

4-27-2019

Gamification with leveling up: Effects on learning science and motivation toward learning science.

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**GAMIFICATION WITH LEVELING UP: EFFECTS ON LEARNING SCIENCE
AND MOTIVATION TOWARD LEARNING SCIENCE**

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Otterbein University MAE Program

March 26, 2019

Submitted in partial fulfillment of requirements for a Masters of Arts in Education
degree.

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Acknowledgements

I would like to thank all the people who helped me to make this paper a reality. My professors Dr. Kristin Bourdage, Dr. Daniel Cho, Dr. Dee Knoblauch, Dr. Diane Ross, Dr. Paul Wendel, and my family: Dave and Cindy, Doug, Anna and DJ for supporting me through this endeavour.

Abstract

This study was a quantitative, quasi-experimental study, comparing 4 classes, studying an 8th grade science unit in a gamified classroom within a suburban middle school. A “Leveling Up” intervention was used in a gamified classroom with the experimental group and compared to a control group in a gamified classroom not using the leveling up intervention. The three driving questions of this study are: Q1) Does Gamification with Leveling Up Promote Learning in an 8th Grade Science Unit more than Gamification Alone? Q2) Does Gamification with Leveling Up Promote Motivation to Learn Science in an 8th Grade Science Unit more than Gamification Alone? And Q3) Does Gamification with Leveling Up Increase Students Perception of Their Motivation? The data showed no significant findings to improve achievement, homework completion or self reported motivation on the survey.

Title: GAMIFICATION WITH LEVELING UP: EFFECTS ON LEARNING SCIENCE
AND MOTIVATION TOWARD LEARNING SCIENCE

SECTION ONE

Introduction

The intention of this study will be to determine if there are differences in the percentages of assessment scores and homework completion as well as motivation when including leveling up in a gamified classroom. If there are differences, will the experimental or control group show the most overall benefit? The questions that are driving this study are:

Q1 Which group will show more gains on the assessment?

Q2 Which group will have higher homework completion?

Q3 Who will show higher motivation levels as reflected in the survey results?

This approach will synthesize results from classroom based assessments, homework completion, and Likert scale data on student motivation. Averages will be compared to determine if there was a significant difference in outcomes.

Problem:

All students are expected to be proficient on standardized tests. Unfortunately, not all students reach proficiency in the United States. According to the National Assessment of Educational Progress Nation's Report Card, (NAEP, 2015), only thirty-four percent of eighth-grade students in the United States performed at or above the proficient level on the state science assessment. Some teachers believe that not all students are able to engage in high levels of scientific inquiry, but would be able to increase their proficiency

if properly motivated. The poor achievement and inadequate motivation of middle school students was clearly shown as a national problem in the book *Development of Achievement Motivation* (Wigfield & Eccles 2002, p.333). This book focused on how students in the middle grades in the United States were obtaining low levels of achievement and motivation that task forces, foundations, and corporations began investigating a way to motivate middle schoolers. They created guidelines for teaching reading and mathematics. As such, this study explores the effect that “leveling up”, a strategy of gamification, has on motivation and student learning in science.

Significance:

In my own classroom, I have seen many students’ motivation to learn increase with a pedagogy that includes game-like vocabulary and activities in lessons. Students seem to be able to relax and become more engaged in the lesson when the lesson resembles the games they play. After teaching for 24 years, I have enjoyed my classes and my students more than ever when using this type of pedagogy. I have also seen it promote positive relationships with my students and me. Its format allows me to see which students have received more praise (points) than others and encourages me to watch closely for positive behaviors from all my students. Positively reinforcing students in the classroom has also led students to understand that I am on their side encouraging their positive behaviors. It also, typically, will encourage students to perform academically when they sometimes won’t for other teachers they dislike or see as unfair. Yet, I have not found this to be a perfect solution to motivate all students. It seems as though the lessons must be designed in such a way to draw all students in, not just the

ones who are used to achieving in the classroom. The lessons need to be set up to motivate even lower achieving students to participate. This project will be researching how differentiating the lessons, allowing students to progress through the game depending on their individual progression and understanding of the academic information, will motivate more students to achieve. This is called gamification with leveling up.

Background:

Gamification is defined as: The use of game components and game thinking into non-game activities in order to engage people and motivate them. This can be incorporated into any field to change people's behavior. Encouraging people to take the stairs instead of the elevator by making the stairs musical gamifies them. Offering points to a real estate office for being the top seller of the month, gamifies the office. Using terms such as Avatars or leveling up gamifies the activity. These terms are used in typical games that many are use to playing in today's society (Kapp, 2012).

Gamification can also be a type of pedagogy in the classroom (Kapp, 2012, Sheldon, 2012, and Tappo, 2015). Including games and gamelike activities into a lesson can increase motivation (Garris, Ahlers, & Driskell, 2002). Sheldon cites case studies that include students progressing through their gamified lessons in their classrooms. For example: In Sheldon's own classroom, the amount of "XP" experience points are directly correlated to the student's grade; a student without any points earns an F at level one where a student earning 1860 points earns an A in the class (Sheldon, 2012, p.64-65). A

“Biology Quest” requires students to gather “XP” to progress through five different levels in the classroom throughout the semester (p.51).

“Leveling up” in the gaming world refers to when your avatar or virtual self is playing the game with so many “lives” and can progress to a new level of the game only after achieving a specific goal set up in the game. For example, you can “level up” in Pac Man after your Pac Man eats all the dots on the board as long as your Pac men have not all been eaten by the ghosts before you completed this task. The next level is harder because the ghosts will re-appear more quickly after you eat the fruit. “Leveling up” can also be incorporated in the classroom. It is meant to encourage students to move through steps of the game (Garris, Ahlers, & Driskell, 2002). The teacher can determine the levels they will progress through and what is required to move on. Students can earn points to move to the next level or complete complicated tasks to “level up.” This will show the teacher and student how well they know the concept and the next task should be harder, just like in Pac Man. If leveling up in a gamified classroom can show significant increases in learning and motivation, this pedagogy may become more widely used to increase learning for all students and increase achievement levels in science.

SECTION TWO

Literature Review

The most important feature of gamification is that it is motivational. Many students in my classroom seem to try harder than ever in a gamified classroom. They raise their hands more, they have better behavior, and they think more deeply about a concept than with other pedagogies I have used. Since a gamified classroom does not

have a required design and can be created by the teacher in their own way, I want to improve my own design to increase the motivation of all my students. So, I need to determine what is motivational and how the lessons could be created to be more motivational.

Motivational Theories of Learning

Motivation is “the process whereby goal-directed activities are initiated and sustained” (Cook & Artino, 2016 p.1) Working with this definition, activities that are initiated by students should be able to be recognized in a classroom as being motivated by something. The second part of this definition is also important, because if an activity is truly motivational, a student should be able to stay with it over time (sustain it) showing they are motivated to complete it. Educators have been trained to use various methods of instruction in their classrooms based on different theories of motivation.

Theorist B.F. Skinner examined motivation and learning through the lens of behaviorism in the 1950s. Skinner's theory (1957/2012) is known as the “operant” behavioral theory. In operant conditioning, a behavioral change indicates learning. It is in contrast to stimulus-response theories made famous with Pavlov’s dogs. The theory is not about automatic response. Behavior is molded by our environment and driven by the reinforcers and consequences organisms receive while conducting the behavior. Skinner (1957/2012) discusses how humans adjust depending on outside influences. They can have positive reinforcers, showing the learner that they should continue the behavior or negative consequences, which encourage the learner to stop or change their behavior.

