A PHENOMENOLOGICAL STUDY OF TEACHERS' EXPERIENCES WITH EDUCATIONAL GAMIFICATION AND ITS IMPACT ON STUDENT ENGAGEMENT IN THE MIDDLE SCHOOL MATH AND SCIENCE CLASSROOM

by

Kimberly Rudd Parks

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Philosophy

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APPROVED BY:

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Abstract

The purpose of this phenomenological study was to understand digital gamification and its effect on student engagement based on the lived experiences of middle school math and science teachers in rural schools in the southeast region of the United States. Nick Pelling's gamification theory guided the study herein. Gamification theory served as a tool to alter learner engagement which impacted instruction and learning. I used a criterion-based purposeful selection of 10 middle school math and science teachers with gamification experience. Participating teachers had three or more years of teaching experience and taught in regional rural schools. The hermeneutical phenomenological study resulted in the themes of gamification elements on student engagement, planning gamification lessons, and obstacles to gamification. The lived experiences of middle school math and science teachers positively addressed the gap in the correlation between gamification and enhancing student engagement.

Keywords: gamification, engagement, middle school, math, science

Copyright Page

Dedication

I dedicate this dissertation to God, my creator, for strength, courage, and perseverance.

To my mother, who encouraged and celebrated with me every step of the way.

To Harper, my puppy who sat hours with me while I was researching, typing, and frustrated, and always kept me calm.

To my chair, who provided a clear path to assist in completing this research study.

To the memory of my father, Douglas, who always believed in my abilities and taught me to stand firm with conviction. He taught me never to let others kick sand in my face.

To my spouse, James: You are the one who sacrificed. I love you.

Acknowledgments

I acknowledge Dr. Chris Deason, Dr. Brian Jones, and Dr. Christopher Clark for their dedication and commitment to my study. I have learned, grown, and achieved because of your guidance.

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CHAPTER ONE: INTRODUCTION

Overview

Gamification is intended to make learning fun and focus learner energy on something they are good at or can get better at while enjoying the learning task (McGonigal, 2011). I conducted a hermeneutical phenomenological study on math and science teachers' experiences with student engagement related to gamification. Gamified learning and learner engagement theories framed this study, as gamification stimulates learning behaviors (Žarić et al., 2021). The problem was that unless math and science teachers' experiences with student engagement through gamification are examined, teachers may forego an opportunity to engage their students in learning (Kokandy, 2021; Smith, 2018). Prensky (2001) highlighted that the generational diversity of edutainment between educators and learners was a barrier because instructors had different approaches, outlooks, styles, and needs, which learners might find boring, so they might not want to engage. The study may provide significance to practitioners and school leaders with experiences from middle school math and science teachers, considering how gamification impacted learner engagement. I explore the background and context of gamification, the problem and purpose statements of this research study, and the significance of the study, and introduce the research questions in Chapter 1.

Background

Gamification has a historical foundation in the classroom as teachers use failure as an instructional tool, engagement through discovery, the transfer of skills for real-world application, and a problem-solving approach to pedagogy (Barab et al., 2009). The social context of educational gamification includes the gaming elements of autonomy, competence, and relatedness (Alabbasi, 2018). Gamification merges education and entertainment in ways that may

elicit engagement that teachers can harness (Alabbasi, 2018). Gamified learning theory and gamification are the theoretical contexts of the study. Educational gamification is an emerging approach for teachers that may increase engagement. Educational gamification first emerged in 2008 by Nick Pelling (as cited in Watson-Huggins & Trotman, 2019).

Historical Context

The historical foundation of gamification originated in 1973 in response to workplace productivity reduction (Coonradt et al., 2012). The origin of gamification was to address the lack of engagement, the onboarding process, and retention in the workplace, which led researchers and designers toward educational gamification. Coonradt et al. (2012) highlighted examples of workers using accurate scorekeeping to compare their performance to their past results, judge against a set standard, and receive frequent, immediate, meaningful feedback. Workers understand the principle of choice, which stimulates their enthusiasm, thus affecting their job performance due to consistent and stable game rules. Workers perform better when they understand their scores, contributing to on-the-job security (Coonradt et al., 2012). Coonradt et al. analyzed this concept in the workplace and the field of education, as employee feedback in these environments needed to be more present, effective, and consistent. Gamification may promote worker engagement through games with well-defined goals, measurability, self-driven tasks, dynamic tasks, personal growth, and immediate feedback (Coonradt et al., 2012). Game mechanics applied within the corporate world may help employee engagement (da Rocha Seixas et al., 2016). In their book *Total Engagement*, ,an exploration of gamification in the workplace, Reeves and Read (2009) suggested that employee enthusiasm and concentration affect how people lead through creativity, competition, and collaboration. Treiblmaier et al. (2018) concluded that applications, task processes, products, services, or contexts are used in many

gamified settings.

Gaming elements used in the business world are also a means to increase engagement and productivity in education. Employees receive virtual rewards when they complete workplace performance tasks through gamified activities that externalize motivation (Mitchell et al., 2020). Wingo et al. (2019) reported that 87% of U.S. workers claimed that gamification in the workplace led to higher productivity, and 80% of workers found gamified learning highly engaging; gamification increased engagement in the workplace by 60% and productivity by 50%. The use of point-based quizzes and trivia assists workers in reflecting on their learning and determining areas for self-improvement. Point-based leaderboards are gamified tools for sales-based employees to enhance productivity (Wingo et al., 2019). Gamified goal trackers with visual progress bars and badging engage employees as they progress and increase achievement toward business goals (Wingo et al., 2019).

A group of authors expanded the study of gamification in education through their research in the 1980s. Malone (1981) determined that video games could encourage intrinsic motivation and collaboration among students, whereas Bartle (1996) introduced a gaming platform for multiple learners. Ben Sawyer and David Reetsky created serious games in 2002, which blended academia, the military, and business in a nongaming form of gamification (Khaitova, 2021). Serious games are entertainment tools for education in which learners practice their skills during gaming (Zhonggen, 2019). In addition, serious games effectively influence the learner's upbeat mood, encouraging continuous play and gameplay interest and increasing academic achievement (Zhonggen, 2019).

Gaming may affect mood formation through the emotions of sadness, happiness, and anger. Through serious games, players are encouraged to engage and have an increased interest

in gameplay as they form a positive mood, resulting in better academic performance (Zhonggen, 2019). Nick Pelling (as cited in Landers et al., 2018) expanded on gamification in 2003 and developed the definition of gamification, defining gamification as applying game-like accelerated user interface design to make electronic transactions both enjoyable and fast" (Pelling, 2011, para. 2). Rajat Paharia founded Bunchball in 2007 as the first gamification platform that used gaming mechanisms for the business sector (Kim & Werbach, 2016). Bunchball helped the business industry address its challenges with worker engagement through integration, analytics, ease of use, custom ability, and performance tracking. Bunchball is a gamification system that provides companies with a platform to create, measure, and execute gamified systems for individual employees and teams from their desktop or mobile device (BI Worldwide, n.d.). Companies use gamified features of leaderboards, rewards, recognition, progress bars, and contests to motivate and engage their employees. Badges and rewards provide visual and physical employee recognition for meeting company goals. Leaderboards encourage competition through ranking systems, yet they can motivate high performers positively and may negatively affect lower performing employees (TechnologyAdvice, 2023). Progress bars track an employee's progress toward company goals, a visual of accomplishment translated into rewards (TechnologyAdvice, 2023).

McGonigal (2010) focused on the global development of gaming platforms such as Quest to Learn and Digital 4 Square. In 2009, a class of sixth grade students used Quest to Learn as a gamified learning platform to measure their retention rate of information (Kalogiannakis et al., 2021). In 2010, McGonigal endorsed gamification through her TED talk, *Gaming Can Make a Better World*. McGonigal, who has a doctorate in performance studies, is a world-famous designer of games; her TED talk has 15 million views (McGonigal, 2010). She is among the top

30 MIT innovators, top 20 Inspiring Women in the World, and *Business Week*'s Top 10 Innovators to Watch (McGonigal, 2010). McGonigal (2010) focused on engagement, whereas Morris et al. (2013) suggested that games are not time wasters or a means to escape the real world; instead, they are grounded on the premise of goal setting, rule sets, and feedback. The first justification of gamification includes a built-in motivation for the player, input on the player's immediate performance, and an understanding of the player's progress toward an intentional learning goal (Kalogiannakis et al., 2021). The successful deployment of Digital 4 Square was a means to influence the behaviors of users using gaming elements such as rewards and badges as people visited physical places and businesses (Frith, 2013). The concept that a nongaming platform could motivate and engage the user and learner activity gained traction in the game design markets (Deterding et al., 2011). Prensky (2001) confirmed that using entertainment elements, such as planned goals, authentic assessment, creativity, focus, character, tension, and energy in the classroom can facilitate student engagement in instructional design. The success of edutainment game design may require a balanced design, according to Prensky (2001). The learner is challenged through an original, fun design with developed characters built on action that continuously engages the learner (Prensky, 2001). The correlation between student engagement and academic outcomes is grounded in research essential to the post-COVID pandemic. When gamified processes are used in the workplace and classroom environment, activities may become more engaging and exciting, provide immediate feedback to the user, and encourage collaboration. Users in the workplace or classroom game receive rewards that provoke motivation to continuously engage in getting the same result or better while having fun.

Social Context

Gamification combines recreational gaming skills in a nongame context in which the

highlight is the element of fun with an academic background in a social context. The social context of gamification focuses on the decisions that drive a learner to make choices in play without external stimuli while having fun. Therefore, students engage and collaborate in instructional activities that are fun and stimulating, and exciting. Gamification can be an instructional tool to support achievement toward an intended learning target that frames the instructional purpose, engage students in learning, encourage behavioral and attitude changes, and spur student socialization (Rivera & Garden, 2021). The reorganizing of instructional strategies post-COVID may result in gamification as a probable technology-enhanced learning tool to supplement traditional teaching practices (Nieto-Escamez & Roldán-Tapia, 2021). As many students shifted to an entirely virtual platform, Fontana (2020) reported that gamification was a means to enhance students' mental health through social interaction. The social context of gamification includes educators' paradigm shift to develop innovative teaching strategies to improve learner engagement and maximize their knowledge requisition (Koivisto & Hamari, 2019).

Social elements of digital gamification positively influence learner autonomy, competence, and relatedness, thus affecting a learner's intrinsic motivation and social satisfaction (Xi & Hamari, 2019). Learners use the elements of autonomy, competence, and relatedness in gamification, which potentially impacts the learners' motivation, engagement, and problem-solving skills. As learners develop competence with an activity, they may become conditioned to the engagement cycle with a progression loop and reward compulsion (Duggal et al., 2021).

Relatedness refers to the learners' social need to feel connected to others respectfully. When relatedness is used appropriately, teachers can motivate learners to engage and relate to

their learning (Chou, 2019). Students have an innate desire to connect and compare themselves to others, which, when used appropriately, can motivate them. The element of relatedness is essential to student achievement and learning outcomes as through these interactions learners build connections through social skill development and experience positive attitudes toward others (Yusof et al., 2020). Sailer and Homner (2020) defined relatedness in the context of collaboration and cooperative learning groups, promoting a sense of challenges that would be difficult to master as individual learners. Avatars and quests are social game mechanics that encourage social interaction, which impacts the users' level of engagement and motivation (Treiblmaier et al., 2018). Through destructive and obstructive competition, learners experience peer pressure to engage in the activity. Gamification may encourage cooperation and teamwork or evoke feelings of inadequacy and suppression (Sailer & Homner, 2020). Educators have an opportunity to teach students how to think by introducing gamification as a real-world tool to grow communication, creativity, and imagination.

Theoretical Context

Scientific studies have explored the varied theoretical foundations of gamification (Krath et al., 2021). Landers's (2014) theory of gamified learning emphasized the educational context of gamification. Studies by Koivisto and Hamari (2019) have indicated that gamification is not a comprehensive solution for learning outcomes in education. There is a lack of knowledge about the mechanics, principles, and structures of gamification and game-based learning that affects the ability of the teacher to appropriately select the tool to match the desired learning outcome (Dichev & Dicheva, 2017). A gap in the overview and analysis of gamification points to the need for further investigation to guide future theoretical research (Krath et al., 2021; Sailer & Homner, 2020). The theory of gamified learning and the learner engagement model offers a potential

foundation for exploring the phenomenon of gamification and its effects on learner engagement. Teachers can use the concepts and principles of gamified learning theory to encourage a change in the behavior of learners through increased engagement and improvement of academic performance (Smiderle et al., 2020). The implementation of a gamified platform may increase student engagement and diversify learning methods in the classroom setting (Duggal et al., 2021). Game mechanics in teaching and learning can engage learners in a productive experience that may change their behavior desirably (Holman et al., 2015). Teachers can use gamification to evoke changes in learners by forming learning habits in individual experiences, which reduces cognitive resources to apply to a learning activity (Robson et al., 2015). Exploring research on gamified learning may enhance the learning outcomes of using gamification in the classroom. Sailer and Homner (2020) suggested that more research is required to support the relationship between learning and gamification with diversity in its effects in the educational setting. Kokandy (2021) confirmed that educators need additional research to understand the value of gamification as a pedagogical instructional strategy.

Problem Statement

The problem is that without examining math and science teachers' experiences with gamification, teachers may forego an opportunity to engage their students in learning through educational gamification (Duggal et al., 2021; Kokandy, 2021; Smith, 2018). In addition, there needs to be peer-reviewed literature exploring the effect of gamification on learner engagement based on the perceptions and lived experiences of middle school math and science teachers (Kokandy, 2021; Smith, 2018).

Educators need a greater understanding of the educational benefits of gamification with middle school students' engagement (Park & Kim, 2021; Patton, 2002). More research is needed

on how teachers can use gamification in education to engage learners (Kepceoglu & Pektas, 2019; Silva et al., 2020; Welbers et al., 2019). Kepceoglu and Pektas (2019) noted that gamification might offer learner benefits, yet the benefits were based primarily on hypotheses through limited grounded empirical studies. Several research studies on gamification were related to higher education, yet limited studies existed at the middle school level (Kalogiannakis et al., 2021). More diversity is needed in empirical research, with studies examining gamification and engagement at various K–12 teaching levels (Duggal et al., 2021; Kepceoglu & Pektas, 2019). Finally, there is a lack of understanding of teachers' experiences and perceptions of student engagement when using digital gamification as an instructional tool (Hébert et al., 2021; Sánchez-Mena & Martí-Parreño, 2017).

Purpose Statement

The purpose of this phenomenological study was to understand digital gamification and its effect on student engagement based on the lived experiences of middle school math and science teachers in rural schools in the southeast region of the United States. The phenomenon included gamification and learner engagement for middle school math and science. For this study, digital gamification was generally defined as a phenomenon of gaming experiences in nongame contexts by combining game design elements. Examples of gaming elements were progression through leaderboards, rewards, and personalization from teacher feedback (Dichev & Dicheva, 2017).

Significance of the Study

My research contributes to research at the middle school level on the effects of implementing digital gamification in middle school math and science classrooms. Before the COVID-19 pandemic, teachers struggled to engage students in the math and science classroom

(Nieto-Escamez & Roldán-Tapia, 2021). Since the pandemic, the field of education had been competing even more with gaming alongside the unanticipated challenges of virtual learning (Dhawan, 2020). Gamification is a method for educators to increase student engagement with the purpose of improving student learning through technology-based solutions. (Nieto-Escamez & Roldán-Tapia, 2021).

Theoretical

A hermeneutical phenomenological approach was be used to frame the experiences of the effect of digital gamification on middle school students' engagement in math and science classes (Larsen & Adu, 2021). My study explored the teacher's experiences of how digital gamification could address the lack of student engagement in middle school math and science classrooms. Gamification allows learners to interact with other students and increase student interest in learning and engagement (Sardone & Devlin-Scherer, 2010). Educational gamification enables teachers to engage students with problem-solving and their intended learning objectives (Malone, 1981). Introducing game-like elements to learning objectives could help make challenging concepts or complex tasks fun (Prensky, 2001).

The theory of gamified learning uses game attributes to affect learner behaviors or attitudes (Landers, 2014). Teachers could influence learners through the processes of direct mediating and indirect moderating. In mediation, the casual construct of a game directly affected a learner's time on task, thus affecting learning outcomes (Landers, 2014). The mediating process in the theory of gamified learning is effective when gaming elements cause a specific learning behavior, and the learning behavior increases learning. For example, students may have fun while participating in a gamified learning activity; however, the action may not directly impact learning outcomes. Using moderation in gamification, Landers (2014) indicated that an

improvement in instructional content should improve student learning outcomes. The elements of mediating and moderating in a nongaming environment may increase student engagement (Alsawaier, 2018).

The theory of engagement has been defined as students meaningfully engaged in activities that the student deemed worthwhile and that provide collaboration with others (Kearsley & Schneiderman, 1998). The fundamental principles of this theory were that students were involved in active cognitive instructional activities that encourage creativity, collaboration with others, and learning application. The use of creativity made learning more exciting and purposeful to the students through choice, ownership, and control. As students worked collaboratively, they developed skills to reason with others, make informed decisions, build team qualities, and foster social skills. Problem-solving provided an authentic opportunity for the learner to define a specific problem and focus their efforts on applying their knowledge in context (Kearsley & Schneiderman, 1998).

Educators were interested in applying digital gamification theory as an instructional tool to enhance the learning process. Gamification was an emerging field with significant potential in education, and the available studies were limited and lacked vigorous research (Silva et al., 2020). Silva et al. (2020) suggested that additional research on the effectiveness of educational gamification might demonstrate an increasing impact on students and teachers. A study by Kepceoglu and Pektas (2019) highlighted the importance of extending gamification research to different teaching levels and varied courses to contribute to gamification's instructional value on learning. Future research should be specific to the classroom environment in which the platform is identified by face-to-face, hybrid, or distance instructional settings (Kepceoglu & Pektas, 2019). Welbers et al. (2019) noted a need for future research on how personalized student

feedback using digital gamification could impact student behavior. Additionally, Welbers et al. suggested further studies on digital gamification regarding learner demographics and engagement. More research was needed to know how teachers can best use gamification in education to benefit learners (Kepceoglu & Pektas, 2019; Silva et al., 2020; Welbers et al., 2019).

Empirical

Thus far, research has, focused primarily on the connection between motivation, time on task, and achievement using gamification (Dichev & Dicheva, 2017). Rivera and Garden (2021) noted that gamification was developing as an instructional strategy to enhance engagement. Extant research showed that digital gamification could be a powerful tool to foster learner engagement. Gamification in education was a tool that promoted social collaboration and reduced isolation while stimulating knowledge-seeking behaviors (Nieto-Escamez & Roldán-Tapia, 2021). Educators used challenge, immersion, and social-based gamification strategies to encourage students to engage in learning. The strategy of challenge promoted problem-solving, while immersion framed the user's experience in a story enriched by audiovisual stimulation as learners developed the skills of competitiveness and collaboration through social-based gamified experiences (Concannon et al., 2019; Nieto-Escamez & Roldán-Tapia, 2021).

Although digital gamification was not new, the impact on student engagement was debatable among researchers. Rivera and Garden (2021) and Da Rocha Seixas et al. (2016) highlighted that the theory of gamification had limitations in education, focusing on social, cognitive, and affective learner engagement. Kahu (2013) concurred that the impact of gamification on student learning had research limitations, as there was limited focus on engagement and more research focused on motivation. Furthermore, without additional research

on game attributes on learner behavior, there might not be an understanding of the purposeful use of gamification as an instructional tool (Rivera & Garden, 2020). The findings of my study provide instructional leaders with an understanding of the effects of gamification on student engagement as perceived by middle school math and science teachers. In education, teachers and administrators struggle to apply pedagogical strategies to address a lack of engagement in learning, so the findings of this study provide evidence of the impact of educational gamification as a learning strategy.

Practical

The decline in student engagement in middle school math and science classrooms is an epidemic contributing to the achievement gap in education (Wong, 2021). The phenomenological research in my study explored a strategy for increasing engagement in middle school math and science classrooms. The study's practical significance provides practitioners and school leaders with insight into resource allocation, professional development, and instructional practices that address the academic challenge of student engagement in the classroom (Bjorklund-Young & Plasman, 2020). Schools with sustained engagement address students' individual learning needs and consider their interests (Wingo, 2021). Teachers may integrate gamified elements in the classroom to provide learners a sense of ownership of their learning, the opportunity for visible learning as evidenced by progress tracking, and higher levels of engagement in an environment that allows for mistakes

Research Questions

I developed one central research question and two sub questions to address the problem and purpose of the study.

Central Research Question

How will middle school math and science teachers describe their lived experiences with/of the effect of digital gamification on learner engagement?

Sub question One

How will middle school math teachers describe their lived experiences with/of the effect of digital gamification on learner engagement?

Sub question Two

How will middle school science teachers describe their lived experiences with/of the effect of digital gamification on learner engagement?

Definitions

1. *Digital gamification* – Digital gamification uses new technologies that entertain learners through connecting instructional strategies that promote cognitive changes (Erhel & Jamet, 2013).
2. *Engagement* – Engagement is an observable behavior of learners exerting time and energy and actively participating in practical academic tasks (Gonyea & Kuh, 2009).
3. *Gamification* – Gamification is an instructional strategy used in an educational setting through balanced design, creativity, focus, character, tension, and energy (Prensky, 2001).

Summary

The problem is that middle school math and science teachers might lose an opportunity to engage their students through educational gamification (Duggal et al., 2021; Kokandy, 2021; Smiderle et al., 2020; Smith, 2018). The profile of K–12 students have change and prompted a shift in pedagogy from traditional teaching methods to student-centered instruction (Nair, 2019).

I used gamified learning theory as the theoretical framework to explore the lived experiences of middle school math and science teachers as they attempted to promote student engagement through educational gamification. The lack of engagement in K–12 middle school math and science classrooms occurred due to student boredom and a lack of connection between school and real-world application of the knowledge. This phenomenological study explored what experiences middle school math and science teachers in rural public schools used to describe how educational gamification impacted student engagement by triangulating semi structured interviews, classroom observations, and participant journaling data. I used the study results to provide state, regional, and district school leaders with synthesized data to drive changes in pedagogy, affect professional development, and determine the use of technology in middle school math and science.

CHAPTER TWO: LITERATURE REVIEW

Overview

Chapter 2 is sectioned into conceptual frameworks and relates literature to the problem statement and gap in research. The problem is that without examining math and science teachers' experiences with student engagement through digital gamification, teachers may forego an opportunity to engage their students in learning through educational gamification (Duggal et al., 2021; Kokandy, 2021; Smith, 2018). Empirical literature has a gap in gamification theory and practice, in which gamification theory was empirically unexplored, and lacked reference limits of educational growth. Without exploring gamification in middle school math and science classrooms, the result may be the use of instructional practices that lack student engagement (Seaborn & Fels, 2015). Conceptual frameworks of this phenomenological study included the theory of gamification and the theory of gamified learning in the context of learner engagement.

Theoretical Framework

Gamification and gamified learning theory are the theoretical frameworks for this study. According to Landers (2014), gamification is the application of lessons from the gaming domain to change behaviors in nongame situations. Gamification has an origin in logic games through the principles of Van Benthem (2003), who indicated that any logical task could be accomplished through gaming. Gamification affects learning through a moderating process in which a psychological characteristic strengthens the relationship between the instructional content and the intended learning outcome. Robson et al. (2015) discussed the advancement of gamification as an instructional tool for classroom management while capitalizing on the increased interest of teachers to find innovative means to increase student engagement. The

distinction between gamification and gamified learning is that gamification uses a selected number of game attributes, whereas gamified learning uses all game elements (Landers, 2014). The popularity of educational gamification necessitates more clarity on the effectiveness of gamified learning by linking gamified learning theory with instructional outcomes (Landers, 2014).

