, I took a much closer look at our special education programming and how the system was played.

Knowing we needed to change as an organization and actually making changes are two very different propositions. Each stakeholder group was willing to acknowledge issues and equally ready to point elsewhere for the solution. As a community we *all* saw a problem that required changes to solve it. Who needed to make the changes was the sticking point. For my part, it was not an option to alienate children any longer. Blaming others was not building new culture, it was reinforcing old culture. We needed to alter our idea of what a "good student" was, what growth looked like, and how we would handle students when they did not look like the ones we had been used to over the last 20 years of otherwise outstanding practice. We had to change the culture and to do so we had to have a common understanding of the realities and effect of the current practices.

IDENTIFYING THE GAME

First, we had to recognize that the act of coming to school each day was a complex system fully loaded with "rules," "permissions," and "personalities"—each played out differently for different stakeholders. School is a shared experience with a common set of rules toward a common goal, but when the goal isn't clear, the "game" changes for players who are reacting to the system, not the goal. For instance, pulling students out of class for extra help seems to be a good thing to adults. Yet we knew from our "players" that it meant something very different within the "game."

Being labeled as needing special education services meant more to these students than getting assistance with a disability—it mean a social status change among their peers; it meant being "one of those kids," socially alienated, or "dumb." An IEP meant that they were about to be pulled out more and more—in front of their peers. So it threatened a change in social grouping, and *everyone* in the school had a negative identity ready to ascribe to an IEP education student.

Students described that then, when pulled out, they could simply choose to *not* work, and work would eventually go away because they had a label to blame: "I can't do math, I'm EBD." This was a game to them too. Watching adults get "all up in our grill" was a form of entertainment to some and well worth changing the goal of the game a bit. When they were tired of being "nagged" to work, they could misbehave and be sent to ISS, where they would at least get some peace and quiet for the day. This was their game. It was not a good game, nor a game system that had any benefits, but a game with rules, results, and strategies, well refined and shared among the students.

Teachers would even say, "That kid is just playing with us!" or "It's just a game to them." Ironically, their complaints were actually the accurate portrayal and understanding of what was happening. We *all* knew there was a game, but none of us liked playing a game with no winners—well, at least with no adult winners and with kids losing at life. The special education teachers needed a bit of pullout time to sort out how the current "game" actually was working *against* their goals—and to consider how to change the system to work *for* them.

We started with our data. At the start of the school year, I asked all three special education teachers to arrange for a substitute teacher for a full week on my budget. I asked them to work together to review each special education student's reading and math scores during his or her time as a student in our school. Then we matched that data to pullout IEP accommodations.[2] The consistent pattern for our school was clear to all four of us: that reading scores *decreased* through time in correlation to increased minutes in pullout environments. So, the more time they spent with special education teachers, the worse their scores got—not plateaued, not stagnant, but *worse*. This couldn't be blamed on the disability. These teachers honestly thought pullout was compassionate, helpful, but it was not; it was causing previous skill to atrophy through time. The cumulative data were clear: Pullout was a form of academic abuse without justification. Their kids were not just dropping out; they were getting less proficient and saving themselves from further damage to their reading and math scores.

One teacher began to cry.

I explained that it was unacceptable and unethical for us to continue with a program that hurt kids. They quietly agreed that this was the situation.

SETTING THE STAGE FOR CHANGE

What next? Where do you go from realization that decades of work was hurting the same kids you were dedicated to helping? The teachers had one week to invent a new system. I told them I would be back each day to answer questions, check in, and help in any way I could. Their job for the week was to redesign their special education program from the ground up.

As they started to consider a new program, I offered them an actual copy of federal and state special education laws. Much confusion around education law can occur when we fail to read the laws (and court briefs) for ourselves and leave our decision making to others. When we know the difference between what is mandated and what is not, we can work within the law and exercise our common sense at the same time. At the end of the day, we were compliant if we:

1. held IEP meetings with the right people at the table;
2. allowed everyone to have a voice in the meeting;
3. carried out the accommodations from the IEP in concert; and
4. maintained paperwork for the state.

Every other myth and construct was fair game at that point. We discussed that if they wanted to move students with IEPs back into the classroom, they would need to assure mainstream teachers of their primary concerns being legitimate and worthy of a little extra work for special education teachers. We handled each concern individually.

Addressing Teacher Concerns

First, mainstream teachers did not want to fudge grades, reduce expectations, or otherwise be dishonest in grading students differently. *Solution:* The special education teacher would take over all grading for IEP students. This meant the mainstream teacher would have *less* grading to do and could

2. Actual data are not included here because they were gathered internally, not as part of an IRB-approved study for publication. In addition, publishing any kind of student scores is appropriately messy.

maintain grading standards he or she valued. In practice, this policy actually encouraged both parties to creatively think of other accommodations than reducing student workload.

Second, mainstream teachers felt alienated from IEP meetings because the special education teacher would say “the law” required a particular accommodation. *Solution:* Our practical rule was that teachers suggested accommodation strategies *first* in our IEP meetings and special education teachers were asked to adopt them unless they had a clear reason not to. The resulting IEPs were innovative, often required extra time from the mainstream teachers, and successfully eliminated most of the pullout activity.

Third, teachers were advocating for pullout because they simply “would *not* have disruptions in the classroom for the rest of the learners.” *Solution:* If a student were disrupting or about to be a disruption, we would as quietly as possible get the student out of the environment. If not, he or she would stay in class. In practice, we started to identify triggers and cues for each student and all teachers started to help students “save face” by removing them from the room *before* conflict. Typically, they would work in the hallway or move their work to the special education teachers’ office or classroom. This consequence was now daily; however, it not for the year and never part of an IEP plan. The same student could return the following day and choose to work hard in the mainstream classroom.

Changing the Game of School

Now that we had determined the changes we would make to our special education program, we had to address the school-wide culture of understanding student learning and growth. We needed an operational framework that would guide our language, our attitude, our understanding, and give a positive option to the negative culture around special education. We tested three tools that would effectively foster a new system and new practices. For each we identified a game mechanic (or interaction) that wasn’t working, what experience we wanted to see happen in the school, and considered how we could verbalize a new “game rule” that would communicate a new game mechanic that we thought would work better and change the game we were playing.

We used three phrases to communicate new ways of thinking about teaching and learning across the school. These helped to set a significantly different tone around who we were, who the students were, and what our purpose was in the school—and we repeated them every chance we could. These were essentially our “game rules” of play for teachers and students. If they wanted to play in the new system, they needed to justify their moves and strategies within the rules of the new game: “No labels”; “Want to/How to”; and “Celebrate growth.” These effectively were an *intentional* shift in discourse in order to show others how to play school. We were telling them how to play. Later in the chapter, I’ll explain that each rule had unforeseen positive results.

Discourse Rule 1: “No Labels, Just Learning”

Although labels are used in the special education profession, medical language, and legal documentation, we believed they were not useful for teaching and learning. If students knew they had a particular cognitive disorder, this reality didn’t change their need to find their way in the world. But our students were using these labels, with minimal understanding, to justify a list of things they "couldn't" do. I noticed that adults were also excusing themselves from teaching and using the labels to justify their choices.

Broken Game Mechanic

In fact, our understanding of "struggle" was skewed. We were perceiving struggle as "bad" and our collective decision avoided struggles using pullout, suspension, and overly reduced or modified work. In the literature, it made sense that those with special needs also had to work hard to overcome, accommodate, or creatively solve difficulties, not just avoid them. Yet many of our students would look at struggle and walk away from it *with their label as rationale*, even when the struggle had nothing to do with their disability.

The Experience We Wanted

We had to create language and actions that embraced struggle and assumed that diagnosed disabilities would not necessarily excuse reasonable work and struggle to complete it. Like in a game setting, we had to embrace failure, or struggle, as expected ("That's not worthy of a reaction"), valuable ("We learn from mistakes only if we have them"), and even fun ("It wouldn't be worth your time if it were easy!"). Language games, in general, are effective at constructing playful new contexts in play; likewise, at school, these were essentially constructing new realities for failure and effort each time we repeated them. This applied to labels, too.

We decided we would combat "label excuses" by not using the labels in the first place. Likewise, some of our kids "struggled with focus" (not ADD, or attention deficit disorder), some of them had to "learn tricks to calm down" (not EBD, or emotional behavioral disorder), others had "gifts that needed balance or direction" (not OCD, or obsessive compulsive disorder). Reshaping our language established a consistent values system and sent a clear message to all of our students that the adults were ready, and making an effort, to change. Most kids picked up on the language too and began to use it. No longer could they say, "I'm ADHD," implying that they *couldn't* focus; instead they "struggled," which implied they could focus but needed to try harder.

Nor did we run from proper medical language. We agreed that we would use labels to communicate between adults what the child's special need was, but only when we had to. Then we would take that label and put it away. When we addressed students in IEP meetings we worked to transform our language. We replaced all acronyms and labels with "struggles," "worthy struggles," and "solutions." One example is the letter we sent home to all parents of students on IEPs that we would be changing our programming.

The word crafting was a key to shifting attitudes and school culture. IEPs were indeed a legal obligation, but "helping" and "caring" were our professional dispositions and they came first. We needed to see IEPs as a valuable process that we would do for *any* student who was struggling. We agreed that IEP meetings were not just an obligation, but the *right* thing to do for the child. In the end, we actually *increased* accommodations made overall by using smaller, smarter, and more targeted changes around the student. We also got hooked on seeing results; the results made the wordsmithing worth the effort.

The New Rule

No labels, just learning. Labels were useless. Learning led to success, self-confidence, and lifetime benefits. As members of our special education staff were now in mainstream classrooms (instead of pullout settings), they were available to *all* students who had a question. Our teachers likewise naturally began to teach *all* students—not "good kids" and "spec kids," just kids. It cannot be understated that the new system, or game, required not only students, but also teachers and staff, to learn the new rules.

Complex systems rarely change with only one stakeholder's participation; the shift has to be systemic. Key stakeholders need to speak the same language to reinforce the student experience. Games with *overly* complex rule systems, obscure language, or that use excessive "insider" discourse can create barriers for novice players. Mainstream gaming may have complex systems, but they are more successful when all the players can learn to speak the same language and play on equal footing. Understanding challenges is scaffolded through time, starting with simple and direct languages and challenges. Careful attention to our game language allowed us to refocus the game goals on overcoming, not avoiding, challenges.

Discourse Rule 2: "You Provide the 'Want To,' We Provide the 'How To'"

The bulk of our special education students were able to learn, but they had to be willing to work at it. Our strategy was to work at ignoring nonengaged students' "gaming" us and actively get excited when we saw any effort to game *with* us. Essentially, we relied on human desire for attention to introduce a new game mechanic to our students. They had to provide the "want to," and we had to be ready to respond, engage, and provide the "how to."

Broken Game Mechanic

We concluded that "forcing" children to work was not working. Telling them to learn was not the same as learning. Punishing students for missing work wasn't necessarily getting the work done. Nor was rewarding students the same as seeing them mature and choose their own self-improvement.[3] Students reported mild amusement at how much the adults got "worked up over a stupid worksheet." Indeed, all these efforts were actually amounting to was our own raised stress. The data showed that the entire system was not leading to student learning.

The Experience We Wanted

So we chose to stop forcing students to do schoolwork. This was initially a hard sell because it sounded as if we were giving up. However, we were not; we believed that internal motivation was more powerful and sustained than external motivation. To persist in policing schoolwork was exhausting and ineffective. We were actually shifting our efforts to reacting to the positive we saw in kids versus the negative. Refusal to do work was a reaction, not a disability. But what were they reacting to? Was the work too hard? Was it fun to see the adult get upset? Was this a way to get more attention? We really never found answers to these questions; we just ended the pattern. If students would give us the honor and gift of effort, we would engage with them. If not, we ignored them and

3. Alfie Kohn's Punished by Rewards was instrumental for me and others in this line of thinking.

made sure they didn't disrupt the efforts of others. If they would provide the "want to," we would be ready with the "how to." We would often deliver the "how to" in the form of smaller challenges or "quests" that we knew would help overcome the challenge.

Learning, for us, had to be an internal experience. We knew that if a student tried, he or she would eventually improve accuracy and quality of work. So, we intentionally began to "reward" effort with a smile and word of encouragement—regardless of academic success. Our work wasn't academic in these cases; it was character or "heart" work on the child. The child needed attention and we could choose how we gave it. This was more important than any worksheet, test, or essay, and it was central to the entire character of our school.

We reviewed each adult role and discussed new strategies that were consistent. As a principal, in most discipline situations, I would lead with "Were you trying?" as my first question. If not, the student could sit quietly without a lecture (and I could get back to paperwork). If so, we would spend the next hour role-playing new strategies for the situation and I would send the student back to class the next day with a "quest" that I would share with his or her adviser to follow up on. If the student succeeded, the adviser would tell me and I would make it a point to catch the child in the hallway to say, "Well played!"

