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Teacher Perceptions of Digital Gaming and 21st-Century Skills in the Middle School Classroom

Elizabeth Omegna

Dissertation Committee

David Reid, Ph.D., Mentor
Richard Blissett, Ph.D.
Marc Cicchino, Ed.D.

Submitted in Partial Fulfillment for the requirement for the Degree
Doctor of Education
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COLLEGE OF EDUCATION AND HUMAN SERVICES

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APPROVAL FOR SUCCESSFUL DEFENSE

Elizabeth A. Omegna has successfully defended and made the required modifications to the text of the doctoral dissertation for the Ed.D. during this **Spring Semester 2020**.

DISSERTATION COMMITTEE

(please sign and date beside your name)

Mentor:
Dr. David Reid _____ 3/13/20 20
Date

Committee Member:
Dr. Richard Blissett _____ 3/13/2020
Date

Committee Member:
Dr. Marc Cicchino _____ 3/13/2020
Date

The mentor and any other committee members who wish to review revisions will sign and date this document only when revisions have been completed. Please return this form to the Office of Graduate Studies, where it will be placed in the candidate's file and submit a copy with your final dissertation to be bound as page number two.

Teacher Perceptions of digital gaming and 21st-century skills in Middle School classrooms

ABSTRACT

The purpose of this research was to capture teacher perceptions on the use of digital gaming in the learning environment of middle school classrooms. Additionally, to speak to perceptions on learning of 21st-century skills such as communication, collaboration and critical thinking.

This study of two middle schools in the same district in suburban New Jersey was utilized for capturing the ideas of teachers who employed a variety of digital games in the classroom as part of their learning objectives.

An interview protocol was utilized to direct questions around ideas with a focus on: game types, game objectives and observations of learning, as well as perceptions around the assessment of learning. Interviews were conducted with educators both individually and in a group to compile their perspectives on how games can be utilized towards a learning target, specifically to support 21st-century skills. The digital games came in the form of a variety of formats and utilized for different intents, but purposefully integrated to support constructivist learning styles and foster learning.

This study contributed information to the literature regarding digital gaming and learning, inclusive and beyond that of engagement. Recommendations for educational leaders and policy makers were outlined as well as suggestions for future research relevant to these ideas were also included.

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Chapter 1: Background

Introduction

Digital gaming has expanded outside its social construct in media and health care and has created a presence in the realm of education. According to the United States Bureau of Labor Statistics (2017), technology engineers, software developers, and analysts stand to be leaders in the job market over other careers accounting for more than 24% of all jobs leading up to 2026. With careers in engineering, service, manufacturing, and medicine all requiring a certain level of technical and computer skill base, nearly all of today's jobs require a computer or computer programs at some point with many becoming fully automated. These computer skills to run daily operations require a skill set with technology on a daily basis. With the invention of the internet, in addition to the workforce utilizing skills, recreation took a foothold online. In time, gaming expanded to not only encompass entertainment and social goals, but business objectives merging both worlds. Foursquare and Facebook alone changed how marketing and advertising were embedded into the social culture and human connectedness. According to a United States statistical archive, the gaming industry stands to clear $2 trillion in sales by 2021, by which gaming and media in the United States will account for 78% of that surplus (Gough, 2019). Businesses in the early 2000s used gaming to obtain information about their market base, products, and services, as well as other data analytics. As companies grew, gaming also became a way to tackle areas such as public relations and the training of employees. One of the most historic examples of using gaming for training purposes has its origins in the military sector. Many digital games in education have been inspired by the United States Department of Defense

"SIMS" that train personnel for varied situations and responses for the purposes of a learning objective or real-life situation (Hill & Miller, 2017).

A digital game is defined as "an interactive program for one or more players, meant to provide entertainment at the least, and quite possibly more" (Kolko, 2005) and may take the form of an online game, a sandbox game or even Commercial Off the Shelf (COTS) game. Game based learning theory speaks to using one of these types of games on a platform in an educational setting to incentive and "further learning" (IGI Global, 2008). Accordingly, gamification, a component within many digital games, is defined by Kapp (2012) as "a system in which players engage in an abstract challenge, defined by rules, interactivity, and feedback, that results in a quantifiable outcome often eliciting an emotional reaction" (p. 7). Both are components being used in America's schools from elementary to higher education. Gaming, which, according to current literature, is validated for its efficacy on student engagement (Kafai, 2006, 2015; Kebritchi, 2008, 2010 & Squire, 2005, 2006, 2011) is being used by teachers for the purposes of remediation and assessment and is also beneficial in that it provides immediate feedback to the user (Gerber, 2012; Gerber & Price, 2013; Plass, 2015). Developers of gaming programs focus on content skills that model a gaming experience for use in the classroom. Many popular games are referred to as serious games, COTS games, or other flash animation games have educational impact such as Minecraft, Civilization and Kahoot.

Digital gaming relies on critical thinking, strategic planning, cooperative practice, and healthy competition to problem solve, all referenced within education as 21st-century skills (Cipollone, Schifter & Moffat, 2014; Gee, 2003, 2013; P21.org, n.d.; Prensky, 2001, 2003; Squire, 2005, 2006, 2008, 2011, 2013). Digital gaming goes beyond just play and has

pedagogical advantages that model constructionist paradigms (Cipollone et al., 2014; Duvall, Matranga, Foster & Silverman, 2016; NRC, 2000). For the past several years, research on the development of gamification in schools for a constructivist implementation as indicated by Kim's study (2015) suggested that,

> gamification is currently being utilized in education and libraries for the purpose of improving user engagement and instruction. But the goals of many gamification projects do not appear to have been clearly set out before the projects began. This is probably due to the fact that gamification is still seen as a relatively new and experimental strategy (Kim, 2015, p. 29).

Digital gaming and gamification as a pedagogical approach still lacks consistently valid data on the ability to provide evidence of 21st-century skills. The P21.org framework for educators speaks to the drive-in education towards preparing the digital native to be contributory in a competitive, global workforce. Mindsets such as creativity, individually and with others, critical thinking and collaboration, all known as "learning and innovation skills" (P21.org) have profound implications in digital gaming. Additionally, these topics lack narrative data on teacher understanding of how and when to use gaming to promote these skills. Furthermore, few attempts to answer questions on whether teachers see value in this as a pedagogical framework to integrate into the classroom to promote understanding of 21st-century skills as a means of fostering long-term learning have been documented.

This research investigation attempts to examine teacher perceptions on the use of digital gaming in middle school classrooms for learning 21st-century skills. Data collected will include: questionnaires, interviews and peer observations of teachers in Grades 6, 7, and 8 in a pair of

suburban middle schools in New Jersey. The examination of middle school in particular over elementary or high school is intended to address the bridge between skill-based learning to critical thinking, which begins in the middle school years. Social and emotional development of young teens as they explore content ideas with prior rote skills are the core of a middle school philosophy. The idea that students will explore, create, build and expand into higher order thinking paired with meaning and creativity into a real-world application is an extension of the developmental years into early adulthood. Beyond that, problem-based learning, cooperative problem solving, and communication are expanded on in the middle school years as higher-order objectives are being promoted as part of the learning process and complex thinking with rationale are more common in pedagogy. These skills are the core of 21st-century thinking that endeavor to "design learning through purposeful integration . . . in an unprecedented age of agility, innovation and acceleration" (P21.org, n.d.)

Problem Statement

Given the rapid development of software programs and the accessibility of young people to technology, higher education has begun to accept digital game-based learning (DGBL) as a more common pedagogical practice. Elisabeth Gee (2016) of Arizona State University, inspired by the Massachusetts Institute of Technology Game Lab, began to study students in higher education and the role of gaming in the college classroom.

> At the 'macro' level, GBDL- and game-centered research has reached enough critical mass to be a legitimate field of study as well as an increasingly accepted form of instruction across many institutions in less than a decade (Holmes & Gee, p. 3).

The use of gaming with the college population targets future teachers in a medium they have learned from and has potential to be used in their own classrooms one day. Currently, teachers in primary grades have only their professional development, if offered by school districts, or their personal interest to learn about this trend. As the digital native becomes the 21st-century learner with a longer exposure period to digital gaming in his or her life, the more pervasive it has become as part of a cultural expectation to be used in and out of school and has potential to be applied in the workforce.

Middle school, as a holistic school experience, attempts to converge social, emotional, and cognitive learning. Today's teens use digital gaming as a means to communicate, express, and learn. The constructivist approach, by which learning and meaning develop symbiotically, provides insight from building as part of the learning process occurs, showing middle schoolers may use gaming to expand their thinking and higher-order processing and outline social constructs (Moore, 2005). Additionally, they may articulate their rationale and defense for their learning process when using digital games in learning. With a need to foster these learning progressions embedded with a need for readiness for future careers, gaming as a pedagogical approach has potential to assist in the bridge toward knowledge acquisition.

The learning associated with digital gaming vacillates depending on the audience and perspective of parties involved. 'Edutainment' an area that utilizes "video games to educate players" (TechTerms.org, 2019) has potential when framed with rigorous objectives, engaging content and user-friendly interfaces. Improving critical thinking, supporting a growth mindset, and enforcing 21st-century skills are areas of need in the current educational climate, all while balancing the need for high student engagement. Teachers are often perceived as the greatest

influence on achievement over anything else; a powerful commentary on the learning process. There is a need for more data, validity, and measurability on the use of games to enhance 21st-century skills by the teachers creating lessons. Dicheva et al., (2015) research and recommendations note that "techniques such as feedback, ordering learning tasks by their complexity, personalization, etc.are as fundamentally essential for games as they are for education" (p. 2), and the literature is sporadic and minimal. As the complexities of a future ready workforce unfold, a need to understand how to challenge students into meaningful learning and creative problem solving is critical. However, the long-term gains of games used in the classroom, beyond engagement purposes, is still an area to expand upon. While current literature validates student engagement while gaming, the literature is inconsistent on the rigor of content and complexity of the outcomes designated during the game. Furthermore, the literature has also only begun to identify the types of the games that are paired with content to examine the potential links between engagement and learning.

Purpose of the Study

The focus of this study is to address gaps in the literature and explore learning gains through digital gaming as a pedagogical medium from a teacher's perspective. Given this field of study has many unanswered questions but stands on the precipice as a potential means of integration between teachers and 21st-century learners, it becomes critically important to validate every viable tool to connect with the learner and to establish evidence on its ability to measure a learning objective and 21st-century skills. School leaders need targeted and reliable strategies to assist teachers and engage them in meaningful dialogue about effective practice. Due to the lack

of focus and engagement many in education perceive this as a result of a gaming society, the use of games for educational purposes is still in question in its efficacy beyond entertaining and engaging. Educational leaders, teachers and even parents often cite a lack of balance for technology in the lives of today's teens. This mindset, validated or not, may be an influence on educational gaming as it has had a limited adoption despite the increase of technology availability in schools.

Lacking substantial data leads to the question: "What is it that we should *do* with games? That is, what are the underlying assumptions about how educational research should treat these media, and what is their utility in shaping instructional environments?" (Duncan, 2016, p. 247). The Association for Supervision and Curriculum Development (ASCD), has begun to encourage policy to prepare for the 21st-century learner before digital natives join the workforce (ASCD, 2015) by encouraging educators to think beyond academics and link with businesses to work around real-world problems to get students ready for college and their careers. Additionally, the P21 Consortium, a group of educators and businesses working collaboratively, continue to foster relationships to promote funding and resources within states to prepare students for the growing demands of a global and technological workforce. These businesses utilize technology and gaming to support learning, stressing the four C's that make the pillars of the 21st-century thinker: collaboration, communication, creativity, and critical thinking (p21.org, 2018). As the workforce seeks to engage digital natives in their own medium now as students, the learning opportunities have potential that should be researched so that policy can be in place for schools to fund, train, and allocate resources for this learning shift.

Research Questions

In this study, I will attempt to answer these questions and better understand *what are teachers' perceptions of the influence of gaming and student learning of 21st-century skills in Grades 6, 7 & 8?* This study will address the following questions:

1. What are teachers' perceptions of the learning process when using digital gaming?
    a. What do teachers perceive in reference to digital gaming and 21st-century skills?
    b. What do teachers perceive in reference to motivation and learning when using digital games?
2. How do teachers assess the effectiveness of gaming in instruction for the learning process?
    a. How do teachers measure and assess student learning when using games?
    b. What kinds of games are being used, with what efficacy and with what frequency?