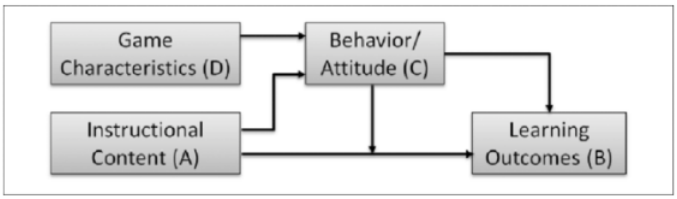
Gamified Learning Theory

I chose gamified learning theory (Landers, 2014), an extension of the concept of gamification to an educational context, as the conceptual framework of the study. Landers (2014) developed gamified learning theory to connect the use of gamification to affect the outcomes of learners. In gamified learning, the behaviors and attitudes of learners are influenced and changed by instructional strategies that use game characteristics. For gaming elements to impact the effectiveness of instruction, they must cause the desired learner behavior and increase learning. Gamified learning theory provides a framework in which the learner's behavior and attitudes influence instructional content and learning outcomes. Gamified learning theory is connected to learner engagement theory, including active involvement driven by a learner's motivation (Carroll et al., 2021).

Gamified learning theory is founded on the relationship between learning outcomes and behaviors through active learning (Landers, 2014). Figure 1 illustrates the gamified learning theory in which psychological game characteristics impact a learner's behavior/attitude, directly impacting learning outcomes (Landers & Landers, 2014). In addition, the macro level of learner engagement is evidenced as teachers select engaging activities for learners related to a learning task over time and in the school context (Sinatra et al., 2015).

Figure 1

Gamified Learning Theory



The principles of gamified learning theory promote learner engagement in the classroom instead of passive learners in traditional instructional methods (Marin et al., 2021). Student engagement in the school is directly proportional to effective learning and is enhanced by increasing the involvement of learners (Duggal et al., 2021). The super skills of collaboration, communication, creativity, and critical thinking prepare K–12 students with technology-based 21st-century learning (Duncan, 2020). Collaboration is the vehicle for critical thinking, and communication is a practical skill in collaborative learning environments (Duncan, 2020). Teachers can use digital gamification as a tool of creativity to allow learners to think outside of the norm, which impacts critical thinking skills (Duncan, 2020). Gamified learning is a tool that may enhance the instructional processes of teachers by providing students with game-like learning experiences (Sailer & Homner, 2020). Gamified learning comprises instructional content, learner behavior and attitudes, game characteristics, and intended learning outcomes (Sailer & Homner, 2020).

Related Literature

Educational gamification provides accessibility for all students as a learning tool to master intended instructional objectives (Vander Ark, 2013). The historical evolution of gamification includes a timeline of the recent development of gaming in both the corporate world and K–12 education. Gamification is present at all education levels, from higher education to K–

12, specifically middle school. In math and science, gamification is an instructional tool contributing to a shift in student-centered pedagogy. Educational games that are well-designed and developed can enhance student motivation and engagement, build persistence, and provide a new and emerging instructional approach to learning (Koivisto & Hamari, 2019).

Gamification

Middle school learners are inherently digital natives, transmitting information is no longer an effective instructional strategy to support learning (Estriegana et al., 2021). A significant gap exists in theory and practice with gamification, in which theory is empirically unexplored and the need for reference limits educational growth (Seaborn & Fels, 2015). Without exploring gamification in math and science classrooms, the result may be instructional practices that lack student engagement. Middle school teachers who apply the theory of gamified learning as a pedagogical strategy may find gamification an effective means to reach disengaged students (Alabbasi, 2018).

Principles of Gamification

Educational gamification has four principles: freedom to fail, freedom to explore, freedom to develop identity, and freedom of effort (Klopfer et al., 2018). By including productive failure, games provide valuable instructional feedback that encourages supported failure (Vander Ark, 2013). Students have the space to learn from their mistakes in low-stakes gameplay as they have the freedom to explore new learning strategies to solve problems through a cycle of active engagement. Gamified learning allows students to learn from failure without fearing embarrassment among their peers, which creates an opportunity for students to increase engagement in their education (Kepceoglu & Pektas, 2019; Silva et al., 2020). Gamified learning provides an experience for the learner that encourages risk-taking to complete challenges in a

virtual environment without fearing real-world consequences (Kepceoglu & Pektas, 2019). Learners are willing to persistently apply effort in learning through the use of gaming, despite the element of failure (McGonigal, 2011). Finally, gaming encourages failure through intentional feedback for the learner (Vander Ark, 2013). Students use trial and error to reflect on their progress through the results and feedback through the gamified platform. As students test and regroup, they understand the material, encouraging and building mental models (Vander Ark, 2013). A primary benefit of gamified learning is enhancing student confidence through the locus of control and self-efficacy (Concannon et al., 2019). As teachers use digital gamification, learners create a mindset to experiment and try new experiences while minimizing the fear of failing, which makes a fun means to learn (Alsawaier, 2018).

Gamification provides a means to assess students based on their needs (Kepceoglu & Pektas, 2019). Teachers who solicit student feedback regarding gamified learning activities, analyze it, and use it to drive instruction may increase student engagement (Wingo et al., 2019). The principle of freedom to explore includes opportunities for the player to investigate, play around, ponder new problems, and take away new ideas from the gamified experience (Klopfer et al., 2018). Gameplay is the opportunity for players to investigate their own identity by experimenting with gamified identities capable of various actions. Through the freedom of effort, learners can immerse themselves at their level as they observe and reflect on the game (Klopfer et al., 2018). Educators can use technology through game-based innovation to promote and provide meaningful learning experiences through a highly engaging platform.

Basic Elements of Gamification

The theoretical focus of gamification is to use instructional practices that enhance student engagement, improve the academic gap, and increase the learner's motivation to learn in the

classroom (Smiderle et al., 2020). As educators struggle with engagement, motivation, communication, and critical thinking skills with students, gamification provides a modern approach to learning (Kepceoglu & Pektas, 2019; Kokandy, 2021). Games serve as a tool for teachers to motivate low-performing students with mechanisms that monitor student performance through constant feedback (Kokandy, 2021). Gamification is an attractive instructional tool for educators to positively impact student learning and enhance their commitment to attaining knowledge and applicable skills (Kepceoglu & Pektas, 2019). However, the positive effects of gamification may decrease over time due to the lack of personalization and overuse of rewards-based gamification (Hanus & Fox, 2015). Games include actions that challenge players, whereas play is associated with fun and entertainment (Shi et al., 2019). Rigorous pedagogy has addressed the conceptual challenge of gamification to build more profound learning of content. Effective educational games align with the intended learning standards as an alternative means of instruction and assessment (Vander Ark, 2013). To validate the rigor of a game, the teacher must look beyond dressed-up games as multiple-choice quizzes in a fun technological format. The dressed-up design allows students to guess or answer a question correctly without understanding the material. Students can circumvent the content as they figure out how to game the system. Students might have an elicited response that they are not as good as their peers. The game's intent must be essential to the game; therefore, the learner cannot play without an element of learning (Vander Ark, 2013).

The challenge in educational gamification is to design a game to meet a specific learning objective with engagement and strategic thinking elements. Gamification is a means to shift the instructional paradigm through challenges, such as Angry Birds, engagement to master a challenge, such as Guitar Hero, and games that require critical thinking and strategy, such as

chess (Ramirez, 2020). The careful calibration process provides a learning system to address the gap between a learner's knowledge and achievement. Therefore, gamification must balance the pendulum of boredom through frustration from complex gaming tasks (Duggal et al., 2021). As a solution, developing and using adaptive gaming platforms provides students with a personalized experience, which addresses the needed balance. Students use gaming attributes to monitor their academic progress while learning tasks. Gaming platforms allow the learner to get the proper lesson, at the right place, at the right difficulty level, and at an optimal time (Soflano et al., 2015). Additionally, gaming is a system to engage learners over time by enhancing their motivation to replay a game until they have attained mastery (Soflano et al., 2015).

World Government Summit's (2016) research and gamification principles included onboarding, instant feedback, collective responsibility, and leaderboards. Onboarding is defined as the initial interaction a student has with an educational game. The process begins with a tutorial and advancement through manageable lower levels. The onboarding process orients the player to the game's learning objectives and mechanics. Learners gain clarity on how to play the game and master tasks, increasing engagement. Educational games are designed to adapt to the player and provide a positive or negative consequence to the student's choices while playing the game. Teachers could use instant feedback to give a short cycle of immediate rewards versus traditional long return cycles. Collective responsibility in gamification incentivized students to continue playing the game through social responsibility and emotional attachment, which promotes continued learning and collaboration (World Government Summit, 2016). The concept encourages students to meet their classmates' expectations, a critical element of motivation and task engagement. Leaderboards serve as a primary means of feedback to the learner that provokes competition (Schlömmer et al., 2021). Through incentive to play, students receive

rankings about their ability level or component of achievement. Although leaderboards have a positive impact, leaderboards could hurt students with poor performance during gameplay and low rankings (Andrade et al., 2016). Students may feel defeated and feel the top is unreachable; therefore, they lose their drive and ambition to play and be active. Gamification is a means for teachers to use engagement to meet the intended learning targets.

The concept of gamification was developed in 2002 by Pelling. Alabbasi (2018), Estriegana et al. (2021), Kapp (2012), Raed (2018), Seaborn & Fels (2015) and Watson-Huggins and Trotman (2019) have outlined similar definitions of gamification through the threads of utilizing gaming elements in a nongaming platform to enhance the user's experience and foster engagement. The operational definition of gamification uses game-based ingredients combined with gaming strategies and techniques to enhance learning, engagement, and critical thinking (Alabbasi, 2018). Learner participation is an added improvement of learner participation in the definition (Estriegana et al., 2021). Gamification is an instructional strategy using gaming elements in which the teacher presents a challenge to the learner that the student would learn through the experience of gameplay (Kapp, 2012). Seaborn and Fels (2015) concurred with the definition of gamification as using game mechanics in a nongaming environment. The definition of gamification has been expanded to include gaming elements in a nongaming learning environment with the intent of motivation and engagement (Raed, 2018).

Educational Digital Gamification

The fundamental principles of digital gamification include conceptual challenges, productive failure, careful calibration, persistence, building confidence, enhancing intrinsic motivation, and accessibility (Vander Ark, 2013). Conceptual challenges include games that incorporate rigorous pedagogy that aligns with learning standards to promote learning. Learning

occurs using gamification when the factors of curiosity and emotion provoke a reaction of arousal by the learner (Aguiar-Castillo et al., 2021). Effective games are calibrated to the identified gap between the learner's knowledge and achievement capacity. Gamification enhances intrinsic motivation through problem-solving and accomplishment, supported by feedback and student rewards (Vander Ark, 2013). Duvall et al. (2018) affirmed that using gamification in education evoked both benefits and compromises regarding pedagogy. On the contrary, Jagušt et al. (2018) disagreed with the positive impact of gamification on collaboration and social skills among learners. Their argument was that digital gamification in isolation may not be sufficient to achieve specific learning outcomes and that gamification was not a one-size-fits-all instructional tool (Jagušt et al., 2018). One game element, such as leaderboards, may not work for all students. Jagušt et al. (2018) suggested that additional research should focus on the efficient use of gamification to increase student engagement and learning performance. Learning occurs using gamification when the factors of curiosity and emotion provoke a reaction of arousal by the learner (Aguiar-Castillo et al., 2021).

History and Evolution of Gamification

Gamification evolved as a problem-solving tool to motivate and engage people in varied fields (Kapp, 2012). Noneducational gamification has been used in the corporate world to influence customer engagement and employee training while impacting productivity. The concept of educational gamification has grown in popularity as a tool for educators to encourage learner engagement at all levels of education (Jagušt et al., 2018). The popularity of digital educational tools stems from the belief that these tools may enhance behavioral changes, engagement, collaboration, and competition in both the business and academic worlds (Dichev & Dicheva, 2017).

Noneeducational Gamification

Gamification has roots in business, marketing, environmental science, math, computer science, engineering, biology, communication, and psychology (Jagušt et al., 2018; Silva et al., 2020; Welbers et al., 2019). Jagušt et al. (2018) indicated that gamification has been applied in diverse environments outside of education, such as marketing, recreation, shopping, and fitness. Monopoly and Top Management are examples of games used in business as management simulations (Silva et al., 2020). SmartStore was a gaming interface in retail using challenges to create a collaborative and interactive experience for shoppers (Polit & Beck, 2014). Silva et al. (2020) also concurred that gamification was first used in marketing, sports, engineering, environment, psychology, and communication. Rajat Paharia, in 2007, founded Bunchball as the first gamification platform that used gaming mechanisms, such as points, badges, and challenges for the business sector (Kim & Werbach, 2016). The initial support for and popularity of gamification came from businesses and web designers, in which the primary idea was that gamification could enhance efficiency and engagement in tasks (Welbers et al., 2019).

Gamification is a tool used in the business sector for employees and customers. Computer games allow employers to present learning opportunities in the business sector (Wolfe, 1997). Simulations and games, such as the Purdue Industrial Administration Decision Simulation, have been used in business education to teach strategic management operations (Wolfe, 1997). In 2013, chief executive officers indicated that corporate executives used gaming as a brain break during the workday (Larson, 2020). Gamification in service marketing was the primary means to influence customer engagement and influence (Landers, 2014). Businesses used gamified learning in technology, training, professional development, performance improvement, and work production (Larson, 2020). Cisco used gamification through the Binary Game platform to

enhance employee foundational knowledge and MindShare as an employee training tool for networking (Larson, 2020). Gamification tools in the corporate world have effectively improved output by motivating employees, recruiting, and training (Vinichenko et al., 2016). Due to generational, cultural, and gender diversity in the workplace, gamification was a challenging approach to meeting the needs of all members of the workplace. Paaßen et al. (2017) claimed that digital gaming was male-dominated, extrinsic rewards motivated younger employees, and less experienced employees were more open-minded about gamification.

The business sector has recognized the challenges and need to differentiate training to address the work population's emotional, psychological, and ethnographic needs (Urick, 2017). Businesses have used blended training, trainer, self-directed instruction, and individual or group delivery to address the diverse needs of their employees. Technology-based education has been delivered via web-based instruction, webinars, and edutainment (Urick, 2017). Gamification is a means for companies to bolster their training programs by enhancing engagement, competition with colleagues, and motivation through extrinsic rewards (Larson, 2020). Urick (2017) recommended that professional development be offered in various learning formats to cater to individual learning styles and preferences while being mindful of generational stereotypes.

The Conception of Educational Gamification

Research in artificial intelligence and mathematics by Papert (1980, as cited in Robson et al., 2015) provided a foundation for gamification as a tool for active learning. Papert claimed that teachers using a traditional means of instruction placed learners in a passive role rather than active learning participants (Robson et al., 2015). Papert followed the constructivist approach to learning, believing that students learn by doing and through play in high-interest activities. In the

1960s, Papert invented the programming language Logo to engage learners in learning activities (Robson et al., 2015).

Malone (1981) and Bartle (2011) continued the study of gamification in education in their research in the 1980s. Malone determined that video games could encourage intrinsic motivation, engagement, and collaboration among students, while Bartle developed a gaming platform for large numbers of learners called MUD1 (Khaitova, 2021). MUD1 was the first gaming platform that involved many players (Khaitova, 2021). The merger between gaming developers and educators encouraged gaming inside the educational environment. In the 1980s, educational gaming software entered technology through the programs Where in the World Is Carmen Sandiego, Math Detective, Great Chase Through Time, and Zelda (Koutsopoulos et al., 2017). Gamification in education evolved into an instructional tool through the development of The Sims and Sim City in the late 1980s. This is an example of gameplay that weaves real-world scenarios in a city-building game. Games built on the concept through the release of Civilization in 1991, in which learners built an empire to withstand the test of time (Koutsopoulos et al., 2017). In 1995, Oregon Trail demonstrated the potential for gamified learning in the K–12 environment (Alexander et al., 2019). As cited in Khaitova (2021) gamification was built on the foundation of creating Serious Games, which blended academia, the military, and the business industry in a nongaming form of gamification. Pelling (as cited in Landers et al., 2018) expanded on gamification in 2003 and developed the initial definition. In 2007, Scratch, an ideological descendant of Logo, was launched as a desktop software program for visual programming to provide students a platform to create interactive stories and share them online (Scratch Foundation, n.d.).

In 2010, J. T. Harviainen published the first article on the concept of educational gamification (Dreimane, 2019). Gamification became a popular tool and research focus, as Woodcock & Johnson (2018)found with a Google Scholar search that provided over 26,000 results published within the recent 5 years. Educators have a responsibility to prepare students for postsecondary transition in a highly technological world where workplace readiness skills are required for personal success. Kepceoglu and Pektas (2019) and Silva et al. (2020) concurred that gamified learning allowed students to learn from their mistakes without the fear of embarrassment among their peers, which created an opportunity for students to increase engagement in their education. Wingo et al. (2019) recommended that teachers solicit student feedback regarding a gamified learning activity and use it to increase student engagement. The objective, type of feedback, and rewards system must be clear for students to accept gamification as a learning tool.

As gamification expanded, the learning platform Adventures in Math was released in 2012 through the Nintendo Wii game (Koutsopoulos et al., 2017). Houghton-Mifflin Harcourt released an updated version of Carmen Sandiego in 2015 to teach the content of geography, history, and culture in social studies (Koutsopoulos et al., 2017). As gamification expanded into curriculum development, Minecraft was built on a 3D platform to evoke problem-solving through adventure and exploration. In 2012, the educational game Kahoot! was created to engage learners through fun, competition, and impactful experiences with content (Kahoot!, n.d.). According to the World Government Summit (2016), John Hunter designed the World Peace Game as a geopolitical elementary-level educational game.

Gamification and the Evolution of Digital Educational Tools

One-to-one computers for students initially provided an opportunity for students to use digital technology as a bridge to connect the ideas of advanced mathematics. Papert developed introductory programming of robots in the tool Lego Mindstorm, which served as an instructional language to teach problem-solving (Atmatzidou et al., 2008). Lego Mindstorm was an early example of a team-based competition learning activity that provided creativity, efficiency, and edutainment in instruction (Atmatzidou et al., 2008). Wingo et al. (2019) expanded on Papert's beliefs, which provoked an initiative to include computer science at all K–12 levels.

Historically, gamification focused on quality instruction to meet the needs of individual students. The evolution of gamification in the classroom used a modern conceptual and educational basis to demonstrate the positive impact on student's motivation, engagement, attitude toward learning, and collaboration with peers (Alabbasi, 2018; Hébert et al., 2021; Kepceoglu & Pektas, 2019; Kokandy, 2021; Silva et al., 2020). In 2010, gamification became a tool to increase students' interest, engagement, attitude, and drive to learn on a nongaming platform (Dichev & Dicheva, 2017). Students who have lost fascination and fun of learning may regain their motivation to learn through educational gamification. Alabbasi (2018) noted that students had a positive attitude, improved motivation, cognitive abilities, and academic performance using gamification as an instructional strategy. Hébert et al. (2021) added that games create a nontraditional method of instruction that provide a higher level of engagement. The use of games as a form of digital learning is a means to stimulate engagement and develop the learner's communication, problem-solving, creative thinking, and decision-making skills (Kokandy, 2021). Kepceoglu and Pektas (2019) confirmed that gamification could encourage

positive student learning behaviors through cognitive, emotional, and social benefits. Using educational gamification as a nontraditional learning process could strengthen a student's ability to communicate with other learners regarding content knowledge (Silva et al., 2020).

Gamification has become an instructional practice that encourages active classroom learning (Alabbasi, 2018; Kokandy, 2021). Gamification was a new concept that reflected the social phenomenon of digitally literate learners (Alabbasi, 2018). Teachers used the emerging technology of digital gaming to find purposeful ways of integration in the classroom (Kokandy, 2021). Poondej and Lerdpornkulrat (2020) noted that gamification in academia was a popular instructional strategy and was one of the top modern paradigms in promoting student learning. Kapp (2012) indicated that gamification could improve engagement, while Zichermann and Cunningham (2011) contended that it could evoke behavioral changes based on psychological principles. Learners may change their behavior once they receive a reward, which incentivizes them into a loop (Zichermann & Cunningham, 2011). A learner's behavior may be affected by the flow of games, as the player is between anxiety and boredom (Zichermann & Cunningham, 2011). Traditional instructional strategies were losing ground with learners due to boredom and lack of time and attention (Kapp, 2012). Implementing gamification provided an attractive solution to increase engagement, relevance, and immersion that impacted the applicability of learning to real-world situations (Kapp, 2012). Landers et al. (2018) claimed that gamification had a considerable amount of growth before it could truly impact the implementation in education.

The impact of gamification in education has been to help learners increase intrinsic and extrinsic motivation, process deliberate lessons, increase engagement, achieve learning goals, increase material retention, and alter their attitude and behavior with learning (Buckley & Doyle,

2017; Jagušt et al., 2018; Treiblmaier et al., 2018). Generation Y learners were goal-oriented, team driven, and socially collaborative, with the innate ability to multitask and shift between multiple challenges and tasks (Buckley & Doyle, 2017). Edutainment, the use of learning games and not mere entertainment, has increased engagement, thus resulting in a positive impact on learning outcomes, problem-solving ability, and enhanced interest in learning through immersion in gameplay (Jagušt et al., 2018). Active student participation, project-based learning, increased attendance, higher participation rates, and higher course pass rates have resulted from gamified teaching (Treiblmaier et al., 2018).

Gamified Learning Theory in School

Education has been impacted by gamification as teachers battle the daily challenges of Generation Y exhibiting apathy and boredom with learning in traditional classroom settings (Treiblmaier et al., 2018). Alabbasi (2018) concurred that Generation Y students had ease and experience with technology-based learning. The rationale for educational gamification was that video games had become a recreational focus of students (Alabbasi, 2018). Implementing gamification in education provided trends in tools for student engagement (Welbers et al., 2019). Gamification in education had mechanical, personal, and emotional elements. Mechanical elements included incremental progression, onboarding, and instant feedback. Individual elements in educational gamification included status, leaderboards, rankings, and responsibility. Emotional aspects primarily focused on the state of flow through gamification.

Learners use transformational play to embed content and skills to understand and solve problems within a fictional context. Educational games lead to enhanced engagement in learning as students learn through activities that require intellectual thinking, engagement, decision-making, and problem-solving (Barab et al., 2009). Shute et al. (2009) concurred that these

learning components could increase student engagement directly associated with learner achievement. The use of educational gamification provides the learner a means to shift from passive to active learning. Through this process, students transform memorized information into a vehicle that has a specific end goal, and the movement toward connecting content to real-world applications based on their actions and decisions (Barab et al., 2009). Educational gamification allows learners to view personal success through a virtual world and transfer that empowerment to real-life experiences.