Our suspension supervisor was told to allow students to put their heads down and sleep rather than forcing them to work all day. If the students wanted help, however, they were to pull up a chair, laugh, encourage failure, and lighten the mood in the room with music. Our teachers were given permission to simply walk away from any student who wasn't trying (as long as the student wasn't bothering others). This was a challenge for many teachers, but the result was less stress and the students' alienating *themselves*. It took away the student accusation that the teacher was "picking on them." Those in our special education staff were relieved to have me tell them that if students didn't provide the "want to," then they were not only able to walk away, but they were actually expected to do so. This initially freed up considerable time for them to work with the kids who wanted help. We contrasted the individual with our collective and consistent will to help: "*You* provide the "want to," and *we'll* provide the "how to.'"

Students at first thought this new idea was a joke. Many who were used to old patterns spent entire days saying, "I just don't 'want to' today!" However, when the fight disappeared (we let them relax), the rebellion did not seem as … rebellious. In fact, relaxing is actually a bit boring. Other students would just shake their heads and keep working. After one week, the broken games just ended, primarily because the game required two players. As adults, we could choose not to play that game.

For instance, instead of focusing on students who were not working, I would start with those who were working well. As a principal, when I visited classrooms to check on students, I'd start by asking active students what they were working on, praise effort, and joyfully recognize innovative thinking (not "mistakes"). I would sometimes deliberately stop by literally every desk, and then arrive at the desk of the student not working and lean in to whisper quietly, "You provide the want to, and we'll provide the how to." This meant simultaneously that "we care enough to give you your independence and respect it, *and* we will move mountains when you show up ready to play." The effects were not immediate, but they were positive and consistent.

The New Rule

So, for every special education student, his or her family, and our faculty and staff, we stopped investing time on power struggles with students who were resisting work, and we agreed that this would be the language we'd consistently use whenever a student was having a bad day, being lazy, or just looking for attention using negative behavior. In parent meetings, they would complain, "I can't get my child to do anything at home!" And we would agree! In truth, we can force only compliance or obedience, but we simply cannot force effort. They would say, raising their voices a bit, "Surely, you are the experts; you should know how to get my kid to learn!" And we would say, "Yes, we know 'how to' learn, but your kid has to 'want to' learn."

The more we said it, the more the philosophy spread. Instead of fighting combative kids, we just chose to say, "You provide the 'want to,' and we'll provide the 'how to,'" and move on. It was letting go of the *least* favorite part of our jobs, and seeing *better* outcomes. Games with unclear directions are frustrating and hard to play for everyone, and the only winners are those who like aggravation. This rule made the goal crystal clear. All a student had to do to get our collective attention was to "try" at whatever his or her challenge was that day. Simple.

Discourse Rule 3: "Every Change in Habit and Action Requires Effort, Heart, and Character, and We Will Celebrate When We See It"

Our third tactic was really an attitude adjustment for the adults involved. While "how to/want to" was how we handled students, "change = celebrate" was a guiding principle for us. At the center of this was a revisualization of special education. We pulled from gaming discourse the term *questing* as a more accurate word for these smaller, individualized goals. Each student in special education should have a clear "quest" he or she was on that had to do with lifetime growth and development.

In fact, this became so central to our communications with mainstream teachers and parents that we drew it up and used a staircase-like graphic (see Figure 1) that, once seen, began to shape all following conversation and planning for *all* of our students. We used this at all profile meetings and started to use it even for our mainstream students in counseling sessions preparing them for college applications. We even joked that we should add a third flight for teacher professional development.

Broken Game Mechanic

Instead of seeing "mainstream" and "spec'd" students, we really needed to present and agree on an understanding of human learning that was progressive and that *everyone* was learning—even teachers. Every person had learning goals that needed to be clarified and encouraged toward a lifetime journey. We needed a visual re-representation of what learning was, and incidentally, what the "end game" was for the school experience. Our solution was to simply show that the "game" was to climb the staircase—for *all* students. The final quests were to be excellent, independent, and helpful. These served as authentic goals that anyone could respect, not just within the scope of completing a worksheet, but in life; the game was big, and the stakes were worthy.

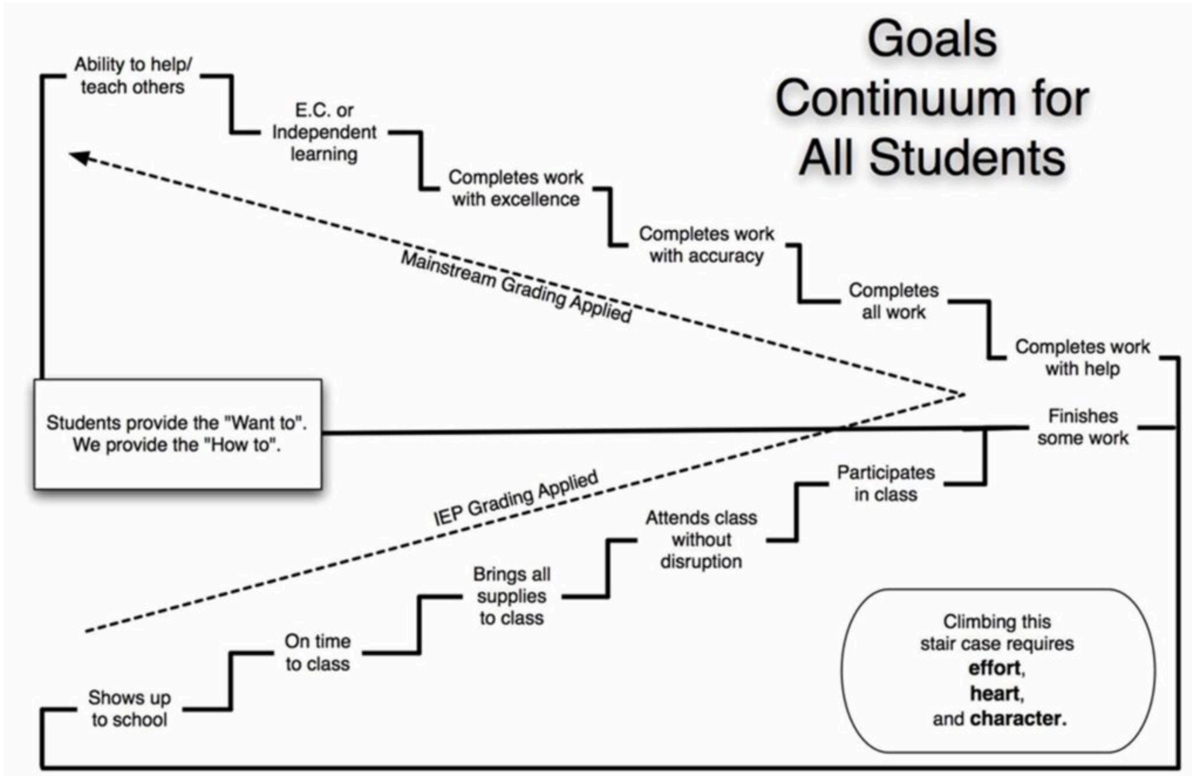

Figure 1. The "staircase" became part of our IEP meetings and student files to communicate goals for growth.

The Experience We Wanted

This visual allowed us to move forward on two key sticking points. Something about having a clear visual made the philosophy "real" for us and easy to use when thinking about program changes. This also created something like game rules that could be agreed on by all parties. Once the rules were clear, we could start to play.

Excusing or adapting work was commonly referred to as "dumbing down" learning for our students with special needs.[4] This graphic helped to clarify that we had common goals as educators, but we had different students at different places on the "staircase." When we had a student skipping school, then the accuracy of the work was not a smart place for us to put our attentions. So instead of asking them for missing work, it was simply more appropriate to say, "Welcome to school; we are glad you got here today!" Teachers could digest removal of work if they knew that we were all expecting them to be fully academic at some point in the future. In addition, when we met and could see students climbing, it was easier to get excited for them.

This provided a clear definition of what special educators were responsible for and what mainstream teachers were responsible for with a clear progression that we all agreed on. The staircase implies equitable "climbing" and effort at all levels, and it also implies that accommodations had an ending point. If we identified a student as being on the lower stairs, we knew that special education would be the ones marking the grade book for that student. No mainstream teachers were ever asked to "dumb

4. Having enjoyed J. T. Gatto's Dumbing Us Down, I was disappointed in this misinterpretation of an otherwise rational critique of schools' lowering academic expectations for all students. Gatto calls attention to overly didactic learning approaches that do not address the whole person, creativity, and original thinking.

down" their standards again. In fact, the staircase implied that they should level up their expectations for advancing students and give them opportunities for challenge, too. Each step provided a clear "quest" for each student as long as we could identify where the learner was. Some teachers began to play with independent studies, having students help teach, lead groups, and do field trips for learning. Most significantly, we started to see teachers offload after-school study groups to students who wanted extra credit.

Even in clear cases in which the disability was permanent (e.g., hearing loss) we wanted to teach the student to:

1. advocate for him- or her self;
2. make his or her own accommodations; and
3. use resources on his or her own to help learn.

We wanted our older senior students to help (top of the chart) younger students with disabilities that they shared, but that the seniors had learned to accommodate for. Students helping with instruction helped them to understand and grow together, it modeled a growth mind-set, and it gave hope to younger students that they would get through (if not over) their current struggles too.

The New Rule

In general, if you want kids to act a certain way, simply wait for them to do so and get excited when they do. Notice the use of "mainstream" and "IEP" were in reference to grading only, not identity. Grading simply determined which adult was doing assessment. All students learn, and we had a framework that reinforced a kind of hope for students to grow out of "spec'd" status into maturity, achievement, and helpfulness.

Every teacher, every IEP parent, and every staff member got a copy of the staircase and we went over it together in a staff meeting. We were going to play a game that actually had winners in it. Whether they agreed with it or not was not as important as coming to a common understanding of how and why we were making all of the above decisions about programming and services. We were *going* to change, we knew how we were going to do it, and we would celebrate anyone who was onboard. If the new game worked, the results would follow.

IMPLEMENTATION AND REFINEMENT

The new game of school had significant impact on our community, but I need to share a few disclaimers before sharing the results. These results are anecdotal memories, as we were designing and implementing rather than thinking about data collection at the time. None of the data are publicly available and were collected as part of normal school operations (not under an institutional review board, or IRB, approval). That said, this case narrative is ripe for replication as a formal study.

That said, we didn't think to gather proper data, but we did collect data that were relevant measures of our own success as a form of local action research. Dropout rates were only a final measure. We also tracked attendance, reading scores, formal and informal conversations with stakeholders, open-enrollment data, course-enrollment choices, class participation, progress on quests, voluntary after-school time, extracurricular enrollment, school-to-work data, behavior data, and community perceptions, including tracking news coverage of the school.

Another consideration of the results below is that not everyone was able to "get on board" with the new discourse tools and game rules. As I tell the story, it comes from the perspective of an administrator who had a team of simply outstanding educators who were war weary and ready for change—and I focus on the positive elements. Not all schools have the kind of faculty and staff that I largely enjoyed, nor were we completely able to persuade everyone within our school to play the new game. Just because I chose and choose to ignore the negative minority does not mean it did not exist or exert some influence in the narrative. In two cases in particular, I had to use the office of the principal to compel teachers to comply with new IEP agreements after they had agreed to them in the meetings. Overall, those who were willing to build a new game did, and we willfully ignored adults who were not—just like we did with the kids.

In the meantime, we decidedly changed our school. Below are memories of what happened next and narratives that our community embraced to "tell our story" to anyone who would listen outside of the school. Within the constraints above, I think you'll find the results to be idea generating, inspirational, and an indication that the game *can* be changed.

The "pencil trigger," for example, was one of our solutions that seemed *obvious after* we changed the game, but that just eluded us beforehand. Stories like this and the resulting changes came strikingly quickly (within one year!) after we shared a common foundation and set of "rules" to work with. Once we started playing differently, we saw a culture of "players" emerge, not just from students but from the teachers who were also part of the game. Likewise, we enjoyed a similar satisfaction when we had "players" enjoying the game we were creating for them. Each month we added "triggers" and "success stories" to our staff meetings so we could refine and improve the initial plan, and we found ourselves thinking like game designers. It is from these conversations that we noticed primarily that the new game was working. So first, the pencils, and then a collection of other observations retrieved from my old files, notes, and memories of an amazing new game.

The Pencil Trigger

Early in implementation, as we integrated students back into the mainstream classrooms, we noticed that a common trigger for an outburst or conflict between student and teacher was *forgetting a pencil* for class. Pencils were a valued commodity at our school and forgetting them was a "move" that students were making in the old game.