Research Design

Through surveys, group and 1:1 interviews and observations in a suburban middle school in New Jersey, this case study will integrate teacher perceptions on the possible benefits of digital gaming in the classroom as a way to promote 21st-century skills. As guides in the classroom in both pedagogy and practice, it is critical to evaluate a teacher's perceptions on the many facets by which games can and may be used in the classroom, it is an area lacking in information beyond what literature indicates about motivation when gaming. Furthermore, to

obtain insight into the possible implications on how this technique may shed light on the student learning process, open-ended interviews are required. While research has contributed to what makes a good game and styles of games used in the classroom, by examining teacher perspectives, we may learn more on this theory and how it influences the student learning process. This case study attempts to contribute to gaps in the literature on teacher perspectives on digital gaming for learning over engagement, an area addressed by current literature.

Definitions

For the purposes of this study, **DGBL** will be defined by the Kolko's Course at the University of Washington: an interactive program for one or more players, meant to provide entertainment at the least, and quite possibly more.

For the purposes of this study, **digital native** will be defined using Prensky's (2001) description and the techopedia dictionary: children who have grown up using technology like the internet.

For the purposes of this study, **game-based learning theory** will be defined by IGI Global's (2008) definition as: "using games on a platform in an educational setting to incentive and "further learning".

For the purposes of this study, **gamification** will be defined using Merriam-Webster's (2019) dictionary: the process of adding games or game-like elements to something (such as a task) so as to encourage participation.

For the purposes of this study, **COTS** will be defined using the techopedia dictionary (2019): a computer hardware or software product tailored for specific uses and made available to the general public.

For the purposes of this study, **serious games,** inclusive of SIMS, will be defined by IGI Global as: A game-based environment where the primary intention is not the entertainment of the player, but the attainment of some other objective which may be related to investigation or players' progress towards an objective of some real-world importance.

For the purposes of this study, **21st-century learning** will be referenced from the P21.org framework. Additionally, the constructs of communication, collaboration, creativity and critical thinking, outlined within the framework as the 4C's will be defined in reference to:

Critical Thinking: Reason effectively, solve problems (use reasoning, systems thinking, make judgements, synthesize, analyze, interpret and reflect)

Communication & Collaboration: Communicate clearly (orally, written, etc., listen, present to a variety of audiences/work in diverse settings, be flexible and show shared responsibility)

A summary of chapters to follow will include a full literature review (Chapter 2) related to the nature of digital gaming and research on motivation as it applies to using digital gaming in the classroom and a chapter on methodological design (Chapter 3) to capture how narrative data will be obtained as well as a full data analysis of teachers' thoughts on gaming to promote 21st-century skills (Chapter 4). Lastly, an opportunity for suggestions on future research and implications for policy recommendations will follow (Chapter 5).

Chapter 2 Literature Review

Shifting Educational Paradigms

The concept of learning and its evolution includes the idea of adapting and extracting meaning from skills and observations. What is deemed meaningful has the individual's own needs and interests driving that pursuit and what we know about what we learn is more studied than how we have actually learned it. Learning begins at birth through observation and modeling to include all facets of social, emotional, and cognitive processes until one's death. In the last portion of the century until now, the neuro-cognitive processes of learning are being included into the transmission of learning as yet another angle to observe, so we might fully understand how information is stored and retrieved differently by so many learners. As meaningful tasks changed from necessity or survival, we are no longer hunter-gatherers and are on to a more self-fulfilling, self-exploratory journey to include and impart knowledge to a changing world laden with access to information at all times. In the book *The Anti-Education Era*, author J.P. Gee (2013), a proponent of digital learning for a 21st-century world, recognizes the history of the learning process and that a need for technology to be a bridge and not be a hindrance are mutually exclusive; "if learning is to be active, it must involve experiencing the world in new ways" (Gee, p. 39). The author challenges people to not use technology as a tool alone to learn from but a tool to learn with. Anecdotally, one of his best examples of this idea is the typewriter, a keyboard invented with letters spaced haphazardly to force people to slow down typing so the type roll would not jam the machine. Today, the qwerty keyboard is still in existence and users cannot type fast enough, but no one has invented a new keyboard (Gee, 2013, p. 89). This story forces educators to reflect on what was *learned* from this process, and was it *meaningful*?

The role of technology in learning presents new opportunities and challenges to the way educators add meaning to learning. Particularly, in the realm of education, technology and learning have still yet to evolve at the same rate with educators who do not feel prepared for the next wave of learners and research data that has yet to validate the role of particular types of technology in the learning process. The history of learning as described by pioneers like Dewey, Piaget, Vygotsky, Reggio, and Montessori all spoke of a learning experience by the person associating meaning to the information and actually doing the learning. For the hundred years that followed, educators studied these trends and patterns to identify and categorize types of learners so they might connect and impart knowledge successfully. Educators today utilize these identified learning styles as a way to capitalize and connect and thereby associate meaning with the learning process. Educators now work with holistic learners daily and must share information, dialogue, experience, collaboration, and interaction; something held to be as equally as important to crystallize and master that information. The educators of today stress the experience and presentation of information as symbiotic for the learner to be successful.

In the past twenty years, as the experience of living and learning becomes more digital, the presentation of information to students has not evolved as quickly as the technology allows. Teachers find themselves behind the curve of their current students who have been born as "digital natives" and obtain and access information at an astonishing rate. The experience for today's learner is far more rooted in a style of learning educators are still trying to ascertain for value and meaning. Today's "digital native" is the next generation of learners who meld societal drives from technology and traditional learning (Gee, 2003, 2013; Squire, 2005, 2006, 2008, 2011, 2013). When studying video games and learning, Squire (2011) specifically notes that

"good educational games employ academic knowledge as a tool for achieving goals" and that games "lend themselves to systemic understanding," "pique players' interests" and "are social" in design (Squire, p. 36). To further validate digital learning and what makes it 'good' digital learning is that it must have a basic characteristic that "requires a deep commitment to content-driven learning" and "requires interest-driven learning, like with Montessori and Reggio" (Squire, 2011, p. 59). Squire (2005) continues to extensively study the effects of gaming on students, noting from research "game-based pedagogies may not produce traditional literacies as efficiently and effectively as traditional approaches do but they may help students develop literacies better suited for a digital age" (Squire, p. 41).

In 2002, the P21 consortium, a collection of businesses, educators, and entrepreneurs, aligned to increase global awareness and enact policy on digital learning for the future of education. With a need to foster digital natives in their environment, they worked on an assessment of skills required by global businesses to develop a framework of learning to support digital thinkers (P21.org, n.d.). Their work and their partnership with Future Ready School program (FutureReady.org, n.d.) have allowed educators to plan and think backward toward a changing business world, allowing students to be ready for a globalized workforce with greater success. The idea of '21st-century skills' in education emerged due to the demands of an ever-increasing technological and digital society. The U.S. News and World Report on jobs (Koenig, 2018) spoke to these skills present in millennials that set them apart from their counterparts, citing collaboration, problem solving, strong communication, and tech savviness as a plus for the changing workforce. Furthermore, the Future of Jobs Report by the World Economic Forum in September, 2018 stated that the United States stands to lose 1 million jobs by 2026 to automation

and technology. The Future of Jobs Reports additionally stressed a need for "education and skills levels of individuals of all ages, particularly with regard to both STEM and non-cognitive soft skills, enabling people to leverage their uniquely human capabilities" (Stefanova & Leopold, 2018).

The digital landscape, inclusive of gaming, sees games as a universally accepted construct for information gathering by digital natives and supports positive competition and a social connection. Digital natives use digital game play similar to traditional game play as a way to communicate, socialize, and derive meaning. Active learning and processing require a skill set that forms from trial and error, curiosity and problem solving; "games provide learners the opportunity to learn by doing, experience situations firsthand and role play" (Annetta, 2008, p. 233). Video games have become so popular because there is immediate feedback, problem solving, and critical thinking, as well as competitions, points, badges, levels, etc., so it stays consistently engaging. Additionally, unlike the traditional classroom where students are taught and then assessed in a final, linear path, games allow for "multiple lives" when problem solving. This opportunity alone teaches about failure and fortitude in the learning experience. For those educating young learners today, the idea is not about getting information to them but teaching them what to do with it; many digital natives prefer this strategy, so, if there are learning opportunities, researchers and educators should teach them (natives) how to use it appropriately (Bourgonjon, 2010, p. 1152). Teachers today are faced with an influx of immediate knowledge access possessed by students, but how to teach students to process, funnel, and apply it is the new realm of challenges. With education still behind the gaming industry, the incorporation of technology successfully to focus equal access of information and to build ideas and skills

becomes the new challenge. Today's educators and learners seek a balance of information presented and assessed via a digital platform as part of the teaching and learning experience. In an expansive study of the widely popular online game taking over schools, Cipollone et al., (2014) looked at Minecraft's engaging and motivating properties as well as the embedded skills noted like collaboration, strategic thinking, and critical analysis. The author notes that research and learning opportunities exist in the virtual world via constructivist approaches via sandbox games. The author encourages those using digital learning as the next style of teaching to continue researching its efficacy and adopt a philosophical approach where "successful use of the technology will depend on the acceptance of a new style of teaching and learning, one that is centered on explorations, productive skills, and self-centered artifacts" (Cipollone et al., p. 3, 2014).

Playing to Learn

Game play models competition, socialization, and learning through mistakes, all concepts that are highly engaging and meaningful and are part of the learning process (Gee, 2003, 2013; Prensky 2001; Squire, 2005, 2006, 2008, 2011, 2013). As coined by Gee (2013) in the description of today's digital natives, "humans are in a simulation, learning from their experience, but they have to care about what they are doing to make it a meaningful learning experience" (p. 13).

Digital gaming and learning in a constructivist platform can serve as a connected social highway to be leveraged for learning and bridging age, gender and socioeconomics (Gee, 2013). And while online videogames are a form of social connectedness, they can extend beyond

entertainment or hobby from the natural form of play to a modern form of learning (Nolan & McBride, 2014). Today's digital learner can be accessed globally and instantaneously, is collaborative, and can be monopolized from the perspective that "meaning making occurs not independently within the individual but in conjunction with other people" (Gerber & Price, 2013, p. 18). This new digital learning model has been under examination by education researchers as they attempt to connect with students beyond the idea of just a device, but with the user experience in mind.

As digital natives travel through the current educational system as it is designed, their demand to be engaged, entertained, and challenged and receive custom, individual, and immediate feedback is imminent; students of today learn with a videogame mindset and "many are recognizing that the learning principles embedded in computer and videogames reflect the best theories of cognition, yet are underutilized as an educational resource" (Squire, 2008, p. 240).

A constructivist approach to learning, as defined by both Dewey and Piaget, uses the idea of experience and play to learn. Piaget, particularly with his theories on child development stages, references learners to be a building block of their own knowledge, taking prior experiences to connect, revise, and build. Gaming allows for this personalized learning experience of trial and error with multiple pathways to complete the objective. As the learner progresses, there is an exploratory component where self-directed and self-driven discovery from enjoyment and engagement are linked. The gaming industry has mastered this concept for entertainment and bridged it into 'edutainment' as the next market to engage digital natives into another realm of learning.

As educators define the 21st-century learner, a need for digital assessments and content for engagement and learning has spawned an industry based on a global demand and the current workforce. “How will educational technologists respond to a generation of students who, raised on interactive games, expect the same kinds of interactive experiences from their educational media?” (Squire, 2005, p. 34) Educators today must constantly reflect on their practice as they see that digital entertainment and learning are now the learning style that is not only preferred but a bridge to connect meaningful learning in context for digital natives.

The gaming industry, from the entertainment perspective, continues to explode with respect to overall users and revenue. As educators have had to adapt to this influx of outside access and how to use it for learning, schools have spent most of this century trying to catch up in a variety of ways. By the mid-2000s, as schools distributed devices into the hands of every type of learner and began training teachers, the next wave of ideas on how to promote effective learning and keep engagement high emerged (Gee, 2003; Prensky, 2001; Squire, 2003). From a constructivist perspective, Gee’s research on “active learning” and Squire’s on “productive play” suggest that gaming had educational potential. Despite this compelling argument, in its infancy, education married to video games appeared dangerous by educators and parents for the possible link to violence. To address this, theorists examined what did work about games and attempted to qualify and quantify “good gaming” to promote various skills. “According to Ito (2013a), connected learning ‘seeks to leverage the potential of digital media to expand access to learning so that it is socially embedded, interest driven, and oriented toward educational, economic, or political opportunity” (Gerber, Abrams, Onwuegbuzie, & Benge, 2013, p. 19).