Gamified Learning in Higher Education

The initial purpose of gamification in higher education was to address the struggles in student motivation, engagement, and concentration in college-level courses (Šćepanović et al., 2015). Instructors competed with many distractions for students during instruction as they were engaged in many tasks other than learning. Universities sought new methods to increase student engagement and maintain student interest in the coursework (Šćepanović et al., 2015). Despite these advantages, Marfisi-Schottman (2022) noted that professors resisted learning games for adult students in higher education. Gamification with young adults may be viewed as childish; professors may find it difficult to assess student learning through a game and feel that actions inside a game do not have real-world consequences. However, according to Fisher et al. (2014), a study of gamification in higher education indicated increased engagement, inspiration, increased interest in academics, and improved student learning. Game mechanics included compelling, appealing, and social stimulation that enticed learners to problem-solve for rewards, badges, or points competitively (Fisher et al., 2014). Learners used gamification as a tool to address real-world problems with real-world applications and solutions through an element of fun. The Resuscitation Game, Rail Simulator, Starbank the Game, CheckiO, Laboratorium of

Epidemiology are gamified higher education simulations that created role-playing opportunities with relief from routine instructional strategies (Marfisi-Schottman, 2021. To encourage adult student and professor relationships, games allowed feedback and judgment from the game versus the professor (Marfisi-Schottman, 2021).

De-Marcos et al. (2016) and Yildirim (2017) expanded on previous research on the impact of social networking and gamification on college students' engagement, attitude, and achievement. Gamification in higher education led to increased collaboration, deeper understanding, and more participation among classmates than traditional instructional methods (De-Marcos et al., 2016). Yildirim (2017) suggested that digital gamification might mitigate learner issues because of traditional teaching processes, such as a lack of interest in learning, to improve students' attitudes toward learning. Students reported that gamification increased their enjoyment of knowledge and willingness to apply more effort to their coursework (Subhash & Cudney, 2018).

However, some collegiate-level learners stated that gamification was ineffective for all students while minimizing the student's intrinsic motivation (Markopoulos et al., 2015). Subhash and Cudney (2018) agreed that gamification did not improve conceptual learning for college students but concurred that it has many positive effects on student learning. Markopoulos et al. (2015) recognized that gamification enhanced students' ability to control learning and the freedom to fail. Gamification at the postsecondary level, implemented through techniques similar to those used in K–12 education, had positive and negative impacts identical to those observed in K–12 student learning.

Gamified Learning in K–12

In K–12 education, gamification is a tool to transition traditional instruction into interactive learning in which students could explore knowledge through gameplay. The rewards appear extrinsic; however, they stem from the learners' self-motivation, engagement, and drive to practice and understand the intended learning targets. Gamification allows students to master the material in a platform where they compete against themselves. Students reap the rewards, such as badges and game-based status, from improving their understanding and depth of knowledge of the learning objectives. Gamified learning supports the four Cs of a graduate profile through creativity, collaboration, communication, and critical thinking (Hébert et al., 2021). Diverse learning styles, peer learning, social interaction, and active learning engagement are additional outcomes of game-based learning (Hébert et al., 2021). Educational gamification aims to reward all students for growth, self-accomplishment, and active participation in learning at their own pace. The focus is not on the winner but on the results of collaboration with team members, individual growth in learning, and their level of engagement with the task. Educators often confuse compliance with student engagement when instructional strategies such as gamification improve the classroom climate and culture (Kokandy, 2021). Gamification empowers learners to set academic goals, determine the achievements to master, and build self-reliance and self-discipline.

Davis (1989) proposed that experiences allow learners to explore through play to promote critical and creative thinking. Younger math students experience being overwhelmed, stressed, and feeling defeated (Davis, 1989). Teachers use gamification to change the mindset of their students to interweave fun with learning. Teachers attempt to provide instruction with resources that may not directly align with their academic program's state-mandated curriculum.

Curriculum pacing maps and curriculum guides help with lesson design that meets instructional objectives and engages students in a student-centered environment. Gamification is a vehicle that provides both the learner and teacher with formative or summative feedback. Gamification is a tool to enhance student engagement and retention (Poondej & Lerdpornkulrat, 2020). Teacher experiences of the use or lack of gamification strategies offer school leaders a basis for allocating technology resources and funding. Teachers with a negative perception of gamification may use technology as student entertainment or as a babysitter, or may not use the resources. As a result, schools have purchased technology resources that lack the ability for deeper learning and are used without a specific purpose.

Math and Science Gamification in K–12

There is a need for more studies on the perspective of math and science teachers toward using gamification strategies in their classrooms. Within the areas of math and science, teachers need more access, understanding, and tools for the implementation of gamification. Using gamification as an instructional strategy in science, learners have demonstrated significant gains in understanding science (Beemer et al., 2019). In math education, teachers have indicated that gamification improves students' affective domain and positively increases foundational math skills (López et al., 2021). Wong and Wong (2021) concurred that motivation is a critical element of mathematics. Kepceoglu and Pektas (2019) indicated that gamification is an excellent instructional strategy to teach math concepts to reduce boredom. Obara et al. (2018) disagreed with previous research because there was no guidance on implementing educational gamification and how it impacted improvements with math learners.

Using gamification in lower grades has improved math students' academic performance while supporting the platform's sustainability (Jagušt et al., 2018). Through built-in competition,

learners who experienced success may gain, while those who did not may experience embarrassment. Primary-level teachers observed a negative impact on performance levels in a traditional learning setting due to higher levels of boredom, lack of focus, and students appearing to be restless (Treiblmaier et al., 2018). Duncan (2020) noted that as students lost engagement, their level of boredom and absenteeism increased, academic achievement decreased, and the dropout rate increased. Furthermore, Filsecker and Kerrs (2014) added that disengaged students had a significant gap in their 21st-century learning skills to be productive workforce members. Educational gamification has demonstrated improved student engagement and motivation through using technology as a vehicle for learning (Wong & Wong, 2021). In comparing gamification elements, math students showed a significant discrepancy when comparing the conditions. The aspects of motivation, engagement, and change in behavior were indicators of student achievement, with motivation as a primary influence on student learning (Dreimane, 2019). The research indicated that game attributes must extend beyond leaderboards, points, and badges to encourage positive results through gamification.

Middle School Math and Science Gamification

Middle school teachers need help motivating their students to engage with math and science concepts and activities. Wentzel (1998) highlighted that learners' social and educational goals may impact their academic results. Wentzel showed that students were interested in the school curriculum while connecting peer relationships to the developmental stage of adolescence. The connection between students, peers, teachers, and guardians was an indicator of motivation for learners to obtain higher academic achievement.

Middle school teachers should understand that their students' motivation levels are intrinsic (Wormeli, 2014). An essential element of academic success is the teacher's ability to

exhibit genuine care for their students, maintain a positive attitude, and demonstrate their belief that every child can learn (Wormeli, 2014). Students admire teachers who understand their developmental level, connect with them through lived experiences, and provide meaningful and targeted feedback (Wormeli, 2014). Gamification in the classroom is an instructional technique that enhances student motivation through extrinsic and intrinsic rewards (Kapp, 2012). The flow in gamification provides a learning platform where learners have a sense of challenge with a balance of confidence to master the task (Kapp, 2012; Wormeli, 2014). Flow allows the student to move methodically through learning at an individual pace to advance when they are proficient in moving forward (Kapp, 2012). Kapp (2012) suggested that teachers use and design games that allow learners to believe they can learn to focus with minimal distractions, promote a sense of control, and have identified goals and objectives.

Middle School Gamification

Kokandy (2021) suggested that middle school classroom gamification shows academic student growth. Studies have confirmed that middle school students demonstrated general gains in learning through gamification (Beemer et al., 2019; Park & Kim, 2021). The pedagogical practice of using digital gamification in the classroom may enhance student engagement and learning outcomes (Beemer et al., 2019). Park and Kim (2021) validated that gamification positively impacts learners' understanding of content and learning behavior. Gamification at the middle school level is an instructional strategy that affects students' intrinsic motivation, self-determination, and communication with other learners and develops their self-efficacy (Park & Kim, 2021). Using gamification as an instructional strategy, students are provided learning opportunities on a gaming platform that differs from traditional pedagogy. Huizenga et al. (2017) indicated that despite the studies on the positive effects of gamification, using this as an

instructional strategy is not widely accepted at the secondary level. Teachers have found sustainability in gamification as it enhances student engagement through specific tasks, missions, and challenges. Teachers must understand their students' levels, needs, and abilities by assessing their background knowledge and learning readiness. Jagušt et al. (2018) cautioned that younger students experience difficulties sustaining gameplay engagement and academic performance by implementing gamification instructional strategies over an extended period. Students may retreat from engaging in gamified activities if the difficulty level far exceeds the student's ability level (Park & Kim, 2021).

Mazhar (2019) validated the positive effects of gamification on middle school students, as this is an instructional strategy that enhanced interest in learning. Younger learners lack interest in traditional instructional strategies (Sánchez-Mena & Martí-Parreño, 2017). Wong and Wong (2021) noted that eighth grade math students underperformed based on higher anxiety levels and lack of self-confidence and self-efficacy. Middle school students learn through activities with context and real-world authenticity; traditional instructional methods lead to artificial-based experiences in school (Ray & Coulter, 2010). Students demonstrate enhanced interest in learning as gamification presents problem-solving opportunities through fun and enjoyment. Ray and Coulter (2010) indicated that digital gamification engages middle school students through mirroring workplace readiness tasks needed for professionals. The element of fun provided by gamification can motivate students to engage with their learning (Sánchez-Mena & Martí-Parreño, 2017). With its positive impact on student learning, gamification contributes to classroom management. The high student engagement through gamified activities makes the teaching process efficient and effective.

Gamification provides a learner with a way to learn challenging content and concepts through an enjoyable means. As middle school students enjoy gamified activities, they demonstrate growth in knowledge with a direct positive impact on their grade motivation. In addition, gamification could affect middle school students' growth in collaboration, communication, and critical thinking (Kokandy, 2021; Treiblmaier et al., 2018). Students have varied opportunities to learn the concept with the benefit of collaborating with peers. Eventually, learners find that concepts they presume to be difficult are mastered through problem-solving in an enjoyable activity. Digital gamification allows teachers to expose learners to failure and success because of their actions in a digital classroom environment (Ray & Coulter, 2010). The failures are simulations and role-play of failure in real life in a virtual setting. Learning evolves into sustainable instructional practice based on the critical role of the teacher in scaffolding the digital gamified classroom experiences (Ray & Coulter, 2010).

Teacher Perceptions of Gamification

Teacher perceptions of gamification provide insight into why a teacher would use or not use digital gamification in their middle school classroom. The barriers to using digital gamification in K–12 include the alignment of learning targets, the impact on student academics, the cost of the products, and learner benefits. Teachers determine their pedagogical instructional practices using gamification and reflect on the effectiveness of the strategies on student engagement. Teacher perceptions are critical to allocating technology resources and shaping professional development to encourage student engagement.

Barriers to Gamification in K–12

Math and science teachers have reported that there may be a reluctance to adopt gamification as an instructional strategy due to a conceptual misunderstanding of gamification in

the classroom (López et al., 2021). Teachers must determine if implementing the new digital gamification teaching methodology aligns with their expected learning outcomes, student performance, cost, and learner benefits (Sánchez-Mena & Martí-Parreño, 2017). Studies have outlined a positive view of middle school students using digital gamification, yet limited studies exist on the teacher's perspective of the implementation and effects of gamification on learning (Alabbasi, 2018; Sánchez-Mena & Martí-Parreño, 2017). Alabbasi (2018) noted that the teacher's perception of gamification is essential to understanding how teachers implement gamified techniques. Sánchez-Mena and Martí-Parreño (2017) provided a different viewpoint on teacher experiences: Educational games can also challenge teachers' attitudes, as implementation outcomes can be uncertain. This was confirmed by studies with high school teachers who observed effortless learning with elevated motivation levels among their students when engaged with gamified learning activities (Sánchez-Mena & Martí-Parreño, 2017). There has been a lack of understanding of teachers' experiences and pedagogical beliefs in adopting gamification as an instructional tool (López et al., 2021; Sánchez-Mena & Martí-Parreño, 2017). Additional research has highlighted the barriers and drivers that affected the teacher's use of gamification, as teachers' experiences are often overlooked (Hébert et al., 2021). Alabbasi (2018) suggested that teachers who are gamers may be hesitant to employ gamification in their classrooms. Nevertheless, limited studies from the perspective of middle school math and science teachers indicate a gap in the literature about the lack of use of gamification as an instructional strategy.

Despite the positive outcomes of gamification, teachers have noted that more resources are needed to implement it in the classroom (Kokandy, 2021). Obara et al. (2018) and Sánchez-Mena and Martí-Parreño (2017) suggested that these barriers include constrained planning time, students' reluctance to engage in gaming activities, the game did not match the instructional

objectives, and the classroom culture and climate. Hébert et al. (2021) indicated that teachers were reluctant to use digital games in their classrooms due to not understanding the benefit of instruction and their own discomfort in using games for education. Teachers specifically identified limited time for planning, scarcity of resources, and lack of professional development as the primary barriers to operating a gamified approach to learning (Sánchez-Mena & Martí-Parreño, 2017). Additionally, teachers viewed technological advancements as a threat, with gamification as the cause of anxiety (Sánchez-Mena & Martí-Parreño, 2017). Hébert et al. (2021) noted that teachers viewed gamification as another new technology.

Teachers believe that using educational gamification negatively impacts attention span and the advancement of student writing and communication skills (Kokandy, 2021). Alabbasi (2018) cautioned that competition might demotivate students from learning in a gamified setting. Additionally, Alabbasi found that teachers were concerned that gamification might impact the learner's ability to concentrate on learning a concept when distracted by advanced graphics and interactive elements. Alabbasi contradicted Kokandy's (2021) findings through research supporting the teacher's perception that using educational gamification gave students autonomy, and those students had a feeling of control regarding their learning. Districts face the challenge of implementing gamification with limited technology resources and a lack of progressive pedagogy. Teachers must provide an environment for equal access to the gaming platform and resources for students to achieve.

Teachers' Pedagogical Decision to Gamify

Teachers must use their pedagogical beliefs to decide if new technologies, such as educational gamification, will provoke desirable outcomes, performance, and student benefits (Sánchez-Mena & Martí-Parreño, 2017). Sánchez-Mena and Martí-Parreño (2017) suggested that

teachers were empowered to use gamification as it quickly focused student attention on the learning objective and entertained students in a gaming platform. Although teachers expressed a positive attitude toward using gamification in the classroom, only a small sample of teachers used it as an innovative strategy for learning (Sánchez-Mena & Martí-Parreño, 2017). According to teachers, gamification increased carefulness and reduced carelessness because it gave the students a relaxing environment (Alabbasi, 2018). Teachers' preferences and instructional beliefs about math directly affect their pedagogical behavior (Obara et al., 2018). In a study by Kokandy (2021), teachers found that students learned through active engagement in trial-and-error simulations. Teachers viewed gamification as a beneficial tool for learning, as their students interacted with lessons due to the element of fun (Kokandy, 2021). The study herein was founded on a gap in the literature in the lack of understanding by middle school math and science teachers of the effect of digital gamification on student engagement. Kahu (2013) added that additional research was needed to include student expectations, teacher satisfaction, and accepting digital gamification as a model for curriculum.

The technology acceptance model predicts a person's likelihood of accepting and adopting new technologies (Davis, 1989). The two components of the technology acceptance model are perceived usefulness and perceived ease of use. External factors such as parent support, teachers' support, school support, and student support were collective barriers to teachers' acceptance of gamification as an instructional strategy (Luo et al., 2021). Parents may have a negative attitude toward gaming, leaving teachers to justify using gamification in the classroom. Teachers identified limitations on availability and time to master a gamified product as barriers to implementation (Koh et al., 2012). School leaders may perceive gamification as a costly investment while questioning the overall effectiveness of the gamified activity. Finally,

the product's complexity may impact gamification's success as an instructional tool for students and the paradigm of shifting gaming to an educational purpose versus straight gameplay (Koh et al., 2012).

Impact of Teacher Perceptions

Teachers' perceptions provide insight into the complex task of providing meaningful instruction for middle school students who are digital natives (Ray & Coulter, 2010). Teachers' attitude toward progressive instructional practices, such as digital gamification, is an essential component that impacts teaching and learning processes (Silverman & Subramaniam, 1999). One reason for the failure of teachers' use of gamification lay in school leaders' lack of awareness regarding teachers' attitudes, according to Luo et al. (2021). Teachers' perceptions of digital gamification were affected by their personal experiences with digital gamification. Huizenga et al. (2017) indicated that teachers using digital gamification perceived increased student engagement through gameplay to achieve instructional goals. Teachers used reflective practice to determine if digital games led to real-world learning experiences contributing to engagement and socialization in middle school classrooms (Ray & Coulter, 2010). Teachers evaluated digital games to determine the engagement of middle school students in authentic tasks to build problem-solving skills in the workplace (Prensky, 2001). Teachers' perception of using gamification may be influenced by their knowledge of digital games and how to implement games into classroom instruction (Ray & Coulter, 2010). Teachers' perceptions are also affected by the concern that they may lose control of their classroom and not connect the gamified learning activity to learning objectives (Da Rocha Seixas et al., 2016). Professional development for teachers on gamification may affect teachers' perceptions of using digital games as instructional tools (Ray & Coulter, 2010).

Engagement: The Intended Outcome of Gamification

Teachers can use digital tools to gamify lessons to increase student engagement. Engagement includes individual, task, and environmental learner factors resulting in cognitive, behavioral, or emotional engagement (Carroll et al., 2021). Through cognitive engagement, the student is invested in the learning process through the effort applied to learn instructional targets (Sellars, 2017). Behavioral engagement factors include learner participation and involvement demonstrated through a positive attitude during activities (Sellars, 2017). An emotional engagement component influences a learner's affective response to learning activities (Sellars, 2017). A learner's likelihood of becoming engaged in a learning task or environment based on individual factors may produce learner outcomes that allow educators to change their instructional design and pedagogy (Carroll et al., 2021).

Egalitarian gameplay provides all learners an equal learning opportunity (Vander Ark, 2013). Teachers use digital gamification to encourage learners' engagement by creating a dynamic experience in daily learning routines. This instructional strategy affects contextual learning, attitude, and engagement (Landers, 2014). Educators who have used gamification in the classroom sought to alter indirect contextual knowledge through learner behaviors charged by engagement. Landers (2014) supported gamification by understanding that the learner's attitude and behavior influenced learning. Engagement is a primary behavior resulting from the implementation of gamification in that learners are rewarded for the quality and frequency of their involvement in the activity (Alabbasi, 2018). Woodcock and Johnson (2018) affirmed that gamification referred to games rather than the act of play. The differentiation between games and play is that games refer to a challenge to a player, while play correlates to entertainment (Woodcock & Johnson, 2018).

Gamification promotes a mindset that the learner is willing to fail until they find success. Through this process, students build resilience and persistence to prepare them to navigate real-world challenges through gaming (McGonigal, 2011). Students who engage in educational gamification gain self-confidence through learning to win, which fuels their passion for gameplay (Vander Ark, 2013). Effective educational games elicit efficacy and a sense of control. Gamification develops the learner's ability to use problem-solving skills combined with accomplishment to enhance intrinsic motivation (Muntean, 2011). The balance of intrinsic and extrinsic motivators improves learners' engagement, impacting their academic performance.

Leaderboards, rewards, and personalization are methods within gamified learning that encourage student engagement. Leaderboards allow participants to compete and compare themselves to others, which promotes engagement or fosters disengagement (Puritat, 2019). Learners increase engagement through personal satisfaction that drives a sense of superiority (Puritat, 2019). Student engagement may be negatively impacted as low performance leads to students giving up, specifically less competitive students (Puritat, 2019). Gamification enables students to gain rewards for mastering tasks in the software application, which impacts student engagement. As students earn rewards, they are motivated to engage in learning, thus improving their attitude toward gamification as an instructional tool that reduces the obstacle of students not enjoying learning (Pereira et al., 2014). Smiderle et al. (2020) validated that personalized learning through gamification platforms significantly positively impacted a learner's level of engagement. Teachers can use gamification to personalize learning for students with varying ability levels and knowledge, fostering student engagement in education (Khoshkangini et al., 2021).

Summary

Research has shown that digital gamification is an instructional strategy linked to student engagement (Dichev & Dicheva, 2017; Kahoot!, n.d.; Kearsley & Schneiderman, 1998). Incorporating game mechanics and principles can influence student engagement (Dichev & Dicheva, 2017). Technology may be a means to facilitate engagement through peer collaboration, experiential learning, and self-directed learning (Kearsley & Schneiderman, 1998). In education, digital gamification may impact student engagement, social collaboration, and improved academic performance as behavioral outcomes (Krath et al., 2021). A comprehensive literature review revealed a gap in understanding the experiences of middle school math and science teachers in implementing gamification in their classrooms. Gamification and gamified learning served as the research problem's conceptual framework and purpose. Gamification has an impact on education from higher education through K–12. The reason for conducting a phenomenological study of teachers' gamification experiences was to understand student engagement through the lived experiences of middle school math and science teachers.

CHAPTER THREE: METHODS

Overview

I used a hermeneutical phenomenology research design for my study. The purpose of the hermeneutical phenomenological study was to explore the effect of digital gamification on learner engagement from the perspective of five middle school math and science teachers in the southeastern region of the United States. This chapter discusses the study's research design, including the setting, participants, researcher positionality and role, recruitment plan, data collection and analysis plan, elements of trustworthiness, and ethical considerations. Criteria-based purposeful sampling was the method for selecting the participants. Social constructivism was the interpretive paradigm frame for the study of consciousness; the participants' lived experiences provide the what and the how of the phenomenon of gamification. Data collection used semi structured interviews, classroom observations, and participant journaling for data triangulation. Credibility, transferability, dependability, and confirmability maintained the study's trustworthiness. Using member checking, horizonalization, and an audit trail strengthens the level of trustworthiness in this hermeneutic phenomenological study.

Research Design

This qualitative study used a hermeneutical phenomenology research design. Hermeneutical phenomenology is a means to describe a phenomenon from the lived perspective of the participants (Teherani et al., 2015). In the mid-19th century, Edmund Husserl and Martin Heidegger defined phenomenology as a research method for clarifying the world's meaning (Larsen & Adu, 2021). The design format was appropriate as my study focused on how things appear in the lived experience of practitioners in the field (Van Manen, 1997). Hermeneutic phenomenology aligns with the research questions of how teachers reflect on their classroom

experiences with digital gamification on student engagement. I selected the qualitative hermeneutic model to facilitate the analysis of teachers' individual lived experiences and perceptions rather than measuring specific outcomes in a quantitative research design. The hermeneutic model is a method of understanding the phenomenon of digital gamification by analyzing individual parts. I sought to understand the need for the meaning of the phenomenon through action or speech, which drove engagement that elicited feedback to challenge the understanding of the phenomenon. The hermeneutic model challenged me to reflect within my diary and anecdotal notes to reinterpret the findings resulting in a greater understanding of the whole (Fuenmayor & Benzmüller, 2018).

I used semi structured interviews, classroom observations, and participant journaling to collect the participants' personal experiences and identify experiential themes (Van Manen, 1997). The reflective interview data were the foundation for interpretive analysis of the lived experiences using the hermeneutic phenomenology research model. The data were analyzed and synthesized through the epoche process, reduction, and imaginative variation. The hermeneutic model was a means to interpret the participants' experiences that extended deeper than background knowledge (Neubauer et al., 2019). Finally, I used the participants' experiences to achieve a contemporary understanding of digital gamification on student engagement.

Research Questions

I aligned one central research question and two sub questions to address the problem and purpose of the study.

Central Research Question

How did middle school math and science teachers describe their lived experiences with/of the effect of digital gamification on learner engagement?

Sub question One

How will middle school math teachers describe their lived experiences with/of the effect of digital gamification on learner engagement?

Sub question Two

How will middle school science teachers describe their lived experiences with/of the effect of digital gamification on learner engagement?