The pencil solution was to devalue them completely. Pencils had too much power in the game—they were out of balance. So, instead of having teachers lose a pencil, or students lose a chance to work, or conflict over repeated offenses, we changed the value of the resource. I bought a veritable boatload of pencils and handed out *boxes* of them—"like handshakes at a rally." I carried a few with me in the hallways and offered them to forgetful students. We chose to keep entire boxes of *sharpened* pencils (eliminating idle time in ISS) at the entrance of every classroom. Pencils were *free* for any student to grab as he or she walked into the room.

When the supply of pencils increased, their value as a game tool dropped. Students lent them to each other, teachers skipped the pencil problem happily, and pencils became positive pieces in the game, not negative. Now forgetfulness was less a problem and more a chance to show generosity. Students saw adults trying to solve a problem, and winning at it. Amusingly, this design change *alone* correlated with lower referral and detention rates for a variety of larger infractions that were stemming from the pencil trigger. Seeing how easily teachers could change the game, we were all ready for more.

Using the New Discourse

We began to integrate the staircase philosophy seamlessly into student meetings as "quests." We would, as a team, identify where we saw the student on the staircase (using the chart). This established a common understanding of the "level" where the student stood, and goals were self-evident within the clearly presented levels. ("What do you do at this level? You work for the next!"). The teachers would suggest what might encourage internal motivation to level up, while parents, admin, and the student would talk about quests that we were issuing to the student as a challenge that might require struggle on his or part.

Instantly the image of a staircase helped us all to *assume* that the goal was to climb within the student's capacity to do so. We also communicated that we understood that any growth would take character and a big heart. Effort, even failed effort, was a "win state" for us. So, once students accepted the quest ("want to"), we would tell them what we could do to help them ("how to")—they won when they tried, not when they tested. Naturally then, the inescapable testing was more a measure of the quests the *adults* designed than of the student. If students failed when they were trying, we needed to learn better "how to" for them.

Notice the lowest levels on the staircase. Returning to class was considered a game "privilege" on the "staircase." Within the year, more than 80% of our students had successfully "made it through a day" of full integration, then "made it through a week," and then forgot that non-disruptive behavior used to be a challenge. The reward was to be a "normal" kid again as much as possible. Using the student understanding of the old game, we could provide authentic and real opportunities that helped them stay in mainstream classrooms—and be part of the social game of school. Being back in mainstream classes was now perceived as a privilege that our IEP students saw as a new "way out" of their alienation. They just had to try to play a new game.

When and how they worked at school was part of their strategy, not ours. So we allowed them to suggest new strategies to deliver support. Many started to ask the special education teachers to check in with them only if they raised their hands (the stigma was still there), so the other students wouldn't think of them as special education. They would get help during study halls or after school. This language pervaded day-to-day communications, too. Once I heard a student ask another, "What quest are you working on?" Overall, the language mattered when we used it, and it established a new conversation about teaching and learning. We provided the rules, clear goals, and allowed students to develop and share tactics and strategies to level up.

Completing Quests

As the language of "leveling up" and "completing quests" grew, we also started to realize that our understanding of positive reinforcement was evolving. Many students, after years of "failure," were seeing clear goals and finding they were able to successfully achieve them. For the first time, the game itself became worth playing. This cannot be understated. We had assumed we had to force compliance with students within the old game, but this might have been because we had so many frustrated players reacting to a bad game design. The new game was more playable, with clear strategies toward student specific goals such as being normal, getting smarter, learning social skills, and learning itself. These were all the reward we needed—the game of learning is much better than the game of school.

That said, mainstream digital games do more than this. Though games are fun to play all on their own, when you "win" or "level up" they often make the achievement an event within the game. Literally, designers show fireworks, play cheering audio, brag the player up socially, and introduce new challenges based on achievement. Play is fun, but having the computer reinforce that your play was well done is icing on the cake. In schools, we can add some icing too, but it requires work and effort on our part.

So when we saw that small or large "quests" were completed, the special education staff grew into and built a system that would track and ensure that we (collectively) reacted to effort and character on our players' part. When our "players" achieved, we chose to *always* prioritize our time to:

1. call home;
2. congratulate students publicly;
3. recognize they were showing character via grading; and
4. tell the principal.

We flipped time spent on negative behavior and spent it on the positive growth we wanted. Calls home were once dreaded events; now they were anticipated and students would tell parents to expect the calls. Public bragging is fun, sends the right message, and shows everyone in the room how to be a hero. Instead of public chastisement of "disruptive" behaviors (such as forgetting a pencil!), we chose to make it a point to appropriately disrupt class, hallways, and all school announcements with achievements. We attached growth to point systems across the school (with cooperating teachers) and made sure that achievement showed up in rubrics, extra-credit points, and ultimately grading systems designed to communicate growth to parents.

Finally, I'll admit I loved embarrassing students with loud, enthusiastic, joyful noise. At first, I incidentally heard about achievements from historically problematic students and made it a point to praise them. Interestingly, other students began to ask their special education teachers to make sure to tell me, too. Together the faculty decided to add this fourth "reward" so the game was fair to all students, and because I was "good at making them blush a bit." Together we made sure that the praise was appropriate and sensitive to particular student needs and quests—so sometimes I privately caught them in the hall to let them know quietly, "I'm watching your progress, and proud of you. Well done!" and sometimes I sang them a song from across a busy hallway. Both got the job done. Icing on the cake.

For me as a principal, this took five minutes max, but for the student, the results lasted all day. When I was out of town, if possible I would *call* the student. Soon, parents would mention how excited their child was that night. All *other* students in the room/hallway also saw the attention that character change now garnered. Some would get a little extra by telling me when they got to school in the morning that "I'm on my last day!" of a weeklong quest.

A final outcome was that at the end of each semester the special education staff began to host reward dinners at which we would recognize the number of steps each student had climbed. No trinkets were involved (save some paper "certificates"), just verbal, public, and honest recognition of human growth and effort. At a few of these events, the special education teachers kept up that habit of shedding some tears—only this time for all the *right* reasons.

We had leftover trinkets from past reward systems that now collected dust because the authentic praise over actual character work was much more rewarding for all of us. We figured that both "games" required about the same amount of time and effort, but one was fun and one was … stressful. Instead of "discipline management," we found we were spending much more time on "design" and "celebration management"—to much greater effect. Office referrals all but disappeared (except for in the classrooms of two teachers who were notably sticking to the old game), saving me disciplinary time, frustration, and paperwork. Likewise, getting "in front" of problems is only part of the equation for special education teachers; the other part is building new, positive, lifetime learning challenges to replace the old game of school. One such design effort was the new Language Lab to accommodate new challenges for both special education and mainstream students.

The Language Lab

We never expected to rewrite the school's course offerings, but within a year of the new game we changed this. As we started to have special education students who wanted to try their hand at harder electives, we also began to review our scope of offerings at the school—and found them lacking a bit. We needed compelling, interesting, and even "fun" courses to replace pullout sessions and study halls that we had dwindling need for. So, each department began to build course offerings the following year. They pitched one exploratory course (often by combining or replacing decreasing study hall enrollment) and we began larger design discussions. The next school year, we began to offer electives, in each subject area, that were designed to be inviting to students with unique interests—both introductory and advanced. The most successful of these additions to the curriculum was the ability to take a foreign language.

For language learning, we partnered with Rosetta Stone to have a fully online "Language Lab," led by our French teacher (instead of a study hall). We started offering 29 languages using computer-based instruction and human supervision. This required a union-level vote (two, actually), public demand fostered by a newspaper article, and testimony from students who needed particular languages. One simply wanted to talk with her Polish-speaking grandmother, others wanted to enter the military speaking basic Arabic (often avoiding frontline hazards through having this skill), and some simply wanted to speak the same Spanish language that 15% of their fellow students spoke at home.

Changing language learning, from a "have to" for college-bound students to a "get to" for anyone who might want to learn a new language, actually worked. We expected a few more students to be able to transfer in Spanish credits and get a second year, but we didn't expect the Language Lab to get the kind of buzz that it did among students.

In the end, we saw enrollment shift from a small number of college-bound students taking a language to more than 80% of our students total—including a number of special education students who found themselves especially adept at language learning; for them this was a welcomed "break from worksheets and math." It hit home for me when a teacher at an IEP meeting suggested taking a language as an *accommodation* strategy to "do something different for an hour and *have some fun* [Italics mine] learning with a different part of their brain." If just one new offering could have this kind of effect, what more could we do across the curriculum?

A New Curriculum

Notice also that our mainstream teachers were having fun embracing innovative classes such as Brain Teasers, Anatomy, The History of War, British Literature, Computer Animation, Pottery, Caring for Your Car, Quilting and Design, and Criminal Law (see Table 1). These were largely project-based, intelligent, lifetime-learning classes. In addition, they added classes that fed health-care, farming, and education professions (our top regional employers) for easier school-to-work transitions. Our teachers not only embraced the chance to make new "games" to play, but they helped to ramp it up to a whole new level. As long as enough students brought the "want to," we would offer the course.

Two reactions come from the new curriculum: First, there's the impact of returning faculty to their subject-area teaching assignments (versus having them serve the shrinking demand for study hall, ISS, and pullout courses). Second, teachers *like* their work and have selected to teach a subject because they *love* their subject area. Just a quick survey of the yellow "new" courses (see Table 1) shows the imagination, relevance, and talent of the faculty in this school.

This a *repressed* resource in schools, not an emergent one unique to my school. Teachers quickly identified what they loved. When given permission to create a class that manifested their passions, they spent their time to align each course with state standards. What can be more fun than making a new class that captures the spirit of what helped you fall in love with your subject area? I wonder still: What designs already exist in schools across the country that simply are not accessed because leaders cannot imagine a new game or make room for innovation?

When the nuts and bolts of scheduling hit, we ultimately offered students a paper *Course Offerings* book and had them request and prioritize classes for us. Not all of the classes generated interest, but many did. Consequently, teachers were able to align their design instincts with student response in an authentic way. Where students, or our energetic guidance counselor, filled classes, teachers were "rewarded" with a class prep that *they* designed and a semester of a subject that was near to their hearts. When the subject had no student interest, we shelved it for next year. The result was a larger set of offerings with no additional faculty needs.

Table 1. **Mapping a new high school curriculum: Catalogs added playful courses.**

Subject	Existing Courses	Redesigned Courses	New "Fun" Courses
Mathematics	7th Grade, 8th Grade, Algebra I & II, Integrated I, II, & III, Geometry	College Probability & Statistics, College Algebra and Geography, College Calculus, College Trigonometry, Vocational/Consumer Math	Logic, Brain Teasers, Applied Statistics, ACT/SAT Math Prep
Science	Life Science, Earth Science, Physical Science, Biology, Environmental Science, Chemistry, Material Science, College Chemistry, Medical Terms	Physics, Anatomy, Physiology, First Aid	
Social Studies	Geography, American History, Political Science, World History	College Government, Economics, Sociology, Psychology, College Psychology	History of Athletics, Local History, The History of War, Cultural Readings, History of Rock-and-Roll
Language Arts	7th Grade, 8th Grade, College English	Composition, Creative Works, Reading Comprehension, Great Works, Mentorship	Communication/Speech, Drama, Mythology, Poetry, World Literature, American Literature, British Literature, Shakespeare
Digital Tech		Intro to Computers, Web Design & Marketing	Keyboarding/Word Processing, Computer Applications, Desktop Publishing, Word & PowerPoint, Spreadsheet Concepts, Intro to Video Production, Advanced Video Production, Senior Video Production, Computer Animation
Art	7th Grade, 8th Grade, Art I, College Drawing and Design, College Color & Design		Drawing, Sculpture, Pottery, Painting Oil, Water, & Acrylic
Industrial Technology	Small Engines, Welding I & II, Construction Skills, CAD, Auto Repair I & II, Woodcrafting, Advanced Woodcrafting		Home Projects, Electronics, Caring for Your Car, Introduction to the Trades, Work Mentorship, Scale Modeling
Family & Consumer Science	7th Grade, 8th Grade, Fashion/Clothing/Textiles, Marketing, Graphic Embroidery, Mentorship	Creative Foods, Foreign Foods, Crafts/Quilting, Independent Living & Family, Education	Basic Foods, Basic Sewing, Lifetime Crafts, Child Development
Business & Law	Accounting I & II	Personal Finance	Career Investigation, Intro to Law, Management & Leadership, Business Law, Criminal Law, E-Business, Education/Family Law
Music	Band, Choir		
Foreign Languages	French I & II		Language Lab (29 Rosetta Stone Options)
Physical Education	7th Grade, 8th Grade, 9th Grade, Fitness		Weight Training, Endurance Building, Group Games, Life Sports

Finally, we did see a small bump in open-enrollment students from neighboring districts who had heard about a course that was relevant to their career goals.[5] Ironically, courses in education, farming,

5. Minnesota students can enroll in any district they wish as long as the district has openings and the student is willing to provide his or her own transportation to the school. State funding follows the student.

and medicine (again, our three *top* regional employers!) were hard to find in schools. So the appearance of these options created interest and conversation around the community.

