Intentional Platform Video Game Design And Its Implication in Classroom Structure and Curricular Design

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BTU Inquiry Project

School Year ‘17 - ‘18

Abstract

This project is an exploration of creating mathematical experiences through classroom structure and instruction that increases meaningful student engagement and alleviates student math anxiety. This high school math teacher, who considers himself a videogamer, wanted to see if designing classroom experiences based on the design principles of platform video games would achieve the aforementioned goals. While this paper does not provide in-depth detail for how the principles of platform video game design were determined, the teacher does refer to a different paper of his work that does provide that detail and summarizes it within this paper. This teacher found that a major theme, that crossed the areas of platform video game design, Universal Design for Learning, math anxiety, and Differentiated Instruction, was choice; providing students with the option and scaffolds of choice. This teach also found that he needs to conduct further research into making a student's reduction of their own math anxiety more visible so students can see progression beyond an academic lens; a grade lens. Lastly, this teacher sees this project as a launching point, a beginning, that has sharpened his own reflection on how to plan and implement a scope and sequence with a threaded storyline that drives content, provide multiple pathways for students to achieve academic success and self-reflection, and the importance of students seeing their personal holistic growth.

Introduction

I love video games! I find them to be challenging, frustrating, fun, rewarding, and engaging. Is that not what I want my students to experience in my math classroom? I have wondered how video game designers purposefully implement features into video games to make them challenging, fun, rewarding, and engaging, because I no longer want any student to be bored or find my math class meaningless. I am also tired of my students making comments like "I'm bad at math", "This is why I don't like math", and "When will I ever use this in real life!" I have had enough of students fixating on what they got wrong instead of reflecting on whether they can consistently demonstrate understanding of a specific skill. It has taken me a few years to shift my focus from being frustrated about what my students were or were not doing, to being reflective on what I was doing; what I was asking of my students. I started to reflect on my strengths and interests, and I had a wild thought, "What if my classroom was designed like a video game?" Can I reduce student math anxiety and increase meaningful engagement in my math class by implementing classroom structures and protocols based on the principles of platform video game design?

I choose the word 'meaningful' when I speak about engagement because I am trying to have students engage with purpose and to know that purpose. Meaningful engagement is being able to ask students what are you doing and why? If you got answers such as: "Math work because it's a grade" and "I don't know, but I don't want to get in trouble", then that student does not have meaning behind the actions he or she is doing. This is not to say that every experience in a high school math class needs to warrant a response that deftly explains why, how, and the purpose of it, but I do believe students should have experiences that do have such

responses. Any class a student takes, no matter the grade level, should provide a meaningful reason for why a student is taking that class beyond just getting-a-good-grade. This is something platform video games, and most other video games provide upfront: motivation, a reason to 'beat' it. Whether it is to save a village, the world, a princess, or a loved-one, that motivation is presented through stories, cutscenes, and/or actions displayed on screen.

I consider myself a casual video game player as I own a Super Nintendo, Playstation 2 and 4, and an Nintendo 64. I have actually been looking into video game design since my Masters program, but I put it aside during my first few years of teaching because teaching full-time was hard, demanding, and at times, defeating. As I entered my fifth year of teaching with more experience, resources, and mental bandwidth I felt I could renew my research with a better perspective. I also thought my ideas might be more practical than idealistic given my experience. This project represents my journey to find out if implementing classroom structures or protocols based on the principles of platform video game design would increase student engagement in the math classroom and reduce student math anxiety.

What Research I Found

About Video Games

Video games provide a learning space in which the player can take risks and, in some cases, pause to assess the situation. Where, unlike the real-world, consequences are lowered (Gee, 2008). Reading James Paul Gee and Marc Prensky's words have encouraged me to keep pursuing this research. At times, I felt as if I was just giving myself an excuse to play more video games, when the changes I was looking to implement could be found in Universal Design for

Learning (UDL) and Differentiated Instruction (DI) practices. However, Gee (2008) asserts that one of the things that makes video games so captivating is how "the game encourages [players] to think of [themselves] as an active problem solver, one who persists in trying to solve problems even after making mistakes." I have witnessed this myself in playing platform video games like *Sonic the Hedgehog*, *Super Mario World*, *Ratchet and Clank*. Whenever I would die or 'lose a life' when playing a video game, I would have two options (unless it was my last life): give up, or try again. I usually tried again, believing I could overcome the challenge, believing I can learn from my mistakes.

I have chosen to focus on platform video games because platform video games are designed in a scaffolded manner to develop a player's skills as they play the game, and require them to employ those skills in situations later on. When a player plays *Madden* or *NBA 2K*, which are popular simulated football and basketball video game franchises respectively, that player is not directly taught the rules or how to play the game. Especially as those video games become more realistic, there is an advantage for players who have played a game in the series before or in real-life. The transfer of experience of real-life into video games, and vice versa, is not limited to sports video games, as the mechanics of playing a certain genre of a video game transfers between different titles within that genre (like when a player plays a new fighting video game and performs button combinations that they know from other fighting games to see what will happen); we become literate in the mechanics of the game play:

> When we learn a new semiotic domain in a more active way, not as passive content, three things are at stake: We learn to experience (see, feel, and operate on) the world in new ways. Since semiotic domains usually are shared by groups of people who carry them on as distinctive social practices, we gain the potential to join this social group, to become affiliated with such kinds of people (even though we may never see all of them, or any of them, face to face). We gain

> resources that prepare us for future learning and problem solving in the domain and, perhaps, more important, in related domains. Three things, then, are involved in active learning: experiencing the world in new ways, forming new affiliations, and preparation for future learning . . . Critical learning, as I am defining it here, involves learning to think of semiotic domains as design spaces that manipulate us (if I can use this term without necessary negative connotations) in certain ways and that we can manipulate in certain ways. The child has much more to learn about [Super Mario] as a design space (internally and externally). He also has much more to learn about not just the single game [Super Mario] but the genre (family) of games into which [Super Mario] falls [(platform video games)] as a design space. And he has much more to learn about not just this genre but about video games in general (a larger and more loosely connected family) as a design space (Gee, 2008).