Marc Prensky, former director of human resources of a Fortune 500 company, recognized a change in learning within his own organization at the turn of the millennium. Beyond Power-Points and training manuals used with new employees, there was a need to make a meaningful and engaging learning experience for employees, so, turning to the changing face of the internet and model ideas like Foursquare, the idea of digital game-based learning (DGBL) was born. Prensky's idea for training within companies, incentivized credentials and positive competition became a template for human resources within companies quickly. As the turn of the 21st-century came about, researchers and authors such as Gee and Squire recognized that this learning strategy had impacts beyond advertising and training but would eventually change a generation of digital natives toward a new thinking and learning paradigm. This preferred medium is still under research on the effectiveness and impact towards the learning, with positive results for engagement, currently. The research on the impacts of gaming environments with certain ages or certain content is limited and sporadic in the realm of education, particularly K-12; however, the ideas, now almost twenty years old, still have relevance and a need to be studied as the digital environment exponentially expands in every facet and is still lacking in schools. "Games can be beneficial if well designed to indicate learning objectives in the context to be studied without losing the game mechanics that make the games successful" (Gerber & Price, 2013, p. 17).

In review of the literature, one notes the limited expanse of relevant data, with some contradictory data, however compelling data that validates gaming with respect to engagement. Studies on either gamified environments, scenarios by which a class had a gamified experience, and classrooms that utilized outside games to introduce concepts represent the bulk of study. Noting that both terms, while generalized, have an industry application versus an educational

application, the specifications for practice are similar. Purists in the field are advocates for the differences in application and use but still hold to the idea of a universal "good game design" inherently shared by both. Early research examined the quality of a good game to mark its effectiveness, particularly in the area of engagement. However, as educators see these concepts as new, there is a blend or misuse of the concepts that has yet to be studied or addressed. In a study by Wu & Wang in 2012, a research team reviewed current literature on digital gaming to find relevant features and how to apply them in the classroom. Their research noted games are engaging and evidence to support this, so gaming could be used as a springboard to diversify teaching and learning. Simultaneously found by their team, however, was that there is little pedagogical evidence to support gaming and constructionism. And while DGBL uses good gaming concepts and actual video games, and gamification uses the same foundation with competition-based gamified concepts, educators have blended portions and may be losing sight of the purpose in favor of copied practice due to a lack of professional development.

> The problem is that like many rapidly growing industries, advances in video game technology are far impacting research on its design and effectiveness. Relatively little is understood about how to apply what we know about teaching and learning to optimize game-based learning" (Kebritchi, 2008, p. 1730).

Additionally, "even though games hold potential for engaging and facilitating learning . . . (DGBL) is still meeting significant resistance" in schools and "no study found on game adoption in schools" (Kebritchi, 2009, p. 256) from this. This evidence, only ten years old, speaks to the lack of consistent data and the massive gaps of areas to overlay in research for further dialogue.

As digital natives now enter the workforce, and more so, college teaching programs, the use of gaming and the use of gaming for learning will need to be examined.

Are We Hooked?

If learning is social in nature and needs connections and crystallization to make it meaningful and a social construct to form it, how technology is used to engage the learner and promote the mastery of skills with efficacy and validity remains unanswered. In 2000, the National Research Council in *How We Learn* noted several key ideas. The council's research expanded on educational theory such as children, after taking their perceptions and prior knowledge into account, when learning must have facts, context and meaning. This connection allows for meaningful retrieval and application of ideas; therefore, it is critical to offer learning and teaching that has several aspects. The foundations for meaningful learning and having it transfer from one place to another successfully lie in use learning that is relative, providing varieties of feedback in multiple forms, to ask critical questions and creating a learning environment for students.

> Children are problem solvers and problem generators . . . they seek novel challenges.
>
> They refine and improve . . . in the face of failure but also by building on prior success.
>
> Children's curiosity and persistence are supported by adults . . . who structure experiences,
>
> support their learning attempts and regulate . . . levels of learning. (NRC, 2000, p. 112)

These universal concepts go beyond the playground and the classroom by applying to online experiences as well. Those in the educational community must then ask, instead of technology as

a tool *of* education, how do we make technology the tool *for* education? Game based learning should endeavor to take the idea of teachers and the tool of technology and pull the best from them both. As a collaborative tool, engaging lessons with content delivery in an engaging strategy allows this as a symbiotic union. Today's students have been raised with the internet, so technology for engagement and socialization and information exchange is their norm. Educators now must use those embedded skills in an effective way in the educational setting to promote and track learning.

The ideas of learning through digital gaming emerged around 2001 with pioneers such as Prensky, Kapp and Gee, who have focused their research in the last ten years and refined the ideas from this concept into digital game-based learning (DGBL) and gamification. By 2010, research in the educational community was defining the ideas into a realm by which educators could gamify the experience for the learner or use games to engage the learner to then promote a skill. In 2013, an encompassing literature review by Future Labs, a UK research think-tank, stated digital learning was "hard to define precisely . . . but that people are 'moving towards a definition'" (Kirriemuir & McFarlane, 2013, p. 7). This same study reviewed how current literature was shedding light on differences in the theories, supportive data, and areas of needed research for those in education and the industry. The current literature points to a universally accepted idea of gamification as a concept to promote learning, DGBL, but a mechanism to do so in education versus industry still remains undefined (Gerber, 2012).

DGBL, the slightly older of the concepts, also rooted in Game Theory, relies on critical thinking, strategic planning, cooperative practice, and healthy competition to problem solve.

DGBL, explained by Paul Kapp and Kurt Squire, looks into the motivation of games with an overlay of content learning to create meaning. Videogames are viewed as an experience, whereby context and play are linked (Cipollone et al., 2014; Gerber & Price, 2013; Kebritchi, 2008; Plass, 2015; Squire 2005, 2006, 2008; Wu & Wang, 2012). The 2013 team at Future Labs expanded on this concept when conducting an encompassing literature review, concluding that "video games support teaching and learning . . . where people learn by trial and error" (p. 7). One of the most popular examples today utilized by educators is Minecraft, where a virtual landscape is created by the user to build at their own pace and create a unique and individualized experience where the objective is driven by the user experience. This idea of a sandbox game, one void of a narrative for the user, has potential to build learning constructs from the idea of building off a virtual world as its outcome (Cipollone, 2014).

Gamification, for the purposes of this study, is defined as "a system in which players engage in an abstract challenge, defined by rules, interactivity, and feedback, that results in a quantifiable outcome often eliciting an emotional reaction" (Kapp, 2012, p. 7). Gamification, which, according to current literature, is studied for its efficacy for student engagement, is being used by teachers for the purposes of both engagement and assessment in learning and is beneficial in that it provides immediate feedback to the user. Developers of digital games create programs used to model a gaming experience for use in the classroom. Gamification, an offshoot component within DGBL, but also a stand-alone concept, goes beyond the playing of games. The implication for classroom pedagogical techniques can take the form of leaderboards and competitions in games, such as with games like Kahoot and Socrative, but does not model gaming in its purest forms but could with that intent when designed. Any COTS, sandbox game,

or traditional game can be “gamified” when certain techniques are embedded (Gerber, 2012). Kim (2015) through his research notes “many gamification projects do not appear to have been clearly set out before the projects began. This is probably due to the fact that gamification is still seen as a relatively new and experimental strategy” (p. 29).

In examining the research, a great deal of effort to define the tenets of a “good game” or “serious game” is an interplay of objectives, skills, the user experience, the environment, and engagement. The idea of games for educational purposes has been broken down into these various styles of games (COTS, sandbox, serious) all while embedding certain common characteristics such as feedback loops, high engagement, and a specific learning objective. However, any of these games or a non-digital game can also be gamified to model a similar environment to induce engagement (Bakar, Inal, & Cagiltay, 2006; Cipollone et al., 2014; Gerber, 2012; Squire, 2006).

These common characteristics were studied in a backward design fashion to extract the common themes that now define a “good game.” Current literature notes the learning environment for the user is equally as important to foster engagement as the content, context, and objective, and that this juxtaposition of all these themes most work with congruence (Bakar et al., 2006; Cipollone et al., 2014; Gerber, 2012; Squire 2006). Specifically, Squire’s use of three COTS games with teachers to analyze potential for learning outcomes demonstrated potential in that the games possessed these tenets. Research studies to follow specifically looked at games for content Pasterigou (2008) as well as Cipollone, et al., (2012) work on Minecraft as a sandbox game with teachers and Dominguez (2013) study using a gamified Blackboard classroom with higher ed students; all demonstrating promise that a ‘good game’ could be used to foster

engagement. All these studies referred to the idea that further evidence was required on the potential of learning from said engagement as potential next steps. Furthermore, the potential for use by these students and future teachers was suggested as fully dependent on adoption of the potential of the game to boost learning. This current research points to gaming as a concept for learning as critical to good game design, and that teachers will need guidance on identifying these games if they are to be used in a way most beneficial to the user.

Gamification to promote learning still lacks valid data on its ability to provide measurable or narrative data on teacher understanding of how and when to use gamification and has unanswered questions on whether teachers see value in this as a pedagogical framework to integrate into the classroom to promote student learning. As outlined by Kapp in 2012, there must be "careful and considered application of game thinking to solving problem . . ." where users and teachers use "all the elements of games that are appropriate" (Kapp, 2012, pp. 15-16).

Given the rapid development of software programs and the accessibility of young people to technology, higher education has begun to accept this mode of instruction more prolifically. Elisabeth Gee inspired by the MIT Game Lab and her husband James Gee began to study students of all disciplines at the level of higher education and the role of gaming in the college classroom in the hopes that these digital natives will provide insight as to suggest the need for teaching at all levels to adjust to this learning style. "At the 'macro' level, GBDL- and game-centered research has reached enough critical mass to be a legitimate field of study as well as an increasingly accepted form of instruction across many institutions in less than a decade" (Holmes & Gee, 2016, p. 3). And while higher education researches the use of COTS and gaming platforms to disseminate learners who choose to be there, there is still a requirement of

engagement for the learner to connect with the material. If these digital natives currently enrolled in college require the same type of engagement in the workforce, they will also need the skills to meet the demands of a globalized workforce. Even more so, if these college educated professionals enter in teaching the next generation of learners, this learning medium may become their teaching medium. This constructivist thinking style, leading to a potential constructivist teaching style requires further reflection for the future teachers of the next wave of digital natives.

The purpose and value of gamification and DGBL vacillate depending on the audience and perspective of parties involved; teacher, student, and even game developer. Improving critical thinking, supporting a growth mindset, and enforcing 21st-century skills are areas of need in the current educational climate, all while balancing the need for high student engagement. Schmoker (2011) noted in Leading with Focus that the future administrators and educators should be most concerned with ideas of the content and quality of teaching above all things. There is a need for more data on the validity and measurability of the use of games to enhance these skills by the teachers creating these lessons. Dicheva's (2015) work references that:

> motivation is a very central and fundamental topic in education (different from other contexts of application of gamification), and a lot of research has been done on it. Also, techniques such as feedback, ordering learning tasks by their complexity, personalization, etc., are as fundamentally essential for games as they are for education (p. 2).

However, the long-term gains of games used for both context and content are still emerging. Mores, to promote mastery of skills, do these programs have other embedded techniques with respect to student learning? In the past seven years, 'serious games' have been

labeled as such in that they contain characteristics of good games but also contain content to promote learning, be it in a sandbox form (no narrative and constructivist in nature) or COTS (narrative has embedded objectives). However, despite this validation from this released research, gaming has a limited adoption despite the increase of technology availability in schools. Duncan's (2016) study noted:

> As with many new subfields, the rise in educational work on digital games in education was initially typified by boosterism, advocacy, and speculation, rather than rigorous empirical research. The early history of games and learning was replete with enthusiasm for the medium with initial insights and directions for the field often coming from academics' and practitioners' personal experience. Underlying this criticism has been a nagging, still-unanswered question: "What is it that we should *do* with games? That is, what are the underlying assumptions about how educational research should treat these media, and what is their utility in shaping instructional environments? (p. 246).

While the current literature around the topic speaks to the engagement of students as a validated motivator, the question about the learning as a factor is yet to be addressed either with DGBL or gamification. "Evidence suggests . . . (gaming) can improve engagement and motivation, but don't rely on games to improve attainment, there's still a lot we don't know about the impact of video games on learning" (Kirriemuir & McFarlane, 2013, p. ii).

Constructivism and the making of a good game round out the most recent literature for the potential to impact learning. The "patterns of practice" noted by Kebritchi (2008) and the idea of making a game building off a constructionist approach to learning (Kafai, 2006, 2015) use the premise that good game structures linked with high engagement can target learning (Tsai,

Yu, & Hsiao, 2012). Successful game design drives engagement and constructivist learning. The immediate feedback validates the learner experience, keeps the objective as a pursuit and continues the potential for learning and enjoys the process (Iten & Petko, 2016; Ke, Xie, & Xie, 2016; Tsai, et al., 2012).