Taking this idea into the classroom, it may mean, for example, the environment in a classroom can be set up to produce certain behaviors.

Skinner (1969), warned that there can be negative programming that reinforces behavior. This can have a negative impact in a classroom. For example if a teacher gives extra attention to a student who is calling out in class, instead of raising his hand, the teacher is reinforcing calling out. Students can tell that they will get additional attention if they call out. Therefore, Skinner advises to use caution with reinforcers. Teachers want to be sure they are reinforcing the right things, the things they want to occur.

Skinner focused on the need for programs in schools to keep the student interested and on track. He outlines an effective classroom including several specific points. One, the program should be at a level to help students feel successful. Two, it should give feedback on their understanding. Three, the classroom should be run similar to a business, focused on gaining customers. Skinner describes how classrooms should do this; decorating and arranging furniture to attract students, using comfortable chairs, good lighting, and plenty of materials.

Motivational theory has progressed recognizing that the learner reflects on and analyzes external influences before changing behavior. This is advanced even further by Bandura who relays that internal dialogue, which tells us what we perceive to be true, influences actions.

Theorist Albert Bandura's (1986) looks at motivation and learning as a Social Cognitive construct where individuals learn from others around them and determine their actions based on what they see others do. Motivation for actions can be derived from

rewards received or punishments endured. But it is also important to note that an individual's perception of their ability to complete a task affects their actions. Individuals who perceive that they cannot accomplish a task may not even attempt it. Bandura discusses this phenomena as "perceived Self- Efficacy" (p. 220). Subsequently, he has laid out specific practices that can be followed in the classroom.

"Mastery modeling" (Bandura & Wood 1989, p.362) is seen as a good strategy to develop aptitude. It has three main components: (1) appropriate skills for learning (*ie.* behavior in the classroom and study skills necessary for success), (2) guided practice to perfect acquired skills (instructive feedback is seen to be an important aspect of this step), and (3) the transference of knowledge to self-directed success. This can occur if skills are basic enough to be seen as achievable, then found more difficult.

Dr. James Schreiber (2016) also looks at how motivational theories can be applied within the classroom. He is well known for his numerous publications and speaking engagements relaying his motivational research theories. In his book, he draws on the importance of teachers understanding the differences between rewards and incentives.

Schreiber's *Motivation 101 (2016)* gives real life scenarios which explain inherent, human motivation. Here, Schreiber looks at Skinner's operant theory and how it applies to teachers and discusses how they can make rewards more effective. Rewards are defined as positive reinforcement where timing was seen as a key component. A reward needs to be immediate, reinforcing an action. Incentives are used less frequently to obtain a more difficult, long term behavior. Although these are not immediate, teachers still must provide them in a timely manner. Schreiber notes that when using "primary

incentives” (p.29), the actions must have already started in some way and then incentives are put forth to increase the time spent on the tasks as well as how hard the student might work on the tasks.

Schreiber (2016) discusses a classroom where students yearn to do well, try their best, and still do not achieve their goals, may result in students quitting. Another caveat here is with high achieving students. If the work is too easy, the student may stop achieving as well. Determining what will motivate students is key. If the incentives and rewards are too easy, students may stop doing their best and only achieve high enough for the reward. There needs to be either a balance of difficulty or an individualized approach so that each student is motivated.

Schreiber (2016) says that praise can be a good type of motivator. But teachers have to be careful, because all of our students are unique. Some may be motivate by praise in front of others and some may prefer that it happens in private, more one on one. Teachers are warned that students can detect the difference between praising them because they put in effort or praising them because they are understanding the material. Sometimes a teacher’s positive praise can be misconstrued by a student. Students may take a positive comment about their work effort to mean they are not smart enough to understand, but at least they tried. Schreiber suggests that teachers keep praise private and focused on achievement until they know their students well enough to do otherwise.

Schreiber (2016) also notes a caveat given by researchers in the 70s and 80s against using extrinsic rewards to motivate, warning that reinforcement of tasks already being done may stop if students are focused on the rewards. Another important

implication given in *Motivation 101* is that students may perceive the assignment as more difficult or stressful if there is an extrinsic reward that they do not achieve, as compared to being less stressful if they were personally enticed to do the work. This leads to Schreiber's focus on intrinsic motivation.

Intrinsic motivation is the side of us that sustains our actions. It can even surpass outside influences of rewards and incentives. Research has shown that if we are challenged by and prefer what we are doing over other activities, then we will engage in meaningful sustained activity. Schreiber (2016) encourages teachers to focus on what may be intrinsically motivating to bring out the best in their students.

In the end, Schreiber (2016) asks his reader to acknowledge that extrinsic motivators do not work for all people. They can certainly work in many cases for a certain amount of time, but there will be situations where they do not work. Teaching pedagogies then, should be cognizant of these theories and attempt to combine them into a coherent whole to bring out the best in all of their students.

Motivation in Middle Schoolers

Wentzel (1998) also discusses adolescents and motivation. This study showed students who were motivated also reported to be interested in these topics in school. It discussed how peer relationships were very important to adolescents. The research found that when adolescents had specific social and educational goals, this was motivational enough to impact their academic outcomes at this age. This study showed that students who feel connected to their peers, parents, and teachers were motivated to achieve at higher levels.

Wormeli (2014) provides suggestions to middle school teachers to motivate their students. Wormeli suggests that teachers keep in mind that motivation has to come from within the child. As noted above by Wentzel, they need to have goals and feel connected to achieve this. The main strategy the teacher needs here is to show their students they care. The teacher needs to keep a positive attitude about each of their students, believing they all can achieve. Teachers should show that they support their students and this will motivate them to take more risks and increase their self- motivation (p.28). Wormeli discusses meeting students where they are as one of the most important motivators for students. If the teacher works with their students at their own level, relating to their culture and experiences, students have reported to appreciate those teachers the most (p.29).

Wormeli also suggests focused feedback. Not assigning a letter grade or just saying good job, but actually focusing on what they did right and specifically what they need to improve. This can help motivate students to try again knowing now they are on the right path (p.30). He discusses how middle school teachers should keep in mind that their students need an overview of the information to be presented eloquently, so as to create a clear context. Adolescents need routines and content to be carried over from other experiences to find the tasks motivational (p. 30). Finally, the sixth approach is to be a storyteller and keep it interesting by changing things frequently to keep their interest (p.31).

Wormeli (2014) also advises against certain practices saying not only do these techniques not motivate students, but they may bring students who were initially

motivated to becoming apathetic in the classroom. To summarize these suggestions: Teachers should not belittle, undervalue, or focus on grades. Teachers should not lecture for a long period of time, nor reprimand at lengths without a clear purpose. Finally, Wormeli advises teachers not to guess what students are thinking or feeling even if it is accurate (p.30). These practices can take away from adolescence own intrinsic motivations that allow them to be successful in the classroom.

Gamification - What is it?

Gamification is a pedagogy teachers use that provides extrinsic rewards in order to motivate students in the classroom. But it is also important to note that gamification can also incorporate intrinsic motivators within the approach (Kapp, 2012). An example of this would be that a student wants to complete a task because they want to have fun playing the game.