I believe mathematics operate in the same manner with my students. The content inherently gets more complex over time and previously taught and learned (hopefully) knowledge is required to comprehend the latter content. This is one of the reasons why teaching mathematics is so tough, if students enter the classroom with weak prerequisite skills and 'gaps' in their understanding, then it is more challenging to learn and internalize more complex content. It is more challenging for them to interact within the semiotic domain of mathematics. This also works inversely as students may have learned a concept, but in a faulty manner that results in a misconception. That is a topic for another time because the focus of this project is on what I can learn from platform video game design, because unlike video games, traditionally taught mathematics does not foster the same level of engagement or feeling of low risk.

After reading many articles, books, and playing many platform video games, I have deduced ten common platform video games design principles:

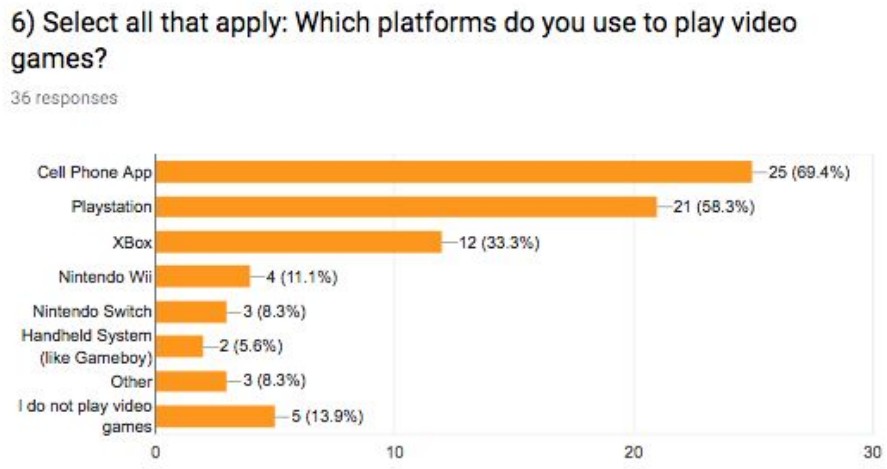
- Principle 1: Active and Critical Learning
- Principle 2: Semiotic Interaction
- Principle 3: Input Amplification
- Principle 4: Identity Adaptation
- Principle 5: Low-Risk
- Principle 6: Actuated Difficulty
- Principle 7: Storyline

- Principle 8: Materia Conservation
- Principle 9: Forked Pathways
- Principle 10: Scaffolded Training

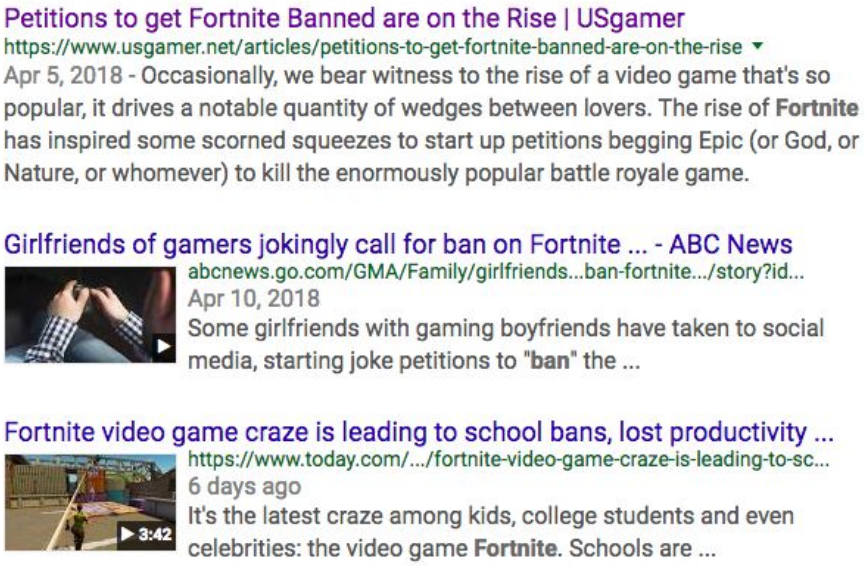
While this list is not exhaustive nor numbered to indicate importance, it does cover a broad range of the design mechanics within the majority of platform video games I have played and read about. I wrote a separate paper about each principle, so for this project I will focus on principles 6, 7, and 10 because my ideas are connected to those three principles which is explained in this paper with my methodology.

About My Students (Briefly)

I have learned that quite a few of my students, whose data I used in this project, have played video games and own a platform to play them:



This has become more evident in the past few weeks of March and early April as the biggest distraction in class has been students playing the first-person shooter video game *Fortnite*. See the memes and headlines below:



While I provide more detail about my students later in this project, I wanted to highlight that my interest in video games is shared with quite a few of my students. Once some of my students found out I had a PS4 they kept asking for my gamer tag, my online video game profile name, to invite me to play the popular games they are playing such as *NBA 2K*, *Madden*, *Call of Duty*, and *Fortnite*. One other game that a few of my students have been playing on their cell phones is *Marvel Strike Force*, a turn-based strategy fighting game that allows a player to build a team from a vast array of Marvel Comics characters and fight other teams.

While I do not think it would be necessary for a student to be a casual video game player to benefit from structures or protocols inspired by platform video games, it does help to know that those students have demonstrated a comfort in being challenged and thinking critically outside the context of my math classroom. I do believe all my students share this capacity to become comfortable with being challenged and thinking critically, it is my intention to alter the mathematical context of my classroom to make it a comfortable play for my students to demonstrate this capacity. That is when I learned about another challenge my students face: math anxiety.