Knowing the current literature has validated qualities of a good game alone, researchers and practitioners caution those utilizing these strategies.

> "Without proper gameplay . . . we risk "redefining" the idea of play for the next generation. We are allowing the game creators mandate over educators . . . There is a question of whether these school-approved games will actually engage the children meaningfully in curricula and activities that hold no intrinsic value" (Nolan & McBride, 2014, p. 596).

Research 2.0

Given this field of study has many unanswered questions but stands on the precipice of a means of integration between teachers and the 21st-century learner, it becomes critically important to put into the hands of today's teachers every viable tool to connect with the learner. School leaders need targeted and reliable strategies to assist teachers and engage them in meaningful dialogue about their effective practice. Literature suggests that the link between motivation and engagement may point to learning inherently with the learner in the process of play (Iten & Petko, 2016; Ke et al., 2016; Tsai et al., 2012).

The connections between flow, cognitive learning, and development need further investigation. These two particular studies shed light on that digital gaming affects many areas of

the brain and learning that go beyond social interactions. Through critical thinking and analysis, learning by doing, and failure with feedback, games provide, when designed well, a continuous experience for learning. Both caution that learning is a complex process with many areas to tackle with regard to digital gaming for learning. This recent idea of engagement in a digital venue has prompted educational psychologists to look for a grounded theory and was linked to Flow Theory, by Mikhail Czalimalisnky. If learning can be captured while playing digital games while tracking the flow experience, then perhaps more concrete data can be obtained (Iten & Petko, 2016). Intrinsic motivation and the relationship with cognitive input is linked back to the days of Montessori and Reggio, and digital gaming for learning is simply the latest platform by which these theories have shown grassroots. This one study introduces the first attempt to quantify and capture learning while in the flow zone. When thinking about being in the zone, engagement, joy, and learning all intersect and the brain is taking information at a deeply rich and contextual level. The idea of studies tracking longitudinal growth was in absence, as noted by Young, Slota, Cutter, Jalette, Mullen, Lai, Tran, & Yukhymenko, (2012) speaks to the need to collect long-term and valid data on a potential link. And while some students engage in flow thinking more than others, the benefits create a lasting impact triggering engagement and a desire for further learning in a digital medium (Oliveira, Bittencourt, Isotani, Dermeval, Marques, & Silveira, 2018).

Additionally, beyond engagement as a potential link to foster learning is to validate good game design and its link to learning; “we need to go deeper and go back to Gee’s learning principles on learning and see where we are falling short” (Gerber, 2012, p. 3). A DGBL curriculum should have elements of good gaming from validated data, that support through

teacher professional development and activities. This speaks to the definition outlined by Kirriemuir & McFarlane (2004) referenced by Denham (2016) that GBL learning ideas should "have a game at their core, either as the main action or a stimulus for related activities and have learning as a desired or incidental outcome" (Denham, 2016, p. 1) but as noted with this prior research, to date, no data have been obtained in this specific area.

From a teacher's perspective, flow, or 'being in the zone' can be noted by educators when students are engaged in the classroom in a digital medium without knowledge as to how or why or what, long term impact it may elicit. While many seem to be able to note enjoyment in the game, there may be more to enjoyment in the task objective of learning and changing based on the game's feedback while playing. In order to validate what may be going on, it is worthwhile to note what teachers observe when using games in the school setting for a learning objective, beyond social growth and overall engagement.

Contributing to the Literature

This study expands on the aforementioned research gaps to collect perceptions by teachers on the impact of Digital Game Based Learning for instructional purposes and learning opportunities. The researcher endeavored to examine teacher perceptions on use of gamification elements and digital games in middle school classrooms for instructional gains. In order to see teachers' perceptions on the differences of the two theories and how they may elicit learning, questions were posed on gaming and 21st-century skills; communication, collaboration and critical thinking. Data collected will include questionnaires, interviews and classroom observations of teachers in Grades 7 and Grade 8 in a pair of suburban middle schools in the

same district in New Jersey. The district has been a 1:1 district for over fifteen years with a validated system for technology devices for students as well as for teacher training in using the hardware and software to support student learning.

The idea is to understand more about why teachers may or may not use digital games in the learning environment and more importantly do teacher's perceptions on gaming impacts on learning have merit. As the digital world expands, the need to see the role of digital games in the classroom learning environment is a critical point for reflection as a pedagogical practice. Meanwhile, as the gaming industry pushes 'edutainment' masked as a potential learning experience, new programs and philosophies will require more valid data to validate learning experiences. 21st-century skills, as previously defined, have made a strong presence in the current educational landscape, thereby looking towards the role of digital games to speak and promote these skills, has potential for investigation for its contribution.

Conclusion

While the emergent field of digital learning is new for educators, for digital natives, their learning style and medium preference far exceeds the data and knowledge currently collected. As video games grew in popularity along with accessibility, the benefits of a quality game showed not only high levels of engagement, but the potential to bridge skill barriers and present content. The remaining chapters present a juxtaposition of ideas based on gaps in the literature. The attempts in this case study are to collect ideas on learning specific 21st-century skills while gaming from a teacher's viewpoint.

Chapter 3 Methodology

This qualitative case study attempted to capture teacher perceptions on the use of digital gaming in the middle school classroom for the purposes of assessing student learning on 21st-century skills. In particular, when using games, the researcher attempted to understand the ways by which 21st-century skills such as collaboration, cooperation, and critical thinking are understood and perceived by teachers using classroom gaming. Interviews with middle school teachers who used digital games were chosen from purposeful sampling methodology that included their years of teaching and frequency of game use with students in the classroom and then interviewed. The researcher collected observations of teachers using games to analyze these skills.

Qualitative research over quantitative research looks at phenomena going on within populations to establish ideas, meaning, and connections between experiences. Qualitative research was chosen for this study in that this type of research is "interested in the meaning people have constructed" (Merriam, 1998, p. 3) to specific experiences and interactions. Case study analyses are undertaken as a way to view phenomena within a group of individuals from both holistic and detailed perspectives. Long periods of time immersed observing the culture and practice of this group allows the researcher to examine the daily activities to obtain a "strong handle on what life really is like" (Miles, Huberman & Saldana, 2014, p. 10). For the purposes of this single case study, because the phenomenon has multiple factors that may or may not contribute into it, Creswell's 2012 model will be employed, thereby the use of observations, field notes, and other documents will be utilized to get a detailed account of these perceptions.

Sampling Criteria

The pair of middle schools were chosen from within the same district in a larger district in northern New Jersey. With a commitment to technology use and supportive professional development, in addition to goals to globalize thinking, the district represents an array of socio-economic backgrounds and is rich in diversity. With the strong commitment to technology use for both students and staff members, the district has more than 7,000 students and more than 600 teachers spread over 14 schools, including the two chosen middle schools. The DFG rating is "GH" (NCES.gov, 2018), and with the district's continuation of technology initiatives, this year's district goals include: "expand the 1:1 device initiative to the middle school setting," foster STEM learning, and offer more "borderless learning opportunities" (Parsippany Troy Hills School District Goals, http://pthsd.net).

Each middle school has students in Grades 6-8 with all utilizing a 1:1 initiative in place for some time. The initial purpose of the digital survey to staff members was to obtain nominal data boundaries inclusive of years' experience, educational levels, and prior experience with gaming to provide heterogeneity in the sample set. Both middle schools have commonalities beyond grade level with the 2015-16 data from National Center for Educational Statistics (https://nces.ed.gov) reporting the following:

Table 1

Schools Demographic Information of Two Suburban Middle Schools in New Jersey

	School A	School B
Title I Funded	No	Yes
Staff Population	90	78
Student Population	879	790
Gender Breakdown Male Female	 439 440	 421 369
Demographic Breakdown Asian Black White Hispanic	 375 22 371 87	 369 25 331 107

However, as noted, one of the middle schools received Title I funding, while the other did not. In an attempt to capture teacher demographics, education beyond the undergraduate level may have been influenced by Title status so a question on "highest degree obtained" was included in the initial survey to control for certain variables as possible influences.

Data Collection

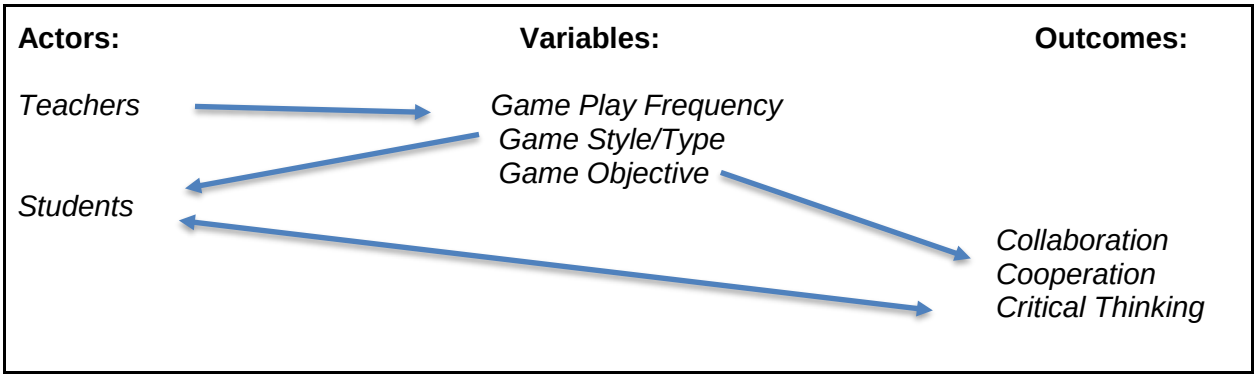
With a critical need to evaluate teachers' perceptions, a qualitative design was necessary to account for the many facets by which teachers can and may be using gaming in the classroom. According to Yin (1994), a case study will allow for "investigations within real world context". Furthermore, to obtain insight into the possible implications on how this technique may shed light on the student learning process, semi-structured interviews will be employed and later

coded (Miles et al., 2014). While research on student engagement and gaming has been obtained from a quantitative and qualitative perspective as outlined in the literature review, by examining teacher perspectives, we may learn more about how gaming influences the student learning process in regard to skills being acquired. A conceptual framework (see Figure 1) was outlined after the development of research questions guiding this study. These questions drove possible domains as variables, actors, and outcomes as a potential template to then assist later with coding, as outlined by Miles et al., (2014) methodology. The use of engagement as an intermediate, or short-term outcome as outlined separately as an outcome based on the previous literature. As a short-term goal this outcome could be further isolated from other long-term goals, those specified as 21st-century skills, to see potential relevance and/or relationships as constructs.

Conceptual Framework

Figure 1

Conceptual Framework of Actors and Outcomes



In order to validate the themes driving the framework and the questions for the interview protocol, the researcher will meet with volunteer staff members in her own district to reduce bias

as a component of the methodology (Miles et al., 2014). The site district of the researcher is noted as Bronze Status as a Future Schools Ready, is a Google Certified Reference School, and has complete use of Google suite tools and classroom by teachers. The district has been issuing micro-credentialing with students as part of a problem-based learning initiative (PBL) to empower students with 21st-century skills. All staff members have been trained by the Google Summer Institute on G-Suite tools and participate regularly in professional development best practices in the realms of 21st-century skills and technology for learning.

During an open professional learning community (PLC) forum, pilot staff members will be introduced to the survey and will share in an open dialogue as the researcher takes memos and field notes of said dialogue. All notes will then be taken to a member check after suggestions have been compiled and then validated for reliability. During the mentor check, the conceptual framework may or may not be adapted to drive potential domains for future coding from these ideas (Miles et al., 2014). A need for predetermined codes by factors will not be applicable at this time as this research is addressing gaps in the literature on perceptions on gaming for learning and the conceptual framework, as well as research in this area has been loosely established.

Methods

Following any updates to the framework, the researcher will introduce herself and the purpose of her study to all staff members in the selected district at each middle school separately. In order to refine the sample size, the questionnaire will collect nominal data to help create initial codes for organizational and management purposes as a cross reference to the conceptual

framework. Questionnaires will be given digitally to all staff members in both middle schools and grouped based on the number of respondents. Nominal data obtained will be used as ways to organize and group participants for a later date, and consent to be contacted for future interviews will be obtained. The groups will be initially separated by each school, listed as school B or school C. Teachers will be asked about their credit status, years of service to validate and memorialize their years of practice as well as education. Beyond that, their discipline or content area will be recorded, as well as the number of times they use a digital game. During the interview protocol, they will also be asked about their experiences with either in district or other venues by which they may have obtained professional development on the topics of digital games.