Activity, or the "verbs," of school design are essential to any consideration of the game of school. What gets done is essentially what any game has to appeal to players; the rest is external to the joy of playing the game. Learning is enjoyable, deeply satisfying, and worthy of our time. If we have students who are not attracted to learning, we need to wonder not how to force them to learn, but what *we* are doing that so repulses people from such a wonderful thing. In this case, we asked teachers to dream and imagine and reacquaint with their first love. Games can be social events, too. When they are, we invite players to join us in learning and playing them. So for our school, the new classes helped to shape how we talked about, recruited players, and connected with students with shared interests. Learning wasn't a static, permanent canon of predictable classes; it could also be alive and worthy of our passion, work, and effort.

Color Coding the Library

In addition, reading levels increased. With new classes, new topics, and new languages, our librarian saw the effect of increased traffic for special-interest books. Also, we encouraged students to read a book for a while when they were frustrated with course work; this was an upgrade to just "putting their heads down on the desk" and in a few cases we made it a quest to swap one for the other. Consequentially, library checkouts increased. Students started to line up at the librarian's desk to get recommendations or the answer to "How hard is this book to read?" Quickly, the librarian was asking for help to manage the increased traffic—what I call a "good problem." So we found a student assistant to help with traffic. We also assigned a high-level student who wanted to quest toward "helpfulness" on the staircase to put colored stickers inside the front cover of every book in the library based on the book's reading level. We color coded the library and students could discreetly pick out their own reading level. In game terms, this allowed players to make their own choices, made the difficulty level clear to the player, and encouraged them to physically grab and open a book before they got the "cheat" information. In school terms, we solved the good problem with a good solution. We were learning new design strategies as a result of a better game being played outside the library.

Overall, among all of the other changes, energy, and mainstreaming practices, our test scores returned the following year with clear growth in reading and math scores. We were still watching the test scores of our special education students especially because they had been *declining* in the previous years. Without forcing extra reading, mandating reading recovery, or hiring a reading specialist, we just gave key information to students at exactly the right moment in the game (selecting a book). The result was that instead of the declining reading scores of the past, the next year's test scores showed that *on average* our special education students increased *two reading levels* in a single school year and *no* students regressed.

A few students actually increased a full *four* reading levels that year. These students were regulars in the library, reading all sorts of books, and actively using the color coding to select books they could continue to find success with—and they found reading to be internally rewarding. They were also pursuing "being normal" in mainstream classrooms and putting amazing effort into that goal. While many readers fall in love with reading in elementary years, these students just needed the game's difficulty to be turned down a bit so they could learn better. Teachers who set rules around topics, not particular books, gave their students and our librarian a key opportunity to set up achievable goals and renewed growth. Giving them control and praising their new passion was natural, simple, and affordable.

Increased Extracurricular Involvement

Extracurricular participation increased in two ways. First, teachers who were invested in promising the “how to” were welcoming more and more students after school who wanted to succeed in class. In addition, they were encouraging student leaders to provide service help as tutors. Across student groups, these partnerships resulted in friendships (and positive social pressure!) that ultimately encouraged students to consider and join sports and clubs, or at least to attend school events.

Second, when special education students returned to mainstream classrooms, into which many of them quickly blended in, they were able to hear general education teachers talk about “the game,” or hear invitations to clubs in class. As a school we realized that much of the promotion for these activities came from one-to-one relationships that coach/teachers formed with students in their classrooms. If the student were pulled out, the relationship could never form.

For example, once in an IEP meeting, when the football coach saw the “staircase” he pointed out that joining the team could be the next “quest” for one of our larger young men. Quests could facilitate more than just academic growth. The rest of the team agreed, and the young man made the JV team as a sophomore—before doing the full load of mainstream work in classes. Traditionally, a student had to have success in class before joining a team. Letting a low-performing student play in sports was “sending the wrong message,” yet for the students, it seemed punitive and punishing in a way that took many special education students out of positive experiences for entire seasons at a time.

We found that, more important, playing on a team had less to do with academic success and more to do with effort, heart, and character. If students were providing the “want to” each day in class (a key game rule here!), they were welcome to join teams on which they would learn even more “how to” lessons, build adult relationships, and enjoy successes. If students didn’t perform, we had the freedom to pull them out of extracurriculars for the day, not the entire season. If students missed work, we had them make it up immediately and had varsity players help them get it done when possible. Coaches were encouraged to bench players who missed practices, but not necessarily to cut them. Likewise, nonathletic programming had consequences that were immediate and appropriate, but not final and excluding. The game had to have hope and a clear path to success.

With each success story, we were able to establish that extracurricular participation was an asset that helped growth. Athletic activity particularly, or lack of it, was part of the student’s condition, energy level, and ability to focus. These were more accurately part of the game, not the reward for playing or a separate element altogether. As game designers, we better conceived how time outside of school could be used within the game of learning. Why would we take away those key benefits when students were otherwise giving it their all in the classroom? Further, as teachers embraced this, we talked about it intentionally. My records show this became an agenda item at one monthly staff meeting: “More special education students joining extracurriculars!”

All of these results came about after simply changing and verbalizing the three rules outlined above.

Each of these rules successfully changed the school in different ways. They are woven into the outcomes above, but they also provided some unexpected experiences that compose what Paul Harvey would call “the rest of the story.” Our faculty, the students, and I were “playing” within a new environment with new rules. Capturing the in-game experience is the rest of the story.

THE REST OF THE STORY:

“No Labels, Just Learning”

As adults, we generally change our own language, but the labels that are so ingrained in special education discourse did not disappear entirely. Language is hard to change. The effect was still noticeable. Our intention was to treat children as children first, and do what we could to forget labels when we were engaged in teaching and learning. Mainstreaming efforts did meet with success for the vast majority of our special education students.

In addition, our special education teachers were also mainstreamed. We didn’t expect that pulling out students also had an effect on the perception of the faculty, who were by default pulled out of our mainstream classrooms too. When they returned to classrooms, without labels but as “co-teachers” or “helpers,” the result was an increase in “help” that students received in classes without having an IEP. The extra adult in the room was a clear bonus for all students. Teachers could bounce ideas and lessons off another adult. All students could ask for help and our special education staff had no qualms about helping anyone or adding one or two students to the small group in the back of the room during work time. If students wanted help, we helped them.

As students fluidly moved in and out of review and help sessions, we discussed that the labels just were not useful. Instead, teachers would say, “Anyone who wants to go over that lesson one more time can go sit with Mrs. [Helper] in the back; the rest of you can start working on your homework now.”

Another observation from the special education teachers was that they perceived their special education students were getting *more* help in the mainstream setting than they were in pullout. They noted that with less of a stigma, and with mainstream students modeling how to ask for help, they were learning the social skill of asking for help apart from their labels. Asking for help wasn’t a fault, or a sign of stupidity—it was a skill and it saved an amazing amount of time and stress for the learner. We began to integrate “asking for help” into our quests for some students. Finally, when the special education teacher had two students asking for help, the mainstream teachers naturally stepped in to help.

The result was that *all* students routinely started to ask for help from *all* teachers in the room. Labels evaporated and students quickly forgot to remember them because they just didn’t change the flow of the classroom. As routine accommodations (such as a hearing aid, alternative challenges, or audiobooks) became common, they lost their mystique too. Mainstream students, who also have learning challenges, occasionally asked if they also could have a “squishy ball” to play with while they worked, or to get a copy of the audio version of the text. These were good learning tools, not just good for special education students. When top students wanted to use the tools too, we could see the stigma dissolve quickly.

“You Provide the ‘Want To,’ We Provide the ‘How To’”

As adults we found we had to intentionally decide how to react to all the “triggers” (such as pencils) and reflect on the conditions that made these little things so explosive in the school. Our reaction to passive or refusing students could be a predictable and boring phrase, such as “You provide the want to, and I’ll provide the how to,” followed by enthusiasm and energy going toward students wanting to try. I’ve recently visited Northwest Passage High School, in Anoka, MN, that so strictly adheres to this idea of letting students sit that the staff allows students to quietly sit by themselves for days and weeks so that effort is the student’s choice, not a behavior issue. I asked an administrator if that had been an issue at all, and he said with a smile, “No, they eventually figure out that they need to work to graduate. They can be seniors here into their 20s, then all they can say is, ‘Man, did I waste a ton of time when I was young!’ That learning is absolutely foundational to the rest of that student’s life and it’s worth a few lost days of work time.”

Just choose not to provide attention for those choosing not to work. Play the “broken record” for students resisting work, and provide positive reinforcement to others. This seems counterintuitive to the culture of many schools. Why would any teacher allow a student to not work? Why would any educator condition his or her effort on the student’s motivation? Doesn’t this mean we were choosing not to care? No. The problem with these questions is that they assume that students have no voice or tools to play with in the game. They do. Teachers are not the only players in a learning relationship. We cared deeply for every student and every student was expected to behave in a way that allowed others to learn. Teachers are best when they are excited about their subject and encouraging the same in students. But students have to choose to play. Students are at their best when they try. If students try and we fail to help them learn, we need to adjust. If students do not try when we help them to learn, they need to adjust. Either adjustment takes character.

So when students refused to do work, most educators in our school let them. We learned that as adults, we could and should control the game, or at least our reactions to bad games that students were inventing. We could choose which game we wanted to play. “You provide the ‘want to,’ we’ll provide the ‘how to’” was a clear, easy-to-repeat, and predetermined response to all triggers that students could invent. It served to refocus us on learning and things that were actually worth our time and energy. It gave permission to teachers to enjoy the students who were willing to play and excuse themselves from feeling they had failed to engage every student every day, or that they were solely responsible for internal motivation—that was essentially not one of their game pieces to play.

In time, students joked about it when feeling tired: “I’m not sure I have ‘want to’ today”—which expresses a very human and natural challenge we all have. Also, when they did try, they could play by the same rule the teachers did and they could hold teachers accountable for the second half of the phrase: “You may not believe me, but I’m saying I want to try today. Please help me.” It allowed for new relationships because the rule was fair, playable by any player, and defined which game we wanted to be playing.

Initially this was a challenge for students used to (and possibly enjoying) getting into verbal combat every day. This was a form of tough love. Ignoring negative behavior was actually our way to love that student and help him or her shape new interpersonal strategies. Really, unless students were disruptive, we left them in class and let them be bored. It was no longer the teachers’ job to force compliance; it was their job to praise and recognize effort. We trusted that seeing their peers get more engaged would eventually crack the students' stubbornness and "want to" would beat isolation and boredom. It did. Defiant or refusal incidents nearly evaporated without teachers' playing the game. Of course, some situations still popped up, but only on occasion, and far from daily and hourly.

For the teachers, this phrase also meant increased effort when we had a struggling student who was trying. When a student wanted help, we resolved to open up lunch study groups, study hall organization, after-school "how-to" sessions, and had some teachers beginning to record "how-to" tutorials on common academic sticking points. I would roam the hallways after school and increasingly saw mainstream teachers sitting with two to five students (both IEP and mainstream) working over a particular idea from class. Normally, I wouldn't associate the changes with the discourse tool, except that when I would poke my head in and ask, "What are you up to?" they would answer, "How to."

"Every Change in Habit and Action Requires Effort, Heart, and Character, and We Will Celebrate When We See It"

Initially, special education teachers sustained "prizes" as rewards for quests. The problem we soon noted was that prizes were an external reward that perhaps works well for external motivation strategies. The effect of the new game was a level of guilt expressed by the special education faculty that they were essentially using "dog training" tricks on kids who were feeling the rewards of effort and character growth.

Real character improvement, however, is substantial, realized, and powerful. Plastic trinkets seemed to be unworthy to us after life changes happened. We met after the first month and concluded that we would just give away trinkets when students thought to ask for them and without any attachment to the work the student was doing. Students could have a trinket just because we liked them. This saved my special education teachers a load of time that they used to spend keeping charts, counts, and tracking behavior-modification nonsense. In addition, this created a kind of armor or resilience from trendy programs and/or "gamification" efforts to attach "badges" to schoolwork. When you have a system built on real relationships and internal motivation, the external cure-alls look a bit pale in comparison. Instead, the staircase, completing quests to get new levels, and praise served sufficiently, so that the students wanted those reinforcements more than any prize trinket. Simply put, acts of character required that they be matched with acts of respect and recognition.

Second, teams of teachers started to catch on to this. In addition to my loud "praise" visits to classrooms, teachers amplified their own recognition of growth by telling other teachers about how a student made strides. Some teachers chose to willfully stop talking about "problem students" and spend their informal time bragging about heroic students. Only a small number of teachers engaged in this covert effort, but the effect was a schoolwide perception among students that "Everyone seems to know everything about me!" and humble reactions such as "Sheesh, all I did was bring my things to class for two weeks!" Not everyone knew, of course, but the students were getting the message—we cared and we talked to each other.