About Math Anxiety

When I walked into the library trying to find books about math anxiety, I came across titles such as *Easy as Pi*, *Mathematics Minus Fear*, and *Math Attack*. You can see a shadow of math anxiety in our culture whenever an adult replies with a knowing, "I'm bad a math" when I tell them I am a math teacher. Math anxiety is not new, educators and researchers made note of this issue in the 1950s and it was defined more clearly in the 1970s (Ruff, 2014). Math anxiety is characterized as a "tension, discomfort, high arousal, and physiological reactivity interfering with number manipulation and mathematical problem solving" in both everyday life and academic settings (Pletzer, 2006). During a study about math anxiety at the University of Salzburg, with 491 students asked (330 women and 161 men), they subdivided math anxiety into two categories: Mathematical Testing Anxiety (math required and thinking for assessments, MTA) and Numerical Anxiety (math required and thinking for classwork and everyday life, NA), and wanted to see if MTA was a primary driver for a person having math anxiety. It was found that women tended to have more MTA and performance anxiety than men. They also

found that mathematics majors showed less math anxiety than Biology, Language, and Psychology majors, and that Biology majors expressed higher levels of MTA than NA when flipped for Language majors. As a result from that study, it was suggested that reducing 'performance anxiety' and 'social responsibility anxiety' (everyday life situations that require mathematical thinking), which both are subcategories of NA, through intervention may have the greatest impact of reducing math anxiety (Pletzer, 2006).

Math Anxiety is suggested to be influenced by cognitive, academic, and social elements. The categories of MTA and NA are two heavily researched subcategories of it and connect closely to cognitive and academic elements, but social factors are also important. Some of these social factors "include continued race and gender stigmas and lack of parental support in low socioeconomic (SES) households." Students who are aware of negative subgroup stigmas ("girls can't *do* math", "AA and Latino boys are at-risk", etc) are more likely to exhibit anxiety, poor self-esteem, and lack motivation (Ruff, 2014). Furthermore, Black students who are performing poorly in math, consistent with the stigma, are more likely to disengage in math related tasks and assessments than are White students. A child's risk of having high levels of math anxiety are also influenced at home as a child from a low SES household likely has less educated parents who also struggle(d) with math and math anxiety, may pass it on to their children (Ruff, 2014). The majority of my students are students of color, vastly Black and Latino, and contribute to my school being Title 1.

This is why I am passionate about addressing my students' math anxiety. Like most of my students, I am a person of color, specifically I am a mixed-raced Black male, and I am a graduate of Boston Public Schools. I relate to the neighborhood struggles of my students and the

mathematical struggles, ceilings, and opportunities that my students have experienced. I have had teachers whose style of teaching was chalk-and-talk, give out worksheets and packets, and set silent classroom expectations. It extended into college as I had professors who rarely took questions in class and speed through concepts that required conceptual knowledge without him or her teaching in that manner. So when a student expresses behaviours related to math anxiety, I understand because of my background, experiences, and newly acquired knowledge through research. A few ideas I have learned about to potentially reduce my students NA math anxiety after reading Ruff's article are increasing the use of class group work and open math discourse, use more real-life applications, adapting the physical space of my classroom to be more stress-free, and foster a positive and supportive classroom environment.

Now that I have my platform video game design principles and knowledge of math anxiety, it is time to implement some ideas to see if I will have more meaningful student engagement and have reduced my students' math anxiety by the end of the project.

Pushing the 'Start' Button

The Ideas

My research pointed me in three areas: video game design, math anxiety in students, and DI. As such, I wanted the data I collected to represent each of those areas. There was also a point of convergence of the three areas: choice. I found player control to be the most prevalent foundation of the principles of platform video game design. The player could choose the difficulty of game play, had flexibility in the manner of how to go about 'beating' the game, and could practice the mechanics of game play in a low-risk environment. I started to think about the different ways I could give my students choice in the classroom, and I reflected on the ways I

could increase the options of choice and implement my ideas without completely changing how I have already structured my classroom.

Heacox cautions that any teacher trying a new idea in the classroom should start small as to not become overwhelmed. I read Heacox's book *Differentiation Instruction in the Regular Classroom: How to Reach and Teach All Learners, Grade 3 - 12* because the challenges of providing more choices for my students and implementing innovative changes strongly aligns with implementing DI. DI may defined as designing a lesson plan by factoring students' individual learning styles and levels of academic readiness and ability. Some teachers may implement DI based strategies by grouping students by shared interest or ability for assignments, using formative assessments to assess a student's learning, and intentionally creating and maintaining a safe and supportive classroom environment. Some goals in Heacox's book are to develop challenging and engaging tasks for each learner, to provide flexible approaches to content, instruction, and products, to provide opportunities for students to work in a varied instructional formats, and to establish learner-responsive, and teacher-facilitated classrooms (2002). If all goes well and I learn how to use the principles of video game design when developing my scope and sequences, curriculum maps, lesson structure, and even worksheets in the future, then Heacox's suggestions and insight will be helpful for me to reflect and think about my ideas holistically and realistically.

I decided to implement Heacox's (2002) idea of "tiered assignments" and allowed students to choose the worksheet(s) to complete. This gave my students choice on the experience they wanted for that day's required review and practice as I used this idea the day prior to assessments. This is tied to Principle 6: Actuated Difficulty (as a reminder, I wrote about the

process and provided full description of each platform video game design principle in a separate paper). As a video game player may have an option to change the difficulty setting for a game, and have a variety of reasons for his or her selection, I wanted to create a choice for my students to choose their difficulty of classroom worksheets. Students had four options to choose from:

- Training Level would provide students with the option to get support and reteaching from the teacher, and it will contain questions that will be on the assessment (of course with different numbers and context for word problems).
- Level 1 would contain necessary prerequisite skills for the assessment and the teacher would only provide yes and no answers when checking student work.
- Level 2 would be the same questions (but with different numbers and context) as the Training Level, and the teacher would only provide yes and no answers when checking student work.
- Level 3 would be harder, advanced questions, and the teacher would only provide yes and no answers when checking student work.

Students could also work in groups, listen to music on their headphones, and required to complete any two worksheets which would be collected.

I also tried to create or adapt a story around a specific math problem when introducing a new topic and/or unit. This is tied to Principle 7: Storyline. A video game player may become emotionally invested in playing a video game because he or she is the "receiver of the narrative … and needs to interact with and influence" the narrative "on the fly" (Prensky, 2001). I want my students to be more invested in the content, not by grades or extrinsic rewards, but by carrying the story through. My hope is that students will be more meaningfully engaged because they will have a reason behind the mathematical content taught in class. I implemented two storylines during this project, got feedback from my students on the storyline, and measured the content connections with the storyline through assigning a cognitively demanding task.