Setting and Participants

The phenomenological study was set in rural public middle schools with Grades 6, 7, and 8 in the southeastern United States. The study participants included middle school math and science teachers with classroom experience in digital gamification. The specific math and science teachers were selected through purposeful criterion sampling using a questionnaire that allowed me to determine their experience with digital gamification. The schools selected had common demographics within my region. The study participants included middle school math and science teachers with classroom experience in gamification. The specific math and science teachers were selected through a questionnaire that allowed me to determine the participants' commonalities.

Setting

The setting included two rural middle schools in the southeastern region of the United States. The selected middle schools consisted of Grades 6 through 8. I selected the schools due to their comparable demographics, socioeconomic status, and state accreditation status. Each of the schools was returning to pre-COVID school operations at the time of the study. The participating middle schools had an average demographic of 70% White students, 12% Black students, 14% students with disabilities, and 45% economically disadvantaged students. Each school was

assigned a pseudonym for confidentiality and to maintain anonymity. The school-level leadership comprises a principal, assistant principal, school counselor, instructional technology resource teacher, and grade-level lead. The study of these schools may generate an understanding of how digital gamification influences student engagement through the lived experiences of the selected participants.

Participants

Participants in this phenomenological study were middle school teachers with 3 or more years of teaching experience in middle school math and science and at least 1 year of experience using digital gamification. I had the availability and willingness of the teachers to participate in the study, as well as their ability to cooperate, communicate, and reflect on their experiences. Creswell and Poth (2018) have indicated that participants should have significant experiences with the research phenomenon. The purposefully selected five math and science participants all had at least 1 year of experience using digital gamification in the middle school classroom. Creswell and Poth pointed out that phenomenological research requires a homogenous selection of participants. Therefore, I used an initial demographic questionnaire to collect the purposeful criteria, including years of experience in each subject, licensure information, employment status, accessibility, and a brief account of their experiences with digital gamification in middle school math and science.

Researcher Positionality

As a practicing middle school administrator and former math teacher, I was motivated to conduct this study based on professional beliefs and assumptions regarding digital gamification in middle school math and science classrooms. I am a White female with professional experience in three rural school districts. Due to my laboratory instructional background, I know that

students learn when they have background knowledge of the content, are provided with hands-on activities, enjoy established relationships with the teacher, and have the opportunity for discovery-based learning. I focused on digital gamification in middle school math and science, as my professional background included 30 years of service in these areas of study. Politically, I disagree with federal and state accreditation accountability measures such as standardized testing results, graduation rates, and compulsory school attendance expectations. I understand that students are humans with external circumstances outside school leaders' and teachers' control. I have had experience with students with disabilities, family dysfunction, trauma, and student mental health concerns requiring coordination of services outside the school's responsibility. However, I have observed that school leaders and teachers are evaluated on numbers rather than each student's needs. I did not have a direct relationship with the teachers in this study, as each potential participant was selected by their school-level leaders who met the criteria of the demographic questionnaire.

Schwandt (2001) indicated that the study should be framed in authentic practice with a social constructivist approach to address the problem of engagement in middle school classrooms. A social constructivist theory provided the basis for learning knowledge through social interaction in a real-world middle school context. Neubauer et al. (2019) emphasized that the researcher's influence and background influence the participant's experiences of being. Lincoln and Guba (1985) defined the characteristics of the human instrument: Humans are virtually infinitely adaptable, respond to environmental cues, and can identify and hit a target without preempting. Therefore, researchers must reserve their subjectivity throughout the research and phenomenological analysis of the collected data. As a human instrument, the researcher can spontaneously summarize data and present it to the participants for clarification,

refinement, and correction (Lincoln & Guba, 1985).

Interpretive Framework

The interpretive framework for the study was a social constructivist paradigm that focused on consciousness and experience through participant observations (Van Manen, 1997). A social constructivist approach allows researchers to understand the world in which they lived and construct the meaning and application of their experiences (Creswell, 2013). The framework originated in the belief was learning is acquired in social environments (Vygotsky, 1962).

The constructivist model means that learners construct knowledge through models that foster an understanding of the experiences (Schwandt, 2001). Teaching in a constructivist paradigm includes constant stimulation through learning activities, the performance of models, continuous assessment, and learning through peer interactions (Vygotsky, 1962). Gamification only sometimes fits the social constructivist framework, as this instructional tool sometimes relies on student interactions and communication. However, digital gamification is an innovative real-time tool to provide immediate feedback to the student through continuous formative assessment allowing the student to make mistakes without academic penalty. Digital gamification is a system to assist with teacher overload, slow feedback to the students, and positively impact student motivation (Larson, 2020). The semi structured interviews with open-ended questions, classroom observations, and participant journaling provided me with an interpretive lens to understand the contexts and settings of the participants (Creswell & Poth, 2018).

Philosophical Assumptions

I approached the phenomenological study through ontological, epistemological, and axiological assumptions. I used an investigative lens to understand the nature of existence and

reality (Lincoln & Guba, 1985). My values, prejudices, and biases played a subjective role in analyzing and synthesizing triangulated data.

Ontological Assumption

Ontological assumptions define reality through the study of being (Crotty, 1998). I sought to investigate the world in which we educate our students and the reality of existing systems. Through this phenomenological study, I used semi structured interviews to capture the math and science teacher participants' feelings, opinions, thoughts, actions, and experiences. Through a social constructivist paradigm, I used the experiences of multiple participants through varied data collection instruments in real-world classrooms to make meaning of their interactions and experiences. Finally, I used the phenomenological study to understand the teachers' digital gamification experiences on student engagement in middle school math and science. As I collected data, I considered that the world is subjectively judged. Social, political, and cultural experiences influenced the participants' meaning of reality (Aliyu et al., 2015).

Epistemological Assumption

An epistemological assumption is the convergence of knowledge from varied data sources found in the field (Aliyu et al., 2015). Crotty (1998) defined the epistemological assumption as understanding and determining an explanation for how we know a phenomenon. Creswell and Poth (2018) suggested that the researcher use the participant's experiences of wonder to understand the phenomenon. I positioned myself through a social constructivist paradigm as I believe learning occurs when students interact and engage with knowledge through interactive student-centered learning experiences. As a middle school administrator, I had an instructional leadership lens, which framed the perspective in which I would analyze and synthesize the data. I sought to understand the participants' experiences through my interactions

in data collection. Holistically, I could not fix the external factors impacting the academic world of students. With this belief, I viewed students through a human side, not the data dashboard created by test scores and grades. I addressed the conditions in my study by examining the real-world math or science classroom to make sense of the use or nonuse of digital gamification to improve student engagement. As my knowledge and experiences influence my interpretation of the findings, I need to acknowledge that my philosophy of teaching pedagogy is firmly founded on engaging students. The engaged students are not merely compliant as they absorb, process, and apply knowledge through active engagement.

Axiological Assumption

Axiological assumptions identify the biases, values, and principles that have influenced the role of the researcher (Aliyu et al., 2015). Creswell and Poth (2018) defined these assumptions as a vehicle to make the researcher's values evident in the study. The axiological assumptions identify the researcher's personal experiences and positions on social, political, and cultural values. I believe education has moved too far from recognizing and celebrating student growth to a flat measurement of progress in benchmark scores. I value data-driven classroom lessons that provide a high level of engagement to generate feedback resulting in differentiated learning. Teachers must use authentic and relevant data to offer prescriptive instruction that promotes individual growth, rather than singularly focusing on the pass rate on a standardized test. Data-driven instruction is a collective process of analyzing formative and summative assessment results, in which digital gamification is an innovative and engaging strategy (Barana et al., 2019). As I work with teachers on implementing gamification in their classrooms in my professional role, they need to know how to interpret data from the educational game to drive their lesson planning. Using digital learning analytics within the gamification platform, teachers

will have the tools to monitor student progress actively and make informed decisions during the learning process (Barana et al., 2019). Teachers who do not disaggregate the data from a gamified activity are using the tool as edutainment or babysitting rather than instruction. As a middle school administrator and instructional leader, I struggle with coaching teachers to see the principle that those who do are those who learn. Therefore, Merriam (2015) claimed that a subjective statement of the researcher's experiences provides the reader with an understanding of the researcher's views, opinions, and position.

Researcher's Role

As a human instrument in the study, I conducted semi structured participant interviews and classroom observations and analyzed participant journals to capture the participants' lived experiences (Adams, 2015). The participants were selected from regional middle schools outside my supervisory or authoritative position. As a middle school administrator, I have a pedagogical belief that the correlation between student engagement and student academic growth is critical in closing the student achievement gap. As I mentor staff, discussing and encouraging instructional strategies that meet the modern learner's needs is necessary. The shift in pedagogy from direct instruction to student-centered instruction requires staff to take academic risks, reflect on their practice, and assess if the strategy promotes growth in their students (Keiler, 2018). Gamification is a means to address pop culture, instant gratification, and the enhanced response to stimuli by today's students (Dichev & Dicheva, 2017). Middle school learners have been classified as digital natives, as their academic and personal worlds rely on technology and digital tools. I used the results of this hermeneutic phenomenological study to understand gamification's barriers and benefits for student engagement in regional schools. The results may guide the continued shift toward student engagement through professional development on the effective use of digital

gamification, data-driven planning using gamified platforms, and tools for personalized student learning experiences while remaining focused on increasing student engagement.

Procedures

I commenced the study by identifying regional middle schools with similar demographics to participate in this research study. The participants were selected through a purposeful sample that was criterion-based, choosing teachers who had gamification experience. Upon receiving institutional review board (IRB) permissions, I coordinated with the selected middle school math and science teachers to conduct semi structured interviews, classroom observations, and participant journaling.

Permissions

After receiving conditional IRB approval (see Appendix A), I provided the district-level superintendent with the purpose, confidentiality safeguards, and data collection procedures to receive district permission for the study. At the request of the district superintendent, I agreed to report the study's findings to the district. Upon obtaining authorization for the research study from the district superintendent (see Appendix H) and full IRB approval, I contacted the building-level principals at each regional middle school to gain access to their math and science teachers. Potential participants completed a questionnaire that included experience with digital gamification, education level, years of service, licensure information, and basic demographics; I then selected participants based on their responses. The selection process for a hermeneutic phenomenological study consists of those who have lived experiences and are willing to talk openly about their individual experiences with diversity to encourage personal accounts of their experiences (Polkinghorne, 1989; Van Manen, 1997). Participants had time to consider the information, ask questions, read the research purpose, understand the anticipated time

commitment, and review the ethical considerations to maintain confidentiality and understand the study's procedures. There were no foreseeable risks or discomforts to disclose to the participants. I provided participants with my personal contact information and Liberty University IRB approval to address further questions or concerns about the study. Finally, participants completed and signed an informed consent document (see Appendix F) to signal their willingness to participate and demonstrate their understanding that they could withdraw from this voluntary study.

Recruitment Plan

The phenomenological study used a purposeful criterion sampling approach (Korstjens & Moser, 2018). The sample focused on middle school math and science teachers in a specified region in the southeast United States who had experience in gamification. Creswell and Poth (2018) stated that the researcher should use criterion-based sampling to highlight common elements among the participants. Therefore, I selected 10 middle school math and science teachers who had shared experiences with digital gamification in the classroom, yet had a variety of backgrounds. The sample size was determined by my need to understand the phenomenon while maintaining an intimate and small sample size (Creswell & Poth, 2018).

I determined the actual number of participants through saturation. Saturation is the point in qualitative research when the researcher determines that further data collection is unnecessary (Saunders et al., 2018). Saunders et al. (2018) suggested that the researcher cease data collection when the level of theoretical saturation is met. I used the principle of theoretical saturation in this phenomenological study to stop data collection when a repetitive pattern formed a category. Fusch and Ness (2015) claimed that the quality of research is diminished if the study does not meet the saturation point. Da Rocha Seixas et al. (2016) validated the importance of saturation in

purposeful samples and called it the rule of quality qualitative research. The participants were selected to complete the questionnaire by building-level leaders based on their years of teaching experience, subject matter, and use of digital gamification. Upon identification, each candidate completed the electronic demographic questionnaire so that I could qualify those who meet the study needs. The questionnaire included a recruitment letter outlining the purpose of the study and the means of protecting and maintaining their confidentiality. Upon review of the questionnaires, I notified each qualified participant and sought their consent.

I notified the selected participants by an email in which an initial meeting was scheduled to collect their informed consent signature (see Appendix F) and review the interviewing process, journaling, and observations. Each participant was provided with a pseudonym, access to an electronic journal through Google Forms, and the expectation of completing the journal responses. During the initial in-person meeting, I scheduled the interview and classroom observation dates in collaboration with the participant. The interview was scheduled for 90 min at most. Each participant determined the observation date based on their teaching assignment and school schedule. Using Google Mail, I sent each participant electronic meeting notices for the interview and observations and reminders to complete the digital journal.

Data Collection Plan

The study had three different data sources in the research plan that provided data triangulation to increase the credibility and trustworthiness of the research study. The data sources were semi structured interviews, classroom observations, and participant journaling. The semi structured participant interview is phenomenology's primary data collection source (Creswell & Poth, 2018). McMillan and Schumacher (2001) indicated that interviews document participants' social actions, beliefs, thoughts, and gamification experiences about student

engagement. The specific order of data collection consisted of individualized semi structured interviews followed by observations in the participants' classrooms and then analysis of weekly participant journals.

The primary means of data collection in this phenomenological study was through semi structured participant interviews. I used an informal conversational format to interact naturally with the participants, complementing the field observations (Gall et al., 1996). The interview questions taught me about individual classroom settings and teachers' pedagogical beliefs. Throughout the interview, I asked clarifying questions based on the interaction and responses of the participants, which provided flexibility and originality in the format. However, Creswell (2005) has cautioned that using an informal conversational interview format may result in unstable responses due to the inconsistency of the questions, which could provide obstacles in the coding process.

Using inductive observations allowed me to observe the study participants in the classroom. I used my senses throughout the observations to develop new questions and evoke emerging hypotheses about the phenomenon (Mack, 2005). Observation data included the participants' interactions, conversations, activities, and behaviors with the students. Additionally, the observation tool captured evidence related to student engagement. I took field notes on the type and details of student-to-student and student-to-teacher interactions (see Appendix C). Using an observation protocol instrument allowed me to record descriptive and reflective notes from the field. The conversation notes included nonverbal cues, specific questions, and the purpose of the exchange. I collected details of the classroom activities to capture the intended purpose, positive and negative factors affecting the implementation of the action, and notes on the level of student engagement. Using an observation protocol instrument allowed me to record

descriptive and reflective notes from the field. Creswell and Poth (2018) suggested using observations to compare coding and themes to the results of the participant interviews. I used the math coordinator school to pilot the interview protocol, a current science teacher for the classroom observation tool, and math and science department meetings to gain feedback on journal prompts.

The study included journaling by the participants, which was collected throughout the data collection period. Journals were a primary source to capture the participant's rationale, thoughts, feelings, decision-making, and motives for using or not using digital gamification as an instructional tool for a lesson. I used participant journals to capture the participants' daily experiences and actions as well as the thoughts and activities of the students regarding the phenomenon. I captured the essence of the idea when lessons did not go as planned, either positive or negative. The research method of journaling allowed participants to reflect on their lesson activities with a focus on student engagement using digital gamification. Van Manen (1997) claimed that using phenomenological methods required the researcher to be open-minded, self-reflective, and use insight through the data collection.

Individual Interviews

Semi structured interviews were a means to explore the participant's understanding of the phenomenon through a conversational interview method based on memories and reflections of the participant's experiences (Van Manen, 1997). The interview questions were formatted as what and how as applicable to a phenomenological study. During the interview process, I reflected on the frame of reference of each participant and kept an open mind. An audit trail in the form of a diary provided me with a means of reflection through the interview process. The audit trail increased the study's trustworthiness by collecting notes that built context and

background for research decisions (Creswell & Poth, 2018). The epoche process required different attention, focus, and presence when collecting data (Moustakas, 1994). I reflected on participants' answers to develop their meaning apart from my teaching experiences.

I solicited specific feedback from the math coordinator improve my ability to determine the participants' understanding of the questions and whether any should be added or deleted. This pilot study allowed me to alter the interview questions to increase the research's quality, reliability, and trustworthiness (Malmqvist et al., 2019). The interview questions were used in a pilot test by colleagues who were not participants in the study. I adjusted the questions or method of interviewing to collect the intended data in the best way. Following the pilot test, I revised and refined the interview protocol to align with the research questions. The interview time was designed to be no more than 1 hr; therefore, the pilot study provided insight into pacing (Creswell, 2005).

The session consisted of opening remarks, the purpose of the study, the semi structured interview protocol questions, and closing remarks. The discussion started with opening statements to clarify the focus of the study, an explanation of the means to maintain confidentiality, and guidance that the participant could stop the interview at any part of the process. The semi structured interviews were in person, and I recorded audio using an iPhone to capture participants' responses. At the same time, through the use of a diary I collected field notes on the participant's behavior and nonverbal reactions during the session. The field notes provided insights to support the participant's responses. Using an interview script delivered in an informal conversational style, I had flexibility through the progression of the interview to ask clarifying or follow-up questions (Creswell, 2005). I used the participant's responses to probe deeper into the intended meaning in the semi structured format. I used a responsive interviewing

model to promote flexibility in the questioning sequence (Brinkmann & Kvale, 2015). The interview concluded with expressing appreciation for their participation and giving the participant the opportunity to provide insight into elements not addressed in the script. I used phenomenological reduction to clarify how individual experiences affected the participants' view of how things are in their classroom environment and school (Schmitt, 1959). The following questions were asked of the participants, using their math and science teaching experience. The interview questions applied to either the central research question (CRQ) or the sub research questions (SQ).

Individual Interview Questions

1. What is your teaching experience in middle school math and science? CRQ
2. How do you describe educational digital gamification? Provide examples of digital gamification programs utilized in your classroom. CRQ
4. How do you describe your experience with digital gamification in the classroom? CRQ
5. What digital gamification platforms in science/math have you used in your classroom? SQ1
6. How do you define student engagement in the middle school classroom? CRQ
7. How do you know if students are engaged in science/math using digital gamification activities in your classroom? SQ1
8. How do you overcome obstacles in using digital gamification in the science/math classroom to improve student engagement? SQ1
9. What else would you like to add to your observation of student engagement using digital gamification in the middle school science/math classroom? SQ1

The design and format of the research questions encouraged the participants to think aloud, which provided an accurate data source for me to interpret (Lauterbach, 2018). The chronological order of the questions promoted rapport while enabling me to understand the initial baseline definition of digital gamification according to each participant. The initial questions were designed to develop a personal connection with the participants and establish a communicative relationship. The questions aligned with the study's research questions, and the focus on the digital form of gamification was woven into each question. I used open-ended conversational questions to explore the participants' thinking rather than relying on memory (Lauterbach, 2018). I designed the questions to capture the participants' positive and negative lived experiences. The question design accounted for the multidimensional human experience in which experiences develop over time within a physical classroom space and through interpersonal interactions (Van Manen, 1997).

Individual Interview Data Analysis Plan

Semi structured interviews allowed me to collect open-ended data that explored teachers' thoughts, feelings, and instructional beliefs about gamification and student engagement. Each interview was transcribed from the iPhone recording with the software Transcribe Me, using pseudonyms in place of the participants' names. Participants validated the transcription upon receiving a password-protected electronic copy from me via Google Docs that was shared between the participant and me. The comment feature in Google Docs allowed participants to note corrections and adjustments to their transcription. Saldaña (2016) emphasized the importance of qualitative researchers having a reflective lens to answer how they explored the phenomenon (in this case, gamification) through their individual experiences. The researcher develops the meaning of the study by analyzing what is inside the brackets (Saldaña, 2016).

I read the transcripts and field notes to identify the data's categories and mine the data for repetitive ideas, thoughts, and relationships (Baskarada, 2014). To identify the emerging themes, the transcriptions were coded and collapsed into categories, with the final categories organized into comprehensive themes. I used the theming of the data to examine what is observable. The themes were collected using a hierarchical outline (Saldaña, 2016). Next, the data were chunked into smaller pieces for reflection and analysis through coding. My diary was a tool to document memos that provided insight into my interpretations as themes, relationships, and patterns emerged. Through this process, I used an interpretive approach that considered my natural biases and subjectivity (Saldaña, 2016).

Observations

Van Manen (1997) suggested that a researcher use close observation to collect data with minimal distance from the participants. Using close observation, the researcher enters the participants' real world while maintaining a reflective attitude as an observer and participant (Van Manen, 1997). Creswell and Poth (2018) highlighted the importance of observation to build a complete picture that notes the phenomenon in a field setting. This study's data collection included scheduled field observations of math and science teachers from the selected schools. In coordination with their school-level leaders, each participant determined the observation dates and times to reduce disruption to the instruction. I used an observation protocol (see Appendix C) with descriptive notes to record activities chronologically (Creswell & Poth, 2018). I noted details about the physical setting, participants, actions, interactions, and conversations (Creswell & Poth, 2018). The observation protocol instrument included a reflective notes section to annotate notes about the process, observation reflections, and my conclusions (Creswell & Poth, 2018). Using observations, I could understand the culture, social design, and daily life of the

teachers in the sample. I scheduled all observations through email with the participants. The number of observations was based on the saturation level with the collected and analyzed data. The estimated saturation level was two observations per teacher participant; however, the data collected determined if the saturation exceeded the anticipated level. The actual observation length was based on input from the participant and the digital gamified activities in that day's lesson. I functioned as a nonparticipant using all five senses of sight, sound, touch, smell, and taste in the observation process with a continued link to the research questions and the purpose of the study.

Using observations as a data source may provide an objective perspective and help triangulation. My position as a complete observer limited participant interference. The phenomenological study has trustworthiness when the observation data is collected with an understanding of the participant's experience.

Observation Data Analysis Plan

Using real-life observations captured the research phenomenon of digital gamification in middle school math and science classrooms. Observations provided me with a first-hand account of digital gamification in action. Merriam (2015) recommended using the results of the first observation to guide the next, tracking the data analysis through written memos, sketching visual models, and uncovering regularities and patterns within the identified categories from the interviews. In manipulating the analysis of observation data, I determined three to eight specific observation elements and developed a matrix to provide a means of charting (Merriam, 2015). The data were tallied for each category to identify patterns. I used pattern matching to predict and understand differences in collected data.

Journal Prompts

Journaling prompts required participants to be self-reflective and interpretive (Sellars, 2017). I used participant journals to uncover unexpected clues about the phenomenon of gamification. Through this process, the contributing factors of the experience were found, forming the structure of the phenomenon. Teachers responded to one journal prompt for each of the 5 weeks, focusing on their experiences, successes, and failures with digital gamification as a tool for student engagement. Teachers completed the weekly journal entry through Google Forms. The form collected their pseudonym and their responses. By facilitating reflexivity, journaling assisted in examining the participants' assumptions, pedagogical beliefs, and instructional goals (Sellars, 2017). I relinquished control to the participant through reflective journaling, encouraging authentic responses for further insight into their values and classroom experiences. Participant journals were used as a primary data source that reflected the participant's feelings regarding the phenomenon of digital gamification after a lesson, contributing to the audit trail to strengthen the study's trustworthiness. Gamification is generally defined by Dichev & Dicheva (2017) as a phenomenon of gaming experiences in nongame contexts through combining game design elements of progression through leaderboards, rewards, and personalization because of teacher feedback.

Journal Prompt Questions

1. What gamification platform did you use this week to support your learning target? When thinking about the selected gamification platform used, describe your observations of student engagement related to using leaderboards, rewards, or feedback. Then, based on the lesson's learning target, describe the strengths and weaknesses of using the specific digital platform for student engagement to assess if your students meet the learning

target.