Also, celebrations moved from individual to classwide to schoolwide. After the first semester, the special education teachers approached me and wanted to have an evening parent dinner the same week as the mainstream "Awards Night" that would highlight special education students' successes "on the top staircase." This communicated that the staircase did not end at "normal" and that recognition of good players actually got *better* the higher the level at which they were performing. The game itself was worth playing, but the icing was good too.

So we proceeded to host parents and make sure that the students who made the most progress were recognized for gains socially (sports and clubs, helping others, leadership, and overcoming adversity), academically (steps and levels, not grades), artistically, and in personal goals students had set (using a pencil, weight loss, asking for help more). Each "recognition" or achievement (we chose not to use "award") was given for documented change of habit or action.

The next semester, four families from neighboring districts transferred their special education students to our school directly as a result of hearing about our quest-based learning approach, mainstreaming, and because they had heard about this night of celebration. Our students were overcoming disabling realities and that gave them the unique opportunity to work harder, learn smarter, and fail forward with a level of character and effort that were worthy of our admiration and respect.[6] We didn't have to pretend they were achieving; they were playing the new game and winning. Parents who had reared wonderful kids could see that and they wanted their children in a school where we saw that too—or at least where we celebrated success more than punished failures.

Together, we began to value any and all efforts that represented a student's change of heart. Phoning home about success turned out to be more fun than calling home about negative behaviors. In IEP meetings we would discuss this with parents of kids who had a history of negative behavior: "Would you be OK if we handled 'failures' in-house as much as possible, and contact you only when it's an emergency? Or do you want us to call home for celebration and hiccups alike?" Many parents were relieved to go to work and have fewer calls from the principal's office—and I was relieved to get a few extra student helpers to color code the books.

CONCLUSION

We had a problem: Too many kids were taking advantage of, or not benefiting from, special education services. The result of this "game" was a culture of dropping out that started with segregation of mainstream and "spec'd" students, and that ended with too many losers. While our particular solutions may not be generalizable, they worked for us because we chose to address the game itself, not the student reactions to it. We shaped our understanding of research-based "best practices" around three core phrases:

1. no labels, just learning;
2. students provide the "want to," we provide the "how to"; and
3. every change requires effort, heart, and character.

These guiding ideas, developed and adopted by a majority (not totality) of our teachers, along with ongoing design-like thinking about the game of school, were enough to essentially transform how we hosted the game of school for our students and transformed our culture and incidentally our test results for the better.

6. Maxwell, J. C. (2007). Failing forward: Turning mistakes into stepping stones for success. Nashville, TN: Thomas Nelson.

Entire libraries have been filled with potential "answers" to the challenge of improving schools, but I wonder if they all appreciate that schools are a game too. Are schools essentially what we choose to make them into? Are we intentional about our "game" design and "user" reactions? What game have we made in America's public schools? Are the current systems in place producing "players" who are embracing learning, developing lifetime skills, or at the very least graduating with work-ready talent? Do we have students who are playing with us or against us? Teachers? Administrators? Parents?

We decide the game rules that we present to students whether we are aware of this or not. I propose that school is a game. There are engaging games and boring ones, complex games and simplistic ones, rigorous games and nearly passive ones. Which are schools? Games can be relevant and complex, or they can be simplistic, inconsistent, or even frustrating. How many players are metaphorically "throwing controllers at their televisions" when they try to play the game of school? How many are gaining relevant and complex skill sets in schools that easily transfer to life contexts? How many are having fun?

In conclusion, this is still just a story. I'm not writing as a researcher, just as a former administrator who can testify that there are answers to the challenges of schools. The recollection does show what can happen when members of a staff think like game designers and actively refine their programs based on "player" reactions to their game. So what I witnessed was a kind of proof of concept work. It can work. The game can be different. If we could get these results without a precedent, I'm excited to see what you can do *with* one.

I am convinced that many of the challenges schools face are solvable if the adults involved are willing to work together, agree on core values, invest the "want to," and research the "how to." Transforming a school is not as much about particular discipline policies or initiatives as it is about a change of effort, heart, and character.

As we did in this case, changing the game may require reading education law for ourselves, identifying sticky problems, changing language, changing policies, and keeping an eagle eye out for natural solutions that need to be part of revolving refinement. We need to be designers, not disciplinarians; gamers, not implementers; and recognize that effort from students is simply worth more than compliance, even if it takes some time to plan for. Frankly, a better game is just more fun to play.

As we move forward, we can share our successes, tell our stories, and direct our own dialogue to inspire, challenge, and direct an educator conversation that will define us. If you, or a school you know, are ready for a new game, let's talk soon.

CONCLUSION: GOOD GAME: ON THE LIMITATIONS OF PUZZLES AND POSSIBILITIES FOR GAMEFUL LEARNING

BY JEREMIAH KALIR

In this concluding synthesis, the author examines the 18 chapters of *Teacher Pioneers: Visions From the Edge of the Map* as a project with a challenging and necessary premise: Educators can creatively design games and usefully research game-based learning, and more educator-inspired and gameful approaches to teaching and learning can and should transform schooling. Because this conclusion—like the book as a whole—considers technological and social developments as inseparable, it is possible to map anew the dynamic relationships between school and game, and to better plot how educator design and agency can reorient schooling from puzzle making and maintenance toward the playful. The expressions of educator agency featured throughout *Teacher Pioneers* act as a collective counternarrative to trends such as games as textbooks, and also games as expert assessment tools. Alternatively, a conception of *gameful learning* is advanced to describe educators as committed to playfulness, design, and agency within game-based teaching and learning.

PUTTING ASIDE PUZZLES

Reading *Teacher Pioneers: Visions From the Edge of the Map*, one has the distinct pleasure of spending time with—and learning deeply from—educators who have put aside the material and metaphoric dimensions of school as a puzzle. Consider the crossword puzzle, its architecture and recreation evoking the linear, entrenched exercises of schooling's status quo. Upon completing even the most daunting paragon—say that featured in the Sunday *New York Times*—few players find pleasure in erasing known answers and embarking upon plodded territory once again. There is little, if any, replay value among the intricately arranged collections of clues. Furthermore, the puzzle affirms the importance of one set of right answers, a prescribed patterning of correctness that may not be questioned, only uncovered. And what of the designer? Not only is the expert puzzler at once judge, jury, and executioner, this mastermind is often either unknown or distanced from the minutiae of players navigating across, down, and back again ad infinitum. The games theorist Fred Goodman has observed: "Schools tend to pose problems to students in the form of puzzles. … This can result in students being taught to think that there is an answer to every question, a solution to every problem. … When students leave school they frequently find that problems in the 'real world' tend not to have 'once and for all' solutions. Many problems seem to have no solution at all" (para. 7).[1] The collection of voices contributing to *Teacher Pioneers* cautions readers from accepting that the problems of teaching and learning—and that the practices of schooling—might be addressed as if by the singular solution to a puzzle.

Yet school, for many students, operates—and, in the worst of cases, oppresses—as an elaborate puzzle. For these involuntary players, schooling persists as an attempt to discern static content guarded inside the expert teacher's head, to decipher the secret of some formula, to scrawl inside small boxes just enough correct answers so that those who credential are convinced of competence. Yet such maneuvering has little replay value for students, whose repetitive schooling-as-puzzling is just that—confusing, irrelevant, and disconnected from everyday interests, or curiosities, or cultural heritages. Just as troubling, teaching—for many educators—has become both puzzle making and maintenance. Often through no fault of their own, educators are seldom supported in cultivating the fluid dispositions of an improvisational musician.[2] Educator agency—-the authority to shape curricula in response to student inquiry, the ability to collaborate across disciplinary silos, the confidence to experiment, and the knowledge that failure does not foretell punitive measures—is celebrated abstractly while seldom ensconced in daily practice. Rather, educators are frequently positioned as engineers who must dutifully service well-worn applications for far-too-predictable student learning outcomes. As the philosopher Maxine Greene eloquently suggests, to neglect imagination and agency as central to pedagogy delimits educators to live and work as "clerks or functionaries" (p. 1).[3]

At a time when the deprofessionalization of teaching and divestment from public education are in vogue, it is additionally disheartening to witness the further coupling of schooling with teachers' puzzle making and maintenance. That so little can be expected from the practice of teaching is, perhaps, inevitable given pressures and prescriptions well beyond educators' locus of control. As American states race atop of some promised education pinnacle, nationwide reforms force local politicians and school leaders to either play within a particular set of puzzlelike constraints or to discard the entire crossword as if it were written in a foreign tongue (for example, four states never adopted Common Core State Standards and three have reversed course and withdrawn, and only 15 states have adopted Next Generation Science Standards).[4] Districts and schools are mandated to report a quantified average yearly progress, often struggling to alter methods of measurement that might better emphasize their distinctive commitments to equity, community, or family relations. Teachers, too, are subjected to demoralizing evaluations of their so-called effectiveness or quality, based largely upon contested value-added models.[5] And those who facilitate teacher professional development are often unwitting accomplices who further curtail the imagination and agency of educators; presenting some tool or list of best apps to the lowest common denominator becomes technodeterminism as distraction rather than an invitation for educators to chart their own inquiry or critical thinking. From policy to pedagogy, a discerning appraisal of schooling reveals the staid influences of Taylorism and "scientific management" as thriving among bureaucratic administration,

1. Goodman, F. (2010). Games, gods, and grades. THEN, 7. Retrieved from http://thenjournal.org/index.php/then/article/view/46/45
2. Sawyer, R. K. (Ed.) (2011). Structure and improvisation in creative teaching. Cambridge, England: Cambridge University Press.
3. Greene, M. (1995). Releasing the imagination: Essays on education, the arts, and social change. San Francisco, CA: Jossey-Bass.
4. CCSS and NGSS adoption data as of November 2015; see http://academicbenchmarks.com/
5. See, for example: American Statistical Association (2014) and Harris and Herrington (2015) in special issue of Educational Researcher (2015, 44(2). American Statistical Association. (2014). ASA statement on using value-added models for educational assessment. Retrieved from https://www.amstat.org/policy/pdfs/ASA_VAM_Statement.Pdf; Harris, D. N., & Herrington, C. D. (2015). Editors' introduction: The use of teacher value-added measures in schools: New evidence, unanswered questions, and future prospects. Educational Researcher, 44(2), 71-76.

teacher isolation, student tracking, mandated curricula and assessments, and the curtailment of academic freedom.[6] Many education stakeholders readily subscribe to the predictable and predetermined while toiling beneath the banner of disruptive innovation. The challenge and prestige accorded in playing to The Gray Lady's weekend crossword puzzle masks both an investment in—and a complicity with—the intransigent familiar.

Most fortunately, the many authors featured in this book share a counternarrative to the machinations of schooling-as-puzzling, teaching as puzzle preservation, and the educator as functionary.[7] Here, a collective evidence is advanced that suggests a provocative premise. It is a premise celebrating the antithesis of puzzle maintenance, rooted in more creative and critical approaches to education. *Teacher Pioneers* captures well—and, perhaps, for an audience unfamiliar with—bell hooks' perception of pedagogy, that "the engaged classroom is always changing. Yet this notion of engagement threatens the institutionalized practices of domination. When the classroom is truly engaged, it's dynamic. It's fluid. It's always changing" (p. 185).[8] Engagement and change, here, manifests as the following: If educators can creatively design games and usefully research game-based learning, then more educator-inspired and gameful approaches to teaching and learning can and should transform schooling.

The purpose of this concluding chapter is twofold: to unpack a thesis about educators as engaged game designers, and to suggest why this generative activity matters as a counternarrative to dominant conventions of formal schooling and traditional teaching. In doing so, I will address two questions. First, how might games and schooling be understood given converging—and conflicting —relations among technology and social practice? And second, what are the possibilities for design and engagement at the intersection of game-based learning, schooling, and educator agency?

INTRODUCING SOCIO-TECHNICAL FORMATIONS

To address this conclusion's guiding questions, I suggest it is necessary to read the prior 18 chapters as a confluence of networked relations: various media and designed technologies that inform patterns of pedagogy, indicators of learning as reflecting the constraint and affordance of multiple settings, and culture as expressed divergently along disciplinary, historical, and ethical dimensions. This patchworked complexity appears noticeably throughout *Teacher Pioneers'* myriad framings of *school* and *game.* These terms are neither assumed nor neutral; rather, they are produced by educator agency.