Lastly, I adapted my after-school office hours to be more of a tutorial space, a place in which students can come and receive specific training on prerequisite skills (like Level 1 of the tiered worksheets) needed for the current topic and/or unit. I might have been doing this as a feature of my after school availability, but I did not create materials or intentionally plan for my after-school work with students to be that; I kinda just hung around for any student to drop-by. This is tied to the Principle 10: Scaffolded Training. A video game player may have an option in the game to literally 'train' within the video game's environment to learn and test mechanics. This is more common in fighting video games like the "Marvel vs Capcom" series and "Street Fighter IV", it is present in the platform series "Metal Gear Solid" and "Mega Man X5". Most of the platform video games I have played that incorporated this feature did so by making the first level of the game the 'training level'; introducing the player to the video game mechanics, often with a character in the game providing instructions.

My qualitative data came from collected student work and student feedback via a questionnaire. I intended to record audio and video recordings of student discussions, but failed to do such recordings during this project. My quantitative data came from a math anxiety self test I gave to my students before the project and after the project, student scores/grades from the cognitively demanding tasks, and my data tracker (to track tiered classwork choice, note notable statements/comments made by students, and who chooses to attend my office hours and why). I implemented my ideas, collected, analyzed, and reflected on my data using the "Plan, Do, Study, Act" (PDSA)[1] method. I have used this process before when trying to implement previous change ideas in my classroom over the last couple of years and found it effective in doing so.

[1] The PDSA is an iterative, four-stage problem-solving model used for improving a process or carrying out a change idea. http://www.tribaleval.org/cqi/plan-do-study-act-pdsa/

The Students

I collected data from two of my three classes: 2nd period B-Block Honors Math 1 class, which is a total of 24 students (16 boys and 8 girls), and my last period E-Block General Education Math 1 class, which was a total of 17 students (8 boys and 9 girls). My B-Block class had a grade average of 75% for Semester 1 and entered Term 3 with a Math Anxiety[2] average of 24.13 from a range of 10 to 50 ("On the border of Math Anxiety 20 - 29). My last period class had a grade average of 64.335% for Semester 1 and entered Term 3 with a Math Anxiety average of 27. While both classes were Inclusion classes, my last period was the only class I teach that has students (4) with an IEP. All four come from the SAR[3] program at my school.

I was also challenged by the fact that 54% of my schools' student body is at risk to fail a math class and 28% are at risk of experiencing absenteeism[4]. While I do have questions on the validity of this data, it correlated with what I learned about my students: some are currently failing, struggling, and/or presenting chronic absenteeism in my class, and some did not pass their 8th grade math class. On that note, only nearly 30%[5] of 8th graders last year earned an Exceeding or Meeting of 8th grade MCAS standards! This is the majority of my currently 9th graders as a handful are repeating the 9th grade.

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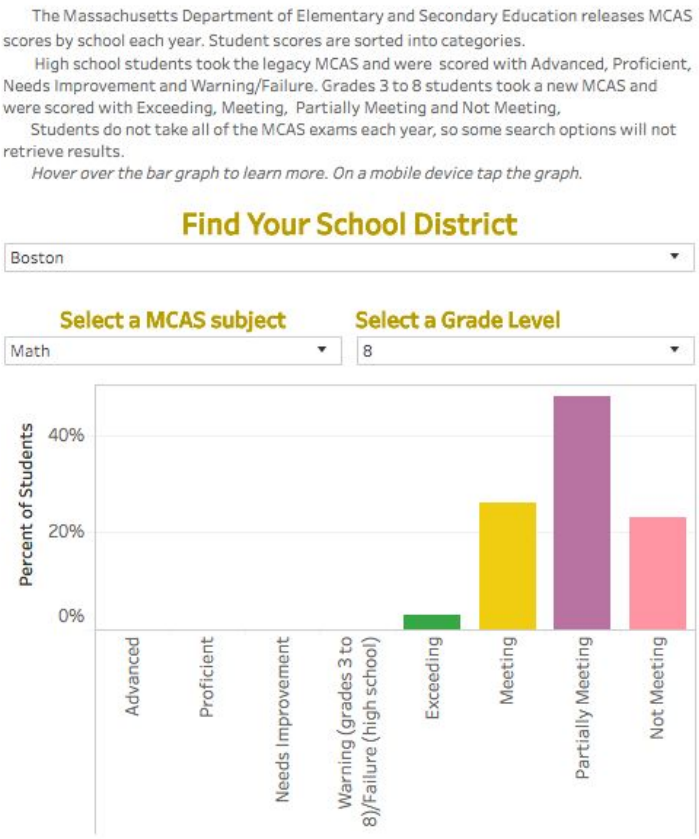
[2] I used an an adapted Abbreviated Math Anxiety Scale self-test for my students. Hopko, D. R., Mahadevan, R., Bare, R. L., and Hunt, M. K. (2003). The abbreviated math anxiety scale (AMAS) construction, validity, and reliability. Assessment 10, 178–182. doi: 10.1177/1073191103010002008.

[3] Mild, global cognitive limitations. These are students who benefit from routines, practice and repetition. They acquire skills at a slower rate than their typical peers. They often experience difficulty applying learned information to new or novel situations. SPECIAL EDUCATION PROGRAM CODES.
http://ebhsjets.net/ourpages/auto/2013/8/23/50616912/Special%20Education%20Program%20Codes.pdf

[4] This data comes from a District Wide calculation within the document titles Opportunity Index for Charlestown High.
[5] This data comes from MDESE as reported on the Wicked Local Wayland newspaper:
http://wayland.wickedlocal.com/news/20171018/interactive-graphic-find-out-how-your-school-district-did-on-2017-mcas



That is the context I teach in; a school with 87.4% considered High Needs, 76.6% African American (AA) and/or Latino[6], and most are below grade level understanding. I am conflicted in presenting those metrics because it may further reinforce that being AA or Latino is a deficit, and that is not what I want to convey.