2. What gamification platform did you use? Describe your observations of student engagement related to using leaderboards, rewards, or feedback. Based on your observations, how does digital gamification impact student engagement?
3. What digital gamification platform did you use? Describe your observations of student engagement related to using leaderboards, rewards, or feedback. Based on the lesson's learning target, how would you change the gamified instructional activities and why?
4. What digital gamification platform did you use? Describe your observations of student engagement related to using leaderboards, rewards, or feedback. What struggles, obstacles, or attributes do you observe in your students that affect their level of engagement?
5. What digital gamification platform did you use? Describe your observations of student engagement related to using leaderboards, rewards, or feedback. What different digital gamification platforms would you use to meet the learning goal? Explain why a different platform is used and what is needed for effective implementation.

Journal Prompt Analysis Plan

I used the participants journal responses to gather insight through a rich source of information provided by the participants (Patton, 2002). The participants' journals provided an opportunity to identify clues leading to further investigation. I coded the entries to develop a chart for categories, tallied their occurrences, and identified themes among the emergent types. The analysis provided the frequency of each category or theme. I used descriptive coding that identified generalized topics addressed in the observation and research data collection process. Key word in context analysis allowed me to study how words were used in context with other

words from the journal entries (Baskarada, 2014). I synthesized the categories, themes, and keywords provided by the individual journal entries of the participants with those that emerged from an analysis of the interviews and classroom observations. Finally, I used a Google Doc as a diary to collect memos and reflections as an audit trail.

Data Synthesis

I used the hermeneutic phenomenological method of synthesis as it focused on a complete body of knowledge combined with the history of the participants' lives (Van Manen, 1997). I used triangulation with the identified themes from the semi structured interviews, classroom observations, and participant journals to validate and explain the data. Each data source was individually coded and analyzed to discover emerging themes that described each element. The individual participant experiences were merged to describe the phenomenon. After coding all three data sources for emerging themes, I synthesized the three data sources related to digital gamification and student engagement in the classroom. The synthesis of data from semi structured interviews, classroom observations, and participant journaling developed into an expression. Using horizonalization, I identified the significance of data sources and grouped the items to produce textural descriptions. The textural descriptions explained the participants' experiences of digital gamification verbatim from each interview. The descriptions provided perspective on the individual teacher experiences with gamification and student engagement. The combined textural descriptions provided a foundation for structural descriptions defining the overall educator experience using gamification to impact student engagement. I weighed each data source equally for interpretation, analysis, and synthesis (Creswell, 2005). Gadamer (2014) cautioned that the researcher should use listening skills and not limit the analysis to the written

words of the participants. Developing individual structural descriptions allowed me to imagine how gamification occurred in the interview, observation, and journal.

The synthesis occurred as descriptions were written in third person to capture the perspectives of the entire group. The composite structural and textural descriptions were interwoven to create a collective meaning of gamification related to student engagement (Mack, 2005). I applied a framework synthesis as the data collection resulted in a vast amount of textual data through observation, field notes, interviews, and journal responses. By synthesizing from multiple data sources, new themes and topics emerged. Reoccurring themes emerged through thematic synthesis to form main headings, with tabulations supporting prominent issues throughout all three sources. I analyzed the relationships identified through the process of convergence. I analyzed each data source to identify emerging themes that describe each aspect through coding. Finally, the collective evidence was examined to critique the strengths and weaknesses of the analysis of the three data sources to identify researcher bias. Van Manen (1997) contended that data analysis and synthesis were misfit terms in qualitative research, as phenomenology focused on the meaningfulness of information versus face-value information.

Trustworthiness

Trustworthiness is built on confidence within a hermeneutic phenomenological study from findings, analysis, interpretation, and specific methodology (Polit & Beck, 2014). Lincoln and Guba (1985) determined credibility, dependability, and confirmability as the primary means of trustworthiness in a qualitative study. Although each factor is not required to promote trustworthiness, the researcher must demonstrate how the qualitative research meets the conventions of trustworthiness (Anderson et al., 2007).

Credibility

I used the core values of integrity and transparency to improve the soundness of the research study. Credibility refers to the confidence that the research findings are truthful (Polit & Beck, 2014). Credibility demonstrates that the conclusions represent the participants' authentic responses and original views (Lincoln & Guba, 1985). Korstjens and Moser (2018) suggested using persistent observations to identify the elements relevant to the research problem. Lincoln and Guba (1985) suggested using prolonged engagement, triangulation, and member checking to validate the credibility of a qualitative study. I used triangulation and member checking to strengthen credibility

Triangulation

Triangulation can improve credibility (Yin, 2016). Using three data sources collected on digital gamification in multiple math and science classrooms from a criterion-based sample strengthened the credibility of this phenomenological study. I synthesized data from interviews, observations, and participants' journals. I sought to identify lines of convergence through the process of triangulation for determining themes. The advantage for the researcher of using triangulation in synthesis is the development of converging lines of inquiry (Yin, 2016). Each data collection element was analyzed as a unit and then related to the others to provide a holistic description of the phenomenon.

Member Checking

Member checking is the validation of a participant's response in data collection that enhances the credibility of a qualitative study (Birt et al., 2016). I read and reviewed the participants' responses to the semi structured interviews. The participants checked the transcription, reviewed the identified themes from my analysis, then provided feedback to me

regarding accuracy and interpretation. Creswell (2005) and Lincoln and Guba (1985) recommended that the researcher ask each participant if the captured descriptions are complete, realistic, accurate themes and reflect modest variations of the collected data. Creswell and Poth (2018) indicated that participants could corroborate the findings by examining the rough draft of collected evidence. The evidence included interview transcripts and observation data that each participant validated. After each classroom observation, participants were provided with a completed observation tool to validate my notes.

Transferability

Transferability is the essence of capturing and determining the meaning of behaviors, experiences, and concepts that prove meaningful for readers or practitioners (Lincoln & Guba, 1985). This phenomenological study may be replicated with partial fidelity as rural schools in Virginia may use the findings in their instructional practices. The findings may provide middle schools with an evidence-based instructional practice that stimulates student engagement. I acknowledge that the participants and settings were unique to the middle schools in the selected region; however, school districts may use the findings to support additions to their instructional technology platform. Due to the small sample size, these research findings may not relate to a general school middle school setting in other areas.

Dependability

Dependability is the stability of the collected data over a specific period (Polit & Beck, 2014). Reflexivity reduced the influence of bias and increased transparency within the research process. To strengthen my study's dependability, I maintained consistency by documenting the research procedures, using an audit trail, and allowing my dissertation committee to examine and critique the research process. The research design included methodology, field notes, memos,

and using my journal to reflect (Moon et al., 2016). The dissertation committee and the qualitative research director reviewed and provided feedback on the data collection procedures to attain dependability within the phenomenological study.

Confirmability

Miles and Huberman (1994) focused on the researcher's predisposition, beliefs, and assumptions as significant confirmability criteria. Confirmability is the connection between the research results and conclusions, substantiating the process and providing replication. I offered steps to reflect on the collected data in that the participants' experiences were collected versus those of myself. I monitored the participants' predispositions, beliefs, and assumptions through an audit trail. It was essential for the research that the impact of my bias was noted in its manifestation throughout the study. Using data triangulation, I could strengthen the confirmability of the study. The collection of memos and reflections in the research diary assisted in bracketing my experiences.

Ethical Considerations

Ethical considerations are the rules to guide the administration of the phenomenological study. The intent is to protect the human participants' rights and enhance the study's integrity. Data collection commenced with prior approval by the Liberty University IRB after district and school-level approvals (Liberty University, n.d.). I obtained site access through the school building principal to access the potential participants. Participants completed a consent letter affirming their agreement to the terms of the research study. The participants had details of the study, an understanding of the confidentiality safeguards, affirmation of voluntary participation, and the right to withdraw as a participant at any point in the study. To maintain integrity, Fink (2000) recommended that a researcher erase any identifying information of the participants and

ensure transcripts are scrubbed for names. All data analysis in this study used pseudonyms to protect the identity of participants and their schools. Suader et al. (2015) cautioned that maintaining anonymity can be difficult in small settings like this study. I used an alphanumeric coding system to store all identifying information on an encrypted spreadsheet. All paper copies of the data, including signed consent letters, my observational notes, memos, and a diary, have been locked in a filing cabinet. All electronic data, including audio files from the interviews, interview transcriptions, and participant journals, are stored in password-protected folders on my Google Drive to maintain confidentiality (Suader et al., 2015). I will keep the collected materials for 3 years after completing the dissertation. Then, the physical artifacts will be disposed of by shredding and deleting electronic files, including clearing the cache and history (Creswell, 2005).

Summary

The hermeneutic phenomenological study described the experiences of middle school math and science teachers with digital gamification about student engagement. Through this study, the reality of the teacher's experiences provided a collective understanding of the phenomenon of gamification as explicitly related to student engagement. As K–12 public schools transition to pre-COVID school operations, the study examined the significance of this phenomenon about teachers' experiences of using digital gamification. Common themes and insight into the in-depth lived experiences of the group were synthesized from semi structured interviews, classroom observation, and participant journaling data. Member checking and triangulation strengthened the findings and the trustworthiness, credibility, and dependability of conclusions.

CHAPTER FOUR: FINDINGS

Overview

The purpose of this hermeneutic phenomenological study was to understand digital gamification and its effect on student engagement based on the lived experiences of middle school math and science teachers in rural schools in the southeast region of the United States. The participants were licensed middle school math and science teachers in Virginia with over 3 years of teaching experience and a minimum of 1 year of gamification experience in the classroom. Following the analysis and synthesis of the data, three major themes emerged: gamification elements on student engagement, lesson planning for gamification, and obstacles to gamification.

Participants

Upon approval for research at the school district level, I coordinated with school-level leaders to identify potential candidates for the study. Using a purposeful sample, I recruited 10 middle school math and science teachers in a rural public school setting with gamification experience. I created a demographic survey to collect participant data to select the participants. Table 1 displays a list of participants with pseudonyms, years of service, grade level, and subject. I emailed all participants a study description, including its purpose and data collection elements, for consideration before they committed to participate. All participants completed the demographic questionnaire and consent forms before arranging scheduled interviews, classroom observations, and weekly journal responses.

Table 1

Teacher Participants

Pseudonym	Years of service	Subject	Grade level
May	6	Math	6
Harper	5	Math	7
Brooke	14	Math	8
Michelle	4	Math	8
Tara	19	Math	8
Jessie	18	Science	6
Caitlyn	27	Science	7
Kamden	22	Science	7
Mitchell	4	Science	7
Kacie	15	Science	8

May

May was a middle school math teacher in the sixth grade with 6 years of total service. May held a postgraduate professional license in Virginia. May had always taught sixth grade math at the same school. She had more than 3 years of experience using gamification in the classroom. May employed a mix of traditional instructional strategies, adding gamification as a review type of learning activity. May appeared to be rigid in planning, with a need for control through deliberate planning and well-established classroom routines for management. She demonstrated an excitement for using gamification, in moderation. May commented that gamified activities give students brain breaks from paper and pencil tasks.

Harper

Harper was a middle school math teacher in the seventh grade with 5 years of total service. Harper held a postgraduate professional license in Virginia. She had previously taught fifth grade math, sixth grade math, and sixth grade science in two public schools. She had more than 3 years of experience using gamification in the classroom. Harper expressed the importance of encouraging student collaboration and focusing on data-driven planning. It was evident through the classroom observation that Harper was laser focused on student performance; games were part of the deliberate design of the class agenda and lesson plan. During the observation, students appeared to respond to the regimented style of lesson design while embracing the fun in learning created in the classroom climate and culture.

Brooke

Brooke was a middle school math teacher in the eighth grade with 14 years of total service. Brooke held a postgraduate professional license in Virginia. She had taught in three public middle schools in the sixth, seventh, and eighth grades. She had more than 5 years of experience using gamification in the classroom. Brooke focused primarily on standards of learning and understanding the prescriptive needs of her students. She searched for varied methods of presenting content to address students' boredom with learning. Brooke focused on universal design, planning for the learning target, and working backward to create the steppingstones. Brooke was enthusiastic about adding tools such as gamification to her lessons if there was an evidence-based return on the investment.

Michelle

Michelle was a middle school math teacher in the eighth grade with 4 years of total service. Michelle held a postgraduate professional license in Virginia. She had 2 years of

experience in seventh and eighth grade math in public schools. In addition, she had more than 2 years of experience using gamification in the classroom. Michelle was comfortable using technology and therefore perceived the inclusion of gamified activities as easy. Michelle had a relaxed climate and culture in the classroom, which transferred to the student's enthusiasm for learning with games and an energy-filled environment. Because of Michelle's limited teaching experience, she was emerging in using gamification to support content rather than simply gameplay.

Tara

Tara was a middle school math teacher in the eighth grade with 19 years of service. Tara held a postgraduate professional license in Virginia and a master's degree with a math specialist endorsement. Tara previously taught seventh grade math with all her time in service in the public school. In addition, she had more than 10 years of experience using gamification in the classroom. Tara expressed the importance of bridging a connection between activities and standards-based learning that made sense to her students. She demonstrated excitement about using gamification in the classroom and was comfortable with weaving in gamified activities, as she could engage many students most of the time.

Jessie

Jessie was a middle school science teacher in the sixth grade with 18 years of total service. Jessie held a postgraduate professional license in Virginia. She had more than 5 years of experience using gamification in the classroom. Jessie expressed in the interview that she was comfortable experimenting with gamification in the classroom if it benefited student outcomes. Jessie was passionate about designing instructional activities that encouraged engagement in the content. Jessie indicated that even before the evolution of gamification, she formatted her lessons

to encourage active student-directed learning. Jessie sought gamified platforms on which the connection of actively engaged learning resulted in student achievement.

Caitlyn

Caitlyn was a middle school science teacher in the seventh grade with 27 years of total service. Caitlyn held a postgraduate professional license in Virginia. Caitlyn had varied experience teaching in public schools: 3 years in middle school math, 4 years in second and third grade, and the remainder in seventh grade science. In addition, she had more than 10 years of experience using gamification in the classroom. During the classroom observation, it was evident that Caitlyn had a rigid style of classroom management and lesson design. She demonstrated caution during gamified activities, which was rooted in her nervousness about using gamification as an instructional tool. Caitlyn expressed the importance of using gamification to engage students, yet used the platforms as activities she could use when needed to fill instructional time.

Kamden

Kamden was a middle school science teacher in the seventh grade with 22 years of total service. Kamden held a postgraduate professional license in Virginia. In public schools, Kamden had experience teaching seventh grade math, algebra, and science. In addition, she had more than 10 years of experience using gamification in the classroom. Kamden described the anxiety of moving from traditional teacher-directed lessons to student-driven technology-enhanced lessons. Kamden was nervous about taking academic risks, particularly with the pressure of standardized tests impacting school accreditation. However, during the interview, it was evident that she was proud of her use of gamification, as this is an out-of-the-box move for her as a teacher.

Mitchell

Mitchell was a middle school science teacher in the seventh grade with 4 years of total service. Mitchell held a postgraduate professional license in Virginia. He had more than 1 year of experience using gamification in the classroom. Mitchell embraced technology and gamification with an understanding of the purpose of these activities to support student learning. Mitchell was a progressive teacher who expressed the importance of using highly interactive lesson activities that students could find a connection with. Mitchell was deliberate in using gamification rather than using it as a time filler.

Kacie

Kacie was a middle school science teacher in the sixth grade with 15 years of total service. Kacie held a postgraduate professional license in Virginia. Kacie had 6 years of public school experience in seventh grade science and the remainder in sixth grade. In addition, she had more than 5 years of experience using gamification in the classroom. Kacie displayed a personal passion for competition and valued the use of gamification in her lessons to use competition as a driving force for engagement. Kacie preferred to pattern her class in small groups for station-based prescriptive instruction.

Results

The study included Van Manen's (2017) phases of data collection and analysis to capture the nature of the teachers' lived experiences, understanding the phenomenon as they lived it, reflecting on the key elements that represented the phenomenon, representing the data with integrity and accuracy, and dissecting the context of the research in terms of parts of a whole. Data collection included teachers' lived experiences through interviews, classroom observations, and journal entries. Data from the three sources were analyzed and coded to identify patterns that

developed into themes. Theming is a phenomenological coding element in which patterns develop from the researcher's perspective and interpretation of the participant's experiences (Saldaña, 2016). The themes and codes are represented in Table 2. My study's major themes were gamification elements for student engagement, planning gamification lessons, and obstacles to gamification.

Table 2

Themes and Codes

Theme	Code
Gamification elements for student engagement	Competition
	Leaderboards
	Collaboration
	Excitement, fun, enthusiasm
	Rewards
Planning gamification lessons	Strategic placement of gamification
	Strategic use and variety of gamification
	Types of games
	Games rooted in content
	Student performance data
	Formative review
	Personalization of the learning experience
Obstacles to gamification	Lack of professional development
	Challenges in classroom management
	Limited funding

Gamification Elements for Student Engagement

Teachers used gamification to focus on math or science concepts to purposefully engage students in an activity perceived as more fun than traditional instructional methods. Each math

and science teacher described the meaning of educational gamification and engagement using the elements of competition, leaderboards, collaboration, enthusiasm, fun, excitement, and rewards. Teachers believed that these gamification elements contributed to the willingness of students to engage in instruction; learning appeared seamless as students had fun while working.

Competition

Kamden, Mitchell, and Kacie believed that educational gamification was a great way to engage students and tap into their competitive genes. Kamden noted in the interview that some activities may look like video games, but without the element of competition, the students were less likely to complete the activity. In addition, the element of competition encouraged students to persevere and not give up, no matter how difficult the task might be. Mitchell echoed this sentiment in his interview, noting that without an element of competition, there would always be students who were reluctant to complete the activity. In her journal, Kacie reflected her belief that competition could be a great way to engage students, so she set the competition level for the entire class, creating a team mentality around concept mastery.

Kacie explained in the interview,

> I set the competition level, so students had to work together to succeed. Once the students saw that they could only do well if they helped each other, they began to take ownership of their learning and become more invested.

During an observation of Kacie's classroom this approach to competition effectively created a stronger sense of community in the class and energized the students.

Based on the interviews, Harper, May, and Kacie described a higher level of engagement when students played games face-to-face. The participants concurred that competition, collaboration, cooperation, and interaction drive student participation more than traditional drill-

and-kill instruction. During the interview, Harper said, “I see the positive push of competition on student engagement.” According to a weekly journal response by May, competition pushed students to respond more accurately and fueled gameplay: “Students were highly engaged when gamification was involved, and the competition was part of the equation.” During the interview, Kacie discussed her observations about evidence of engagement through student verbal responses during gameplay in a station-based activity. Kacie noted that students were highly engaged and competitive as they progressed through the different platform modes of the game. Every Friday in Kacie’s classes, students moved through a series of learning stations. During a classroom observation, the timed activities included Dreambox, Gimkit, Prodigy, Blooket, and a small-group teacher-centered lesson. I observed in the classroom that as individuals and teams competed to reach the top of the leaderboard with each activity, students were rewarded to strive for greater engagement. Kacie claimed during the interview, “The game’s competitive nature drove my students to persevere and aim to be the better than their peers.” Each station had a leaderboard, making it even more exciting for the students to compete against each other and try to gain the highest score. Kacie’s weekly journal response summed up the idea that the game’s competitive element was a great motivator and encouraged students to remain engaged and strive for excellence.

Leaderboards

Caitlyn, Kamden, Tara, Kacie, Jessie, and Harper believed that competition combined with leaderboards drove factors in encouraging student engagement. During the observations, several different leaderboards encouraged student engagement: Dreambox, which provided a personalized leaderboard; Blooket, which displayed individual rankings; and Quizlet Live, in which students had a visual progress bar. As I observed during classroom observations using

these platforms, the leaderboards displayed a progress bar that was constantly updated, providing the students with a sense of accomplishment. Caitlyn claimed during her interview that she observed that student engagement with leaderboards differed based on whether gameplay was teacher or student directed. According to Caitlyn, “Different platforms require every participant to respond and be actively involved with the task.” During his interview, Kamden revealed that while monitoring students during a gamified activity, “Leaderboards positively affect student engagement as competition caused an increase in enthusiasm, participation, and energy.” Similarly, during a classroom observation, Tara displayed the Blooket Tower of Defense leaderboard on the interactive whiteboard to keep the students engaged and competitive. As student accuracy improved, the leaderboard reflected their progress, keeping the class motivated as they worked. In observing Tara’s gamified activity of Fishing Frenzy, I saw a similar effect, with students becoming more involved as they strove to achieve the highest score. In a journal response, Tara reflected on her observations that the presence of the leaderboard maintained a sense of competition that pushed the students to keep trying and do their best. Tara believed that the game should have a mechanism for students to track their progress, like a leaderboard, regarding whether they know the content. Jessie expressed through a journal response that learning activities that appeared to be gamified would draw the students’ attention since they would have the chance to earn rewards tracked on a leaderboard. During an observation of Jessie’s lesson, the atmosphere became increasingly louder during play as the game clock counted down to the leaderboard result. Jessie validated the use of leaderboards during the interview and claimed that this element might positively or negatively influence student engagement. For example, Kacie and Jessie indicated in weekly journal responses that leaderboards might present an obstacle when using gamification, as students would express their

frustration when not winning a game. Kacie stated during the interview that "the games can backfire as students state it is unfair and may not participate in subsequent games." In addition, Jessie noted during the interview that "using leaderboards could lead to students quitting the game as they seem never to make it to the top." As I observed Harper's class, she monitored the leaderboard for student groups to track their progress rather than displaying them. I observed that Harper used a Desmos activity that did not have a leaderboard, as students competed at their level and their own pace. Harper reflected in a weekly journal response that she believed that individual challenge and success in the Desmos activity contributed to student engagement. Harper stated during her interview that "students may have only been active participants as they knew their work would be most of their grade."

Collaboration

Harper, Michelle, May, Jessie, Brooke, Tara, and Mitchell had seen a difference in face-to-face versus virtual teaching as students collaborated, communicated, and problem-solved with others when gaming. Harper claimed in her interview that "students had to work as a team which required engagement, and the content was purposeful." Michelle also affirmed in her interview that "student engagement with gamification was vital as every group member had a role." During an observation of Michelle's class, students appeared to comply with the expectation of team collaboration before submitting their answers. May concurred in a weekly journal response that "games require collaboration amongst students to determine the correct answer." Jessie affirmed in her interview that "several students, who would not usually work together, would participate in the learning activity in pairs or teams when gaming." Additionally, student teams must collaborate to communicate as a team with two components of accuracy and time. Brooke added in a journal entry that "students are excited, work together, and learn simultaneously when

engrossed in gamified activities." In her interview, Brooke described active group participation as using these games as an observable positive attribute of using gamified activities. Brooke's journal entries also characterized gameplay as "students highly engaged while participating in Quizlet Live relay races and begging to play more rounds." During Brooke's classroom observation, students collaborated and assisted their peers while having fun learning. As all students participated in the group, only one of the group members had the correct answer. I observed that, due to the format, students willingly communicated and collaborated with their teammates. The gamified activity engaged every student and created a sense of urgency to feed team competition. At no point during the observation were there nonparticipants, as tasks could not be completed without each student's input. Tara's statements during the interview confirmed that students were interested in the activities as they learned seamlessly while having fun, even though each student team was randomly selected. As evidenced during the classroom observation, students quickly moved to their designated group with eagerness, excitement, and without complaining about their randomly selected team members. The students were highly motivated to work together and reach their goals. The atmosphere was one of collaboration, and everyone contributed to the group. Tara reflected in the weekly journal response that all her students had a positive attitude and were excited about the tasks at hand. Tara further elaborated during the interview that the gamified activity was a great learning experience for all the students, and students could take away valuable lessons from it. During a classroom observation, Mitchell provided an example of using gamification in which students were engaged in the gaming platform, the Island Expedition game. Student groups were required to collaborate and communicate within the group to move to the next level. During the Island Expedition observation, students determined the coordinates to which the ship needed to travel to find the

gold. As students collaborated to make calculated predictions, the game would allow them to use a sight line as a prediction, allowing the group to change their coordinates and provide feedback as they locked in their answers. Mitchell noted in a weekly journal response that he sought to incorporate games in his lessons by identifying platforms that "encourage communication and ones in which students cannot approach the activity with an everyman for themselves mentality."