This paper adopts Raed's (2018) definition of Gamification. "The use of game components and game thinking into non-game activities in order to engage people and motivate" (p.1). According to Kapp (2012), in a gamified classroom, teachers set up ideal social situations and behavior expectations and students will model other students' behavior in order to comply with social norms while earning points in the game. Kapp suggests that teachers design the game as they see fit in order to meet the needs of their classrooms such as improving social relations and behavioral concerns. Where one teacher may decide to give points to students for attendance, another teacher may decide to give XP (experience points) for pushing their chairs in. Points and XP are words used in games students are familiar with outside of the classroom. Using gamification in the

classroom takes into account that a larger number of people are enjoying gaming than in years past and can relate to these terms when used. (Kapp, p. 18-19).

Kapp (2012) points out that in a gamified classroom, the same content a conventional classroom covers is taught using game-like strategies and vocabulary. For examples, using avatars (a make-believe name for your character), leaderboards (a way to determine how a variety of characters are progressing in the game), and XP can be used to teach topography. These terms can be connected to grades or they can be completely separate. Usually they are separate, just used as motivators in the game created by the teacher. Using language typically associated with the digital game world helps gamify a lesson. Calling a research project a quest instead of a project helps gamify your lesson. Using the term level-up (requiring them to accomplish a goal to move on to a harder task) instead of just saying they need to go on to the next worksheet or activity, brings gamification into your lesson.

Gamification and Motivation

Although it can incorporate intrinsic motivators, Gamification's focus is on extrinsic motivation (Botha-Ravyse, Lennox, & Jordaan, 2018). The concept of gamification is that tasks can be turned into a game, and with this game feel, the "players" will be more motivated to complete it (p. 441-467). Kapp (2012) believes that focusing on game-based mechanics can increase motivation and interest and can help students use the knowledge gained in the real world. Gamification authors are advocating that schools, businesses, and even governments use this strategy to motivate people to do things they would not typically be motivated to do.

It is important that teachers use gamification properly in a classroom to encourage and motivate students. Alcalá & Garijo (2017) reported how their mixed method approach was used. They determine how students in grades one through four in Spain perceived their own motivation and achievement in PE class. Two teachers were also in this study to note their perceptions of the importance of using this method. Their different, unique perspectives of using the method was discussed when reviewing the success of the lesson. The experimental group of students experienced Teaching Games for Learning, while the control group experienced a technical- traditional approach also known as direct instruction.

Alcalá & Garijo (2017) explain how Teaching Games for Learning is a pedagogical method developed in the 1980s. It focuses more on the understanding of knowing the basics of how to play and the actually skill playing rather than the techniques used in the sports. This quasi- experimental design used groups that were naturally designed, because the students were already placed in a particular PE classes. A pre and post test were used to determine students' motivation and achievement in sports outside of school. Students also answered a questionnaire to measure their motivation to learn during the PE lessons. Teachers gave weekly reports of the work done by their students.

Although there did not seem to be any measurable difference in students' perception of achievement in their activities, the experimental group as discussed in Alcalá & Garijo (2017) showed results where students were more highly motivated to learn about sports after gamification was introduced (effect size = .92). Even more

importantly, results showed that overall academic achievement was higher in students who participated in the gamified PE activities.

Students seem to be more motivated to learn not only in PE, but in their regular coursework as well. This shows that a learning by doing approach can be both motivational and produce positive results. Increasing tactical complexity or guiding students to be able to accomplish certain techniques in games to facilitate the understanding of the game, is one of the aspects in the Teaching Games for Understanding approach. This is related to the concept of "flow" in gamification. Kapp (2012); defines flow as the condition set up where players in the game feel challenged enough, yet confident enough that they want to accomplish the task. As mentioned above, this is particularly motivational to middle schoolers according to Wormeli (2014). Flow is the same concept as meeting students where they are that Wormeli discussed as being motivational. If flow is present, student begin realizing that the task is difficult, but are able to feel confident to take on that challenge. Kapp suggests that flow within a classroom lesson should take each student step by step through the learning, allowing them to progress at their own pace and letting them advance to the next level of understanding when they are ready, not when the class needs to move on.

Even with some conflicting results such as Bandura's 1986 research which states rewards can decrease intrinsic motivation and decrease the likelihood that a student will complete the intended work, Kapp (2012) notes "Temporary achievements or verbal boosts increased intrinsic motivation and do not infringe on the player's sense of self-determination" (p.228-229). Kapp notes that the difference between the increase and

decrease of this intrinsic motivation comes down to flow. If students are feeling praised for a significant growth, motivation increases, but if they feel the praise is unwarranted or exaggerated, intrinsic motivation will decrease.

Raed's (2018) literature review showed that gamification can be motivating to learners. It found that students will struggle to learn something if expecting to have fun and play. It was noted that Self-Determination Theory (SDT), which examines the relationship between motivation and social context, is a large part of research on motivation and several essential components of this theory can be found within gamification (Deci and Ryan, 2015). The SDT pillars are that people are motivated by competing with others, working with others, and making their own choices on things. Raed found that all of these can be a part of gamification in the classroom (p.4). Then, analysis uncovered that gamified lessons that were provided periodically were more motivational than lessons where rewards were predictable. This encourages teachers to use XP and Avatars more sporadically rather than using them all the time. So, leveling up may occur in one unit, and not in another. Team Challenges may only occur once a month to ensure they are motivational.

Gamification and Learning

Within the last 20 years, there is a growing base of literature developing, where many agree that Gamification can be used to motivate people and increase outcomes. Games are another way of varying pedagogy and engaging students to help with achievement (Toppo, 2015). Yildirim, (2017) analyzed how gamification in the

classroom had a positive effect on attitudes and outcomes of the students. Wolfe (1997) presents the benefits in learning that computer games have. He reveals how businesses have benefited from using computers to help their employees learn.

Another case study comes from a Middle School 7th grade class in Hawaii. When the teachers gamified their classroom in the second semester of their year, including badges, XP quests, and points, they were able to show an increase in achievement in 30% of their students (Sheldon, 2012, p.195-202). Thus, there are case studies from both middle school and high school that suggest improvement in school performance with the use of gamification.

KIPP Academy (Knowledge is Power Program) in Columbus, Ohio is not just one classroom using gamification, but an entire school using the gamification teaching strategy. In April 2017, I visited this school, interviewed several members of the staff, and researched how they were running their schools. They require all their teachers to use a web-based platform to keep track of student points. Each student has an avatar on this platform and it has a strong game feel. In the 2016- 2017 school year, KIPP Columbus earned its rank as "The top 5 of all Ohio schools for student growth on state assessments" ("Kipp Columbus," 2018). Cited above are only a few of the many case studies that are seeing achievement growth with gamification.

Classroom Gamification Design

These findings are verifying that gamification increases achievement in students, but there are many different ways the teacher can design their lessons within a gamified

classroom. Lynch, Lerner, & Leventhal (2013) discuss how gamification can increase motivation and learning, but it is necessary for the teacher to create the game correctly in the classroom. This pedagogy does not always lead to an increase in learning. Students need to be interested in the learning to be motivated and find success.

Kapp (2012) says "flow" (as defined above) is the solution to assuring student success. Flow can be accomplished by incorporating specific steps in game creation in the classroom: Teachers need to design games that students believe are achievable, they can concentrate on, and where clear goals are laid out. The game needs to have clear and immediate feedback so students can tell if they are on the right track. A good game needs to be challenging and yet still feel effortless. Students need to feel that they are in control and they will become so engaged that all sense of time is lost (Kapp).