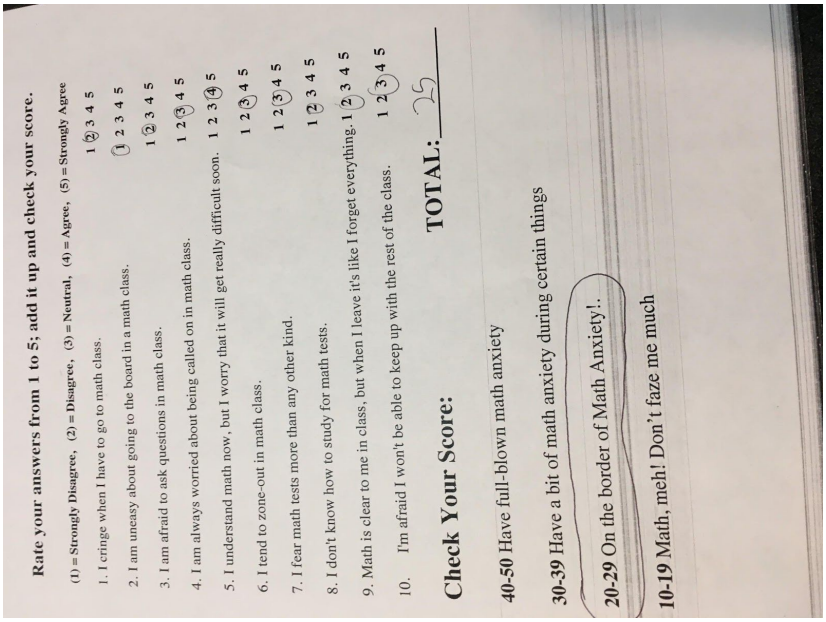
I believe it is my role to improve student confidence, raise them to grade level, and provide an educational experience that gives them the tools to met or exceed expectations and their own goals. I do not believe a one-size-fits-all model nor an aim-for-the-middle approach serves all of our students, whether under, over, or at grade level. This project has the potential to inform me what works and does not work in increasing meaningful student engagement and

[6] This data comes from MDESE. http://profiles.doe.mass.edu/general/general.aspx?orgtypecode=6&orgcode=00350515.

reducing math anxiety. At the end of the day, I entered this project knowing this was a start. While it is only a start, it is a start I would not have made had it not been for the BTU Inquiry Project which motivated me to pursue this research. Below is a graphic of the questions, predictions and manner of data collection I will use in my PDSA cycle along with a MA self-scored survey:

Questions: What do you want to learn? *Be sure to include a question examining the depth of student engagement.*	**Predictions:** What do you think will happen?	**Data:** Describe the measure you will use to collect the data to answer the question. *Be sure to attach each measure to this form.*
Which **tiered assignments** will students select and what is their reasoning?	Week 2 Prediction: I think 50% will choose Level 2, and 25% will choose Training Level. Week 4 Prediction: I think 50% will choose Level 2, and 25% will choose Training Level.	Week 2 Measure: Weekly Student Tracker Week 4 Measure: Weekly Student Tracker
Will I be able to record my students via **audio or video** at least once a week?	Week 1 Prediction: I think I will record my students once. Week 2 Prediction: I think I will record my students once. Week 3 Prediction: I think I will record my students once. Week 4 Prediction: I think I will record my students once.	Week 1 Measure: Cell phone Audio or Video Week 2 Measure: Cell phone Audio or Video Week 3 Measure: Cell phone Audio or Video Week 4 Measure: Cell phone Audio or Video
Will I be able to consistently introduce new **materials using a story** and conclude the storyline along with a student reflection?	Week 1 Prediction: I will be able to introduce the storyline to both of my intended classes. Week 2 Prediction: I will be able to conclude the storyline and give my students an opportunity to reflect on the experience. Week 3 Prediction: I will be able to introduce the storyline to both of my intended classes Week 4 Prediction: I will be able to conclude the storyline and give my students an opportunity to reflect on the experience.	Week 1 Measure: Lesson Plan Week 2 Measure: CDT + Reflection Week 3 Measure: Lesson Plan Week 4 Measure: CDT + Reflection

Will my students' **math anxiety** scores decrease over the course of 4 weeks?	Week 1 Prediction: NONE Week 4 Prediction: I predict my students math anxiety will decrease by 1 point on average.	Week 1 Measure: Math Anxiety self-assessment Week 4 Measure: Math Anxiety self-assessment
Will students find the storyline engaging and connected to the material taught in class?	Week 2 Prediction: I predict students will give an average of 6 on the 1 to 10 rating scale of storyline engagement. Week 4 Prediction: I predict students will give an average of 5 on the 1 to 10 rating scale of storyline engagement.	Week 2 Measure: Student Feedback Survey Week 4 Measure: Student Feedback Survey



Rate your answers from 1 to 5; add it up and check your score.

(1) = Strongly Disagree, (2) = Disagree, (3) = Neutral, (4) = Agree, (5) = Strongly Agree

1. I cringe when I have to go to math class. 1 (2) 3 4 5
2. I am uneasy about going to the beard in a math class. (1) 2 3 4 5
3. I am afraid to ask questions in math class. 1 (2) 3 4 5
4. I am always worried about being called on in math class. 1 2 (3) 4 5
5. I understand math now, but I worry that it will get really difficult soon. 1 2 3 (4) 5
6. I tend to zone-out in math class. 1 2 (3) 4 5
7. I fear math tests more than any other kind. 1 (2) 3 4 5
8. I don't know how to study for math tests. 1 2 3 4 5
9. Math is clear to me in class, but when I leave it's like I forget everything. 1 (2) 3 4 5
10. I'm afraid I won't be able to keep up with the rest of the class. 1 2 (3) 4 5

TOTAL: 35

Check Your Score:

40-50 Have full-blown math anxiety

30-39 Have a bit of math anxiety during certain things

20-29 On the border of Math Anxiety!.