Enthusiasm, Fun, and Excitement

Caitlyn, May, Michelle, Harper, Kamden, and Tara believed that gamifying learning activities could help the students stay motivated and engaged in the learning process by having fun while learning. For example, during a classroom observation of Caitlyn, audible cheers of excitement filled the room as students played the gamified Dreambox activity. Dreambox is a computer-adaptive online gamified platform that creates personalized learning in math. In a weekly journal reflection, Caitlyn claimed all students were engaged and focused on the task, demonstrating a palpable visible and auditory enthusiasm. May and Michelle affirmed in their interviews that gamification is about finding ways to make learning more enjoyable for students. During the interview, May concluded that when students find learning fun, they become actively engaged rather than passive learners. During an observation of Michelle's classroom, students were excited and rowdy as they worked on circumference and area. In a weekly journal response, Michelle wrote that "games are an excellent way to encourage student engagement, as students often express excitement and enthusiasm when playing them." Harper and Kamden also expressed during their interviews that they believed games were a great way to bring learning to life, make it fun for students, and allow students to work collaboratively, think critically, and practice their problem-solving skills. Both participants agreed that using games reinforced learning objectives and helped students understand the material more deeply. Harper said in the

interview, “Gamification elicits enthusiasm, excitement, and meaningful experiences from students.” Harper shared her observations in a weekly journal response that when using gamification platforms, students learn with a mindset that learning is fun rather than work. Kamden responded in her weekly journal entry, “Overall, students seem more excited and engaged during game-based learning activities.” Kamden followed the journal entry with a verbal affirmation during the interview that “students were learning, having fun, and being motivated to improve.” Kamden concluded that using games as part of the curriculum motivates students to be more engaged in the classroom. Tara noted in a weekly journal reflection that gamification positively affected her students, noting that students became “energized, excited, and drew attention” during gamified activities. She also stated that “gamified activities’ encourage enthusiasm, excitement, and engagement.” However, to ensure that students stayed on task during these activities, it was essential to have a well-established classroom management routine. During gamified activities, Tara described her observations in the interview that her students would “hunch over their computers with intense focus and excitement.” Overall, Tara detailed the positive effects of gamification in her classroom in a weekly journal response, validating that using gamification is a great way to engage and motivate students.

Rewards

Brooke, Michelle, and Caitlyn believed that rewards promote student engagement and excitement because games offered instant rewards for correct responses to content-based questions. In an observation of Brooke’s class, students played Blooket Tower Defense. Students earned points when they answered questions correctly. During the interview, Brooke stated that “rewards give them a sense of accomplishment and motivate them to keep playing.” In Blooket Gold Quest, students earned gold that affected their overall ranking and unlocked different

options. Michelle concurred in an interview that “using rewards in games incentivizes students to keep playing and stay engaged with the game. Moreover, earning gold gives students an additional goal to work toward, providing them with a sense of purpose.” Caitlyn concluded in a weekly journal that “gamified activities focused students on earning rewards for their team, which reduces the need for behavior management.” During the classroom observation, as the activity concluded, the students begged Caitlyn to be allowed to play another round, clearly enticed by the reward of winning.

Planning Gamification Lessons

The lesson planning theme for using gamification to impact student engagement included subthemes of games rooted in content, strategic placement of games, strategic use and variety of games, types of games, formative review, student performance data, and personalizing the learning experience. As detailed in participant interviews, May and Tara observed that incorporating games into their lessons positively impacted the classroom’s culture and climate. May explained in the interview that “I must also include traditional classroom activities to prevent overuse of using gamified activities.” If she over plans with games, May observed that students “lose the enthusiasm and magic of gamification as an instructional tool.” In the classroom observation, it appeared that May’s students would play a game for the entire period if permitted, confirming her pedagogical decision in planning gamified activities to engage students. Tara noted in a journal response that her typical clock watchers are more engaged with the game versus the time class ends. Tara wrote that “students live in a digital age in which gaming is second nature with instant feedback.” Tara further stated in the journal reflection that “gamification in the classroom is easy to weave in instructional activities.” Collectively during participant interviews, teachers expressed that planning for gamification in lessons was essential

for developing appropriate engagement while remaining focused on the expected and intended learning objectives.

Games Rooted in Content

Kamden, Harper, Brooke, and Kacie deemed lesson planning a crucial part of using gamification to support content and learning standards. Kamden described in the interview that the teacher was responsible for selecting educationally sound games with engaging bells and whistles. Kamden claimed, “While some games may appeal to students, ensuring the content is accurate and meaningful is important.” For example, in a weekly journal response, Kamden noted her concern that students have the ability to click through questions until they get the correct answer, as it defeats the purpose of using a gamified activity for educational purposes. Kamden explained in response to interview questions that she researched and vetted the game to ensure it was beneficial to the lesson plan before introducing it to the students. Kamden added in the reflection that she sought gamified activities to keep the students interested while achieving learning targets. Harper concurred during the interview that students needed a foundation and understanding of the intended concept before playing digital math games. According to the interview with Brooke, “Content proficiency must be first in selecting games to complement a lesson, and playing the actual game is second in the activity.” Kamden claimed in a journal response that using premade question sets from a question bank was usually ineffective, as they might be geared toward Common Core and not specific state standards. Kamden referred to planning during the participant interview, saying, “Games are engaging for early finisher activities; however, the lack of student motivation becomes a factor when planning for stations.” It was observed that Kacie used gamification as a learning tool to effectively engage students in class, especially when teaching them essential knowledge and vocabulary. In an interview, Kacie

confirmed that “gamification is an excellent way for students to work with essential material and increase their knowledge retention.” A classroom observation affirmed Kacie’s reflection in that students who were otherwise disengaged and uninterested in traditional activities were highly attentive and enthusiastic about gamification. The participants expressed within the interviews and journal reflections that lesson planning should target and align the gamified activity to enhance student engagement that positively impacts academic achievement.

Strategic Placement of Gamification

The strategic placement of gamification was a planning technique in which gamified activities were built intentionally rather than as a time filler. As evidenced by interviews and journal reflections, Brooke and Harper understood the importance of planning to help their students succeed in their classrooms. As I observed her classroom, it was evident that Brooke designed her lessons to include multiple transitions combining traditional and interactive activities. Brooke claimed during the interview that “transitions ensure that all students have limited opportunities to check out during class which results in student engagement.” During the classroom observation, as Brooke presented her outline of the daily agenda and class activities, the students were visibly excited when they heard that learning activity would use the gamified learning platform Quizlet Live. Through journaling, Harper mentioned the use of Quizlet Live in lesson planning as a content review tool at the unit’s conclusion.

Strategic Use and Variety of Games to Engage Students

Michelle, Mitchell, Jessie, and Harper believed it is essential to vary the games and use them strategically when planning gamified activities. During the interviews, participants identified the need for variety to prevent oversaturation and maintain the activity’s core purpose. For example, Michelle said during the interview, “Students in elementary school used Prodigy

frequently, but by the time they got to sixth grade, they did not have the same enthusiasm as they had lost interest." To counter the lack of interest, Michelle noted in a journal response that Dreambox, when used as an individual station that required minimal supervision, was a beneficial tool to engage students. Michelle added in the journal entry that presenting different games to students could keep them interested and engaged. Mitchell and Jessie claimed in their interviews that students needed variety in games to prevent boredom, stagnation, and the lack of choice in gameplay. Mitchell stated, "I know that students will get bored playing the same game all period, so I deliver content in different forms to reach all of them." In his journal responses, Mitchell reflected his observations of the deflationary element of traditional learning activities compared to gamified activities. Jessie added in her journal responses that she encouraged student buy-in with gamification by allowing classes to choose the gamified activity. Jessie explained during the interview that classes tended to select types of gaming platforms that weighed heavily on the element of competition. Jessie expanded on her perceptions in an interview response that in lesson planning, she would prepare adaptable question set that could be used within each platform without designing a specific set per game. In a journal response, Harper concurred that she also varied gaming platforms to keep the game fresh and exciting to ensure students do not become bored. During the interview, Harper affirmed that teachers could use various types of games as a formative review in which students can engage in the game and learn effectively while having fun.

Types of Games

Mitchell, Tara, Brooke, Michelle, and May expressed the importance of understanding the types of games, their availability, purpose, and ability to provide analytics, as well as the pros and cons of using specific platforms as instructional tools. During a classroom observation,

Mitchell adjusted gamified learning activities to match student interests and needs while capitalizing on the instructional strengths of the game platform. Mitchell connected with his students to understand what games were popular and determine which would most benefit and align with the intended learning goals. In addition, Mitchell stated in an interview that "planned gamified activities should have educational merit and not used for the sole purpose of entertainment." Mitchell claimed in a journal entry that through this process, he successfully created an educational and entertaining lesson plan to engage his students. In a journal entry, Mitchell expanded on the concept of gamification that games like Blooket and Kahoot! were based on a core question set that applied to the entire class. In journal entries, Tara noted that "selecting the appropriate gaming platform is essential to promote engagement as it depends on if the activity is introducing, exploring, or reviewing content." During the same weekly journal response, Brooke indicated, "Every student works at a different processing speed and thinks about the problems differently. I struggle with identifying platforms that adapt to each student." Michelle, May, and Mitchell used a variety of gamification platforms in their middle school math and science classrooms involving question sets built within the platform that aligned with the intended learning target. During the participant interviews, Michelle and May revealed that they selected gaming platforms that allowed them to build questions due to lack of time for planning, otherwise known as refillable games. Michelle claimed in a journal reflection that she found it easier to understand platforms like Quizziz, Kahoot!, Blooket, and Gimkit with reusable question sets. With a defined group of learning standards, May explained during a participant interview, she used repurposed question sets throughout the school year. May stated, "The question sets are easily interchangeable during a lesson, encouraging student engagement." During the interviews, the participants stressed the importance of understanding the inner workings of various types of

games to support their content. Mitchell stated in the interview, “There are limited platforms, such as Dreambox, that may increase student frustration due to leveling not being tailored to the student’s needs. I use games, such as Blooket and Kahoot!, usually as a formative review as they are based on a core question sets that applies to the entire class.”

Formative Review

Teachers need instructional tools to assess students on learning standards formatively, which is essential to personalized learning. Harper, May, Brooke, Tara, Caitlyn, Kacie, and Jessie used gamified activities on Blooket, Quizlet Live, Brain Pop, and Team Kahoot! to conduct formative reviews of learned content. During a classroom observation, Harper chose a team or individual-based game on the lesson’s intent, whether remedial, introductory, mastery, or spiral review. May stated in a journal response, “Lesson planning, with gamified activities, is routine, as I use a digital game as a review after most units of study or as a spiral review.” In a similar journal entry, Brooke concurred, “Using games is an engaging way to review essential content vocabulary constantly.” In the interview, Tara supported Brooke’s thoughts that her weekly lesson format also includes a “culminating game to review critical essential knowledge and vocabulary.” Caitlyn expressed during the interview that she differed in planning style as she “has yet to plan with gaming in mind and uses gaming as an instructional tool primarily as a filler or for spiral review.” Caitlyn described in a journal reflection that she used games to review learned content. Additionally, during the interview, Caitlyn revealed it is essential that she be able to discriminate between gameplay and content centric platforms that reinforces and reviews learning standards. Caitlyn claimed in the interview, “I try to always put a game in as a unit review. I have students that designed their game questions in Blooket, which encourages engagement.” Kacie elaborated in her interview that “gaming activities were primarily used to

review unit content and give students a break from routine lessons." Through the interviews and journal responses, it became apparent that the participants collectively agreed on the importance of formative assessment as students receive feedback on their strengths and weaknesses, which teachers may use to personalize student learning. Classroom observations of the participants provided evidence that using formative assessments to collect student performance data led to strategically using various gaming platforms to engage their students.

Student Performance Data

A mechanism to analyze student performance data in a gamified activity was essential for Harper, Caitlyn, Tara, and Michelle. Each participant described in their interviews the use of data from gamification platforms to drive lesson planning. During an interview, Harper claimed that "data analysis offers a check for understanding and engagement statistics for each student." "It is essential for planning that the game platform track the most missed questions per student and class to provide me an opportunity for prescriptive lesson design," said Caitlyn in a weekly journal entry. Tara identified in a journal reflection that gaming platforms typically had questions in a multiple-choice format, maintaining the intended learning target primarily at the recall or comprehension level. Without the ability to provide varied questioning platforms, Tara claimed during the interview that the "data from gameplay might paint a picture of mastery that may have resulted from guesswork." Michelle responded to the same journal prompt that analytics provided the teacher a mechanism to customize or personalize intervention, remediation, and extension and to check for student understanding in a nontraditional format. In her interview, Michelle stated, "I use gaming platforms to provide feedback in the form of data and analytics to check student understanding and identify misconceptions." In synthesizing participant responses, several participants indicated that evidence-based gamified platforms should have the

mechanisms to provide data for concept analysis and lead to personalizing the learning experience for each student.

Personalization of the Learning Experience

Personalization in student learning was a factor as teachers determined which gamified activities would promote student engagement. Gaming platforms such as Dreambox, observed in a classroom observation of Michelle and Brooke, were computer adapted to personalize the learning experience. Personalization accounted for student strengths and weaknesses as the gamified platform adjusted to individual student needs. During the interview, Brooke stated her belief that there are limited options to personalize student gamification: “Most platforms work off a generalized set of questions and are not computer adaptive.” Brooke elaborated in the interview that games could impede engagement, as platforms often do not have a personalization feature. As she noted in a journal response, Brooke was consistent in her perceptions that “it is difficult to find computer-adapted games that can personalize the learning experience for the student.”

Kamden, Tara, and Mitchell described the need for more personalization for student performance in the IXL, Gimkit, and Blooket platforms. These platforms are based on full group content, which does not allow personalization. In an observed lesson, Kamden used Blooket; students were presented with the same review question set each round during the classroom observation. In a weekly journal entry, Kamden reflected, “The gaming platforms needed to be computer adapted to meet the needs of individual students.” During the interview, Tara also expressed the importance of selecting “gaming formats with a planned think time mechanism before a question appears as student accommodation.” I observed that Tara prioritized game platforms that allowed her to tailor the hang time, reducing the opportunity for students to spam

their way through the questions to get to the game. Mitchell claimed in a weekly journal response that isolating personalized games to meet each student's needs is challenging during weekly and unit planning.

Harper, Mitchell, Tara, Caitlyn, and Brooke noted the impact of accommodations in gamified activities on student engagement. All four participants concurred during their interviews that there must be a balance of mathematical problem-solving and the student's ability to guess and click to succeed at the game. Harper found it essential to "select an appropriate game to hold student attention at their mastery level to prevent them from giving up while playing." Mitchell added that he also selected educational gamification platforms to "incorporate into his weekly plans focusing on strategy and skill rather than speed." In a weekly journal, Tara concurred that learner engagement might be impeded: "Students with weak processing speeds may feel defeated in a rapid-fire type of timed game and succeed in a self-paced or team-oriented game." Gamified activities do not always provide accommodations for struggling learners. In a journal reflection, Caitlyn noticed that using timed games can be ineffective, as "students will stop working and close their computers due to frustration." In contrast, students with weaker processing or reading skills may exhibit engagement, finding a boost of academic confidence as they move up the leaderboard. Caitlyn explained during the interview, "I observe struggling readers and those with weaknesses in processing skills become easily frustrated when playing an educational game. My gaming platforms do not typically include a read-aloud feature, meaning students must function independently." Brooke indicated in a journal response that she may plan activities without technology, as not all gamified platforms provide student accommodations.

During their interviews, Jessie, Mitchell, and Michelle discussed their concerns about limited gamified resources with the capability of personalization. Jessie expressed in the

interview that “gaming platforms I use are built from question sets that are not computer adaptive.” In a weekly journal entry, Mitchell also expressed frustration in “finding a game appropriate to find the level is either too high or low for the students.” Therefore, during the observation, students had variable levels of engagement in their class. However, Michelle used the platform Dreambox as it was based on individual proficiency. In a weekly journal entry, Michelle described her observation that students would only engage with Dreambox if the level was manageable. Michelle explained in the interview that “Dreambox is personalized as it adjusts to the levels of each student as they progress through games and concepts.”

Obstacles to Gamification

Six teachers spoke about obstacles with gamifying their lessons, including professional development in its practical use, managing games in the classroom, and finding funding to support gamification. Four teachers did not specifically note any obstacles to gamifying lessons during the interview. Three main subthemes emerged from their stories: lack of professional development, challenge of classroom management, and lack of funding.

Lack of Professional Development

Harper and Mitchell highlighted the need for workshop-based professional development in their interviews. Harper expressed the difficulty in “learning how to use gamified platforms and disaggregate the data to plan purposeful learning.” Mitchell identified a personal obstacle to gamification in a journal response: more training and professional development to use the various digital games. Mitchell stated in the interview, “Often, I cannot easily find a digital game that meets the intended learning target and objectives.” To address this issue, Harper suggested in the interview that professional development “focus on training teachers to use digital games that have already been designed to meet specific learning objectives.” Harper suggested in a

weekly journal response the need to provide teachers with access to resources to help them develop the skills to design their digital games. This approach would help teachers stay current with gamification trends while also allowing them to customize their programs. With increased training, Mitchell claimed in the interview, “I would be able to use various gamified platforms and data sources available to create purposeful learning experiences for my students.”

Brooke, Tara, and Michelle highlighted the need for more professional development on effectively using gamified platforms in instructing without technical support. In the interview, Brooke stated, “There are limited opportunities for professional development on how to use gamification in the classroom in my school, and I would love to have the chance to be able to add technology resources to support it.” Professional development must be hands-on and tailored to the teachers’ needs to ensure the successful implementation of gamification for instruction. Without the proper guidance and support, Tara claimed in a journal entry that “teachers are often left to their own devices in figuring out the nuances and complexities of the game, playing and testing it, and troubleshooting any issues that may arise.” Intentional professional development would provide teachers with the resources and knowledge to use gamified platforms effectively. Michelle, however, was forthcoming in the interview that she is no stranger to gaming and was willing to take risks by trying out new gamified activities. Michelle elaborated in the discussion, “Students were comfortable solving problems when learning to navigate a new gamified activity which allowed me to want to use the games without a complete need for training.” Michelle affirmed during the interview that with professional development, teachers might effectively and confidently implement gamified classroom activities. Michelle indicated that she has a school-based instructional technology resource teacher who provides individual assistance when she wants to implement a game with her students. According to a journal response by Michelle,

professional development presented in a workshop setting would demonstrate to the teacher how to effectively implement a specific gaming platform in the classroom. Without proper training, teachers may employ a platform without knowledge of the interworking's, resulting in potential challenges with classroom management.

Challenges of Classroom Management

Classroom management was a critical element in ensuring successful game-based learning experiences. In a weekly journal response, Brooke affirmed that "excessive talking and off-task behaviors can quickly reduce student engagement and disrupt the lesson." During the observations, it became apparent that Mitchell, Michelle, Caitlyn, and Kamden struggled with classroom student behavior when the class was playing games together, which could potentially detract from the target objective of the lesson. Mitchell suggested during the interview that "the games should be used to supplement the lesson and that it should be allocated an appropriate amount of time rather than just a few minutes at the end of class." In addition, a journal response from Mitchell added his belief that there should be an incentive for participating in learning activities, such as a grade, to ensure that the students take the activity seriously. Mitchell elaborated during the interview that "my students often need a carrot to engage in learning, regardless of if the activity includes gaming." Mitchell further stressed "the importance of teacher monitoring to ensure the game does not distract from the lesson objective." Michelle concurred that "I have difficulty controlling the students' behavior and needed professional development before I risk adding gamification as a tool." Caitlyn reported in the interview that students could "easily become disruptive and disengaged if the rules and boundaries of the game were not established." Kamden expressed in a weekly journal response that she was also worried about the potential implications of introducing gaming into the classroom. Kamden elaborated

during the interview that she was concerned that students could become too excited and overactive, potentially causing a classroom disruption. Kamden mentioned, “I need to be in control, so I have a hard time when students exhibit higher energy levels while gaming. It is difficult to find teaching moments because kids are such high energy.”

To combat these issues, teachers must develop effective strategies for controlling student behavior. Classroom management is critical to the success of using gamified activities in the classroom. While students may become passionate and motivated by the game, it can be difficult to redirect them when needed. In a journal entry, Brooke claimed she knew this challenge and had incorporated a classroom management plan. The management plan outlined student expectations and helped to transition seamlessly from the game into the next activity without the disruption caused by high energy levels. Brooke said in the interview that “I plan not to start a class period with a game, as it is more challenging to transition from a high-energy activity to another.” By setting expectations and creating a plan for implementing gamification, Brooke could manage her classroom and ensure that students learn effectively.

Limited Funding

Teachers in this study said they experienced funding as a barrier to using educational gaming platforms, as many games required a premium subscription to unlock the most valuable academic data. As a result, teachers often only used digital games with limited functions if they elected not to purchase a premium subscription. While premium subscriptions could be a great way to access more features, it could also be an obstacle due to funding.

According to journal responses by Harper, Michelle, and Brooke, schools needed more resources to invest in gamification tools, which could be a significant barrier to using gamification in the classroom. To address this issue, Harper recommended during the interview

that “the district allow teachers to use their instructional funding to purchase premium gaming subscriptions.” According to Harper, “This would help increase student engagement in math learning.” Michelle expressed in her interview, “I have interest in having access to additional funds that could be used to purchase annual subscriptions or to unlock premium game elements.” Michelle wondered during the interview if teachers could use annual instructional funds to cover the cost of digital gaming upgrades. In response to interview questions, Harper believed that “with proper funding, teachers can take full advantage of the game’s features while providing students with a high-quality learning experience.” Michelle and Brooke concurred through a journal response that funding was an obstacle when implementing gamification in the classroom. Michelle said, “I do not have the resources to create games and activities, which limits the ability to use gamification in my lessons.” To combat this obstacle, teachers like Brooke look for free-only platforms that offer limited student progress tracking without paying for the premium features. Brooke claimed in the interview that “purchasing premium features can unlock analytics to design data-driven lesson plans.” Harper concurred in the interview, stating, “I am willing to use my money to purchase these subscriptions if it means that my students are engaged more interactively and effectively in learning.”

Outlier Data and Findings

Through interviews, classroom observations, and journals, the reluctance to game based on personal comfort level and alignment to standards were outlier data collection themes. The participants were excited to implement gamification as an instructional tool as a group. However, although Caitlyn and Tara used gamification, they each expressed unique concerns. Due to Caitlyn’s limited technological comfort and need to control the learning environment, Caitlyn was reserved about weaving gamified activities into lessons. Despite Tara’s extensive experience

with gamification, she was unwilling to use gamification if she could not validate the alignment of the activity to the content standards of learning and the need to use analytics to drive instruction. Tara indicated in the interview that even before digital games became popular, she used teacher-directed traditional games such as Jeopardy and Who Wants to Be a Millionaire. As digital education games emerged, she expanded her instructional practices to include interactive platforms.