The sampling criteria obtained to differentiate by schools is that within the district, one is a Title I funded school, and one is not. Teachers working in Title I funded schools, depending on the content area, are eligible for loan repayment by the Department of Education and therefore may have impacted future schooling of teachers by location. Additionally, years of teaching may obtain different types of data including a willingness or unwillingness to embrace new technology or methodology, such as games, as noted in current research (Bakar et al., 2006; Becker, 2007; Bourgonjon, 2013; Denham, 2016; Hunt & Jones, 2015; Kebritchi, 2010). Lastly, teachers who are recent graduates of undergraduate teaching programs may or may not have been exposed to teacher coursework on gaming and technological pedagogy beyond district offering impacting their usage of gaming.

Once digital surveys come in, an initial grouping using the precoded nominal data will be done to schedule 1:1 interviews. As noted, questionnaires and interviews are of use for their

ability to be both “concrete and measurable” and contain a “special kind of information” (Merriam, 1998, p. 69 & 71). This purposeful sampling will help organize groups of teachers around domains to later assist in tracking themes and ensure validity when obtaining a representative, equitable sampling. Purposeful sampling is used in qualitative research because, as per Liamputtong (2013) it is “information rich” and provides “deep insight”. This initial questionnaire will vet a large enough sample of teachers who are/were game users to assemble perceptions on the use of games for instructional purposes to achieve learning gains on 21st-century skills while accounting for other variables such as experience and comfortability as noted in prior researchers’ designs.

The scheduled interviews will be recorded with a Samsung Galaxy S10 phone using the Android application Voice Notes. In order for the researcher to maintain a welcoming and open atmosphere, the focus will be to keep eye contact, engage in active listening, and focus on the interviewee. Listening, being flexible and allowing the interviewee to be the expert is the most recommended approach to foster rapport and trust (Bogdan & Biklen, 2007, p. 167). All respondents’ interviews will be labeled with an alphanumeric code to protect anonymity of respondents, and interviews will be conducted offsite at a time, place, and location of choice of the interviewee. Beyond trust established by the researcher and the interviewee, a need to protect their anonymity will foster honest responses as well as reduce any coding bias after transcription occurs. Field notes in a small notebook will be used during interviews to record ideas on thoughts, feelings, and perceptions to be transcribed along with interview recordings to increase validity. Within 24 hours of each interview, a contact summary sheet of basic themes will be collected (Miles et al., 2014, p. 127). The use of the contact summary sheet in congruence with

member checks will reinforce themes emergent in interviews. These themes will be organized into coding categories in two waves: the first to validate the conceptual framework's domains, making changes as necessary, and the second to categorize codes into a schema based on patterns of responses. Member checks may or may not be with the mentor or with coders depending on the data flow.

The use of a summary form will be used at the immediate end of each interview. An initial reading first to obtain general domains will be done of the interview along with the summary sheet to look for patterns. A second read will be done along with field notes, and identified domains will be organized to develop a continuous, fluid, and open-ended coding system; "data must be organized and reduced so that the ideas, themes, units, patterns, and structures within them begin to become apparent" (LeCompte, 1999, p. 45). An open coding scheme will allow for further development of trends in data during future reads. After sampling this methodology with 1 interview from each subcategory, codes will be expanded by emerging patterns as the data are cleaned to further expand out on trends. This type of item analysis as outlined by LeCompte, along with usage of Spradley's descriptive analysis techniques (LeCompte, 1999) will allow for ongoing identification of themes. A Google document (codebook) will track all codes and sub codes based on organization of data and include feedback reflections side by side during the process. All codes will be shared at member checks along with reflective memos to validate coding schemes, eliminate bias, and attempt to increase reliability of data.

Group interviews of selected staff using games will be conducted after the completion of interviews to provide as a member check to clarify themes and influences. Group interviews for

staff at the conclusion of the 1:1 interviews will be obtained for staff that target and identify such specific skills of communication, collaboration and critical thinking. Those teachers using games will be asked to further expand overall around these topics. The groups participants discussed, for validation, evidence of themes and evidence of identification of skill levels of those 21st-century skills. Teachers openly discussed the types of games that spoke to those skills best and ways they as teachers perceive these skills to enhance and contribute to the learning process while gaming. This informal, collaborative setting allowed teachers to expand and dialogue as open-ended questions were presented from the protocol, to further speak to how engagement, a short-term outcome, allowed them to perceive other long-term outcomes, i.e., 21st-century skills in the learning environment.

Data Management

All interviews were transcribed in Samsung Voice Notes and read a second time, being edited in a Google document from the interview recordings. All domains, factors, and codes were managed in a secondary Google document. The use of a Google document was to allow for tracking via date and time stamp trends and edits by the researcher in real time. A backup of the Google documents, both transcripts and codes, was stored onto a flash drive. Additionally, Samsung Voice Notes and all documents were kept in a hard copy deposit box to maintain confidentiality of data and responses as a secondary backup.

In order to increase validity and reduce bias, Creswell's (2012) model of qualitative research was utilized as an overarching model to analyze collected data. As such, the "1) reading of data such as transcripts, 2) coding and reducing data, 3) using codes to develop themes, 4)

connect themes, and 5) construct interpretations" were all employed as a model to organize and manage large amounts of data into useable evidence (p. 254).

Field Notes and Memos

As outlined by Miles et al., (2014), memoing is useful in the ability of themes and clusters to emerge (p. 96) with an intent to get themes or ideas for the purposes of coding. This practice allows for data to be documented in a secondary way, increasing the validity of what can be obtained. Notes and memos described the setting, time, and location of interviews and data about the participant. This information went beyond the demographics of the survey but encompassed effect, mood, and overall participation response. Additionally, nonverbal responses that require prompts by the researcher to verbalize thoughts and feelings are noted and recorded to match the tone and response of participants during the interview process (i.e., head nods or tilts, etc.).

Coding

The reduction of data into a more manageable pattern to expand on the conceptual framework was done so as outlined in LeCompte (1999). The utilization of LeComptes' methodology is to clean and code data allowing for reliability checks and increased validity of data but also by reducing the bias of interpretation.

With the development of the conceptual framework, there were partially predetermined themes. According to Merriam (1998) "qualitative design is emergent" (p. 155) and the data process "recursive and dynamic". Predetermined codes were not immediately available; however, some domains (themes) were identified from the researcher's initial questions that

were utilized to create the conceptual framework. To that end, a hybrid approach of deductive and inductive coding will be utilized (Miles et al., 2014, p. 81). The topic of digital gaming beyond the uses of engagement into a learning paradigm has been referenced to have potential as a grounded theory idea (Cozaar-Gutierrez & Saez-Lopez, 2016; Demirbilek & Tamer, 2010; Duvall et al., 2016; Ke et al., 2016; Plass et al., 2015). Since this particular study will try to add to that data void, the use of themes will be captured through interviews and observations. These data points will be organized from the bottom up, an inductive approach and promote deeper questioning, by which smaller themes will be identified. After several reviews of the data while cleaning in addition to follow up questions, the deductive approach to further analyze the concept of learning skills will be organized.

The ongoing coding and data reflection were further developed utilizing an item-level analysis (LeCompte, 1999, p. 68) during the multiple reads of interviews. All interviews had a first read to maintain and organize thoughts within a 48-hour period. A second read was then done to develop an open coding system or create coding families and potential factors and subfactors. These overall codes were entered into the Google document (code book) and later verified with member checks.

Bias

As a former field researcher in the biological sciences, my prior experiences in field note recording was, as a purpose, to contextualize behaviors observed and not make comparative underpinnings. Coding was based on functional behaviors and was non-interpretive. In order to minimize bias when coding for this research analysis, the member checks that are inclusive of

the field notes and memos will be included. Additionally, when validated, this will further support the triangulation of the study with participant interviews.

Also, as a former teacher in the district utilized in the study, my perspective on technology initiatives and participation in training had a heavy influence driving my professional interest. While I was an employee, training on gaming was not offered. While training on games and gaming has been offered in other settings, the researcher will take steps to ensure neutrality in the questioning of teachers on this topic. Conversely, while there is potential for some of the participants to be former peers, my connection with them comes from a respect and appreciation of all educators for their efforts in utilizing technology to reach all students, not based around other specific philosophies or ideologies on the topic. Their commitment to student achievement at all levels is part of a philosophy shared by not only this particular group of teachers, but in the district's initiatives.

In the review of the literature on this topic, there was a large amount of evidence linking engagement and digital gaming. In 2015, Plass commented that it is more complicated than fostering learning from engagement than to actually link it to learning. One study by Iten & Petko in 2016, alludes to a linkage potential of engagement as a precursor to skill development and/or learning with suggestions that research expand on this area. To that end, my own research has had some questions on whether engagement may or may not be a component of how students acquire 21st-century skills when gaming. Questions in my research protocol do not directly ask or attempt to link engagement to learning; however, it is noted as a factor by which my framework accounts for as a possibility. While evidence to flow thinking, or “being in the zone” when learning, and gaming have been separately tracked (Iten & Petko, 2016; Plass, 2015; Tsai

et al., 2010), this study does not directly seek for a correlation but merely recognizes a potential for this to be an emergent theme.

As a student and practitioner in the field of education, not my initial field of training, my personal background must be accounted for. Historically, the hard sciences and research was part of my family background, including my parents and extended family members. Education was highly valued, as were scientific philosophies such as problem solving, critical thinking, and objective analysis. As such, I attended Montessori schools that fostered this constructivist thinking style and carried it into my life practices as modeled by family members. This style of thinking drove my dedication to the sciences and research, leading to my initial career in biological research. My personal philosophies are noted as a source of potential bias; however, with the methodology outlined and steps in place, this bias will be reduced.

Limitations, Reliability and Validity

The transferability of this research will be reduced by the context of alternate sites comparative to the site chosen for this research. Specifically, this school has in each classroom an interactive projector and all students are 1:1. The district provided devices at the middle school level to all students that are Chromebook carts. Within the building, there is staff participation with Google Classroom as well as online textbooks. The research is limited by its ability to relate to schools without these resources or districts where technology for learning is not a focus.

In order to maintain validity, all semi-structured interviews will be conducted offsite at a time and location of choice with the interviewee identified by an alphanumeric code to increase

anonymity and confidentiality. All recorded interviews will elicit themes. Mentor/reader check-ins to discuss themes will occur after the sampling of every six interviewees to further validate questions and patterns and identify any biases. The interviewer's field notes will be shared with mentors/readers for feedback so the interviewer can remain reflective during the process as well as accurate.

Generalization, as it expands on digital gaming in education, is noted to be limited by the audience of teachers, their acceptance of said resources, and the availability of resources. This set of participants' perspectives may not be uniformly representative of a "common" academic structure but reduced to be comparable to a magnet, charter or technology-driven district. Additionally, district funds for technology may not lie within gaming or teacher training but in areas such as infrastructure. Lastly, goals such as 21st-century thinking, while adopted within the state of New Jersey, are in varied phases of implementation depending on the particular district and state.

Conclusion

This qualitative case study inclusive of peer observations, memos, field notes, group and 1:1 interviews of teachers in two middle schools in suburban northern New Jersey was conducted to derive teacher perceptions on digital gaming to promote 21st-century skills.

Chapter 4: Data Analysis

This qualitative case study attempted to capture teacher perceptions on the use of digital gaming in the middle school classroom for the purposes of assessing student learning on 21st-century skills. In particular the researcher attempted to understand the ways by which 21st-century skills such as collaboration, cooperation, and critical thinking are perceived and assessed by teachers using classroom gaming for learning. As stated previously, within the public education landscape, as educators attempt to reach all students, particularly digital natives, being cognizant of the 21st-century skills, as outlined by P21.org, to prepare them for a workplace ready environment, is a pertinent skill. While engagement is noted in the literature with digital gaming, it was listed as a short-term goal towards these other long-term goals as part of the learning process. These constructs, collaboration, communication and critical thinking have been defined and outlined in previous chapters and were referenced as part of teacher's perceptions in the overall gaming experience in the learning environment.

Individual interviews with middle school teachers who have experience using digital games in the classroom were collected and then in a group session, questions were asked to verify, validate and substantiate their perspectives. Thirteen middle school teachers participated in the study, all with more than ten years experience, noted in Appendix G. In order to fully understand teacher perceptions based on their classroom experiences, questions were asked about what they see as professional educators in regard to learning, and how they validate this when students game. Expanding on that, teachers were asked to see if they saw connections between learning and engagement when playing and the types of games that may demonstrate this.