10-19 Math, meh! Don't faze me much

Leveling-Up

The Happening and The Learning

Using the PDSA cycle helped me organize what I was measuring and how I collected my data. Since I limited this project to four weeks, I had a lot to record, plan, reflect, and write. During the first week of the project I implemented a storyline that was featuring the the character T'Challa aka Black Panther from the Marvel film *Black Panther*. My students and I went to see it the previous week as an entire 9th grade and the vast majority of them enjoyed it. I decided to use the concepts of Supply and Demand curves and tie that into systems of linear equations and inequalities. The storyline was as follows:

Essential Question	
How much Vibranium should Wakanda Supply to the Global Market?	
Guiding Story	
At the end of Black Panther the King of Wakanda, T'Challa, was addressing the United Nations to proclaim that his nation, Wakanda, will share their knowledge and resources with the rest of the world. Assuming King T'Challa was referring to Vibranium and a few uses for it, what would be the process of sharing this resource?	
Options to Guide the Story	
VIDEO "Black Panther Trailer" https://www.youtube.com/watch?v=xjDjIWPwcPU	PHOTO "T'Challa addressing UN"  Quote: "Wakanda will no longer watch from the shadows. We cannot. We must not," T'Challa declares. "We will work to be an example of how we as brothers and sisters on this earth should treat each other. Now, more than ever, the illusions of division threaten our very existence. We all know the truth: more connects us than separates us. But in times of crisis, the wise build bridges, while the foolish build barriers. We must find a way to look after one another as if we were one single tribe."

It was challenging to keep the storyline threaded through the everyday class content. I tried to reask the question a total of two more times while giving my students more information each time. I gave my students a survey after we ended the storyline and had a quiz, in which I only got 18 responses because I decided to give it to students who finished the quiz and many students needed the full class period to finish the quiz. Out of those 18 students who rated the storyline of the Black Panther's vibranium dilemma on a scale of 0 (made me sleep) to 10 (made me excited), the average was a 4.33. In the third week I introduced a new storyline (prior to reading

my students' feedback because I was swamped with grading and a few snow days) that connected to our next unit of Exponents and Functions. The storyline was as follows:

Essential Question	
Which Coupon?	
Guiding Story	
Imagine you are walking into Target and a sales associate is standing by the entrance handing out coupons. The sales associate say's "You can only use one at the register so choose wisely and have a great day!" As you walk away you wonder, which one should I use?	
Resources to Guide the Story	
	
PPT "Unit5_5AStoryline"	

I planned to give my students three attempts to respond to the question in the guiding storyline, much like the last storyline, but was only able to give my students two attempts. I was not able to give my students a chance to give me feedback on this storyline, but after I read their previous feedback, I felt I did incorporate some of the thoughts they had to make our math class more relevant (see Tables and Figures) by presenting a problem students could be faced with in real-life.

I gave my students a math anxiety self assessment prior to the project and my B-Block (19 of 24 students self-scored) had an average of 24.13 ("On the border of Math Anxiety" 20 -

29) and my E-Block (17 of 17 students self-scored) had an average of 27. I once again gave my students the same self assessment and my B-Block (22 of 24 students self-scored) had an average of 22.09 and my E-Block (10 of 17 students self-scored) had an average of 26.2. When I only account for students who took the initial and post self-scored Math Anxiety survey, the average change for B-Block and E-Block is -0.5 and -0.9 respectively. While I was happy to see a overall decrease, I found myself asking, "what could I attribute this too?" I missed, what I think, was a golden opportunity to get specific feedback from my students about their math anxiety scores and what they think attributed to it. I also missed an opportunity for students to tell me whether or not they think they have been more engaged during the last four week in comparison to before the project.

I believe I missed these opportunities because I was trying to measure and do too much at one time; not just in the classroom, but in my personal life as well. Having my focus and outside of the classroom time taken up by personal life planning, other outside professional development organizations and events, and the time required to lesson plan and grade, took away from the quality of my implementation of this project. I failed to record audio and video of student conversations during this project, and I did not track the "Tiered Assignments" with my E-Block. However, despite all of that, I did learn some lessons and should celebrate what I was able to learn from this ambitious project.

The Final Boss Battle

The New Battle Plan

After reviewing my data, readdressing my predictions and making new ones, reviewing new data, and getting feedback from students, I realized that I had learned some lessons that I

would not have learned or had clarified had I not done this project. I would place my lessons learned into three areas: implementing and sustaining storylines, measuring and addressing math anxiety, and implementing new ideas in a small way.

While only 18 students took the first and only storyline feedback survey, it was still enough data for me to understand that my implementations of the two storylines could have been better. I knew that for myself, as I felt the storylines were more of a tacked-on experience to the lesson and not the throughline I intended it to be. The storyline should have been driving the material covered in class, but I used it more like bookends. I will use backwards design in planning my future storylines, a process that is similar to story writing. The narrative in a platform video game is strewn throughout the playing experience. This can be done through character dialogue (like when a Koopa Kid tells Mario he will never save Princess Toadstool, Peach after being defeated in the Super Mario video game franchise), environmental design (like how posters or statues in the background of *Ratchet and Clank* for the PS4 display characters in the game or propaganda that furthers the viewpoints of the in-game characters), or through tangential experiences (like if the player is able to collect the chaos emeralds along the way to beating Dr. Robotnik in the end of *Sonic the Hedgehog 2* for the Sega Genesis). I will try to create a larger storyline that will encompass the smaller yet related storylines that run parallel to the content being covered. This will hopefully foster a sense of interest in the 'happenings' of the storyline. I would need to further research and think about how to make my students the characters in the storyline, much like a video game player becoming the games main character/protagonist, to hopefully foster a sense of investment in their character development.

While the average student from my B-Block and E-Block had a decrease of -0.7 in their math anxiety score, I could not confidently attribute this to a specific action(s) done in class. That is the reason why I will continue to do more research into helping my students measure and reflect about their math anxiety. If my students are able to develop more insight into *how* and *why* they think and feel about math the way they do, they can better manage the challenges associated with math anxiety: test taking, class participation, and self-doubt to name a few.