Based upon context and intent, both "school" and "game" function reflexively as noun and verb, thing and action. Schools, like games, are material technologies; both are products of design that afford particular behaviors (such as demarcating where and how to learn or play), both transmit and also

6. See, for example: Apple (2006); Ross (2010); and Watters (2015). Apple, M. W. (2006). Educating the" right" way: Markets, standards, God, and inequality. New York, NY: Routledge; Ross, E. W. (2010). Exploring Taylorism and its continued influence on work and schooling. In E. Heilman (Ed.), Social studies and diversity education: What we do and why we do it (pp. 33-37). New York, NY: Routledge; Watters, A. (2015). Is it time to give up on computers in schools? Retrieved from http://hackeducation.com/2015/06/29/is-it-time-to-give-up-on-computers/

7. Counternarrative plays a notable role in teacher education and teacher learning research (e.g., Bullough, 2008), and in critical analyses of race and positionality in education and education research (e.g., Ladson-Billings, 2004; Milner, 2007). Bullough, R. (2008). Counter narratives: Studies of teacher education and becoming and being a teacher. Albany, NY: SUNY Press; Ladson-Billings, G. (2004). New directions in multicultural education: Complexities, boundaries, and critical race theory. In J. A. Banks & C. A. M. Banks (Eds.), Handbook of research on multicultural education (2nd ed., pp. 50-65). San Francisco, CA: Jossey-Bass; Milner, H. R. (2007). Race, culture, and researcher positionality: Working through dangers seen, unseen, and unforeseen. Educational Researcher, 36(7), 388-400.

8. hooks, b. (1994). Teaching to transgress: Education as the practice of freedom. New York, NY: Routledge.

obstruct certain values (such as competition or cooperation), and both technologies are deployed to construct meaning (about, for example, accomplishment or failure). Yet so too are schools and games practices, or activities situated within the social world. To school and to game require the acceptance of norms (such as curricular standards or lusory attitudes), the appropriation of culture and identity (namely the costumes, gestures, and dialects indicating who is a student or player), and the mutual creation of conditions for shared engagement (summarized, perhaps most famously, in Paley's *You Can't Say You Can't Play*).[9] The technology of a game overlaps complementary social practices, and vice versa. Consider, for example, how the game *Math Blaster* reinforces and rewards memorization, speed, and factual recall. At the same time, schools require benign activities to manage behavior and tools to assess decontextualized factual knowledge, thereby rationalizing the "integration" of technologies such as *Math Blaster*. In recognizing the technological and the social as inseparable, it becomes possible to map anew the dynamic relationships between school and game, and to better plot how educator design and agency can reorient schooling from puzzle toward the playful.

In her book *Learning Futures: Education, Technology, and Social Change*, the education and social futures scholar Keri Facer describes how the design and affordance of any particular technology is intertwined with "different cultures of use." Designed technologies are interpreted within cultural and social contexts, changing how to understand the promise and pitfalls of a game, or a mobile device, or a model of schooling. A mobile phone, for instance, may help parents supervise children from afar, or provide individuals with an accessible safety net, or strengthen connections between distant lovers, or afford governments the capacity to surreptitiously breach private communication. Ultimately, Facer contends that "a useful way of considering how technologies 'shape' the world is to consider it as a process of 'co-production' between the potential capabilities of the technologies and the ways in which they are perceived and taken up in the social context" (p. 7)[10] Each case in *Teacher Pioneers* affirms that the social context of school matters when designing games and facilitating game-based learning, just as the social context of gaming and play matters to considerations—and (re)visions—of schooling.

Moreover, it is also necessary to recognize associated patterns, or what Facer terms *socio-technical formations*, characterizing how the material, the social, and that which is known are recurrently negotiated and coproduced. A designed artifact such as *Minecraft*, from this perspective, may be understood as coproduced through adaptation by classroom teachers for helping an entire school build Campbell City or for teaching earth science concepts (see Wilmot and Pusey, Chapters 8 and 9, respectively). So, too, might *Minecraft* become part of a civic geography siting youth design of their future cityscapes,[11] or an online iteration of summer camp whereby coding replaces canoeing.[12] *Minecraft*'s varied "cultures of use" reflect broader socio-technical formations about the capacity of media, and game platforms specifically, to alter enduring conceptions of what school and education are, or could become. Like promising coproductions surrounding *Minecraft*, the projects

9. Paley, V. G. (1992). You can't say you can't play. Cambridge, MA: Harvard University Press.

10. Facer, K. (2011). Learning futures: Education, technology and social change. London, England: Routledge.

11. Hollett, T. (2015). Nashville: Building blocks. Civic Media Project. Retrieved from http://civicmediaproject.org/works/civic-media-project/nashville-building-blocks

12. Learn about Connected Camps at https://connectedcamps.com/.[/foot[footnote]Complementing this book, there are a number of organizations and schools exemplifying this stance, including the Institute of Play (and their Quest to Learn schools, http://q2l.org/), The Incubator School (http://www.incubatorschool.org/), and GameDesk's PlayMaker School (http://www.playmaker.org/).

featured throughout *Teacher Pioneers* speak back against dominant socio-technical formations associated with games and schooling while simultaneously advocating in favor of educators' voice and creativity.

Teacher Pioneers is an invitation for educators, school leaders, and research partners to proactively design new socio-technical formations—and possible education futures—associated with games and schooling. One consequence of this book is a call to coproduce alternative school and game mashups in service of greater teacher agency and more equitable student learning[13]. Through descriptions of *Minecraft*, *Mystery Trip*, and many others, the sharing of counternarratives exemplifies a critical stance that discards the sanitized adoption of material technology into the established social norms of teaching and learning. Rather than replicate pervasive forms of school-as-puzzle, these authors share journeys of traversal and transformation; it is that which carries us all to the edge of their maps.

Spanning primary to higher education settings, multiple disciplines and pedagogical commitments, and an array of playful designs, *Teacher Pioneers* looks beyond game and school as immutable and inherited. Having put aside puzzles, and having shared visions from distant horizons, it is difficult to dismiss recurrent themes of more significance than flavor-of-the-month fixations with some new app, game mechanic, or learning analytic. The stakes, as presented and analyzed here, are higher, and the social and technical convergences richer and more complex. Given adequate support and shared purpose, educators' agency as game designers and game-based learning researchers can alter schooling. Doing so reimagines how the coupling of social, pedagogical, and cultural practice with varied technologies can (re)form a more playful—and, as I will later argue, a more gameful—approach to teaching and learning.

SOCIO-TECHNICAL FORMATIONS AMONG GAMES AND SCHOOLING

The possible ways of understanding how the technological and the social dimensions of games shape people's shared reality are many—from leadership development in *World of Warcraft*,[14] to gaming as a platform for global advocacy,[15] to collaborative play that solves long-standing problems in medical research.[16] The authors of *Teacher Pioneers*, however, indicate that there are also particular ways of understanding how the technological and social dimensions of games and school together and recurrently coproduce ways of teaching and learning. Here, I summarize and discuss two such socio-technical formations; both explain certain convergences between games and schooling, and both appear to motivate these educators' sense of agency and creative pedagogy. Specifically, and perhaps unavoidably, the designs, failures, and insights shared in *Teacher Pioneers* both reflect and react against (digital) games as "leveled up" textbooks and also game-based learning as a comprehensive means of assessment. In contrast to these two—admittedly not exhaustive—coproduced meanings regarding games and schooling, I will later argue that the educators in this book represent a third and radically dissimilar counternarrative about the promise of game-based teaching and learning.

13. Complementing this book, there are a number of organizations and schools exemplifying this stance, including the Institute of Play (and their Quest to Learn schools, http://q2l.org/), The Incubator School (http://www.incubatorschool.org/), and GameDesk's PlayMaker School (http://www.playmaker.org/).

14. Wolfenstein, M. (2013). Digital structures and the future of online leadership. In S. D'Agustino (Ed.), Immersive environments, augmented realities, and virtual worlds: Assessing future trends in education (pp. 257-279). Hershey, PA: IGI Global.

15. McGonigal, J. (2011). Reality is broken: Why games make us better and how they can change the world. New York, NY: Penguin.

16. Coren, M., & Fast Company. (2011). Foldit gamers solve riddle of HIV enzyme within 3 weeks. Scientific American. Retrieved from http://www.scientificamerican.com/article/foldit-gamers-solve-riddle/

The Textbookification of Games

Teacher Pioneers challenges a trend in perceiving and deploying games as a more interactive, sophisticated, and—to borrow a well-worn phrase from video gaming—"leveled up" textbook. Whether in print or digital form, the textbook persists as one of the most pervasive educational technologies associated with formal schooling. The emergence of eTextbooks has done little to alter basic conventions; textbooks are produced en masse for blanket distribution, disseminated through lucrative corporate contracts, aligned to the mandates of standardized assessments, seldom vetted by educators, and politically divisive. Furthermore, the textbook's material design complements far too well schooling's more traditional social practices—adherence to scripted curricula, reliance upon conventional and didactic instruction, and little regard for dissenting or critical perspectives. With textbooks, the medium is indeed the message. The tool deftly advances what the critical educator Paulo Freire termed the "banking" model of education, whereby students are arranged as empty containers lacking identity or interest who vapidly await the efficient depositing of expert knowledge.[17]

It is troubling that commercial video games are becoming the textbook's avatar, this generation's deceptively pleasurable rendering of yesteryear's basal reader. The textbook "big three"—Pearson, McGraw-Hill Education, and Houghton Mifflin Harcourt—aggressively market games initiatives under the guise of personalized, blended, and adaptive learning campaigns. Smaller "independent" game-design companies, launched often in start-up technology hubs and backed in some instances by university-based research partners, scramble for their market share. The ease with which educators and school leaders can access, demo, and buy games at scale is exacerbated by well-intentioned efforts to provide every student with a device, or teach 21st-century skills, or close some newly identified gap. Yet this enthusiastic adoption of (digital) games echoes a concerning history of educational technology hype-cycles as documented in Larry Cuban's seminal book *Teachers and Machines: The Classroom Use of Technology Since 1920*.[18] His more recent commentary on the development and marketing of educational technologies is woefully applicable to the creation, procurement, and suggested promise of commercial games:

> The lure of money and doing good (e.g., solving problems of equity, academic achievement, classroom management) draw start-up entrepreneurs into the half-trillion dollar education market daily. Yet treating end-users [i.e., educators] as the customers, knowing their world well before designing and pitching new "solutions" to old problems continues to be the exception, not the rule.[19]

Games are an unlikely panacea for the shortcomings of either pedagogy or student learning; textbooklike proliferation only further cements the status of certain games as silver bullets. Cuban's critique points toward a shared concern for many of the *Teacher Pioneers* authors: Do (digital) games designed by outside entrepreneurs—whether in industry or the academy—meet these learners' needs or address these teachers' pedagogical dilemmas? The marketing of commercial (digital) games for schooling—aided in no small part by everyday social networks, viral media, and promises of

17. Freire, P. (1970). Pedagogy of the oppressed. New York, NY: Continuum.

18. Cuban, L. (1986). *Teachers and machines: The classroom use of technology since 1920.* New York, NY: Teachers College Press.

19. Cuban, L. (2015). District purchasing of high-tech devices: How teachers continue to lose out. Larry Cuban on School Reform and Classroom Practice. Retrieved from https://larrycuban.wordpress.com/2015/06/06/district-purchasing-of-high-tech-devices-how-teachers-continue-to-lose-out/

pedagogical transformation—masks more critical thought about nothing more than an endless buffet of chocolate-covered broccoli.[20]

Like textbooks before them, the commodification of games in and for school—and the ease with which concern for scale outpaces commitments to community—represents the antithesis of how some envision the impact of this technology.[21] Educators' creative agency with games and game-based learning, rather than uncritical and extensive tool adoption, matters to designers and researchers such as Kurt Squire. In his book *Video Games and Learning: Teaching and Participatory Culture in the Digital Age*, Squire reflects upon the coupling of design, agency, and scale, observing: "That [teachers' creative application] is the goal of scaling—not getting 10,000 teachers to all do the same thing at the same time. In fact, if 10,000 teachers were all doing the same thing, our intervention would have failed. We *wanted* [original emphasis] students and teachers to design games about their unique local communities" (p. 211).[22] Playing this out to a hilarious and disquieting conclusion, one shudders at a vision of schooling whereby games become substitute teachers and students sit compliantly before computers dispensing, conveyor belt–style, *Math Blaster*, *Civilization,* and *Minecraft*.

As with the introduction of any material technology, it behooves educators and school leaders to critically question how games relate to, possibly exacerbate, or usefully subvert enduring school inequities and social practices. For example, how are game-design companies responsive to the expertise and interests of educators? The case of Pittman, the game *Portal 2*, and his interaction with Valve (Chapter 6) is encouraging;[23] such collaborations could become models further developed by others. How might gaming platforms or companies support game design in response to local circumstances or student interest? Kavaloski's efforts with the open-source ARIS platform (Chapter 11) and Isaacs's students' creation with *Gamestar Mechanic* (Chapter 16) are both promising exemplars. These are important counternarratives precisely because educators who are content to adopt games bought by administrators and designed by companies far removed from everyday schooling may not recognize how decisions made in the name of innovation inadvertently delimit educator agency. Media consumed uncritically can readily reify the "textbookification" of schooling and a "revelling in the superficial" (p. 217).[24]

Games and the Authority of Algorithms

Teacher Pioneers also contests a narrative that games are a means of thoroughly assessing learning given supposed shortcomings in educators' ability to understand what students know. An ill-informed logic—in the worst of cases—suggests that educators possess neither the skill nor the professional disposition to accurately or adequately assess what their own students have learned during a given lesson or upon completion of a unit.[25] As a tool that exemplifies the mining of big

20. This perennial critique of games and learning has appeared in many forms, including Bruckman (1999). Bruckman, A. (1999, March). Can educational be fun? Paper presented at the 1999 Game Developers Conference, San Jose, CA.