Teachers shared their experiences as well as perceived barriers to the learning process

utilizing games in the classroom. These items included ideas such as: the game style, the quality of objectives outlined and, the purpose of the game as part of the learning process. Availability of technology, experience with certain game styles and a need for further understanding of how games could be used beyond how they were currently becoming thematically emergent.

All teachers interviewed expressed students demonstrating high levels of engagement when gaming, previously cited in current gaming literature (Kafai, 2006, 2015; Kebritchi, 2008, 2010; Squire, 2005, 2006, 2011). Also noted with certain serious games, referred to as SIMS, teachers noted high levels of constructivist elements also noted in the literature in regard to the learning process in reference to 21st-century thinking (Kafai, 2006, 2015; Kebritchi, 2008, 2010; Squire, 2005, 2006, 2011). Subtle nuances within the realm of engagement, as a construct were further discussed in group sessions to verify their impact on the perception of learning. While engagement is still consistently referred to, a sub-section was dedicated in this study to tease out this as a short-term goal to promote learning. Scaffolding of ideas using engagement as a platform was discussed and the types of games to promote the 21st-century constructs were then spoken apart. Emerging themes missing from current literature noted in this study spoke to the idea of peer on peer feedback as well as teacher feedback as a way to validate critical thinking from teacher's perspectives. Teachers also noted the quality of feedback during and after these higher order games took place was noteworthy when discussing the cyclical nature of engagement and critical thinking.

Review of the Research Questions

The questions explored in this study included:

1. What are teachers' perceptions of the learning process when using digital gaming?
    a. What do teachers perceive in reference to digital gaming and 21st-century skills?
    b. What do teachers perceive in reference to motivation and learning when using digital games?
2. How do teachers assess the effectiveness of gaming in instruction for the learning process?
    a. How do teachers measure and assess student learning when using games?
    b. What kinds of games are being used, with what efficacy and with what frequency?

When examining the data, several emergent themes came to light in reference to overall frequency and in relation to the research questions. These themes included:

1. Engagement
    a. Motivation
    b. Winning
    c. Focus
2. 21st-century skills: communication and collaboration
3. 21st-century skills: critical thinking
4. Game Type & Quality

These themes became regularly and continuously expressed ideas within the interviews in relation to the research questions both directly and indirectly. Teachers frequently expressed the

value they saw in higher level games, often known as SIMS or serious games, an ability to support critical thinking, collaboration and communication in reference to content when solving for an objective. In support of that, teachers also observed a high level of engagement, as previously validated in multiple studies, (Kafai, 2006, 2015; Kebritchi, 2008, 2010; Squire, 2005, 2006, 2011) as a way to increase buy-in for task completion. Teachers saw this with students in their relationship as the educator but also with social capital amongst peers, not previously noted in the current literature. During group follow ups, teachers were very specific about what kinds of engagement they saw or how it presented which will be explored as sub-themes under the topic of engagement as teachers referenced that they felt they were reasons for student's engagement while gaming. Teachers were asked again what they perceive in reference to 21st-century skills while gaming and how evidence was noted in regards to the learning process and learning environment. The teacher's narrative spoke to varied game types to elicit different types of 21-st century skills that in the presence of rigorous content and high engagement fostered critical thinking. In the follow up group sessions, teachers were asked about evidence of learning through feedback again as well as sharing and expanding on the role of certain games to build beyond engagement for rigorous task completion.

When speaking with teachers regarding games as a form of learning, the ideas of feedback, peer dialogue, teaching others and question design were all listed as validators of the learning process and student conceptual understanding, a newer idea referenced in only a few studies (Gerber, 2012, Gerber & Price, 2013; Plass, 2015). Teachers also referenced their need to build checkpoints into games prior to use to validate content objectives and/or concepts within games as a way to confirm the learning process. Lastly, teachers noted the link of student

engagement during all of these ideas as highly evident from their experience. Regardless of the game, the teacher's intent to use games beyond engagement matched the task at hand.

In reference to RQ 1 (A), the perceptions on instructional gains came from teacher's observations of engagement and demonstration of 21st-century learning. Through games, students can collaborate and communicate with peers on content knowledge, demonstrate problem solving, and support strategies for learning like critical thinking and analysis. Through constant feedback cycles with peers, teaching others, and designing questions for each other, students are actively engaged in the learning process. Teachers cited that by adding checkpoints for learning to affirm understanding of content, they observed that when adding variables to the objective, which added to the play experience of students.

In reference to RQ 2 (A), the evidence used for learning while gaming was captured as teachers spoke specifically to the idea of what are known as 21st-century skills; collaboration, communication, and critical thinking. Collaboration and communication were noted in reference to feedback, peer dialogue and teaching others. Critical thinking was noted in question design when teachers observe students creating their own questions or content strategies within a game.

The ideas of engagement and 21st-century skills were noted as ways to see learning and assess learning, the two ideas presented in the first portion of both research questions, 1 (A) and 2 (A). All four of the themes outlined contributed to the evidence that supports all components of the research questions, with a connection in RQ 2 (B). Teachers described in this area that game types indicate the type of learning that can be elicited and then captured to evaluate student understanding. RQ 1 (B) also derived a connection between the research questions in the sub themes that drive engagement, which were noted by teachers that connected with student

learning.

Engagement

When asking teachers about the ways they validated learning, and the role games may have on this, all spoke to the digital native and their need for constant engagement through immediate feedback. Many believed this to be hard-wired into their learning DNA and stylistically, teachers have few learners today that don't come to the classroom without this mentality. They mentioned that this was a perception of growing up as part of a video game generation, however, indicated games were being utilized for skills beyond engagement. One teacher noted even when she is outlining the goals and objectives for the day, students have an immediate response if a game is being utilized. Participant C1 stated,

> they light up because if they see it on the board or posted in (google) classroom there will be a quiz at the end and they have so much more buy-in . . . be it the kahoots review game or the online quiz it will give them an immediate grade and that is what they want, the immediate feedback and if they are getting it right.

In referencing pedagogical structures, teachers note that this "hook", the new anticipatory set, has a significant link to student learning styles whilst being highly engaging. Teachers stated that there are benefits to this type of engagement and that games were chosen with this in mind, but for other benefits that allow for learning activities to progress depending on the task or objective. The idea that the engagement is seen or being driven from different influencers depending on the challenge or objective that is presented, was captured when speaking to teachers about what kinds of learning was happening. Participant C3 mentioned, "I can see this as a great start to the

learning process because it develops with time and each student can focus on a skill within a skill, even if they can't "win" the game or level."

Other teachers noted that the idea of engagement spoke to student learning style and preference, like participant C3 who commented that: "games are what they know best; with learning, teaching, play, it is their realm style or their intrinsic motivation". Other participants noted that this embedded engagement for games could drive learning for a variety of reasons. Participant C1 noted that the engagement came from an intrinsic motivation, "some students do play to challenge themselves and beat their score or level" while participant B2 felt the game's design engaged them into longer and more focused play to promote skills and learning: "they (games) are highly addictive and have intrinsic rewards built in and they get immediate feedback and they definitely energize their brains in a way I can't always do as a teacher." While using the games, teachers shared that the engagement is high enough that depending on the game, most often "serious games" or SIMS, deep learning can happen with this sustained engagement and focus. Teachers often noted that through play and manipulation, a constructivist approach is applied and students will problem solve more critically. Teachers observed that engagement had a purpose or intent but as noted previously, came from different origins that drove it. Participant B1 mentioned: "they can manipulate variables in the game and compare it, so this led to higher interest and that saved us time and we could go beyond just measuring, data collection and really analyze ideas". And in this conversation with teachers, it led them to perceive that this cycle of engagement, play, and discussion all led to learning that was observed when gaming. Participant B2 mentioned: "(when gaming) you don't see inattention; and with that focus they have that deep dive into the material and are motivated." Teachers noted that the need to switch things up

frequently and constantly engage students is in every facet of the learning process, be it in the assessment, the activity or in the mini-lesson portion of their teaching block. One teacher noted that when giving freedom to students to present what they have learned, they revert to the medium they also demand as a way to also acknowledge their understanding. Participant B3 summarized all of the components of her teaching are enhanced with games, be it at a low rigor or high rigor task.

He shared that "(games) it keeps them engaged, and they request it. They ask to do kahoots for parts of their presentation and this is my 3rd year doing these sound presentations with the kids and I tell them it has to be interactive, some aspect of it at least, and a good bit of them want to include kahoots in it because it is competitive, it is engaging, the kids get to use their own devices."

With the literature from the last ten years referencing and acknowledging that the digital native uses games as a way of engagement and connection (Kafai, 2006, 2015; Kebritchi, 2008, 2010; Squire, 2005, 2006, 2011), teachers now see this medium as a necessity to their practice as it is a way to connect with the students in their classroom. Students reference a need for this engagement as almost a requirement for their learning as a way to stay committed to the task in all phases; the practice, the assessment and the application of knowledge.

Teachers also referenced game type, inclusive of engagement, and digital games were then chosen to match a learning objective. The observation by teachers in this study was that engagement has a more complex etiology when observed with various influences observed by teachers with students engaged in the learning process. This speaks to the idea that engagement, previously noted in the literature, has potential connections to learning that can be seen here

through motivation and focus, which will be further explored in the second part of research question 1 (B) in the sub themes of engagement. Engagement, overall however, as noted in RQ 1 (A) is highly observable and supports literature to that effect.

21st-century Skills

Communication and Collaboration

When speaking with teachers for evidence for learning, they will cite they simply "know it" or can "see" learning happen. While this comes across as some type of intuitive talent honed through years of questioning and understanding like any true artist who has mastered their craft, in the art of teaching, this was explored in depth in order to qualify some of these ideas in 1:1 interviews as well as in group sessions. Teachers mentioned that the observation of students interacting with peers shows them into the mindset of the learner and their take-aways from the experience. During gaming, teachers spoke to the mentality of being the 'guide on the side' to the learning process and by observing the dialogue and interactions by which most students guide and teach their peers naturally from their own experiences, they gain insight. Half of the teachers interviewed cited teaching peers demonstrated a level of understanding after the students game as it showed evidence of learning. Two teachers specifically cited this:

> I can see so much learning going on as they can play and want to know who did what and how; in my classroom we see this learning process and you have to tell someone how you did what because you have to share what you know, and if it is a simple skill like how did you change a color gradient or how you conquered a level, you have to teach and tell (C3).

And participant B1 mentioned: “they are engaged when they show me how they do stuff as well; they may be completing a task but master it and show me what we can do to the game, the question or the level and are eager to not only show me but their peers.” This observational learning and teaching are a validation for these teachers of not only mastery of the content objective, but of those 21st-century skills like collaboration and communication. The teachers speaking in the interviews stated that many feel what this generation lacks from gaming could actually be present. “I think learning like this is very collaborative” a sixth-grade teacher mentioned to me when sharing that this is a side of her students she only sees when gaming and not even in her lab environment (C1). She noted that students are often immature and socially awkward, but this common ground comes across like a hidden language they can all share. In the same vein, a teacher of special education students noted, “for socialization and communication, in that aspect, there are a lot of strengths to games for those students”. He referenced they often do not have the skills to interact with peers normally and that the games provide a level playing field for a shared knowledge of content and skills combined (B2).

Collaboration between peers, like communication, were noted as critical observations of the learning process. Teachers noted that while students can be engaged individually it can often be hard to determine what the students take-aways are. Teachers found that by watching the interactions of students, this often led them as educators to deepen understanding of student’s learning. Many teachers also mentioned using this as informal feedback to guide their practice and a way to assess student understanding. These ideas continue to expand and support RQ 1(A) and RQ 2 (A) and that interplay.

Communication

A great deal of time and conversation among professional organizations is dedicated around the topic of teacher-student feedback. ASCD in a series of articles and books noted that good feedback is not only timely, but specific (Rapp, 2012). While the literature on gaming has yet to comment to a large extent on the *quality* of feedback, teachers in this study noted the depth of feedback between peers and from student to teacher. Teachers spoke to the immediacy games provide by giving back feedback when playing, but also the feedback they received as educators when using games in their instruction. "Immediate feedback is them (as a generation) they need constant and immediate feedback" (C1). Teachers also commented on the feedback that was observed when playing games with their peers and what it showed them as teachers in relation to the student learning process. Teachers used the games in process as an informal formative assessment towards the objective, allowing them to adjust or adapt based on the gathered information. Participant C1, a middle school science teacher often uses serious games and simulations that can be adapted as a learning activity. She observed games to be highly engaging with students. She observed that students played alone and in pairs, and that by observing the student interactions she could learn what to improve on in her objective but how to challenge students into deeper understanding and accountability through questioning. During her self-reflection of the activity and our conversation she said:

> They learned nothing when I just let them play at first; they were just clicking. I created objectives for each level where they had to check in with a partner and then after a series of levels, check in with me so we could all talk and check for understanding . . . now, they play with a purpose.