The last lesson I have learned from doing this project was to take things slow and implement one change at a time. Heacox conveys this very message in her book stating that a teacher should start small and celebrate the good work he or she is already doing in the classroom (2002). It is easy for me to get so excited about an idea, that I consider overhauling my class or trying to do too much at once. This project was my attempt to find a comfortable space in-between doing one thing and too many things. While I do not think I failed, I do think I experience more stress about this project than what was necessary. If the goal is to work more effectively and efficiently in creating better outcomes for my students, then my end of the work should be hard in the beginning and get easier over time. If I could have done this project over the course of a whole semester, the process of creating storylines and recording data might have gotten easier for me. That is why I am eager to continue this work.

The Conclusion

My larger goal is to find, use, and develop innovative practices in the classroom that increase student engagement and confidence, and has a positive impact on their academic achievement. I chose to tackle that goal in a smaller way by using the principles of platform

video game design to adapt my curriculum design and instructional practice, because I found platform video games to be challenging, frustrating, fun, rewarding, and engaging. That *is* what I want for my students to experience in my classroom! I think I have found an opportunity for innovative practices that are connected to differentiated instruction, universal design for learning, and, potentially, social and emotional learning practices.

The status quo of education often leaves my 9th graders feeling disconnect, unmotivated, and *wounded* before (an unfortunately for some after) they entered my classroom. Some ideas that I or other teachers can use to heal a wounded student are to honor and welcome differences is race, gender, class, and sex, use multiple representations of content presentations, make instruction student-centered, be playful and experimental in instructional design, and build and create experiential learning models (Olson, 2009). When a student's learning is disconnected from him or herself by having a highly confined choice or no choice and limited self-direction, that student replaces joy in learning with a fear of making mistakes and lack of self-confidence (Olson, 2009). I want my classroom to be student-centered and welcoming, I want my curriculum to be engaging and meaningful, I want my students to be more confident in themselves and in using mathematics. So the next time you are playing a video game, reflect on why you enjoyed it how you can create those reasons in your classroom, at home (like chores), and/or how you can support other teacher in doing so.

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Tables and Figures

Data Tracker using Google Sheets

First, Last	Block	T3 - Begin M.A.	T4 - Begin M.A.	Math Anxiety Change	Week 2 Completed Worksheets	Week 4 Completed Worksheets
[redacted]	B	21	24	3	1	T
	B	28	16	-8	1 , 2, T	T,1
	B	11	10	-1	NONE	T, 1,2
	B	19	18	-1	T	1,
	B	m	24		1 , T	T, (1)
	B	36	36	0	1 , 2	T, 1
	B	30	31	1	1	m
	B	21	31	10	T , 1	1
	B	m	17		1	1
	B	33	m		1	m
	B	27	m		T	1, 2
	B	14	10	-4	m	1, 2, (3)
	B	28	28	0	1, 2, T	3
	B	24	21	-3	T, 1	T,1,3
	B	29	19	-10	1, 2	m
	B	m	15		T, 1	T, 1
	B	m	22		m	T, 1,2,3
	B	27	19	-8	2, 3	1, 2
	B	16	19	3	m	1, 2
	B	28	30	2	1	m
	B	19.5	18	-1.5	1, 2	1,2
	B	25	31	6	m	1,2,3
	B	22	25	3	m	1, 2
	B	m	22		1, 2	m
B-Block Av	B	24.1315	22.0909	-0.5		

Storyline Reflection 0 - 10 Black Panther average	4.33		Reflection average for males of color (7)
-18 Responses			4.4286
What would make math class more relevant to you and your life			
- IDK Response	9		

		"Black Panther Dilemma"				"Which Coupon?"			
First, Last	Block	1st Response	2nd Response	Final Response	CDT Grade	1st Response	2nd Response	Final Response	CDT Grade
[redacted]	B	A	A	blank	0	A	BLANK	BLANK	0.5
	B	A	A	6 pounds for 6k	2.5	A	1/4	BLANK	0.5
	B	A	A	blank	0.5	BLANK	BLANK	BLANK	0
	B	A	A	blank	0	A	A	EITHER, BUT WITH CHIPS 25%	3
	B	A	A	blank	0	A	A	DOESN'T MATTER	1.5
	B	A	A	6 thousand oz for $6000	2.5	A	A	25%, SAVE MORE	2
	B	A	A	m	m	A	A	25%, SAVE MORE	1
	B	A	A	blank	2	A	1/2	BLANK	1
	B	A	A	m	m	A	M	M	M
	B	blank	blank	blank	0.5	A	A	25%, LESS	2
	B	A	A	blank	0.5	A	1/2	END	1
	B	A	A	blank	1.5	A	A	GREEN MONDAY, CHOICE	1.5
	B	A	A	m	m	A	A	$30 OFF	1
	B	A	A	blank	0.5	A	A	25% OFF	1.5
	B	A	A	m	m	A	A	EITHER, BUT WITH CHIPS 25%	3
	B	A	A	do what is right for the world	1.5	A	A	BOTH, SAME	1.5
	B	A	A	$2000/oz	1	A	1/2	BLANK	1
	B	blank	blank	7 per thousand oz at a price of 6,000 per oz	2	M	1/8	BLANK	0
	B	A	A	blank	0	A	BLANK	BLANK	0
	B	A	A	blank	1	A	A	25%, CHEAPER	2
	B	A	A	blank	0.5	A	A	25%	2
	B	A	blank	blank	1.5	A	A	EITHER, BUT WITH CHIPS 25%	3.5
	B	A	A	blank	0	M	BLANK	BLANK	0
[redacted]	B	A	A	m	m	A	A	EITHER, BUT WITH CHIPS 25%	4
B-Block Av	B				0.9473				1.4565

What would make math class more relevant to you and your life		
NOTABLE RESPONSES		
- IDK Response	9	out of 18
"More back to back quizzes but only to see where we stand"		"We should learn alittle bit of work that the 10th grade is doing my 8th grade teacher made us do 9th grade"
"more real life math problems"		"if it challenges my mind"
"harder challenges for do nows and exit tickets"		"Using more real world problems"
"learning how to solve more real world problems"		"I don't need math to be more extra!"
"nothing is wrong as of now, I enjoy math class"		