Reluctance to Game

The reluctance to use gamification for instruction was due to Caitlyn's comfort, confidence, and control levels. Caitlyn limited herself to Kahoot! and Quizlet and was reluctant to add progressive platforms like Blooket and Gimkit. Caitlyn expressed the need for learning activities to progress as planned, because mistakes cause anxiety and uncertainty in meeting the intended learning target. Caitlyn was an experienced science teacher with minimal experience of or exposure to gaming and had some nervousness about academic risk-taking. She was reluctant to add gamification as a classroom activity due to uncertainty about using the platform and concern about managing the students; instead, she preferred a traditional instructional approach of "sit and get." However, Caitlyn claimed during the interview that with extensive troubleshooting, she was likely to add gamification to her lessons.

Gamification with Alignment

All participants deemed gamification a tool that contributed to student engagement; however, concern about alignment to the curriculum was identified as an outlier theme. All participants embraced gamified activities, yet Tara expressed a definite and consistent concern about games being more for edutainment. Tara stressed in the interview the importance of implementing gamification to meet a specific learning objective rather than as a time filler or for

mere entertainment. Tara indicated that she would forego a gamified activity if it would not support academic growth through genuine learner engagement. During the interview, Tara said directly that she spent ample personal time searching for vetted gamified resources to teach the math curriculum. In doing so, she would default to traditional activities over a game if she could not validate the applicability to meeting the defined instructional target.

Research Question Responses

Central Research Question

How will middle school math and science teachers describe their lived experiences with/of the effect of digital gamification on learner engagement? The participants' perspectives based on lived experiences were that digital gamification impacts learner engagement. Teachers in the sample identified gamification elements, planning gamification lessons, and obstacles to gamification as primary considerations in using gamification as an instructional tool. To positively impact student engagement with gamified lessons, science teachers valued the elements of competition and collaboration in using gamification in science middle school classrooms. Math teachers identified that lesson planning with gamification should include considerations of the strategic placement, use, and variety of gamified activities. Science teachers further expressed concerns about the strategic placement of gamification as a means to review content. Accordingly, math teachers emphasized the types of platforms and their foundation in the data-supported content. Both math and science participant responses suggested that gamification was a strategy to personalize instruction based on students' academic strengths and weaknesses, as evidenced by the data generated from the gaming platform.

Sub question One

How will middle school math teachers describe their lived experiences with/of the effect of digital gamification on learner engagement? Middle school math teachers in the study described their experience with engagement as a means for students to interact with content while relying on their mathematical skills. The participants expressed the need for gamified platforms to support data-driven lesson planning. Math teachers prioritized math skills' focus over gameplay's function in a gamification platform. Math teachers expressed confidence in locating digital gaming activities yet indicated the need for professional development to use all platform components. Participants claimed that the challenge of classroom management was directed toward station-based activities or small-group instruction. As math teachers identified applicable gaming platforms, teachers consistently outlined the lack of funding to purchase premium tools that provide individualized student performance data and unlimited access to their question banks.

Sub question Two

How will middle school science teachers describe their lived experiences with/of the effect of digital gamification on learner engagement? Middle school science teachers in the study described their experience with engagement as a means for students to compete with one another with the measurement of progress through leaderboards, collaboration with peers, increased student enthusiasm and fun with learning, and immediate feedback through rewards in the game. The participants used gamification in lesson planning for a spiral review of learned content. Science teacher participants described question building in the platforms as time-consuming. Due to the perceived limitations of applicable platforms, participants needed help identifying gaming activities that supported the personalization of the learning experience. With engagement

connected to gamification, science teachers concurred with math teachers that a lack of professional development, the challenge of classroom management, and limited funding are obstacles to using gamification in their science lessons.

Summary

The lived experiences of math and science middle school teachers collectively supported using gamification as an instructional tool to impact student engagement. Using Van Manen's (2017) data collection and analysis phases, the main themes that emerged were gamification elements for student engagement, planning gamification lessons, and obstacles to gamification. The participants identified gamification elements of competition, leaderboards, collaboration, excitement, fun, and rewards as tools to foster student engagement. The participants highlighted that competition was a significant motivator for student engagement in using gamified activities. As a result, students demonstrated enthusiasm and fun for learning as they earned rewards. Lesson planning included strategic placement, use, variety, types of games, content, student performance data, formative review, and personalization. Regarding lesson planning, the participants used gamified activities primarily for formative assessment. The identified weakness in planning was the lack of gamified platforms that personalized the learning experience to match the strengths and weaknesses of the student. Despite the popularity among the participants of using gamification in math and science middle school classrooms, the obstacles of lack of professional development, challenges of classroom management, and limited funding were major subthemes. The study included as outliers the reluctance to use gamification due to the teacher's comfort level and concerns about aligning gamified activities to content standards.

CHAPTER FIVE: CONCLUSION

Overview

The purpose of this hermeneutic phenomenological study was to understand digital gamification and its effect on student engagement based on the lived experiences of middle school math and science teachers in rural schools in the southeast region of the United States. Chapter Five consists of five discussion subsections: interpretation of findings, implications for policy and practice, theoretical and methodological implications, limitations and delimitations, and recommendations for future research.

Discussion

This phenomenological study aligned with my observations as a middle school administrator on pedagogical practices in math and science classrooms to foster student engagement. As a practitioner in middle school, classroom observations were evidence that traditional instructional strategies led to limited student engagement and a lack of feedback to affect student achievement. The interpretation of the study's findings herein focuses on gamification elements for student engagement, planning gamification lessons, and obstacles to gamification in using gamification as an instructional tool. To combat the epidemic of apathy for learning, the interpretation of policy and practice applies to real-world middle school practitioners faced with accreditation benchmarks. Too often, district-level administrators fund and implement the latest fad in education. Therefore, my study explored instructional practices from teachers' lived experiences in middle school math and science education.

Interpretation of Findings

My interpretations of the study's findings focused on the differing quality in gaming platforms, how the data generated by games could help teachers plan effective and engaging

lessons, and how teachers and systems could overcome obstacles to gamifying middle school math and science lessons. The participants' lived experiences taught me that gamification elements increased classroom engagement. As a result of this study, I agree with Alabbasi (2018) that teachers can enhance student engagement when the elements of gamification are used in education, combined with entertainment. As a school-based leader, I have consistently worked with teachers to build student-centered and engaging lessons. During this study, I observed and learned through participant interviews that teachers did not always understand that compliance from their students did not equate to engagement. As Sailer and Homner (2020) highlighted, it was apparent in the analysis of the data that teachers need to understand that gamified learning is more than just entertainment, as gamified learning must account for the instructional content, student behaviors, attitudes, and game characteristics that support a deliberate learning target.

Gamifying lessons may help students move from compliance to engagement, particularly in using the elements of competition, leaderboards, and rewards that bring fun and excitement to learning. The participants' lived experiences aligned with the positive impact of leaderboards driving competition through immediate feedback, as claimed in research by Schlömmer et al. (2021). Similar to research by Pereira et al. (2014), the study herein supported using rewards in gamified activities to motivate and engage students to learn with an improved attitude, thus reducing the obstacles for teachers to teach and learners to learn. Teachers should be cautious in using gamification so that the activity aligns with an intentional learning objective. Teachers may lose focus on the instructional target when using gamified activities and get caught up in edutainment specifically for fun and as a time filler. The participants in this study used games primarily for review and needed development on how to use data from gaming platforms to help inform their future lesson plans. The participants' perceptions additionally concurred with

Duggal et al. (2021) that, to balance boredom through frustration, gamified activities should include a personalized learning experience that measures learners' specific instructional needs yo support knowledge and achievement.

The participants in this study specifically noted the obstacles related to planning, resources, and lack of professional development, as also described by Sánchez-Mena and Martí-Parreño (2017). The participants said that financial support to implement games, time to plan data-driven lessons with gamification, and professional development that helped teachers integrate games into their lesson plans could help teachers gamify lessons to engage their students. In alignment with Ray and Coulter (2010), the participants identified that professional development impacted a teacher's perceptions of using gamification. This study highlighted the minimal progress that has been made in providing teachers with the skills needed to provide effective, gamified instruction.

Summary of Thematic Findings

The thematic findings of the study were that some gaming platforms were better than others, the use of data from gamified platforms to drive instruction, and obstacles to gamification. Teachers claimed through their lived experiences that when learning occurred in the context of games, instruction appeared to be fun for the student. Teachers expressed the importance of gamified platforms with data points to personalize learning and the need for professional development on how to use the student performance data from gamified activities to drive instruction. The participants indicated that the obstacles were time to build content in gaming platforms, the management of students (particularly in implementing small-group instruction), and the need for funding to unlock premium features in gamified math and science platforms to personalize student learning experiences.

Some Gaming Platforms Are Better Than Others. Through data collection using participant interviews, classroom observations, and journal responses, I found that the participants believed that gamification was an instructional tool that could positively impact student engagement. Teachers should use gamified platforms to encourage students to engage in the content while seamlessly having fun. The participants' beliefs aligned with Vander Ark's (2013) assertion that to use gamification as a meaningful instructional tool, teachers should include rigor and look deeper than the fun of gameplay. Gamification platforms such as Blooket, Quizlet Live, and Kahoot! use the elements of competition fueled by the influence of leaderboards, rewards, and the enhanced classroom culture to make learning engaging and fun.

The participants specifically identified the gamified platforms that provoked student engagement through the gamification elements of competition, fun, collaboration, leaderboards, and rewards. Blooket is a gaming platform used by the participants that encouraged competition among their students through visual leaderboards resulting in rewards with evidence of fun and enthusiasm for learning. Gold Quest, Crypto Hack, Fishing Frenzy, Tower Defense, and Tower of Doom were other platforms mentioned. But regardless of the specific game, participants noted that students would enthusiastically engage in these platforms due to the embedded competitive spirit of learning. Quizlet Live is a gaming platform that uses collaboration among team members to drive competition, as evidenced by visual leaderboards. As student teams elicited correct responses, the participants indicated that all students participated with full engagement. In addition, participants claimed that after each round, students were enthusiastic about gameplay even when they had a change in group members. Kahoot! is a game that wraps the gaming elements of competition, leaderboards, rewards, learning, and fun in one platform. The participants noted that Kahoot! engaged students with content regardless of their level of

proficiency. In addition, the game maintained anonymity, rewarded students as individuals, and provided analytics for the teacher to personalize forward instruction.

Gaming platforms that led the way in student engagement in the middle school math and science classroom were founded on best practice instructional technology elements. Blooket, Quizlet Live, and Kahoot! all use the key element of competition as a vehicle to coerce students to engage. Each platform has an individual and team leaderboard to provide immediate feedback, giving it a competitive gamified element that can help make learning more fun. In the interview, Mitchell endorsed these platforms, as each had a simple method to building question sets, easy sign-on for students to maximize instructional time, and a means to analyze student data quickly. When I observed Brooke, every student engaged with Quizlet Live without complaints about their teammates. Brooke indicated in a journal response that outside of gamification, students were reluctant to embrace teamwork and collaboration with various peers. Despite the longevity of the Kahoot! platform, Jessie, Kamden, and Harper described in the interview that they never had students complain that they were playing the game; students jump at the chance to compete with content. All three of these platforms are classic examples of instructional tools that efficiently use competition as a vehicle to engage students in enthusiasm to learn with the vital element of fun.

Some gaming platforms were better than others as educators sought to merge elements of gamification and learning. In value-added research by Mayer (2019), the features to consider in determining the educational value of a game for promoting learning included cognitive consequences and media comparison. Teachers should understand the the cognitive consequences on the intended instructional learning target by playing games to achieve a desired outcome (Mayer, 2019). To determine if one platform is better than another, media comparison

research analyzes whether people learn effectively from gamified activities. Teachers must evaluate digital games that increase engagement and have real-world tasks (Prensky, 2001). In considering these factors, educators need a decision matrix to determine if some games are better than others to use in middle school math and science to drive instruction, considering the game's alignment with a learning objective, how much it supports students' understanding of that objective, and its level of perceived engagement among students.

Using Gamified Data to Drive Instruction. Teachers could use gamified platforms to provide valid data for prescriptive lesson planning. Many of the platforms the participants used had data points that provided insight into individual student performance. Through my observations and interviews, it was apparent that teachers either disregarded the data provided or needed to use the analysis in deliberate and prescriptive lesson planning. Teachers' perceptions were influenced by their ability to use the game in their classroom effectively and their knowledge of how to use the platform (Ray & Coulter, 2010). Teachers could benefit from professional learning in disaggregating data to personalize student learning. In my discussions with participants who used data from their games, they indicated gamification was a tool that had a purposeful place in their daily learning activities. The relationship between learning benchmarks and gaming elements was an influencing component as teachers wove gamification into lesson design and in the execution of the activity (Zhonggen, 2019). Additionally, although some participants observed excitement, fun, and engagement during a game, the final result for the students was just a score on the leaderboard. Teachers should monitor students throughout the game, as leaderboards may positively impact high performers and negatively affect academically weak students (TechnologyAdvice, 2023). The lack of personalization in gamified platforms limited teachers' ability to plan differentiated lessons or meet students' specific needs.

Further research is needed in educational gamification to explore the benefits of using automated games to improve personalizing student learning while examining learning outcomes (Oliveira et al., 2023). The factor of personalization would use learner demographics in gaming platforms to adapt to the student's specific needs while focusing on precise learning tasks. The data analytics from games could address the challenge for teachers to differentiate and personalize students' learning in future lessons.

Obstacles to Gamification. Participants described obstacles to using gamification as a learning tool in their classroom. Teachers in the study indicated that they often navigate various gamification platforms blindly. They searched for gamified activities as they observed an increase in student engagement and sought tools to add to their lessons, without realizing all the instructional benefits a gaming platform could provide. Teachers' use of these platforms was typically through trial and error; due to time constraints, they usually borrowed pre-made question sets from other educators. Therefore, the learning value in those question sets was suspect, since they might not align with the intended learning standard or target objective. Teachers expressed a need for more professional development in implementing gamification as an instructional strategy.

Classroom management was an obstacle to gamification if the participant was concerned about executing traditional collaborative versus gamified activities. During the interviews, participants expressed a definite need for a classroom management plan, as student energy increased with student competition, enthusiasm, and engagement. Through the perceptions of the teachers' lived experiences, the change in energy level and excitement required different classroom management strategies. Learning environments with gaming activities may appear noisy, chaotic, and disruptive (Kinder & Kurz, 2018). A few participants expressed the need for

complete control of student behavior during a lesson, which presented an obstacle to using gamification in their lessons, since students' reactions might be spontaneously expressed. On the contrary, those participants with established classroom routines and expectations and those willing to take academic risks were willing to try a gamified activity, regardless of whether they had worked out every angle of execution and instructional intent. May described in a journal response that gamification created a classroom environment where students collaborated in random groups with lots of laughter and competition. May observed that students expressed excitement and were willing to help a struggling classmate when a reward is at stake. The engagement in May's classroom was evident during the classroom observation, as students at all levels experienced success and were part of a winning team.

Most teacher participants in the study embraced gamification in their middle school math and science classrooms but needed help with funding these tools for student engagement. The concern about lack of funding aligned with research by Koivisto and Hamari (2019), in that participants had difficulty securing financial resources and hardware to support effective use of gamification for instruction. Several participants stressed that the platforms hooked the teacher and then limited their ability to tap into the premium-level attributes such as student performance data and extended question building. In interviews, most participants said they paid for premium-level access out of personal funds because they valued the level of student engagement in seamless and fun learning for kids. Teachers claimed that without premium-level subscriptions, limited access to data for analysis and limited time for access to a teacher-designed game were definite obstacles to lesson planning that included gamification platforms The participants indicated that due to the return on the investment, schools should permit teachers to use their annual instructional allocation to purchase premium subscriptions. Based on responses during the

participant interviews, teachers would appreciate a vetted list of gaming products to avoid using funds for any gaming product. This study's findings suggest that schools and systems should address teachers' use of school funds for to access gamified tools with a deliberate instructional purpose outside of mere edutainment.

Implications for Policy and Practice

The implications for policy and practice of this study relate to student engagement in middle school math and science classrooms. Bergdahl et al. (2020) acknowledged the challenge of maintaining student engagement in a technology-enhanced environment despite classroom distractions and disengagement. The focus of policy implications of the study was for policymakers to understand, select, fund, and support gamification in middle school math and science classrooms. The implications for practitioners of using gamification in the classroom center on addressing the learning needs of individual students through an instructional practice that encourages student engagement.

Implications for Policy

Policies for gamification and funding may provide districts with technology-based instructional tools to address the lack of student engagement. To drive policy, district leaders need to understand the implications of gamification for student engagement. As a school leader, if given the opportunity I would present district-level curriculum specialists and leaders with data to support the use of gamification platforms to support engagement in math and science middle school classrooms. The policy includes a menu of approved educational digital resources based on evidence-based instructional practices. In addition, teachers need feedback from administrators and content specialists to eliminate gamified activities solely for entertainment and fun versus products that support content. Teachers can discriminate between the platforms

based on the features of each gamified platform to customize the question sets, choice in individual and team-based platforms, and data to drive personalized student learning. As a school administrator, if given an opportunity I would encourage teachers to include gamification as a routine activity in their weekly lesson planning. Through analyzing student performance metrics in gamified platforms, teachers could make informed decisions on remediation, intervention, and enrichment for their students. However, teacher participants in the study expressed a lack of professional development in implementing gamification as a classroom instructional strategy. Teachers are required to engage in continuing education for teacher licensure.

District-level leadership could define a list of evidence-based instructional games for teachers, to ensure that activities aligned with district-approved content and curriculum. The lesson plan template could be designed for teachers to reflect on the needs of their students, specific learning targets, and the level of student engagement when using a specific gamified activity. Teachers need training on choosing an applicable gaming platform to meet the instructional objectives, choosing a suitable gaming platform based on student demographics, designing practical question sets, analyzing student data, and planning activities to support learning rather than the element of pure fun. Districts should create policies to allocate resources such as instructional specialists, coaches, and technology resource teachers to assist in the execution of gamification in classrooms. At one point, teachers were required by the Virginia Department of Education to demonstrate minimum technology proficiency. As districts define professional development, there is a need to focus on policies for instructional strategies that specifically address engagement and technology. For example, the teacher evaluation policy could include a student engagement component with technology-based resources. In addition,

district technology funding could consist of line items to purchase evidence-based educational gamification platforms.

Implications for Practice

Teachers should consistently reflect on how gamification could be used with their instructional practices to evaluate how they have engaged students. Gamification elements could be used as tools to provide a variety of instructional activities that may help teachers engage students. The technology-based analytics offered by some gamified platforms could be used to drive differentiated instruction. For example, the teacher might monitor the level of competition among individual students and teams to identify the strengths and weaknesses of gamification. Leaderboards could be used in practice as a reflective tool for students to identify their progress, combined with an understanding of the content. According to the findings of this study, gamification impacts student engagement and should be included in unit activities to encourage student engagement.

Teachers may use student performance data to drive lesson planning. Lesson planning should include whole-group and individual instructional needs. Because teachers use gamified activities as formative reviews, the data analysis indicates the need for remediation or intervention to meet the needs of each learner. Teachers could use gamification to focus on specific and intentional concepts, a layer deeper than edutainment. When planning lessons, teachers should use multiple gaming platforms to reduce boredom, stagnation, or saturation. When using gamification in personalized instruction, teachers must have a mechanism to quickly adapt instruction through technology. Teachers needed to build question sets for units in gaming platforms, storing them for ease of access during spiral review or subsequent years. With limited

funding, teachers must evaluate the strengths and weaknesses of specific gamification platforms with building and district-level leaders.

According to the participants, there are obstacles to gamification, such as a lack of professional development, challenging classroom behaviors, and limited funding. The participants expressed the need for professional development in building questions aligned with the curriculum, using the specific game, analyzing data from the game, personalizing the student experience, and reflecting on the effectiveness of the activity to engage students while meeting the learning targets. I recommend using colleagues, team leaders, content specialists, instructional coaches, technology resource teachers, and school administrators to provide professional development in the use of gamification for student engagement in content effectively. School leaders should provide a specific list of gamification platforms that are financially supported by the district. However, an exhaustive list, rather than a targeted one, may detract from the use of games to engage students and address specific learning objectives. As a middle school administrator, I recommend that teachers refrain from randomly searching the Internet for games; many games have only limited functionality unless one pays for premium subscriptions. Without paying for a higher level subscription, participants in the study said teachers may gain access to a program that is fun for students yet lack the ability to analyze student performance data. The expansion of professional development could include using gamification as an instructional tool. Professional development would be in a workshop format for participants to learn the platform, build classes, load content, and learn to analyze student performance data. The participants shared the need for hands-on professional development in which they walk away with a usable tool for instruction instead of a sit-and-get style of professional learning.

Classrooms with a lack of student engagement were likely to have challenges with behavior; therefore, eliminating obstacles for the teacher was a crucial component of a teacher's implementation of gamification. I would identify subject matter experts who effectively use gamification in their classrooms as peer mentors. Districts may have an instructional technology resource teacher; however, the study participants indicated that the best way to learn how to use specific platforms was to jump in through trial and error. Through peer observation and collaborative planning of gamified activities, a novice teacher would prepare for execution with guidance and reflect on the lesson to acknowledge the pros and cons of student engagement and learning. As an administrator, I must support and encourage teachers to take academic risks and try instructional tools such as gamification that may turn out to be messy. Teachers must recognize that their efforts to teach disengaged students are wasted. Therefore, teachers need to identify effective learning strategies to encourage engagement. Teachers may use gamification as a station-based activity to engage students, allowing the teacher to implement small-group instruction. Teachers should share their experiences using gamification to drive student engagement with colleagues, as it may be an overlooked tool. As a school instructional leader, I must complete informal observations to support teachers in managing their students during gamified activities. Some participants expressed concerns with classroom management when using gamification, as each participant had an idea of student engagement with a higher level of energy, enthusiasm, and fun. The school administrator must elicit proactive conversations to provide support related to classroom management; otherwise, participants indicated that they would abandon the activity due to personal frustration.

As a practitioner in middle school, my study provided data to support the inclusion of gamification in math and science classrooms to address a lack of student engagement. The study

provided subthemes under the lesson planning umbrella, including strategic placement, strategic use, variety, games rooted in content, student performance data, formative review, and personalization of the learning experience. As a school leader, I would use these themes as an opportunity to enhance the lesson planning capacity of my middle school math and science teachers. I would break down the use of a gamified activity by translating each theme into an instructional design question. A teacher should use a specific gaming platform if there is a purpose to the placement of the activity, aligned to specific content and with an analysis of the student performance data to personalize student learning experiences. If teachers use gamification as a time-filler, the educational value may be lost if the game's learning is not aligned with the lesson's learning objective. Teachers need continual support in implementing gamification through deliberate professional development; they also need assistance with managing student behaviors and identifying funding sources for gamified platforms that are vetted for alignment.