21. A comment from Sujata Bhatt—who agreed to be named as a manuscript reviewer—suggests an alternative relationship between scale and community given various education reformers' concern for scale and impact. She suggests educators' creative agency may be difficult to cultivate en masse until teacher preparation opportunities expand values and pathways.

22. Squire, K. (2011). Video games and learning: Teaching and participatory culture in the digital age. New York, NY: Teachers College Press.

23. Unfortunately, Valve subsequently ended education programming as of early 2013.

24. Brabazon, T. (2013). Take the red pill: A new matrix of literacy. Journal of Media Literacy Education, 2(3), 209-229.

25. Sujata Bhatt reminds readers that games can also serve as a playful form of assessment, particularly when student gameplay is predicated upon their prior content acquisition.

data and the capabilities of embedded learning analytics,[26] digital video games are often lauded as a means of closing this presumably troubling gap in educator competency. Yet when educators do use digital games as a means to assess students, the game—in and of itself—rarely functions as the sole mediator of evaluation. A recent survey of more than 450 classroom educators investigated formative assessment practices during students' digital gameplay. These educators did not passively monitor students' gaming, as some narratives might suggest. Rather, the teachers actively observed their students, interacted with them via questioning, and created opportunities for complementary problem solving.[27] Such relational and in-the-moment assessment practices can deepen and further contextualize students' digital data trails. Video games can serve as a mechanism to assess what students know and can do. From this perspective, however, an outstanding tension concerns the extent to which educators' assessment practices complement—or are ultimately circumvented by—the authority of algorithms.

A number of explanations—some reasonable, others debatable—amplify this depiction of who (or what) can skillfully and meaningfully assess student learning. For starters, the learning "black box" —what really does happen inside a child's mind, or among the social worlds of a classroom, or across a trajectory of schooling?—has long motivated the development of ever more sophisticated education-research methods. Subsequently, a methodological arms race—rife within both academe and industry—reflects an obsessive physics envy, or the idea that so-called "softer" sciences (such as education) can and should develop mathematically valid explanations of foundational concepts (such as motivation or self-efficacy).[28] An inclination to count only that which is reliably measured has also influenced the realm of education policy, where it is now de rigueur to follow big data correlations—from students' standardized tests scores, to educators' value-added evaluations, to compounded averages of a school's yearly progress. Within this context, it is no surprise that (digital) games are used as a quantifiable intervention that can lead to predictable student learning outcomes via reformed assessment practices.[29] The data, in one respect, flow up; if research suggests that a student who plays *Ratio Rancher* is more likely to develop proportional reasoning skills, then she may increase her score on a future mathematics assessment, thereby improving her class's average and reflecting favorably on the school's overall achievement. Finally, it is no accident that advocates of game-based learning seek to advance their own counternarrative given long-held biases against video games as a playground for (mostly male) violent fantasy. Amassing evidence that video games are, to the contrary, powerful learning tools makes it that much harder for detractors to claim that gaming is related to aggression or antisocial behavior. While none of these trends is, in its own respect, necessarily or entirely "bad," a collective influence can magnify unintended consequences. Forced to administer someone else's algorithm—whether via video game or standardized assessment—educators readily lose authority and autonomy as experts in their own classrooms.

26. See, for example: El-Nasr, Drachen, and Canossa (2013); Halverson and Owen (2014). El-Nasr, M., Drachen, A., & Canossa, A. (Eds.). (2013). Game analytics: Maximizing the value of player data. London, England: Springer London; Halverson, R., & Owen, V. E. (2014). Game-based assessment: An integrated model for capturing evidence of learning in play. International Journal of Learning Technology, 9(2), 111-138.

27. Fishman, B., Riconscente, M., Snider, R., Tsai, T., & Plass, J. (2014). Empowering educators: Supporting student progress in the classroom with digital games. Ann Arbor: University of Michigan Press.

28. Phillips, D. C. (2014). Research in the hard sciences, and in very hard "softer" domains. Educational Researcher, 43(1), 9-11.

29. See, for example: D'Angelo et al. (2014); Gee and Shaffer (2010). D'Angelo, C., Rutstein, D., Harris, C., Bernard, R., Borokhovski, E., & Haertel, G. (2014). Simulations for STEM learning: Systematic review and meta-analysis. Menlo Park, CA: SRI International; Gee, J. P., & Shaffer, D. W. (2010). Looking where the light is bad: Video games and the future of assessment. Phi Delta Kappa International EDge, 6(1), 3-19.

Teacher Pioneers highlights a tension about educator agency, algorithms, and assessment. How are methods used to assess student learning authored and then administered? What role—if any—do educators play in these processes? Despite ongoing debate about how to measure and make meaning from the impact video games have on student learning,[30] I raise these questions not to suggest that learning analytics, or benchmark metrics, or evidence-based practices are either unnecessary or invaluable to classroom teaching and learning. On the contrary:

> *The pressing questions aren't which measures to use, but how to rethink assessment and evaluation procedures for a more participatory age. ... People enjoy participating in these [performance and assessment] systems in part because they have a voice in shaping the rules that govern them. This is oppositional to the idea that testing bureaucrats somewhere set standards, goals, and measurements and then see how well others live up to them. (p. 234)*[31]

Numerous cases in *Teacher Pioneers* describe a more participatory approach, whereby the rules—or the literal and metaphoric algorithms—that govern assessment are redesigned. In what is referred to on more than one occasion as "hacking," educators and school leaders do have the agency to alter assessment algorithms by authoring new measurement and competency practices, and by redefining what counts as evidence of student learning. Dikkers (Chapter 18) describes how, as principal of a rural Minnesota high school, he collaborated with his faculty to shift school culture, map new curricular pathways, and implement goal setting and reward structures to better support the success of special education students. After a game-based unit, Saunders (Saunders and Kalir, Chapter 15) supplemented a district-mandated standardized test with qualitative questions aimed at more thoroughly capturing his students' voice and knowledge. Darvasi (Chapter 5) captures well the commitment to agency shared by many of the authors in this book; reflecting upon *The Ward Game* he emphasizes his own "resourceful and playful subversion as an agent of change ... playfully pushing boundaries and reprogramming the structures and routines of my school and classes." Algorithms—whether those programming big data systems, the grammar of schooling, or games as assessments—are created by people with biases (about what counts) and blind spots (and what is not measured tends not to matter). The eager embrace of learning analytics so often associated with game-based learning should accompany a similar commitment to support educators as authors and authorities of assessment.

TOWARD GAMEFUL LEARNING

Teacher Pioneers does more than plot where and how game-based learning has contributed to more playful and less prescriptive schooling. The hallmark contribution of this book is a mapping of that which is just now being traversed: educators as designers of games for their own students, educators who craft gameplay to seed new social practices and interdisciplinary insights, educators as researchers of their own game-based teaching, and educators whose pedagogies are no longer constrained puzzle maintenance. This shared effort guides readers toward a seldom-explored set of contours where educator agency is aligned to a definition of play as "free movement within a more rigid structure" (p. 304).[32] Despite the rigidity of conventional textbook-friendly schooling, and despite the inflexible measures of learning mandated by faceless bureaucratic puzzle masters, an unmistakable counternarrative of "free movement" emerges from these contoured edges. Educators

30. Stokes, B., Walden, N., O'Shea, G., Nasso, F., Mariutto, G., & Burak, A. (2015). Impact with games: A fragmented field. Pittsburgh, PA: ETC Press.

31. Squire, K. (2011). Video games and learning: Teaching and participatory culture in the digital age. New York, NY: Teachers College Press.

32. Salen, K., & Zimmerman, E. (2004). Rules of play: Game design fundamentals. Cambridge, MA: MIT Press.

are writing for their peers, questioning their own biases and practices, and navigating discovered—and recovered—teaching and learning terrain. Here, the concept of *gameful learning* is advanced to capture these commitments to playfulness, design, and agency. In this section, I suggest that the educators and researchers featured in *Teacher Pioneers* represent a promising vision of gameful learning.

The gameful learning presented throughout *Teacher Pioneers* disrupts presumptions about who plays and learns with games. The previous 18 chapters introduce readers to educators who proudly—and publicly—design, play, and learn with games. Educator agency, in this respect, manifests as dedication to reflecting upon novel teaching experiments, documenting honestly ethical implications of gameplay (see Cook and Duncan, Chapter 14), and sharing rich descriptions of pedagogy and curricular development.[33] Whereas game-based learning typically presumes that an intervention—and, perhaps, subsequent research—focus upon K-12 (and, to a lesser extent, higher education) students, gameful learning shifts toward a more expansive framing that does not parse student from educator learning as two independent phenomena. It is not possible, for example, to read Vann (Chapter 12) and distinguish his growth as a first-year teacher from his students' project-based learning. Both "projects," in that case, required mutual goal setting, collaboration, and iteration; "If I expect my students to learn through failures," Vann reflects, "I should as well." Consequently, this book presents a reorientation in discourse and priority, as educators' pedagogy and reflective practice are opened for examination alongside students' interdependent play and learning. Elsewhere, and in collaboration with classroom teachers and teacher educators, I describe how playful attitudes, experimentation with identity, and engagement with uncertainty characterize the necessary "plurality, personality, and difference" of educators designing and then playing games with their students. A gameful learning perspective focused upon teacher growth can usefully discern:

> how educators are creative professionals capable of being held to high expectations for generative intellectual work ... [and] can help researchers to reveal how teachers adapt – and actively design – curricula and tools that emphasise higher-order thinking skills, broad areas of knowledge, and process-oriented activity. (p. 198)[34]

Complementing a focus on educator learning, *Teacher Pioneers* also showcases educators motivated to play with their dispositions—as designers, as teachers, and also as researchers. Not content to facilitate school as a puzzle with one right instructional answer, many authors evidence an inclination toward attributes often described as design thinking, including creating for and with users, prototyping, and iteration. Hergenrader, for example, details six design principles for immersive role-play that "give educators many different pieces with which they can experiment and tailor to their specific purposes" (Chapter 4); Pusey, likewise, describes her own "experiment" with the "versatile" *Minecraft* (Chapter 9); and for Glazer, her design took the form of a "mashup" between *Beowulf* and a role-playing game (Chapter 3). In addition to designing resources and experiences, some authors redesigned themselves—that is, their identity—as teachers. Saunders became Creepor the intergalactic emissary (Saunders and Holden, Chapter 15), Darvasi acted as both Dr. Spivey and

33. See, for example: McCall (2011); McClintock (2011); Squire (2011). McCall, J. (2011). *Gaming the past: Using video games to teach secondary history.* New York, NY: Routledge; McClintock, S. (2011). Counting priests, paladins, & pets. *Mathematics Teacher, 105*(3), 214-218; Squire, K. (2011). *Video games and learning: Teaching and participatory culture in the digital age.* New York, NY: Teachers College Press.

34. Holden, J. I., Kupperman, J., Dorfman, A., Saunders, T., Pratt, A., & MacKay, P. (2014). Gameful learning as a way of being. *International Journal of Learning Technology*, 9(2), 181-201.

"Big Nurse" Ratched in the simulation of *One Flew Over the Cuckoo's Nest* (Chapter 5), and Fallon feigned being a "Mild-Mannered English Teacher" (Chapter 2). In this respect, gameful learning helps to explain embodied and improvisational identity play foregrounding qualities such as exploration, nonlinearity, and improvisation.[35] Furthermore, all contributors to *Teacher Pioneers* adapted the very real role of researcher. Just as the classroom teachers embraced elements of practitioner inquiry, university-based research partners also developed new inquiry dispositions. As Howell and colleagues note: "Parallel to the ways that e-textiles bridge many forms of expertise across school, family, and friends, we too brought different expertise and were each willing to work across our normal boundaries in order to make this project work. It was unique and atypical for each of us" (Chapter 13). The concept of gameful learning is further useful in describing the sustained agency of play at the intersection of educator design, identity, and research.