This powerful takeaway for her pedagogy allowed her to modify the game to keep engagement high but also increase accountability. The communication between students proved as informal communication to her as the educator. Participant C3 mentioned she not only uses the games to see communication, but she allows students to make questions and even times their own game to understand student skills. She said that, “using games like kahoots to get to know how they understand things or playing these games or coding I see their interactions.” She mentioned “when they play each other's games (created by them or designed by them) I learn.”

Communication and collaboration often went hand in hand when gaming according to teachers. The impact on student learning was mentioned as a form of assessment of students as well as teachers. These 21st-century skills, often thought to be missing in students by today’s educators, are seen in a gaming environment. These subtle observations speak to part A of both research questions 1 and 2 as a means by which learning can be validated in context.

Collaboration

The feedback process noted by teachers was equally valuable to both the instructor as it was to the students. While observing and collecting informal data, teachers were cognizant of the request for quality dialogue in a variety of sources, speaking to the skills of collaboration and communication as well. In short, according to teachers, students were requesting immediate feedback from the game, from their peers and from their teacher. One teacher, speaking about her experience with SIMS in the classroom as a new way to gather data for a lab, changed her approach. Rather than conducting the lab over several weeks, she expressed that when observing their questions, conversations and back and forth between students, that this was an adaptive

cycle. She noted, “I can see the benefit for analysis and thinking (when in play) . . . the feedback is so much deeper and richer¨(C1). She continued on noting that this game allows students to change an infinite number of variables to limitless responses and then adapts in real time. Given the many possibilities, she noted that instead of taking the time to collect all the data and copy it, while a worthwhile skill, the game does that, so the variables allow from so many angles for students to discuss the concept of what is influencing the results, a critical component of scientific and critical thinking. Participant C1 shared her summary of her game activity by mentioning, “sitting alone or with a partner, I see them pulling from the vocabulary and concept to reflect. And when talking with their feedback to each other has more depth and I can observe in them seeing it all work.”

Perspective in context for this educator validated the learning process while gaming and gave meaning to peer communication and peer collaboration as ways to confirm understanding. Many participants noted that the use of games gave them feedback also as educators on how to challenge students in their learning. Feedback cycles are often used by teachers to increase higher order thinking and deepen self-reflection. Questioning provides cyclical guidance towards an objective, similar to a game. Teachers noticed the value of this and referenced it as ways to see learning and assess it as well as the potential for influencing why students engage in the task, relating to RQ 1(A), RQ 2 (A) and RQ 1(B).

Critical Thinking

Critical thinking, previously defined within the P21.org framework, was evident within the learning environment, as captured in the narrative of the teachers in this study. A subtle

nuance that later elicited further dialogue within group sessions was the cyclical nature between engagement and critical thinking. As engagement was outlined as an intermediate outcome, teacher's perceptions of this in the learning environment contributed to the long-term outcomes of the 21st-century skills. Teacher's spoke to their perception that critical thinking when coupled along with gaming engagement and the type of game created an environment for rigorous content to be introduced and scaffolding to occur. These nuances were discussed and outlined further in this chapter.

With a richer dialogue supporting the communication between students, the ability to design questions within games was noted by several teachers as an opportunity to demonstrate critical thinking, an essential component of the learning process. As noted by Tsai et al., (2012) learning as a process may be coincidental to game play or an actual result of game play, therefore determining the type of game was an area of discussion that teacher's perceived to be associated with the learning. As teachers reflected on their observations of students during game play, engagement paired with robust content in serious games and SIMS was noted through student and teacher feedback. This was perceived as evidence of learning over the flash animation games, something also noted previously in the literature by Kebritchi & Hirumi (2008).

While critical thinking speaks to these elements of constructivist thinking, the game component of serious games specifically was noted as having this over flash animation games was lacking according to teachers. While current literature has just begun to look into the role of serious games in the learning environment, to date, further evidence that compares serious games with flash games in the area of critical thinking is required. Flash animation games have a purpose for learning and boosterism towards a learning environment, every teacher interviewed

confirmed that, but the type of learning was more rote and recall based. “These (flash games) are immediate and great for major assessment prep but also as a collaborative activity for students to design questions and sustain focus and add content when working with peers” said participant B2. The key in this teacher's mind was to utilize the immediacy and engagement of a flash game but allow students to design questions in the game for reviews to spark the higher levels of critical thinking. A few other teachers also spoke to flash games having more potential in the realm of game design, and one teacher who has a class on game design spoke to this skill to promote critical thinking. Participant C3 said:

> They judge each other and are critical of each other in a good way, to learn and to improve. So, they can play a game created by a friend and give them feedback so I can as well as the students see the skills mastered, and in the process, you make them evaluate and critique and then everyone helps with getting the student there.

Assessing understanding and learning both formally and informally, through gaming, was observed by these participants in the realms of collaboration and communication. Furthermore, the depth of communication and the results of the collaboration challenged the learning of students into higher orders or constructivist thinking by challenging them to think, speak and respond more critically. This analysis of higher order thinking application through design was a way to perpetuate better understanding.

Teachers wanted to assess all students, not just those who played with a peer or who sought them out, but those who worked independently. To that end, if peer observation, 1:1 feedback or question design was not noted, some teachers referred to checkpoints in the game as another type of formative assessment to validate critical thinking. Many teachers observing the

21st-century skills referenced in both research questions ideas such as: learning taking place, types of learning in context, and how that learning is assessed, spoke to variations and adaptations to their pedagogical practice to continue these results. Participant C1 shared:

> I edit the goals and objectives before the game; the goal is to let them play and make it look like fun when it is also learning. We discuss the checkpoints as groups and 1:1 so I can see their learning.

These questions were designed specifically to induce self-reflection and critical thinking. Another teacher shared, "in order to get the formative data, I use it as an assessment; I need to have something from each person . . . it is very personal and hard to describe that learning is happening . . . so kids are working in a group or designing and telling each other how they did what, it comes from them." Participant C3 noted like other participants that observing games in play allowed her to analyze not only levels of understanding and application but the kinds of knowledge students were pulling from the experience. For teachers who used games for a quick checkpoint to scan for basic knowledge, one teacher shared, "I use those games (flash animation) to basically check for learning on the goal and keep a high level of engagement" (Participant B1). This indicated that more complex tasks and questioning, led to higher levels of thinking.

Learning, according to most teachers, can be hard to observe as noted previously. However, with the evidence they cited: peer dialogue, question design, feedback cycles, engagement and checkpoints, all felt could be demonstrated in reference to critical thinking. Not only that learning can be assessed, but communication and collaboration, skills noted as essential for the 21st-century learner. This became a critical cycle within the learning process while engaged in this context. Critical thinking was perceived to be an observable skill, or long-term

outcome, of game play as part of a constructivist approach to learning. This skill, as part of a natural scaffolding process, was noted along with engagement, collaboration and critical feedback, or communication. Teachers observed 21st skills between students that validated basic as well as higher order learning. Teachers observed that the quality of the dialogue and feedback spoke to a level of understanding that was observable and measurable and lastly that this was accomplished by a variety of mindsets driving student engagement when gaming. All of these ideas support and expand on the concepts presented in research question 1 (A), 2 (A) and 2 (B).

As teachers began to discuss the ideas of evidence for learning, they also shared their thoughts on what they see in a student's desire to learn and the influencers responsible for that. RQ 1 (B) explored learning paired with engagement; what drives learning with games? As noted previously, a cyclical relationship between engagement and feedback supported a platform towards critical thinking. While engagement has been supported in the literature in a digital gaming learning environment, this engagement was further discussed in the group interviews. Teachers' perceptions confirmed their beliefs that high rigor content objectives were able to be addressed by engagement paired with the specific game styles. Motivation was mentioned as a component of both learning and engagement teachers recognized and a need for connection to content. While motivation may not be solely linked to learning, teachers in this study felt that if students can connect through the medium of gaming or game like structures and experiences, the motivation to complete more difficult tasks while engaged supports this connection. Teachers said they endeavor to engage students in a variety of mediums to pair with their learning style and also seek to minimize distractions to allow learning to occur as part of good pedagogy. However, teachers noted that leveraging games to encourage focus and validate intrinsic rewards

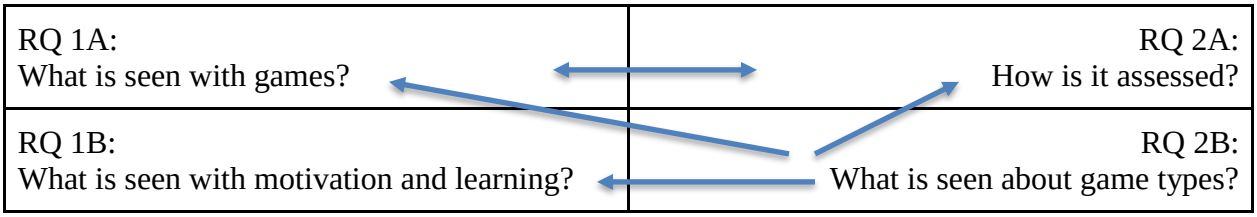
for the gaming generation allows buy-in for the content.

In asking teachers to validate their evidence for student learning while engaged in games, and knowing engagement as a heavy influence within the literature on gaming, questions were also asked of teachers about any evidence they saw on motivation to learn when gaming. Teachers were asked about what they see with games as they relate to being a motivator for tasks that would elicit thinking and learning. Many teachers talked about the "buy-in" games created to add credibility to them as a teacher, to create tasks that were fun but also to create positive competition amongst students. "They light up when they see we are doing something . . . they need to be engaged. If it's not laptop carts, it's their phones or to google something and always to play a game" (C1). And while a few teachers stated that the desire to win was always prevalent, they also noted students who were self-motivated and self-directed ways to keep playing after winning.

While RQ 1 (A) and RQ 2 (A) found engagement, as well as 21st-century skills like: communication, collaboration and critical thinking as observable and measurable, they also found the engagement could be further dissected into influencers that impacted the ways teachers observed the 21st skills and how students responded to the task. RQ 1 (B) looks further into this idea of varied forms of engagement as a way to observe specific types of learning, symbolically represented below.

Figure 2

Engagement & Learning



Engagement & Learning

Motivation

The positive peer interaction, previously documented in the observed ideas of peer communication and collaboration, continued to be referenced as a motivator in the minds of teachers to foster resilience with more challenging objectives and as a way to sustain engagement. Additionally, the 'grit' that teachers often cite 21st-century learners are lacking in terms of focus, staying on task and completion after a loss or failure were absent in the teachers documented when students were using games. "They want to play to beat it or challenge themselves" (C1). She also later referenced the idea of challenging herself with the games to increase rigor to keep motivation high, "I am liking the idea of raising the bar with kahoots in my reviews . . . using their healthy competition as it is not a bad thing" (C1).

Teachers also discussed that these ideas can be modeled, learned and built through peer interaction and through games, working as an intrinsic motivator as well as a form of positive peer pressure. One teacher noted: "if you find those gems in students, those things that spark interest in the game; I do not think they have to be engaged day one, that can be developed" . . .

and in specificity to the game as a motivator, she mentioned, “games is what kids know and enjoy best . . . they have great potential in any classroom “(C3).

Several teachers referenced that the motivation captured through play kept students wanting to participate and stay engaged for a focused amount of time. “I am not sure of the educational impact in any way, but we use them as an introduction or common ground between students, a kind of social capita” (C2). Participant C3 who uses games daily commented on game play as a positive peer influencer: (when playing) “they judge each other, they observe and are critical in a good way in helping each other. There is a leveling or hierarchy with gaming and I think for middle schoolers, especially, it is a social engagement”.

Teachers who used games in their classrooms noted that the engagement to play a game was as equally noticeable as the engagement to learn. This engagement came from different intrinsic and extrinsic motivators and supported ideas outlined in RQ 1 (B). Assessing learning at the levels of rote memorization and critical thinking could further be discussed in regard to the type of game play in RQ 2 (B).