Theoretical and Empirical Implications

The theoretical frameworks of gamification and gamified learning theory framed this phenomenological study. Gamification was applied to lessons to change behaviors in traditional nongaming activities (Landers, 2014). Robson et al. (2015) viewed gamification as an innovative instructional tool to increased student engagement. This study clarified the effectiveness of gamified learning in education as a tool to engage middle school math and science students; as Landers (2014) indicated, there is a need for a theoretical model linking to instruction-based outcomes. Gamified learning theory (Landers, 2014) was the framework that connected how game characteristics implemented as an instructional strategy impacted learners' behaviors and attitudes. This study's lived experiences of middle school math and science teachers supported

the tenets of gamified learning theory by reiterating how student engagement was impacted when gamification was used as an instructional strategy. Kepceoglu and Pektas (2019) indicated that gamification was an excellent instructional strategy to teach math concepts to reduce boredom. My study supported the idea that teachers using gamification in math classrooms may combat the loss of engagement that results in boredom and absenteeism, decreasing academic achievement and increasing dropout rates (Duncan, 2020). My study provided qualitative data to expand studies to use the teacher's perspective on gamification to impact student engagement. Sánchez-Mena and Martí-Parreño (2017) supported the use of gamification as a means to add the element of fun to engage and motivate students to learn. My study contributed to the gap in the literature about understanding of gamification on student engagement in middle school math and science classrooms, as noted by Kokandy (2021). Additionally, research by Zeybek and Saygı (2023) identified the problem of low engagement in educational settings. Therefore, I believe the aspects of gamification that specifically impact student engagement in middle school are grounded in the positive impact gamification has on student attitudes, motivation, cognitive abilities, and academic performance in learning math and science (Alabbasi, 2018). From the results of my study, the critical aspects of gamification that foster engagement are competition, fun in learning, and the student-driven nature of the learning activities.

Current research and literature supported the positive effect of gamification on student engagement. Gamification provokes a social engagement loop through leaderboards that increases student engagement (Zeybek & Saygı, 2023). In addition, the element of fun provided by gamification could motivate students to engage with their learning (Sánchez-Mena & Martí-Parreño, 2017). The high levels of student engagement through gamified activities made the teaching process efficient and effective. However, my study contributed to a deficit in the

research regarding the lack of understanding of teachers' experiences and beliefs on adopting gamification as an instructional tool (López et al., 2021; Sánchez-Mena & Martí-Parreño, 2017). The varied perspectives of the study participants collectively support the adoption of gamification in their middle school math and science classrooms, as evidenced by their real-world experiences in the classroom. The participants observed increased student engagement in learning math and science content through gamified learning activities. My study supported the research of Bartle (2011) and Malone (1981), who found that gamification applies to education as a collaborative platform that turns work into a game. The participant interviews and classroom observations supported Bartle's study of gamification, as teachers noted that through using gamified learning activities. Malone determined that video games encourage engagement, which was corroborated by the results of this study. In my research, participants believed that gamification positively impacted student engagement toward learning, promoting active learning and collaboration with peers, consistent with research by Alabbasi (2018) and Kokandy (2021). Participants' views aligned with research by Kapp (2012) that using gamification as an instructional tool is a viable solution to boredom and lack of attention among students. The participants claimed that modern students are team driven and socially collaborative, with the ability to multitask, supporting the rise of edutainment. The study participants concurred with Jagušt et al. (2018) that gamified activities increased student engagement, helped develop students' problem-solving ability, and encouraged a profound interest in learning through gamification.

The participants in my study identified the need for more professional development, challenging classroom behaviors, and limited time for planning and funding as obstacles to using gamification in the math and science middle school classroom. My study concurred with Ray

and Coulter (2010) that a lack of professional development impacts a teacher's perception of using gamification in the classroom. Teachers had limited availability and time to learn and master gamified platforms (Koh et al., 2012). Teachers expressed concern that using gamified learning activities to support the learning target may lead to a loss of control over student behavior (Da Rocha Seixas et al., 2016). The enhanced use of technology in the classroom could help student engagement, resulting in meaningful learning and increased student achievement in a behavior-managed classroom (Fang, 2022). This sentiment reflected the need for professional development in classroom management when introducing gaming into the classroom. It is essential to ensure that students remain focused and engaged in the game while maintaining an acceptable energy level. There must also be an emphasis on teaching moments, as gaming can effectively teach students new concepts. With proper classroom management and instruction, gaming could be a beneficial addition to the classroom.

Delimitations and Limitations

Delimitations provided a focus of the research study by outlining the scope of the study and defining boundaries for the study to maintain scope and focus (Coker, 2022). The researcher must remain focused on extraneous data outside the research questions. Limitations of phenomenological research include the element of subjectivity and a narrow scope that limits the application of the study (Emiliussen et al., 2021). I collected the data, which may increase the potential for bias; in hermeneutical phenomenology, the researcher must acknowledge and recognize that past experiences and lifeworld knowledge guide the inquiry of the research (Neubauer et al., 2019). The following sections describe this study's intentional delimitations and its limitations for transferability.

Delimitations

Delimitations of the study included the geographic location, middle school level, subject, sample size, demographics, time, and teacher experience. I focused on the geographic location of rural school districts in the southeastern region of the United States; therefore, the transferability may be limited. I selected this geographical location so that the results would apply to where I am a practitioner as a middle school administrator. My region's middle schools needed help meeting state and federal accreditation standards. Consequently, it is logical and necessary that I focused my research on strategies to foster student engagement that may help us meet and exceed those standards. The subject and grade level were specific to 10 middle school math and science teachers in rural public schools. The gap in the literature identified by Kokandy (2021) supported research in understanding the impact of digital gamification, specifically in middle school math and science classrooms. Finally, the participant delimitations were narrow, as the study was focused on the lived experiences of licensed teachers with a minimum of 3 years of teaching experience and a minimum of 1 year of experience with gamification. I chose to conduct the research in this manner because this study's results applied to my professional practice as a middle school administrator in a rural region. Additionally, due to staffing challenges in a rural area, I selected participants with a minimum of 1 year of experience with gamification; identifying enough participants with more extensive experience using gamification in the classroom might have been challenging.

Limitations

The limitations of the phenomenological qualitative study included my subjectivity and bias and the geographical constraints of the research sample. First, the research method's subjectivity limited the results' generalizability (Neubauer et al., 2019). I am a practicing

administrator in middle school, and my bias based on my experiences and knowledge as a practitioner may have influenced my interpretation, analysis, and conclusions of the study. Second, the study's small sample size in middle school math and science in a specific geographic region narrowed the transferability to other schools and comparable settings. Third, the location impacted the results, because the pool of participants was shallow compared to a large district. Since each school was in a rural district, there was typically one math and one science teacher per grade level. Fourth, the data collection period was limited to the third 9-week period, as I had to await IRB approval for data collection. The data collection time frame was intended to extend throughout a full academic semester.

Recommendations for Future Research

Future research on the impact of gamification on student engagement in middle school math and science classrooms should focus on the perceptions of teachers with less than 3 years of experience. Teachers new to the profession are likely to have more comfort with technology than older teachers do with using gamified activities in the classroom. Additionally, teachers directly out of formal teacher training may have collegiate experiences using educational technology. The perspective of both veteran and new teachers is important, as districts need to source instructional tools that provide a substantial return on the investment. To address the need for more student engagement, this study provided a foundation for district-level leaders and school-based administrators to consider gamification as an investment in engaging students.

The study herein was focused on teachers in a rural middle school; therefore, my analysis should be expanded to suburban and urban school districts. The schools in the present study had small student populations of 100 students per grade level, equating to one content teacher per grade level. Future research should include larger middle schools in which multiple teachers

teach each level of math and science. Larger school districts may have more logistic hurdles, including an inability for science and math teachers to work and plan together. Future research should evaluate the specific needs of gamification for math and science in large districts versus small and rural school districts.

Additional research should also explore how middle school math and science should use gamification in a block schedule that meets for 90 min biweekly or a 4×4 program comparable to a college semester format. The participants in my study had standard 60-min class periods that met every day. Gamification often requires extended blocks of time and a clear rationale for using gamification to impact specific math and science learning outcomes. Many of the participants in my study claimed that they used gamification to have fun and fill the final 10 to 30 min of a class rather than having a deliberate instructional need for gamification based on lesson planning and learning outcomes.

Future research should focus on participants in higher education by analyzing data from the lived experiences of math and science professors. There was limited research on higher education professors' lived experiences using gamification to engage learners in math and science courses (Gómez-Trigueros, 2019). The effects of the COVID-19 pandemic may have altered higher education professors' interest in and experience with gamification. The global pandemic affected the ability to use face-to-face learning in higher education, which resulted in managing instruction through digital platforms (Pacheco et al., 2023). Gamification has been shown to increase student engagement in K-12 education; therefore, I recommend researching its effect at the collegiate level and why professors may or may not include it as an instructional technique.

Gamification may be an instructional strategy that promotes middle school student engagement among students with disabilities (Majdoub, 2022). It would be beneficial to understand how gamification focuses on learning outcomes of instructional content for students with disabilities. Teachers may use gamification to entertain learners with disabilities, mainly when student behavior presents challenges: they may neglect learning outcomes and content. Gamification rooted in instructional outcomes may have more benefits on students' learning than its use solely as an entertainment or management tool.

I recommend that future research use a mixed-method approach to assess the academic achievement of middle school math and science students by using gamification as an instructional strategy and open-ended interview data. Quantitative research could focus on the specific learning outcomes for math and science when teachers gamify lessons. Quantitative measures could include tests, assignments, and other learning tied to lesson plans with gamified elements that address state and federal standards. While gamification may positively impact engagement, it is also essential to understand its effect on learning outcomes.

I recommend that future research include refinement of qualitative methods, including other interview questions or including a different data source than participant journals. In my study, the journals added little value to the other data sources. I wrote the journal response questions with a specific purpose, yet the participants interpreted the questions differently. The intent was for weekly reflection on lesson planning and engagement, and often I would receive apologies from participants for being behind on their responses. The responses became more about box checking than insight. Participants' journal responses could be used before the interviews so researchers could follow up with probing questions, but the design of this study started with the participant interviews, with journal responses in tandem. Targeted interview

questions based on their responses would allow a deeper understanding of how teachers think about and utilize gamification in their lessons. Researchers may learn more from an inverted data collection model than this study, where data collection begins with classroom observations followed by journal responses and concludes with participant interviews.

Conclusion

According to the lived experiences of middle school math and science teachers, student engagement is affected by using gamification. Gamification elements for student engagement, planning gamification lessons, and obstacles to gamification were emerging themes through collecting, analyzing, and synthesizing data from teacher interviews, classroom observations, and journal entries. Teachers noted that competition and leaderboards led to student engagement, as evidenced by fun and enthusiasm for learning math or science. Planning gamified lessons that engaged students included the strategic placement, use, and variety of gamified activities. Additionally, in planning gamified lessons, teachers should consider the type of games, student performance data, using a gamified platform for formative review, and the desire to personalize the student learning experience. Teachers claimed that gamification affected student engagement and noted concerns about a lack of professional development, classroom management challenges, and limited funding to implement gaming as a learning experience. The implications of middle school math and science teachers using gamification to drive student engagement should extend beyond using games to entertain students. School districts should require effective school policies to support best practices of using gamification in the classroom as a tool to improve student engagement. Additionally, teachers needed applicable professional development to better help them understand how to plan for and use gamification. The delimitations of the study included the geographic location, middle school level, subject, sample size, demographics,

time, and teacher experience. My bias was a primary limitation of the study, which may impact subjectivity. Future recommendations of the study include expanding into larger middle schools to increase the pool of participants, expanding into schools with a block schedule, and focusing on the student's lived experiences with gamification and engagement. The participants' lived experiences in the study validate that gamification is a tool to combat a lack of student engagement in middle school math and science classrooms.

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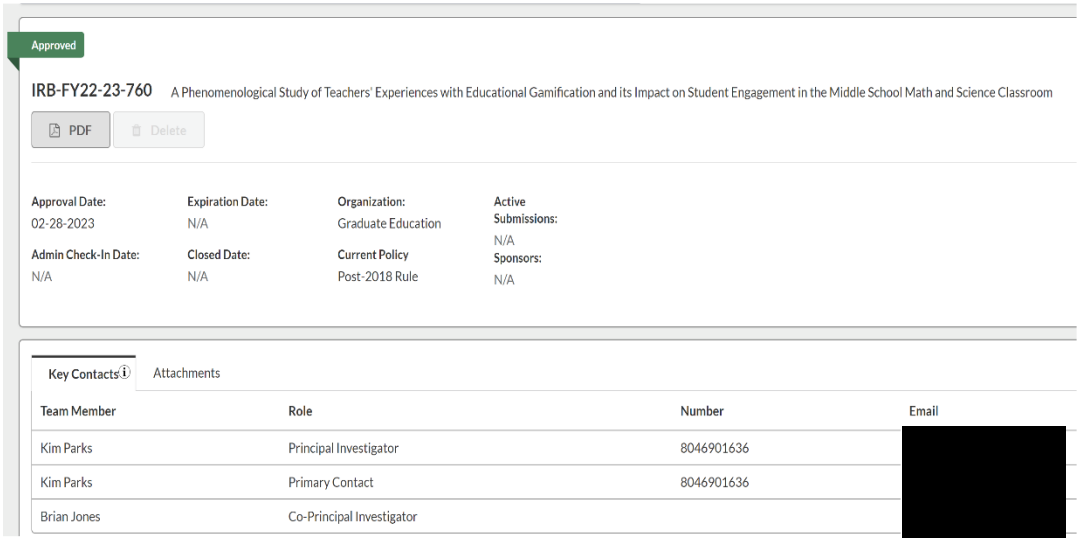
Appendix A

IRB Application



Approved

IRB-FY22-23-760 A Phenomenological Study of Teachers' Experiences with Educational Gamification and its Impact on Student Engagement in the Middle School Math and Science Classroom

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Approval Date:	Expiration Date:	Organization:	Active Submissions:
02-28-2023	N/A	Graduate Education	N/A
Admin Check-In Date:	**Closed Date:**	**Current Policy**	**Sponsors:**
N/A	N/A	Post-2018 Rule	N/A

Key Contacts Attachments

Team Member	Role	Number	Email
Kim Parks	Principal Investigator	8046901636	[redacted]
Kim Parks	Primary Contact	8046901636	
Brian Jones	Co-Principal Investigator		

Appendix B

Interview Questions

CRQ How will middle school math and science teachers describe their lived experiences with/of the effect of digital gamification on learner engagement?

1. What is your teaching experience in middle school math and science?
2. How do you describe educational digital gamification?
3. How do you describe your experience with educational digital gamification?
4. How do you define student engagement in the middle school classroom?

RQ 1 How will middle school math teachers describe their lived experiences with/of the effect of digital gamification on learner engagement?

1. What digital gamification platforms in math have you used in your classroom? SQ1
2. How do you know if students are engaged in math when using digital gamification activities in your classroom? SQ1
3. Tell a story of when you used a digital gamification platform and describe the impact on student engagement. SQ1
4. What is your perception of gamification's impact on academic performance made possible through increased engagement?
5. What else would you like to add to your observation of student engagement using digital gamification in the middle school math classroom? SQ1

RQ 2 How will middle school science teachers describe their lived experiences with/of the effect of digital gamification on learner engagement?

1. What digital gamification platforms in science have you used in your classroom? SQ2

2. How do you know if students are engaged in science when using digital gamification activities in your classroom? SQ2
3. Tell a story of when you used a digital gamification platform and describe the impact on student engagement. SQ2
4. What is your perception of gamification's impact on academic performance made possible through increased engagement?
5. What else would you like to add to your observation of student engagement using digital gamification in the middle school science classroom? SQ2

Appendix C

Observation Tool

L =Leaderboards. R = Rewards. F = Personalized teacher feedback

	Date of Observation: Length of Activity: Subject:	
Time	Descriptive Notes	Reflective Notes

Appendix D

Phenomenological Research Questions

The research has developed one central research question and two sub questions to address the problem and purpose of the study.

Central Research Question

How will middle school math and science teachers describe their lived experiences with/of the effect of digital gamification on learner engagement?

Sub question 1

How will middle school math teachers describe their lived experiences with/of the effect of digital gamification on learner engagement?

Sub question 2

How will middle school science teachers describe their lived experiences with/of the effect of digital gamification on learner engagement?

Appendix E

Journal Prompts

Week 1 Gamification

paintsandme13@gmail.com (not shared) Switch account

* Required

What is your assigned pseudonym? *

Choose

What gamification platform did you use this week to support your learning target? *

Your answer

When thinking about the selected gamification platform used, describe your observations of student engagement as related to the use of leaderboards, rewards, or feedback. *

Your answer

Based on the lesson's learning target, describe the strengths and weaknesses of using the specific digital platform for student engagement to assess if your students meet the learning target. *

Your answer

Week 2 Gamification

paintsandme13@gmail.com (not shared) Switch account

* Required

What is your assigned pseudonym? *

Choose

Describe your observations of student engagement as related to the use of leaderboards, rewards, or feedback. *

Your answer

Based on your observations, how do you think digital gamification impacts student engagement? *

Your answer

Based on the lesson's learning target, describe the strengths and weaknesses of using the specific digital platform for student engagement to assess if your students meet the learning target. *

Your answer

Week 3 Gamification

paintsandme13@gmail.com (not shared) Switch account

* Required

What is your assigned pseudonym? *

Choose

What gamification platform did you use this week to support your learning target? *
*

Your answer

When thinking about the selected gamification platform used, describe your observations of student engagement as related to the use of leaderboards, rewards, or feedback. *
*

Your answer

Based on the lesson's learning target, how would you change the gamified instructional activities and why? *

Your answer

Week 4 Gamification

paintsandme13@gmail.com (not shared) Switch account

* Required

What is your assigned pseudonym? *

Choose

What gamification platform did you use this week to support your learning target? * *

Your answer

Describe your observations of student engagement as related to the use of leaderboards, rewards, or feedback. *

Your answer

What struggles, obstacles or attributes do you observe in your students that affect their level of engagement? *

Your answer

Week 5 Gamification

paintsandme13@gmail.com (not shared) Switch account

* Required

What is your assigned pseudonym? *

Choose

What gamification platform did you use this week to support your learning target? * *

Your answer

Describe your observations of student engagement as related to the use of leaderboards, rewards, or feedback. *

Your answer

What different digital gamification platforms would you use to meet the learning goal? *

Your answer

Explain why a different platform could be used and what is needed for effective implementation.

Your answer

Appendix F

Consent Letter

Title of the Project: A phenomenological study of teachers' experiences with educational gamification and its impact on student engagement in the middle school math and science classroom.
Principal Investigator: Kimberly Parks, Ph.D. candidate, Liberty University

Invitation to be part of a Research Study

You are invited to participate in a research study. To participate, you must be over 21 years of age Virginia-licensed middle school math or science teacher with educational gamification experience. Taking part in this research project is voluntary.

Please read this entire form and ask questions before deciding whether to participate in this research.

What is the study about, and why is it being done?

This phenomenological study aims to understand teachers' lived experiences with educational gamification and its effect on student engagement for middle school math and science teachers at rural public schools.

What will happen if you take part in this study?

If you agree to be in this study, I will ask you to do the following things:

1. A semi-structured interview in face-to-face format audio recorded. The interview will last up to one hour. The interview will be scheduled in coordination with the participant. The participant is provided the interview transcription to validate the accuracy of the content.
2. Two classroom observations of one class period (45 minutes) each are scheduled in coordination with the participant. The participant will be provided a copy of the completed observation tool.
3. Participants will respond to five weekly journal responses that take at most 10 minutes. The journal responses are recorded through a Google form.

How could you or others benefit from this study?

Participants should not expect a direct benefit from participating in this study. However, benefits to society include significance to practitioners and school leaders with experiences from middle school math and science teachers, considering how gamification impacts learner engagement.

What risks might you experience from being in this study?

The risks involved in this study are minimal, which means they are equal to the risks you would encounter in everyday life. The researcher is a mandated child abuse and neglect reporter as a licensed educator in Virginia. The parents/guardians of students will be notified of the study highlighting the focus on teacher perceptions. Parents/guardians will be notified that data

collection is focused on the teacher and that no identifying student information will be collected from the classroom. Parents will have an opt-out option for their child.

How will personal information be protected?

The records of this study will be kept private. Published reports will not include any information that will make it possible to identify a subject. Research records will be stored securely, and only the researcher will have access to the records. Your data may be shared in future research studies or with other researchers. If data collected from you is shared, any information that could identify you, if applicable, will be removed before the data is shared. The data collected will not be shared with other school personnel.

- Participant responses will be kept confidential using pseudonyms. Interviews will be conducted in a location where others will not easily overhear the conversation.
- Data will be stored on a password-locked computer and marked password-protected in Google. The data may be used in future presentations. The data collection tools will not be electronically shared. After three years, all electronic records will be deleted.
- The semi-structured interviews will be recorded and transcribed. Recordings will be stored on a password-locked computer and password-protected Google folder for three years and then erased. Only the researcher will have access to these recordings.

How will you be compensated for being part of the study?

Participants will be compensated for participating in this study. Participants will receive one recertification point toward their Virginia educator license for each hour of participation in the data collection process. The participant will receive a certificate awarding the licensure points. In addition, participants will receive a $25 Amazon gift card upon completing the interview, observations, and journals. The gift card is not prorated if the participant withdraws from the study early.

What are the costs to you to be part of the study?

To participate in the research, you will incur no cost.

Does the researcher have any conflicts of interest?

The researcher serves as an Assistant Principal at St. Clare Walker Middle School in Locust Grove, Virginia. To limit potential or perceived conflicts, a research assistant will ensure that all data is stripped of identifiers before the researcher receives it. This disclosure lets you decide if this relationship will affect your willingness to participate in this study. No action will be taken against an individual based on their decision to participate or not participate in this study.

Is study participation voluntary?

Participation in this study is voluntary. Your participation will not affect your current or future relations with Liberty University, Caroline County Public Schools, and Richmond County Public Schools. If you decide to participate, you are free not to answer any questions or withdraw at any time without affecting those relationships.

What should you do if you decide to withdraw from the study?

If you choose to withdraw from the study, please contact the researchers at the email address/phone number in the next paragraph. Should you decide to withdraw, data collected from you will be destroyed immediately and will not be included in this study.

Whom do you contact if you have questions or concerns about the study?

The researcher conducting this study is Kimberly Parks. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact her at [redacted]. You may also contact the researcher's faculty sponsor, Dr. Brian Jones, at [redacted].

Whom do you contact if you have questions about your rights as a research participant?

If you have any questions or concerns regarding this study and want to talk to someone other than the researcher, **you are encouraged** to contact the Institutional Review Board, 1971 University Blvd., Green Hall Ste. 2845, Lynchburg, VA 24515 or email at irb@liberty.edu.

Disclaimer: The Institutional Review Board (IRB) is tasked with ensuring that human subjects research will be conducted in an ethical manner as defined and required by federal regulations. The topics covered, and viewpoints expressed or alluded to by student and faculty researchers are those of the researchers and do not necessarily reflect the official policies or positions of Liberty University.

Your Consent

By signing this document, you agree to be in this study. Make sure you understand what the study is about before you sign. You will be given a copy of this document for your records. The researcher will keep a copy of the study records. If you have any questions about the study after you sign this document, you can contact the study team using the information provided above.

I have read and understood the above information. I have asked questions and have received answers. I consent to participate in the study.

The researcher has my permission to audio-record me as part of my participation in this study.

_____

Printed Subject Name

_____

Signature & Date

Appendix G

District Approval

Dissertation Research

[redacted] Wed, Aug 31, 2022 at 8:44 AM

Good morning Kim,
I'm happy to support your research and approve both the study and awarding of recertification points. I've copied [redacted] in this response so that he is also in the loop about points. Let us know if there is anything else we can do to assist you.
[redacted]

[redacted]

b [redacted] Tue, Nov 29, 7:36 PM (11 hours ago)

Dear Kim Parks,
[redacted] and myself are ok with your study. Please reach out to him for any additional details.
Good luck.

Sincerely,

[redacted]