When games are adopted as textbooks, assessment systems, or even as rewards to covertly manage student behavior, teaching and learning remain confined within a classroom's walls. The gameful learning evident throughout *Teacher Pioneers*, however, does not adhere to this spatial demarcation. Rather, gameful learning also encompasses a decidedly ecological approach to the design and subsequent activities of gameplay.[36] Some authors detail how they created and sustained novel learning opportunities across settings, whether for students or via educator-facilitated professional development (see Glazer and Ng, Chapter 17). Working in the context of an outdoor summer camp, Martin (Chapter 10) explains how place-based narratives and augmented reality tools shaped youth inquiry and exploration. The cross-setting qualities of gameful learning also emerge from more conventional school contexts. Fallon's alternate reality game *Dolus* (Chapter 2) situated student learning in multiple classrooms, outdoors across the school grounds, and via numerous digital platforms accessible to students anytime and anywhere. In Darvasi's *The Ward Game* (Chapter 5), the social world of *One Flew Over the Cuckoo's Nest* was wrapped around students' classroom, online, and out-of-school lives. These approaches to trans-spatial learning[37]—that is, embracing online, social, interest-driven, and hybrid or mixed-reality configurations both within and outside of school—suggest that games are a viable means of designing learning within and across everyday and academic settings.[38] Gameful learning constructively signifies that educators have the design knowledge and skills to situate student engagement across settings, as well as the ability to leverage various media and curricula to document how expressions of inquiry span multiple learning locations.

The cumulative insight gleaned from considering gameful learning as diverse expressions of educators' agency and growth, willing playfulness, and cross-setting design suggests that a particular way of knowing has been shared throughout *Teacher Pioneers*. This knowledge—about design, play,

35. See Gee's (2007) explanation of identity play as a learning principle in well-designed games.

36. See Salen (2008) for a discussion about the ecology of games and play. Salen, K. (Ed.). (2008). The ecology of games: Connecting youth, games, and learning. Cambridge, MA: MIT Press.

37. Squire, K. (2009). Mobile media learning: Multiplicities of place. On the Horizon, 17(1), 70-80.

38. See, for example: Hayes and Games (2008); Kafai & Peppler (2011); Mathews (2010); Squire, (2010, 2011). Hayes, E. R., & Games, I. A. (2008). Making computer games and design thinking. Games & Culture, 3(3), 309-332; Kafai, Y. B., & Peppler, K. A. (2011). Youth, technology, and DIY developing participatory competencies in creative media production. Review of Research in Education, 35(1), 89-119; Mathews, J. (2010). Using a studio-based pedagogy to engage students in the design of mobile-based media. English Teaching: Practice and Critique, 9(1), 87-102; Squire, K. (2010). From information to experience: Place-based augmented reality games as a model for learning in a globally networked society. Teachers College Record, 112(10), 2565-2602; Squire, K. (2011). Video games and learning: Teaching and participatory culture in the digital age. New York, NY: Teachers College Press.

and the assessment of student learning—is not expressly technical. Readers expecting a prescriptive tutorial on, for example, the craft of game design may be disappointed and should look elsewhere (despite the inclusion of many resources about role-playing, pervasive, and place-based games). Nor have these authors each contributed to a single, universal truth about games and learning—some distanced observation and unchanging understanding regarding how game-based learning may be applied to any classroom or school. Rather, the type of educator knowledge glimpsed distinctively in this book is what Aristotle referred to as *phronesis*—or practical wisdom—a way of knowing that differs from the applied and technical (*techne*) and from the universally true (*episteme*).[39] Here, educators have shared their phronetic knowledge about games and school—and it is a wisdom that depends upon a given learning context, reflects particular ethical commitments, and is oriented toward ongoing practice and agency.

As *Teacher Pioneers* chronicles educators' gameful learning as practical wisdom, the book also surfaces and holds a peculiar tension between charting innovation and prescribing design. As these many authors share pragmatic knowledge accrued from years of teaching, an invitation is proffered for others to develop their own skills, cultivate their own dispositions, and fail in their own spectacular ways.[40] In doing so, readers will avoid the trap of copying whole cloth some formulaic procedure. Indeed, the moment some method is held aloft as the pathway forward for games and schooling—such as gamification, or efforts to "gamify" classrooms—the sooner educator agency is subverted by a return to the technical of puzzle making and maintenance. The difficulty in celebrating *Teacher Pioneers* as an inventive mapping of educators' phronetic knowledge is the accompanying challenge that other teachers, school leaders, and university research partners cannot merely embrace this road map. Recall that these many cases are visions from an edge, not recipes amenable to every palate. Rather, our (or any) efforts must commit leaders and visionaries to creating the conditions for gameful learning. However they may vary across setting and circumstance, establishing the conditions for gameful innovation in education will more likely lead subsequent pioneers to glean with nuance their own embodied ways of knowing and doing game-based teaching and learning.

A FINAL NOTE ON LIMITATION AND POSSIBILITY

For all that it offers—counternarratives to typical and troubling uses of games within school, glimpses of gameful learning, and an indication that educator agency reflects the ongoing cultivation of practical wisdom—*Teacher Pioneers* is an incomplete project. Any journey invariably selects one pathway over another. Subsequent forks in the road determine, as they branch and then branch again, one destination rather than many others. This book, as a collection traced along back roads and blue highways, is no different. The richly contoured edges upon which readers have arrived are both inspiring and an indication that other passages remain to be written. What limitations among this collective pursuit are most notable? First, *Teacher Pioneers* is primarily written by white men. There are many educators whose labors of love agitate against an orthodoxy of disheartening norms and veiled expectations (reflected, unfortunately and more broadly, in the fields of computer science

39. *Though the ideas are simplified, readers interested in the relevance of Aristotle's conceptions of techne, episteme, and phronesis to education are encouraged to read Halverson (2004) and Loughran and Berry (2005). Halverson, R. (2004). Accessing, documenting, and communicating practical wisdom: The phronesis of school leadership practice. American Journal of Education, 111(1), 90-121; Loughran, J., & Berry, A. (2005). Modelling by teacher educators. Teaching and Teacher Education, 21(2), 193-203.*

40. Beyond the agency of individual educators, Sujata Bhatt challenges readers to further consider questions of scale, suggesting an examination of policy recommendations and theories of change that enable agency among sociocultural, socioeconomic, and sociopolitical conditions.

and educational technology). The distinctive explorations of these pioneers should be celebrated as central to subsequent volumes. Second, a majority of authors are veteran educators, or those who are experienced and comfortable with improvisation. Only two chapters concern the struggles and insights of early career teachers, or individuals just learning to play their scales and chord progressions. Complementary research should examine the shortcomings and successes of more novice educators as they harmonize between new professional practices and gameful learning pedagogies. Finally, *Teacher Pioneers* bypasses a focus on early adopters for a concern with eager, though often isolated, inventors. A forthcoming volume should further explore communication and collaboration dynamics so as to help transform pockets of innovation into generative communities of practice.

In spite of these limitations, *Teacher Pioneers: Visions From the Edge of the Map* is a provocative guide to game-based teaching and learning beyond the didactic, past singularly constrained settings and disciplines, and toward the outer reaches of critique and creativity. The forms of agency and wisdom associated with gameful learning illustrate why educators need not solely instruct to their passive students, delimit learning within the walls of their own classrooms, consume scripted curricula deemed acceptable by others, or perpetuate schooling as a practice akin to a crossword puzzle. Rather, the lived edges of gameful learning require that educators embrace a reflective stance toward practitioner inquiry. So, too, that they champion the trans-spatial affordances of gameplay as stretched across settings and student interests. And—perhaps most important—that educators wisely share how the transgressive possibilities of play foster more engaging and equitable learning opportunities for others.

ABOUT THE CONTRIBUTERS

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Deborah A. Fields is temporary assistant professor of Instructional Technology and Learning Sciences, Utah State University, and independent research scientist. Crafter and informal educator.

Gabriella J. Ducamp, EdS, is an educator who researches teaching and learning in people of all ages. Her work focuses on spatial-skills development as a way to engage a diverse range of students. She has employed a number of technologies in the curricula that she writes, including 3-D printers, e-textiles, paper circuits, digital die-cutters, and CAD software. She hopes to better understand the ways in which design-based tasks that use makerspace technologies affect those less likely to participate in STEM activities. The students she taught as an elementary school teacher for nine years inspire her to continue to learn.

James Howell is an eighth-grade science teacher and high school football coach for the past 10 years.

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John Fallon teaches English at Fairfield Country Day School in Fairfield, Connecticut. John designed *Dolus: Finding the Journal of Odysseus,* an immersive ARG (alternate reality game) designed to augment his seventh-grade students' exploration of Homer's *Odyssey.* With Paul Darvasi, he also co-designed *Blind Protocol*, an interschool ARG that instructs on research skills, privacy, and online surveillance. His work has been featured in National Public Radio's *MindShift,* and you can find more about his work on thealternateclassroom.org.

John Martin is a senior teaching and learning consultant at the University of Wisconsin-Madison, where he teaches and develops socioculturally rich teaching and learning practices. John investigates tools of inquiry and expression that promote greater understanding and appreciation of the social and physical spaces we inhabit. He also helps run Flying Moose Lodge, a wilderness camp in Maine, and there noticed that when people actively engage their bodies in personally and culturally meaningful physical places, they learn a lot. He continues to help develop experiential and social learning tools and methods, such as siftr.org and arisgames.org. Learn more at regardingjohn.com.

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Laini Kavaloski is assistant professor of Humanities/English at SUNY-Canton, where she teaches digital literary media, game design, and new media writing. She received her PhD from the University of Wisconsin-Madison in 2015 and her MA from the Hebrew University in Jerusalem in 2005. Her research examines the ways that emerging media forms such as graphic narratives, activist websites, and digital games are shifting rhetorics of diaspora in the 21st century. Her work has appeared in *Studies in Comics, 6*(2) (2015), in *Comparative Drama, 48*(3) (2014), and in the collection *The Good Life and the Greater Good in a Global Context*. She is at work on a coauthored book with Jon McKenzie (UW-Madison) titled *StudioLab Manifesto: Smart Media for the Liberal Arts* (Routledge). Read more at https://kavaloski.wordpress.com/.

Lucas Cook is a doctoral student in the Learning Sciences Program at Indiana University and a graduate assistant working in the Playful Culture Lab. His research interests include learning through games, learning through collaboration and competition, and online game streaming through Twitch.tv. He joined IU's Learning Sciences Program after teaching in Washington, DC public charter schools for the previous two years.

Megan Pusey is an Australian high school science teacher who enjoys playing video games in her spare time. She has spent many years working for science museums, communicating complex ideas through exhibits, hands-on activities, articles, and live-action science shows. After moving into teaching, Megan started to experiment with using video games in her science classroom. She is now using games such as *MinecraftEdu*, *Contraption Maker,* and *Portal 2*. Megan continues to experiment with weaving game-based learning into the science curriculum. Connect with her through Twitter @scienceninjagal.

Paul Darvasi teaches high school English and media studies at Royal St. George's College in Toronto, Canada. He is working on his PhD at York University's Language, Culture and Teaching program with a focus on the integration of digital and pervasive games in educational environments. He has experimented with video games in his practice and designed *The Ward Game*, a pervasive game to teach Ken Kesey's *One Flew Over the Cuckoo's Nest* to high school English students. With John Fallon, he also co-designed *Blind Protocol*, an interschool alternate reality game that instructs on online security, privacy, and surveillance. Paul speaks and writes about game-based learning, and his work has been published by Edutopia, MindShift, TeachThought, and ETC Press.

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Seann Dikkers is an assistant professor of Educational Studies at Ohio University. Previously he served as a public school teacher and principal for 14 years. He presents and writes nationally on engaging design practices for curriculum, professional development, and policy in education and academia. Publications vary from student learning to leadership feedback models, including *Real-Time Research: Improvisational Game Scholarship* (2009), *Mobile Media Learning: Amazing Uses of Mobile Devices for Learning* (2011), and the forthcoming *Mobile Media Learning 2* and *TeacherCraft: Using Minecraft for Learning.* Read more at http://www.gamingmatter.com.

Steve Isaacs teaches Video Game Design and Development to middle-school students at William Annin Middle School in Basking Ridge, New Jersey, and an online version of the course he developed for Virtual High School (http://thevhscollaborative.org/). He is committed to empowering students in the learning process by offering a choice/quest-based approach to content delivery and project-based learning. Steve is also a huge advocate for student voice and his students have been publishing their games, tutorials, and other projects to an authentic audience in a number of ways. Finally, Steve does not claim to be an expert and loves to model his passion for learning with and from his students daily.

Tim Saunders is an elementary teacher at East Grand Rapids Public Schools in East Grand Rapids, Michigan, and is a founding member of the Coalition for Gameful Learning. He is a past president of the Kent Reading Council, a teacher consultant for the National Writing Project, and he serves on the Playful Learning Initiative Advisory Board. His teaching interests include the mashup of digital and analogue pedagogies, gameful learning, and 21st-century media literacy.

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William Vann is the technology coach and middle-school computer science teacher at Immanuel Lutheran School in St. Charles, Missouri. He received his BSE at Concordia University at Seward, Nebraska, and is pursuing his master's degree in Educational Design and Technology. Will has presented on multiple topics, such as creating and assessing makerspaces, flipped and blended learning, project-based learning, and Lego robotics. To find out more, check out his vlog on YouTube—MegaMrVann.

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