First, Last	Block	T3 - Begin M.A.	T4 - Begin M.A.	Math Anxiety Change
	E	13	m	
	E	28	m	
	E	22	15	-7
	E	16	m	
	E	36	m	
	E	22	18	-4
	E	37	26	-9
	E	39	m	
	E	17	14	-3
	E	35	27	-8
	E	32	30	-2
	E	33	m	
	E	29	33	3
	E	19	20	1
	E	22	m	
	E	25	40	15
	E	34	39	5
E-Block	E	27	26.2	-0.9

		"Black Panther Dilemma"				"Which Coupon?"			
First, Last	Block	1st Response	2nd Response	Final Response	CDT Grade	1st Response	2nd Response	Final Response	CDT Grade
	E	A	M	blank	0.5	M	M	M	M
	E	A	A	m	m	A	M	M	M
	E	A	A	enough to supply meet demand	2	A	A	25%, SAVE MORE	2.5
	E	m	m	m	m	M	M	M	M
	E	m	m	m	m	M	M	M	M
	E	A	M	m	m	A	BLANK	BLANK	0
	E	blank	blank	blank	1.5	BLANK	BLANK	BLANK	0
	E	m	m	m	m	M	M	M	M
	E	blank	blank		1	A	A	25%, BETTER	1.5
	E	A	A	m	m	A	A	25%, W/CHIPS	3
	E	A	A	blank	0.5	BLANK	BLANK	BLANK	0
	E	A	M	blank	0	A	M	M	M
	E	A	M	m	m	m	A	25%, W/CHIPS	3
	E	A	A	blank	0	M	A	$92.25	1.5
	E	m	m	m	m	A	BLANK	BLANK	0
	E	A	A	blank	0	A	A	$30	1
	E	m	m	m	m	A	A	25%, CHEAPER	1.5
E-Block	E				0.6875				1.2727

The “Study” portion of the completed PDSA Cycle

3. STUDY		
Questions: What do you want to learn? *Copy from Plan, Step 1.*	**Predictions** Make a prediction for each question. Not optional. *Copy from Plan, Step 1.*	**What were the results?** Comment on your predictions in the rows below. Were the correct? Record any data summaries as well.
Which **tiered assignments** will students select and what is their reasoning?	Week 2 Prediction: I think 50% will choose Level 2, and 25% will choose Training Level. Week 4 Prediction: I think 50% will choose Level 2, and 25% will choose Training Level.	Week 2 Measure: I was only able to reliably track choices from my B-Block class. 7 out of 19 students (36.8%) choose and completed Level 2. 8 students choose and completed Training Level (42.1%), and 78.9% choose and completed Level 1. Week 4 Measure: I was only able to reliably track choices from my B-Block class. 8 out of 19 students (42.11%) choose and completed Training Level. 9 out of 19 students (47.37%) choose and completed Level 2. 84.21% choose and completed Level 1 and 21.05% choose and completed more than two worksheets.
Will I be able to record my students via **audio or video** at least once a week?	Week 1 Prediction: I think I will record my students once. Week 2 Prediction: I think I will record my students once. Week 3 Prediction: I think I will record my students once. Week 4 Prediction: I think I will record my students once.	Week 1 Measure: I did not record my students Week 2 Measure: I recorded one audio clip of my honors class during the week. Week 3 Measure: I did not record my students Week 4 Measure: I did not record my students
Will I be able to consistently introduce new **materials using a story**?	Week 1 Prediction: I will be able to introduce the storyline to both of my intended classes. Week 2 Prediction: I will be able to conclude the storyline and give my students an opportunity to reflect on the experience. Week 3 Prediction: I will be able to introduce the storyline to both of my intended classes Week 4 Prediction: I will be able to conclude the storyline and give my students an opportunity to reflect on the experience.	Week 1 Measure: I was able to introduce the storyline to both of my intended classes. I also was able to provide a second opportunity for both classes to give a second response to the question Week 2 Measure: I was able to conclude my storyline with my honors class on Tuesday and my last period class on Friday. I did give my students an opportunity to reflect on the experience. Week 3 Measure: I was able to introduce the storyline to both of my intended classes. Week 4 Measure: I was able to give both classes an opportunity to give a final response to the storyline question, thus concluding it. I did not give my students an opportunity to reflect on the experience

Will students stay after school on Tuesdays or Thursday to get **prerequisite skill help**?	Week 1 Prediction: I predict two students will stay after school both days, for a total of 4. Week 2 Prediction: I predict two students will stay after school both days, for a total of 4. Week 3 Prediction: I predict two students will stay after school both days, for a total of 4. Week 4 Prediction: I predict two students will stay after school both days, for a total of 4.	Week 1 Measure: No students stayed after school for prerequisite skill help. Week 2 Measure: No students stayed after school for prerequisite skill help. Week 3 Measure: No students stayed after school for prerequisite skill help. Week 4 Measure: No students stayed after school for prerequisite skill help.
Will my students' **math anxiety** scores decrease over the course of 4 weeks?	Week 1 Prediction: NONE Week 4 Prediction: I predict my students math anxiety will decrease by 1 point on average.	Week 1 Measure: B-Block (19 of 24 students) average 24.13 ("On the border of Math Anxiety" 20-29). E-Block (17 of 17 students) average 27 ("On the border of Math Anxiety"). Week 4 Measure: B-Block (22 of 24 students) average 22.09 ("On the border of Math Anxiety" 20-29). E-Block (10 of 17 students) average 26.2 ("On the border of Math Anxiety").
Will students find the storyline engaging and connected to the material taught in class?	Week 2 Prediction: I predict students will give an average of 6 on the 1 to 10 rating scale of storyline engagement. Week 4 Prediction: I predict students will give an average of 5 on the 1 to 10 rating scale of storyline engagement.	Week 2 Measure: The student average was 4.33 Week 4 Measure: I did not give my students an opportunity to reflect on the second storyline.