Leveling Up- One Gamification Strategy

One specific way of using gamification is leveling up. Sheldon (2012) cites case studies that include levels for students to progress through their gamified classrooms. For example: a "Biology Quest" requires students to gather "experience points" to progress through five different levels in the classroom throughout the semester (p. 51). Another example is seen in Sheldon's own classroom in which the amount of "XP" (experience points) are directly correlated to the students grade. A student without any points earns an F at level one where a student earning 1860 points earns an A in the class (p. 64-65). Sheldon (2012) also shows a university class taking students through levels from Bronze to Gold starting with basic concepts and progressing students through the levels as they complete more difficult modules in the class (p. 86-87).

Teachers are ultimately the game designers in their classrooms. Each game will be unique to the teacher and will include elements the teacher creates. Literature reveals several specific techniques: flow, timely use of gamification, including competitions, and student choice help teachers design their lessons appropriately to be effective. When these specific techniques are incorporated, gamification can be motivational to students.

In Summary

Motivation to learn is linked to reinforcers and consequences. It is brought about when students see others experiencing success. Gamifying a classroom allows students to see others earn points and shows how they too can be successful. Success will occur more readily if there are rewards linked to actions. Gamification designs provide XP to students when their actions help them succeed in the learning. When students see their peers earning points, it motivates them to want to perform the same action which can lead to their own success. Gamification, when using reinforcers and consequences, can motivate students in the classroom. It could lead to higher achievement and greater outcomes for students. Educators need to be sure to include “flow” into their games. Lessons need to be designed to be both challenging and at a level each student feels they can find success to gain significant achievements. If schools partake in this type of pedagogy, their students may achieve at higher levels while the players, as well the game designer, also have a little fun.

SECTION THREE

Method

Design

I took a unit that I had taught before that I felt had gone well in years past. I changed the unit in the two classes considered the experimental groups. With these classes, I was trying to follow the research covered in chapter 2 above. I develop an intervention to allow students to progress at their own pace. I added a “leveling up” technique to see if it would increase motivation. The “leveling up” technique was meant to provide positive reinforcement to students and encourage them to work to make progress in their learning. For example, if they were struggling during a level, I would adjust it so they could still move on to the next level and not lose confidence or drive. By doing this, I intended to add flow to the lessons to keep students engaged. Then I compared the outcomes of these techniques to the control groups following the techniques I had used in years past.

The testing period took place over four weeks, with the original intended time frame to be three weeks, but inclement weather extended the unit. In this instructional inquiry, I was teaching the class while analyzing the effects a gamified classroom had on motivation versus a leveling up intervention within a gamified classroom. I had hoped to find a significant difference in the results between the two different pedagogies.

A quantitative data approach was used following the design suggestions in the book, *Introduction to Educational Research* (Mertler, 2019). It is considered quantitative research, because I compared the pre and post test data to determine the gains made by the experimental and control group. Then I included the data on the gains in homework completion from before the experimental time period and after the experimental time. Finally, the quantitative data was gathered from the likert scale surveys and analyzed

based solely on the numbers generated on a scale from one to six. I chose a quantitative method, because I wanted to be able to triangulate the data to see if they were consistent across the experiment. I intended to show with the data sets that one pedagogy was more motivational in their work in my 8th grade science classroom. The surveys followed the research suggestion of Kane and Chimwayange (2014) that teachers ask their students for their feedback so the teacher does not take for granted that their lessons are going well (pp. 52-77). I wanted to be sure that the lessons I thought were so engaging were also considered as engaging to my students.

The research used Mertler's (2019) quasi-experimental design (p. 109). This was necessary, because the four classes involved had been created by the school administration before school began. I was unable to complete a true experimental design because I was unable to form the groups completely at random. Once the groups were formed by the administration, I chose which two groups would be the experimental groups and which two would be the control groups using Random Number Generator (2019). Once the groups were chosen, signed consent forms sorted the groups further. When I required consent forms to be returned to participate in the study, 41 of my 90 students returned the consent forms. This determined the final experimental and control group.

The District

The District in which the research took place is one of the largest in the Ohio, serving about 15,000 students. It is a suburban, public school district which has four middle schools. According to the Ohio Department of Education (ODE, 2016-2017), this

district received an overall district grade of a C. The district earned an achievement grade of a D, Gap Closing grade of an F, and their Progress score was a D. The average scale score in Ohio on the science state test from 2018 was 716. The district comparatively received a 724. Since the proficient range of the test in 2018 was between 700-724, on average students were scoring proficient in this state and this district scored higher, on the verge of being rated accelerated at 725.

The School

The school where this project took place was composed of about 750 students. This school scored above both the state and the district in 2018 with a score of 746 on the 8th grade science state test. This data is consistent with data from past-year assessments as well, showing that this school typically had higher achieving students on the state test than the rest of the same district and the rest of the state. The student body is composed of about 70% Euro-American and about 30% non-Euro-American. This is consistent with the population used in this study. The project took place within one building of the three middle schools of the district.

The Classroom

The classroom included one 8th grade science teacher and one teacher aide. This was only the second year I had used gamification to motivate students. Within my four classes, there was one teacher's aide present during the 6th period class only. She was present to work with the two multi-handicapped students. There was a total of 41 students involved in this study. The 2nd period class with 9 students and the 7th period class with 12 students were considered the control group and did not receive the additional

“Leveling Up” intervention. The control group continued to work within the gamified classroom structure, but followed the same curricular strategy used in years past. The two other classes (1st period including 11 students and 6th period with 9 students) were the experimental group and were the only classes to receive the “Leveling Up” intervention.

Participants

The control group took place during 2nd period between 9 and 10 am with 73% Euro-Americans and 27% non-Euro-Americans and during 7th period from about 2 to 3pm. In my 7th period class, there was 69% Euro-Americans and 31% non-Euro-Americans. So both classes within the control group fit very closely to the school’s overall student profile. The experimental group did not fit the school profile nearly as well. The ethnicity happen to be more diverse in the experimental group. These classes took place 1st period from 8 to 9 am with 58% caucasian and 42% non-caucasian and 6th period from 1 to 2 pm with 48% caucasian and 52% non-caucasian.

The control groups were very different in their students populations, since there was only one special education student placed in the 2nd period class and nine special education students in the 7th period class. In the experimental group, there were two special education students in the 1st period class and the 6th period class did not have any special education students. So, there were ten special education students in the control groups and only two in the experimental groups. I feel it also important to note that the control group consisted of two classes, both including one with attendance issues. The experimental group included two to three students with attendance issues in 1st period and no students with attendance issues in the 6th period class. The experimental group

also had two students with intellectual disabilities who are members of the class purely to focus on social interaction. Neither of these two students participated in the pre or post data, because they were exempt from grades in the class.

Intervention

The driving questions, as mentioned in Chapter One, were:

Q1 Will the leveling up intervention improve post test scores compared to the pre test?

Q2 Will the leveling up intervention improve homework completion? and

Q3 Will students find for themselves that the leveling up intervention was motivational?

Following this guide, the intervention was developed in an attempt to motivate all students taking 8th grade science to provide their best work and put forth their best effort.

Before the intervention, there was already a system in place set up with game components following the definition described above by Raed (2018, p. 1) to work within a gamified classroom. This included a system for all students to earn points with a list of things they can acquire with these points such as a homework pass (See Appendices A and B). Also, they all picked their own avatar name to conceal their actual identity from their classmates so they could keep track of their own points as compared to their classmates' points earned. Since their identity is hidden from their classmates, these points were called masquerade points. To encourage and remind students to earn points, masquerade masks were hanging in the room as decoration and used to remind students to try to continue to try to earn masquerade points. The points were also used following

the research of Cook & Artino (2016, p. 1), to have goal-directed activities provided by the teacher, sustained by the students, and thus motivational.

To answer question one, the unit started with both groups taking a pretest and each class' average scores were calculated. Students were allowed to choose their own groups with which to work on the project. They seemed to choose peers that they thought they could do well with and enjoyed being around. All students were told a story (a motivator, according to Wormeli, 2014, as mentioned above). They were asked to imagine that the teacher's Uncle was a multi-millionaire and would leave a \$10 million inheritance to the group of students who gave the best presentation on how to use the inheritance to build a house on a geographic landform created by a glacier. His niece, their teacher, would decide the winner of the \$10 million inheritance which would actually be gold chocolate coins.

To answer question two, the experimental groups were given a timeline (Appendix C) and told that they needed to complete different homework assignments on Schoology (an online learning system) in order to "level up." The original project timeline was two weeks, but the overall project ended up taking four weeks because of unplanned days off due to inclement weather as well as adjustments made during the experimental time. A leveling up slideshow was presented to the experimental group with an explanation of how to work through and advance to the next level. This slideshow was accessible to the students via Schoology to remind them, as needed, how to progress through the levels (Appendix D). The only deadline they were given was for the project and test. They were told they could work at their own pace through the levels in order to

advance to the next level as they worked through the different parts of the project. As they met the minimum requirements for each level, the next level was “unlocked” on Schoology and the students could try to “level up.” This design was structured this way to include flow, as mentioned above (Kapp, 2012), to provide an individual level of difficulty in the “game.” Students could complete the different steps at their own pace, when they felt they were ready.

The control groups were also given a timeline (Appendix E). These classes were given specific dates in which certain the homework assignments needed to be completed. This is how the assessments and homeworks typically work for this cohort. Assignments are given with a set due date and students need to complete them by the due date even if they are not ready to move on by that date.

During the unit, the term “level up” was used frequently to remind students of the expectations in the experimental group. The term was not used in the control group at all. Rather, when they entered class and while they were working, they were reminded of deadlines and expectations originally given.

For the control groups, the assignments were opened a week after the project started when a student asked if he could start the assignments. Prior to that time period, students in the control groups had only focused on the project. After the assignments were opened in Schoology, students in both classes were reminded to complete the assignments by the due date.

The experimental group followed Kapp’s (2012) work that suggests “Temporary achievements or verbal boosts increased intrinsic motivation and do not infringe on the

player's sense of self-determination" (p.228-229). So, frequently using the term "level up" and playing songs to celebrate students who were able to meet expectations was used in order to see if motivation in the experimental classroom would increase.

The control groups were given deadlines for homework, research, and assessments, then the average assessment scores were calculated in each class. The experimental groups was given the leveling up information and allowed to progress at their own pace and then their assessment averages were calculated. Both groups were expected to complete all work and take the posttest assessment within the same three week period. At the end of the unit, both groups' average homework completion and post test assessments were calculated and then they both were given a likert scale survey (Appendix F) to report their levels of motivation.

The first thing that was due was the vocabulary quiz. To prepare for this quiz, both groups were encouraged to use the website Study Stack (Study Stack,2019) which had the words for the unit on it. This website allows students to choose which game they want to play with the words to learn the material. They could choose from flashcards, hangman, matching, bug match, hungry bug, targets, chopped, unscramble, or take quizzes and test.

In the experimental groups, I discussed adjusting the amount of vocabulary words with students who were not leveling up. I wanted to follow the research of Kapp (2012) to provide flow. The intention was to help students feel compelled to continue in the game, since it was adjusted to their level. This group was required to earn an 80% on Study Stack in order to attempt to "level up" on Schoology. So, if they had not been

successful in doing this, I adjusted the requirement to 80% successful on 10 vocabulary words one day and if they received 80% on the next 10 the next day, they could level up.

The next step was to focus on the stream labs and topography videos and worksheets. Students could “level up” if they completed the checkpoints covering these topics with an 80% or higher.

The next level required students to revisit the pretest. In the control group, students were not assigned the pretest again, it was only a suggestion as to how to study. With the pretest revisit, students in the experimental group were also required to play Kahoot, an online review game, in order to prepare for the quiz. Once again, the control group was only suggested to play Kahoot before their quiz. These choices were provided for the experimental group in order to provide flow, as mentioned above, students were encouraged to continue through the game at their level in the experimental group, where the control group was simply told how to study the material as I had done in past lessons.

There was no way to keep track if and when students played Kahoot on their own. I only received reports from Kahoot when I initiated the games. Three groups from the experimental groups asked me to start a Kahoot with them during their study hall. I also witnessed students in the experimental group playing at some point during the unit. I did not see any students playing in the control group.

Although the leveling up slides discussed homework passes and a cloak of invisibility to students leveling up early, only three students ever used the cloak of invisibility to have their hoodies up in class and only three used it to use the restroom

without having to provide their hall pass to me to sign. Students seem to be more motivated by the accolades than by the rewards.

On the last day of the unit, to answer question one, the unit assessment was administered to all students. When they finished their assessments, they were asked to complete their survey to answer question three. If they had not returned their consent form, they were told to find something else quiet to complete. Most students returned the surveys the same class period that they completed the assessment. Some returned the survey the following day.

Plan for Analysis

The results will be triangulated by looking at three main aspects of motivation. The data will be analyzed to answer the original questions for the experiment provided above and compared as follows.

Q1 Will the leveling up intervention improve post test scores compared to the pre test?

This was analyzed by taking the pretest data on the student's prior content knowledge on this unit before the instruction and comparing it to the post test data, then calculating the gains made from the pretest to the posttest for both groups.

Q2 Will the leveling up intervention improve homework completion?

This was calculated by noting whether or not students completed homework. They earned a 100 if homework was completed and a 0 if it was not. All students completed the project during this unit. Not all completed all sections of the project, so for the project, students who earned a D or above scored 100 for completing the project and a 0 if they

received an F on the content. The homework completion before and after the intervention was then averaged for both groups to show the differences in homework completions.

Finally, Q3 Will students find for themselves that the leveling up intervention was motivational? For these questions, survey data on motivation to achieve was compared for both groups after the intervention. Groups responded on a scale from 1-6. A Mann-Whitney U-Test was completed in order to determine if there were any differences between the experimental groups' responses and the control groups'. This survey is provided in Appendix F.

SECTION FOUR

Data

In order to answer the three questions posed in this study, the assessment data was analyzed before the unit and then after. The homework data was analyzed before and after the unit and then the survey data was analyzed. These three questions were posed to determine if the leveling up intervention in the experimental group was significantly more motivational for learning science or the standard gamification pedagogy used in the control group. The unit assessment, homework completion, and survey results are provided below.

Unit Assessment Results

Prior to this experimental period, the experimental classes averaged a 33.03% on the pretest, while the control group averaged a 32.97% on the pretest. After the experimental period, the experimental group earned an average of 81.94% on the post test

and the control group earned an average of 83.47%. The average gains from the pretest to the posttest was 46.83% for the experimental group and 46.92% for the control group. An experimental t-test indicated no difference in means between the experimental and control groups. The Shapiro -Wilk test indicated that the data was normally distributed.

Homework Completion Results

The average homework completion baseline data before the intervention for the experimental class was 84.29%. In the control group, the average homework completion was 84.61%. So the control group happened to be completing homework at a higher level than the experimental group before the intervention. After the intervention, the experimental groups homework completion rose to an average of 94.1% and the control groups dropped to an 86.46%. The average gain after the experimental time for the experimental group was 9.76% and the gain for the control group was 2.89%. When the t-test was run on this data set, there was not a significant difference in homework completion for the experimental group during the testing period as compared to the control group. There were 3 outliers on the box plot, but they were not extreme. I chose to keep them and I do not believe they affected the analysis.

Survey results

Using the Bonferroni reliability test, a result of .005 or less is necessary to show sufficient reliability which was not met in the surveys. None of the results showed a significant differences in responses between the experimental group and the control group. The results are as follows:

Means	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
Exp	4.8	4.62	4.9	4.14	4.48	2.95	4.29	4.76	5
Control	4.37	4.37	4.16	4.63	4.21	3.05	4.58	4.74	4.31

There were not any boys that reported to not like video games in either the experimental nor the control group. For the girls, 64% in the experimental group reported they did not enjoy video games whereas in the control group, only 44% reported not liking video games. This did not seem to affect the results on the survey, since more girls reported being motivated by the leveling up intervention in the experimental group than girls in the control group.

Observations

Even though the experimental quantitative data does not show any significant differences between the experimental group and the control group, below I have noted things that happened during the unit that seem to show that students were motivated by the intervention. Some are pointed out here because they showed how students seemed to be moved to sustain a behavior and some are noted because they seemed to be influenced by their peers to complete a behavior. Since I did not conduct student interviews, it is hard to say for certain why their actions took place, but given the provided theories on motivation, peer relationships and positive social acknowledgements, these are the most likely reasons.

Before the intervention began two students introduced the teacher (outside of the regular science class) to a song by Ciara called “Level Up.” This song seemed to be a favorite of theirs at the time. With leveling up as the focus in this research, the song seemed to be a good fit. The work to complete was the same for the experimental group and the control group, but when students in the experimental group decided they were ready to move on to the next step of the activity, the Ciara song “Level Up” was played. The only part of the song that was played was the introduction which goes- 5,4,3,2,1 Level up, Level up. When this happened for the first time, several students asked, “Who leveled up”? I would say, “They can tell you if they like”. The energy in the room changed. The drive in the students changed, many seemed very motivated at this point to progress and many did progress contrary to this same class just the day before who showed very little progression. Perhaps at this time students’ inefficacy was also occurring. This may have discouraged some students and pushed them to believe they should give up.

When students seemed additionally encouraged by the song, I added another song when the next levels were achieved. For the Mad Dog level, I played “Who Let the Dogs Out?” by the Baha Men. Then, when the first student was about to “level up” to Phoenix, he asked what the song was for that level. I told him, he could choose the song. He decided on “Hall of Fame” by the Script. Then the plan became, when students hit the last level, Emperor, the song “I Just Can’t Wait to be King” by Elton John and Tim Rice played. But no students reached this level before the deadline where everyone was expected to test. So instead, I let all the classes compete for the highest overall grade on

the unit test and offered all classes a free period if their class's average was the highest. I told the experimental group that I needed to add another level and if their class was the highest, they would be considered the Masquerade Masters and earn the incentive day. Levels was not mentioned to the control group.

On the first official day of the project, no one in the experimental group leveled up. The second day the 1st period experimental group did not mention leveling up and neither did I. The 6th period experimental group had a lot of discussion about the vocabulary and who had or had not finished the vocabulary work they had assigned each other. Then one group of girls showed me how close they were to leveling up, so I announced to the class that one group was close to leveling up. Then, one student in that class asked me to remind her how to "level up." I reminded the class that the levels were on Schoology for them to refer back to if they like. The third day, the first student leveled up in 6th period shortly after that, and during the same class period, two of the three other members of her group leveled up. Three snow days followed, then the last member of that group leveled up. Then two other students leveled up in that same class period. Still, no one leveled up in first period. So it seems as though students in the 6th period experimental group were motivated by the other students in the room. Since first period was not leveling up, they were not motivated by anyone leveling up. It was not until day five (day seven if you count the snow days) that first period had anyone "level up." By the next day seven people had during that class. Once again, it seemed motivational to see classmates "level up."

Motivated students seemed to spark motivation in many students to “level up,” but not how I thought. Since I let the students choose their groups, I was suspecting that they would be motivated by the peers they chose to work with. That is not what happened. Students from each group would “level up” at different times. One or two people would “level up” at table one, then one or two from table 6. Many times there were one or two students from a table that would go days without leveling up.

A reverse type of motivation happened too. Tables that were not leveling up in the experimental group were not motivated to “level up.” The first day of the project, in the 1st period experimental group, no one leveled up. When I saw students who were not leveling up, I would approach them separately and discuss an intermediate level, so they could be successful. This was done to help with the flow. As mentioned above in Kapp (2012), if students do not think they can be successful, frequently they will stop trying. But if given a task that they believe they can achieve, they will usually keep trying. This is what I saw happen. For example, one student could not seem to get an 80% on the vocabulary on Study Stack, so he gave up and went on to the next leveling without asking me if that was all right. When I realized he wasn’t leveling up, I asked him if he wanted to just work on ten words and then study the other ten the next night to “level up.” He said yes and started studying again, so he could “level up.”

Chapter 5

Analysis and Discussion

Implications for practice

The main reason I enjoy gamification is the fun it lets me and my students have during lessons. I enjoy turning things into a game. I enjoy seeing hands go up of students whose hands had never gone up prior to this pedagogy. Besides having fun, I was hoping to motivate my students to complete their homework. I also wanted to improve achievement overall and after analyzing the data, I found that my leveling up intervention did not help with that. There was no significant difference in the unit assessments between the experimental group and the control group. It seems that students who were intrinsically motivated without the songs and without the gaming language achieved at about the same rate. The 2nd period control group actually won the incentive day by having the highest average score. This was not surprising, since they were scoring higher on average for earlier assessments.

The surveys did not show the method was motivational to students. There may be one or two vocal students convincing the teacher a certain practice should be stopped or started and the rest of the class does not actually feel the same. Yet, because these minority opinions are presented, a teacher can be led to believe that all students feel the same way.

With no data to show that students were actually motivated to study and learn more, it may have been that some of the sections were too difficult for students and missed bridging the work for them. I saw this happen in the vocabulary section, so I realize I may have missed it in other sections.

If student felt that some of the work was too difficult, their self efficacy may have decreased. As mentioned above, Bandura and Wood (1989) discussed what students

believe to be true influences our actions. They may have felt it was too difficult to complete and just given up. I saw this very obviously in the vocabulary section of the unit, so it may have happened in other sections as well.

Students may have been motivated by something else. As Skinner (1969) discussed, I may have been reinforcing socializing or working towards the goals over the learning. Their behavior during the unit showed that they were very motivated to socialize with their peers during this time. This may have overshadowed the actual learning.

Future

This still leaves the questions in the study to be answered. Does gamification with leveling up increase learning? The answer is difficult, because there are so many ways that a teacher can set up gamification in their classroom, but it is easy if you look at my study. The answer is no. The way I designed the leveling up intervention did not motivate students enough to increase their test scores. Then my study asked if it increased students motivation to complete their homework, the answer was still no. Even though more students in the experimental group on average completed their homework, the intervention did not bring about significant homework completion in either group. So the way the intervention was designed once again was not motivational. Finally, the surveys did not show any significant increase in motivation either.

So, with the results not pointing to leveling up being motivational, the question then becomes, will I “level up” again? The answer is yes. But I would adjust it significantly. I would need to keep in mind the Lynch, Lerner, & Leventhal (2013) that it

is necessary for the teacher to create the game correctly in the classroom. In the future, I will try to follow Wentzel's (1998) suggestion to be sure the focus is on making the topic interesting to start the unit. I would try to follow Wormeli's (2014) suggestion to not guess what the students are motivated by. I may ask them how they think they should progress through the levels. Also, I believe that the flow needs to be improved in the unit to increase motivation, particularly at the beginning during the vocabulary section. If all students were expected to only focus on five words at a time, they might have more motivation on the other assignments as they continued through the unit. In the future, I would also adjust the instruction so that all students only focus on one step at a time rather than introducing the entire timeline at once. I think students were a little overwhelmed with the various pieces of the project. I would also try to follow Skinner's (1969) suggestion to be sure students were being motivated in the right way. If I see that students are being more motivated to socialize than to complete the tasks to level up, I may add a motivator of some sort for just that study group. For example, I may say, who will get the highest grade in this group? This may turn the focus back to the learning.

Originally I wrote in chapter 2 that the most important feature of gamification is motivation. Many students in my classroom seem to try harder than ever in a gamified classroom. They raise their hands more, they have better behavior, and they think more deeply about a concept than with other pedagogies I have used. Since a gamified classroom does not have a required design and can be created by the teacher in their own way, I want to improve my own design to increase the motivation of all my students. So, I still feel like I need to determine the best design to be more motivational.

However, I will be scaling back my gamification technique in the future. I do not plan on using it the entire year. I hope to incorporate it at the beginning of the year to aid with behavior and include it again during this same leveling up unit, but I plan to include other pedagogy such as service learning and project based units throughout the year.

I believe it is important for teachers to provide a variety of experiences and pedagogy for their students. In my own study I did find that leveling up greatly motivated some students. It was not motivational for all students, especially outside of the classroom. Students might have been more motivated to complete the work in front of their peers, but once they got home, the motivation to study for the test seemed to have been more limited. I did see homework being turned in by students who did not typically turn in homework, so motivation did increase for them. Perhaps the students who were motivated very little with leveling up would be more motivated by a service learning pedagogy or project based pedagogy. As an educator, I would like to continuously seek to add different experiences for students and keep it interesting for them. The world changes quickly and students are eager to “flow” into learning the next new thing. I want to be sure I can help them to do just that.

Limitations of this study

One of the largest issues of the study is that the intended time period was changed due to the inclement weather. This was partially problematic because the design of the game did not allow for students to move forward without meeting a checkpoint with me. They also needed to wait for me to open the item on Schoology for them to complete and then move on. I was not able to note their motivation during the snow days, because the

Study Stack link they needed to be using for their vocabulary during this time did not monitor their usage. I also did not survey the students to check to see how or when they studied. I do feel that the 6th period students were motivated to study during the snow days because a few of them passed their vocabulary quiz the day we returned to school. Unfortunately, this is only a guess. I do not have data on this.

A systematic error occurred when I decided to gamify the unit assessment and I told a control group class accidentally that they could “level up.” They looked at me very confused and I had to apologize to them and let them know that I didn’t mean that. They simply could earn the incentive day if they were the highest class. This same day I made another mistake by telling this same class, 2nd period, that they would probably win the incentive day, because they had typically scored higher than other classes on past assessments. This added another variable to the experiment. Did 2nd period win, because they were motivated to study and do well in order to earn the incentive or because their teacher had high expectations for them and believed in them?

Another limitation was in the survey. I wish I was able to more closely monitor their motivation with another tool either with interviews or a study or work journal. Since sustaining a task is motivational, I would like to be able to look back and see how much students studied at home showing if the motivation at school was continuous even when they left their peers in the classroom. Even though it asked the question on the survey, I would like to have been able to further document how much time they actually spent trying to “level up.”

Another limitation was that I did not focus on the students' individual motivational differences. I did not separate between how motivational leveling up was for girls compared to boys. Nor did I compare how motivated students who are motivated by video games were motivated compared to students not motivated by video games.

Dissemination of Results

With the strong use of Schoology in this pedagogy, I have applied to present my findings at the Schoology Connect Ohio conference this summer. I intend to let other teachers know how I set up the leveling up intervention with Schoology. I will let them know that it showed no significant differences in outcomes and I plan on discussing how a variety of teaching methods can be motivational and their should not be one method considered to be used consistently.

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Appendices

Appendix A

How to Earn Masquerade Points

1pt.

Get caught being..... Good, nice, kind, following directions, going above and beyond or just extra.

2pts.

Challenge winners

5pts.

Winner of Team Games

100% on an assessment

Kahoot

1st = 10pts 2nd= 9 pts. 3rd= 8pts. 4th= 7pts 5th= 6pts.

10pts.

WALL OF FAME

Appendix B

What do Masquerade Points Equal?

Highest overall = 4 points extra credit

Highest in class= 2 points extra credit

117=No Midterm

106-116 = Extra day to study

100 - 105 points= Can use notes on Midterm

100 points = Choose a partner to take Midterm with (both use 100 pts)

75-99= 15 minutes of notes on Midterm

74 = 2 questions eliminated on Midterm
73 = Free day
64-72 = Can use front and back of small note card for Midterm
51-63 = Jag award
50 = Sit wherever you want
36-49 = 1/2 a free day
35 = Homework pass
11- 34 = Front of the line pass
10 = Wheely chair for a class, earbuds for a class, hat in class, sunglasses in class
food in a class, choices for dive in, 3 pieces of candy

NEGATIVES

-1 = warning
-2 = warning
-3 = lunch detention, call home
-4 = extra assignment
-5 = lunch detention, call home
-6 = after school detention, call home
-7 = Office referral

Appendix C

Streams, Glaciers, and Topography Project

Today, January 25th, your student's stream, glacier and topography project was assigned. This project has three parts: Part One covers streams where students complete 4 laboratory investigations in class and fill out an accompanying worksheet as they discover information about streams. Part Two covers glaciers. Students will be working in a group to complete a Google Slide presentation on Glaciers to present on February 12th. Part Three covers topography. Students will complete a topography worksheet packet. During this project, they will also complete a vocab. Quiz and Streams and Glaciers Quiz. Once this project is completed, students will take a test to show

understanding of the topics. The Test will be on 2/15th. Please read the following and note important due dates your student needs to follow.

Also please note that dates can change due to unforeseen circumstances, but will be reflected in Powerschool.

January 25th Students will be presented the directions for the project (found on Schoology) and will pick their own groups to work with. **You may ask them if they made good choices with whom to work.** Some students might be able to start a Stream lab. or Topographic map time permitting. While working, students may have points deducted from their personal grade if they are not working on the project at any given time.

January 28th Students will start on their stream labs or topographic maps, depending on their assigned group.

January 29th Project groups are solidified. Some groups will work on their stream labs. while others will continue brainstorming and create their rough drafts for their glacier project using the Chromebooks, while others still may work on their topographic maps.

January 30th Students may work on any part of their project on this day. stream tables as well as chromebooks are available. BECAME A SNOW DAY

January 31st Students may work on any part of their project on this day. stream tables as well as chromebooks are available. BECAME A SNOW DAY

February 1st Students may work on any part of their project on this day. stream tables as well as chromebooks are available. BECAME A SNOW DAY

February 4th -Students may work on any part of their project on this day. Stream tables as well as chromebooks are available.

February 5th - Students may work on any part of their project on this day. Stream tables as well as chromebooks are available.

February 6th - 1st and 2nd period will have work time. 6th and 7th will not have class. They will be with their Junior Mentors, so they will need to work outside of class on their project.

February 7th- We will work on the Slides presentations in the classroom.
LAST DAY for STREAM TABLES

February 8th - Work on the Slides or Streams and Topography Questions on Schoology. BECAME A WORK DAY WITH A SUB.

February 11th - Streams and Topography Questions on Schoology due by midnight. Review Topography in class.

February 12th- Project work time

February 13th- Project work day/ **Topography Review and Schoology Checkpoint on Schoology due by midnight.**

February 14th - Streams, Topography, and Glaciers Quiz

February 15th- Glacier Project DUE

February 18th - NO SCHOOL PRESIDENTS DAY.

February 19th - Career Center Field Trip

Since I only saw my 1st, 6th, and 7th period classes. I only let them know about the upcoming Unit Review assignment.

February 20th - Science-opoly Review in class BECAME A SNOW DAY

I emailed my 2nd period class students to let them know the Review was available on Schoology and due by class time on Friday.

February 21st - We will review all with Eraser Slide Unit Review Assigned.

February 22nd - We will take the Streams, Glaciers, and Topography TEST*

Appendix D

Levels

Scamp = Mastered vocabulary (80% or above). If not mastered, written review work is assigned. Then retake on Schoology.

Squire = Mastered Complete Stream Labs and associated Schoology Questions

1st Try = A 2nd Try = B

After 2nd Try, written review work is assigned.

3rd Try is your grade.

Mad Dog = Schoology questions on Topography. Homework pass to 1st 10 students

1st Try = A =10 pts. 2nd Try = B= 5 pts.

After 2nd Try, written review work is assigned.

3rd Try is your grade.

Phoenix = Kahoot Review, Mastered Pretest and Quiz. Cloak of invisibility= Teacher

looks the other way. For example: You can use the pass without the teacher signing your restroom pass.

If the score on the Quiz is 80% or above, move on to Level #5. If it is 79% or below create a quizlet to review and take the Quiz retake

Emperor = Take the Test On the Throne. 1st Try = Your grade

Appendix E

Control Groups Timeline

Streams, Glaciers, and Topography Project

Today, January 25th, your student's stream, glacier and topography project was assigned. This project has three parts: Part One covers streams where students complete 4 laboratory investigations in class and fill out an accompanying worksheet as they discover information about streams. Part Two covers glaciers. Students will be working in a group to complete a Google Slide presentation on Glaciers to present on February 12th. Part Three covers topography. Students will complete a topography worksheet packet. Once this project is completed, students will take a test to show understanding of

the topics. The Test will be on 2/15th. Please read the following and note important due dates your student needs to follow.

Also please note that dates can change due to unforeseen circumstances, but will be reflected in Powerschool.

January 25th Students will be presented the directions for the project (found on Schoology) and will pick their own groups to work with. **You may ask them if they made good choices with whom to work.** Some students might be able to start a Stream lab. or Topographic map time permitting. While working, students may have points deducted from their personal grade if they are not working on the project at any given time.

January 28th Students will start on their stream labs or topographic maps, depending on their assigned group.

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January 30th Students may work on any part of their project on this day. stream tables as well as chromebooks are available. BECAME A SNOW DAY

January 31st Students may work on any part of their project on this day. stream tables as well as chromebooks are available. BECAME A SNOW DAY

February 1st Students may work on any part of their project on this day. stream tables as well as chromebooks are available. BECAME A SNOW DAY

February 4th Students may work on any part of their project on this day. Stream tables as well as chromebooks are available.

February 5th - *VOCAB QUIZ in CLASS* ½ the class works on stream tables

February 6th- 1st and 2nd Period will have class. 6th and 7th period will not have class. They will need to work at home. (Junior Mentors in classes 6th and 7th)

February 7th- This is the **LAST DAY for STREAM TABLES....**

February 8th - Stream Table Worksheets need to be completed. You can access the correct answers on Schoology. BECAME A WORK DAY WITH A SUB.

February 11th - Last Day to complete Topography W.S.

February 12th- Project work day

February 13th- Project work day/ **Topography Review and Schoology Checkpoint on Schoology due by midnight.**

February 14th - Streams, Topography, and Glaciers Quiz

February 15th- Glacier Project DUE

February 18th - NO SCHOOL PRESIDENTS DAY.

February 19th - Career Center Field Trip

Since I only saw my 1st, 6th, and 7th period classes. I only let them know about the

upcoming Unit Review assignment.

February 20th - Science-opoly Review in class **BECAME A SNOW DAY**

I emailed my 2nd period class students to let them know the Review was available on Schoology and due by class time on Friday.

February 21st - We will review all with Eraser Slide- **Unit Review Assigned**

February 22nd - **We will take the Streams, Glaciers, and Topography TEST***

Appendix F

Survey

Please choose a number 1-6 for each question below to show how strongly you agree or disagree with the statement.

1 Strongly Disagree **2 Disagree** **3 Slightly Disagree** **4 Slightly Agree**

5 Agree **6 Strongly Agree**

1. I was motivate to spend more time working than I normally would in other classes, because of how the class was set up.

1 Strongly Disagree 2 Disagree 3 Slightly Disagree 4 Slightly Agree 5 Agree 6 Strongly Agree

2. During this unit, I was motivated to spend more time working even when it was harder to reach my goal.

1 Strongly Disagree 2 Disagree 3 Slightly Disagree 4 Slightly Agree 5 Agree 6 Strongly Agree

3. Compared to science lessons earlier this year, the lessons in this unit encouraged me to work harder during class time.

1 Strongly Disagree 2 Disagree 3 Slightly Disagree 4 Slightly Agree 5 Agree 6 Strongly Agree

4. The lessons motivated me to review the material at home more than I usually review them at home for science.

1 Strongly Disagree 2 Disagree 3 Slightly Disagree 4 Slightly Agree 5 Agree 6 Strongly Agree

5. The lessons helped me learn the material better than regular lessons helped me in science.

1 Strongly Disagree 2 Disagree 3 Slightly Disagree 4 Slightly Agree 5 Agree 6 Strongly Agree

6. The lessons did not seem any different to me than a regular lesson in science.

1 Strongly Disagree 2 Disagree 3 Slightly Disagree 4 Slightly Agree 5 Agree 6 Strongly Agree

7. The lessons encouraged me to ask my classmates more questions than I normally would have asked.

1 Strongly Disagree 2 Disagree 3 Slightly Disagree 4 Slightly Agree 5 Agree 6 Strongly Agree

8. The lessons encouraged me to ask my teacher more questions than I normally would have asked.

1 Strongly Disagree 2 Disagree 3 Slightly Disagree 4 Slightly Agree 5 Agree 6 Strongly Agree

9. When I saw other students moving on to the next step, I was motivated to try/ work harder too.

1 Strongly Disagree 2 Disagree 3 Slightly Disagree 4 Slightly Agree 5 Agree 6 Strongly Agree

CIRCLE YOUR ANSWER BELOW

I am a BOY GIRL

I like to play video games DO NOT like to play video games