As a way to assess the true learning within the game, and derive the engagement observed, feedback stands to create a strong foundation for teachers to base understanding on the level of learning when assessing students. Teachers cite that the depth and rigor that accompanies critical thinking and analysis, evident in student questioning, shows that they are willing to commit and focus on the task at hand. Two science teachers and a computer design teacher all spoke to this when observing students creating games, designing questions for games and participating in serious games that had varied objectives:

C3: Games are what kids know best and enjoy; so, if you take it and add critical thinking

skills with it and collaboration, all those things can be incorporated with the game, I think they (games) have great potential in any classroom.

B1: They are so engaged and so excited when they show me stuff as well. They may be completing the objective and master it so then they come to me and say 'did you know you could do this; can I show you that' and it is within the game that I did not know about.

B3: I see kids who are, and I am thinking about engineering challenges we do with the FET SIMS, and they set it up and they do a blueprint and they build it how they think it will work out from the game and then it does not pan out what they thought so they have from their experience what to do for the next round. So, they learn by diving in with other materials and they learn from having conversations with their peers and modifying and adapting.

Many teachers, these in particular, noted the value of de-stigmatizing the idea that games were just idle play with no meaningful contribution to learning. The power of feedback between peers and even teachers shared deeper insight to the learning motivations and content mastered. While their use of games in the classroom was shared, they also shared their desire to find quality games with rigor, paired content and engagement not rooted in simple competitions on a leaderboard.

This concept was explored in conjunction with RQ 1 (B) as themes were relevant in both sets of responses and had a symbiotic ebb and flow. When teachers were looking at evidence of learning 21st-century skills a need to identify the type of learning could be noted as was reflected in the type of game being played. As noted with the prior research games, not all games are

created alike. Teachers noted that game types matched the intent of the objective; while certain games were used as they were highly engaging, they may be for a review or check for basic understanding. However, other games were used and teachers noted higher levels of critical thinking through communication and collaboration, all 21st-century skills of importance. The games were not intended for the outcomes of those skills per se, according to teachers, but were noted that they created pathways for stronger learning.

Winning

Another teacher specifically spoke to the idea of winning as a motivator that she sees with younger middle schoolers as a way to engage but instill learning. She noted that the boys are often immature and see a game as simply a game with no learning, no matter the checkpoints or dialogue and guidance from her or peers. “There will always be a kid who blasts through it who gains nothing . . . they just want to click a button to move it along.” (C1) However, the serious games she uses have told her a lot about how to turn winning into motivation and a positive influence for both students but her practice as well; “so they played . . . multiple times with partners and had a blast; like days of silence in the room! And there are those kids that want to play simply to beat it and challenge themselves after they get material and are intrinsically motivated.” However, she also noted the first time the motivation was not the content and students were playing and learning nothing, so with that feedback, she changed how she presents the game, how she created checkpoints to keep motivation and engagement high, to keep the win and share the content in a way she could see as an educator.

Engagement of all games has been a focus of literature on this topic for over ten years.

However, this study points to the idea that the engagement manifests itself in a variety of forms that elicit learning as noted by teachers in this study. A focus towards an objective or manipulation of a variable to change in outcome, the desire to collaborate with peers on how to solve problems, a way to solve a problem to master understanding and a desire for feedback from their teachers to validate their skills and understanding were all noted as valid ways to assess for the learning of a content objective. RQ 1 (A) and RQ 2 (A) provided teachers and researchers insight into assessed skills, but also contributed to RQ 2 (B) as they provide insight into motivators for learning behaviors.

Focus

Of the referenced influencers, for many of the teachers interviewed, it still comes back to the idea of what drives engagement when learning. In synopsis, teachers and students need to go beyond "edutainment" to get into content and not lose interest. Participant B2, who works regularly with special education students for pull out and push in settings noted:

> Kahoot, which we may use too much, is a great collaborative activity. We get through it in a reasonable time frame and create a sustained focus on the activity and there is a benefit to that I see . . . sustained focus is starting to fade.

However, he continued to share that kahoots keeps focus and attention for the most basic levels of knowledge, but not for higher order thinking. That particularly his students need flash animation games to start or end a lesson or even as a brain break from activities that require more focus and attention, an area where they struggle. He expanded sharing:

> (when using games) I deal with a lot of challenging behaviors all the time and I never

have them engaged so we are constantly varying pacing, checking flow, doing a lot of repeat, but I do the games so the kids can control the environment.

When asking for clarity about the kinds of games and what he sees in relation to focus and engagement, he did, as did many of the teachers, divide games into different types. The games of the style of flash animation were regularly used for focus, engagement and buy-in; to review concepts and/or take a snapshot of understanding. A seventh-grade teacher in the general education setting mentioned the advantages of that for her and the students: "these games even for review are universally understandable and playable, so they log in and boom, page loads and they are good to go" (participant B1). However, multiple teachers who used SIMS, or serious games, noted that a different type of focus and engagement were observed when using games that address critical thinking and analysis. The aforementioned special education teacher even noted that using a SIM with students "engages the brain in a different way, there are no wandering eyes, you don't see inattention and certainly show there are different ways to engage" he noted (B2).

Teachers in this study found that engagement came from varied origins that through gaming, enhanced the learning process. Ideas like motivation, focus and winning were engaging enough for students to either complete a task, modify a challenge or master a concept, all positive outcomes in the minds of these teachers as ways games enhance the learning experience.

When speaking with teachers on their perceptions on games for learning, and the motivations driving the learning process, teachers were asked to dig deeper and examine in the second set of research questions how teachers measure what they observe. Specifically, in RQ 2 (A) teachers were asked how they measure student learning or assess student learning with

games. In congruence with this, they were asked if they saw a relationship between the game type and the frequency of the games being used and how that affected the type of learning being observed in RQ 2 (B).

Once again, engagement as it broke into things like focus and motivation drove critical thinking in games with higher order objectives. The game types, explored in the latter sections, spoke to levels by which 21st skills were displayed, i.e. the kind and quality of communication and collaboration and the motivation that drove the desire to play. Through games, be it flash animation games or serious games (SIMS), students receive immediate feedback to validate knowledge and skills noted by all. Many teachers referenced this when asked in the earlier portion of the protocol how they see learning with games. This immediacy causes a feedback cycle in of itself eliciting buy-in through engagement and motivation which can be both positive and negative to the student learning process. The focus required to play and win, the motivation to win from trial and error or from a knowledge base, fosters the pattern. From a social perspective, games allow peers to compete, bond and collaborate, share strategies and discuss. This is a critical interaction for middle schoolers, many who may be at various stages of maturity several noted. The social capital associated with winning at a game, or the leaderboard mentality common in many games, is addictively powerful and "hides the learning" many teachers referenced.

As noted with data from the research question 1(B), the links of engagement as a motivator to promote learning for student engagement purposes drives many of the subsequent additional activities. Teachers interviewed perceived the effectiveness of engagement in specific areas while gaming, particularly when collaborating and communicating to analyze problems.

Collaboration and communication to problem solve and challenge critical thinking was perceived by teachers to be tied to elements of the engagement process. These skills scaffolded promote constructivist thought practices to validate critical thinking. Also, while observing these cycles, teachers observed that the motivation to play games to simply assess lower level learning targets as a motivator in the learning process as well, referenced previously with RQ 2 (A).

The finite lines between how teachers see the instructional gains while gaming along with how they assess it come from similar themes that build upon each other as noted prior. In essence, if a teacher is using a set of cyclical questioning techniques to check for understanding, the leveling of student responses or questions posed as a follow up to the teacher or peers to extend the learning show how they see the learning but in conjunction how they assess that quality of learning. While the teacher's perceptions did not reference causality, it was noted that these outcomes, both short and long term, are linked. Multiple examples captured spoke to validate their perceptions in this research. Teachers noted that certain games drove certain tasks, and while engagement to play was not only varied, but high overall, the game influenced the outcome, an idea explored in RQ 2 (B).

Games Quality

In RQ 2 (A and B) teachers noted that depending on the game, be it a SIM or a flash game, they could elicit different levels of learning. For skill and drill learning, vocabulary and rote memorization the engagement of a flash animation game served as a timely assessment with healthy competition, high engagement and motivation to win and recall. "Using games like kahoots to get to know how kids understand things OR kids playing games . . . it's a wide variety

to assess their learning," said participant C3. Another teacher noted, "the game itself, kahoots in particular, is a right or wrong, but they want the in-depth feedback from their classmates or me" (B2). This transition to game types allows for different types of learning to occur as observed by these participants.

With serious games (SIMS) several teachers noted that the critical thinking levels noted as relevant for 21st-century learning and in the higher levels of Bloom's Taxonomy were present. "They change up the variables to create multiple effects. I see it beyond the drilling of another flash game (re: Kahoot) . . .Gizmos (SIM) are not just simple vocabulary drills. They manipulate the variables to affect the data and it leads to high interest and questions from them" (B1).

Participant C3 noted that in the classroom while observing learners going through the process of thinking and learning in a serious game, that critical thinking and analysis are evident, a way for her as an educator to assess their skill level as well as their understanding.

> I see so much learning . . . they will sit for hours and want to see how a kid is beating a level or capturing a flag so to speak and there is a learning process . . . and they will ask each other how did you do that? And in my room, you have to give an answer and share what you know and it is important to me to be clear that you are learning something, even if it is to change the color from gradient to solid and be like "how'd you do that" so I learn a lot as do they.

She began to say that as a coach to the learning process, she notes students all come with different skills that she can foster or encourage; knowing where they are at and what they can become as learners with this information. "I have kids say I am no good at this, I can't get good

at this and we are all like, no you can do it and while you may not be like the guy next to you at playing the game, you may better at telling the story or designing the code and find an avenue for creativity and skill that is for you" (C3).

To that end, teachers note that the learning process, while at times individual, can also be observable when students dialogue with each other during and after play. The observable dialogue between peers that the teacher can then hear, observe and ultimately assess indicates their knowledge on the topic or skill using the game as the medium of that dialogue. Participant C3 who uses games on a regular basis and teaches students how to make their own games and manipulate games to develop a "good" game shared:

> They judge each other, they observe and are critical in a good way in helping each other. So, they play a friend's created game and give feedback so you set up the skills you are looking for and have them evaluate and critique that process and more so, what makes a good game and if they do not meet the criteria they have to tell the person how to get there.

A sixth-grade teacher, participant C1, who routinely uses SIMS known as Gizmos for each unit spoke to this idea of quality feedback and dialogue that is observable. Both teachers recognized the value in critically analyzing the content as well as their peers as a way to assess understanding. She shared:

> I wish I had more time with them (Gizmos-SIMS) because I am seeing the benefit for analysis and critical thinking. They are using their hands to model what they saw in the game. There are kids that want to play again to challenge themselves.

Interviewer: So, are you using different games to elicit varied responses in the learning process?

"I think Gizmos and other SIMS can do the higher order from what I have observed and I am liking the idea of raising the bar with kahoots (flash game) in our reviews for higher level questions". When teachers have to individually assess formatively the understanding of a concept or skill, each game type has a style that speaks to the learning target; recall or analysis. The games routinely spoke to flash animation games like Kahoot to allow for that assessment and SIM or serious games like a Gizmo, to evaluate critical thinking. Her insight was shared by other teachers who have noted that game types often elicit responses or pathways to learning that are different and that depending on the intent of the objective, choosing the right game is critical to enhancing learning and being able to assess understanding.

These testimonials from the use of these games in the classroom assess content understanding as well as 21st-century learning from the perspectives of teachers. Building on varied learning levels, focus and engagement, they as well as other teacher's questioned note that the assessment for learning is observable within the games and that it is robust and varied. Teachers, while not knowing the vocabulary from the research on games, could speak in generalities of "flash games" known by research as "edutainment" and "SIMS" known in research as serious games. Beyond that, they understood from their own experience and perspectives that these games were universally engaging, noted by the literature, but have different end results as far as their intended objective. Teachers spoke to flash animation games being used for reviews, and formatively assessing concepts or vocabulary, with a distinct advantage of having a time advantage and creating an environment of healthy competition. SIMS were favored for higher order analysis, application and critical thinking, but noting they shared robust feedback and collaboration within the students who played them, either in pairs or

individually.

Game Type

Edutainment Games

Universally noted by all teachers in the study, these quick games are perfect for reviews, vocabulary and to assess previous foundational understanding. These "edutainment" games have high engagement, excitement, competition, and are requested by students. This can create buy-in for teachers looking to engage students in rote tasks or skill and drill activities in a medium they connect with. Participant B3 shared the flash games with leaderboards can have value when used correctly, controlled and modeled by the educator, with reflection as part of the process:

> So, kahoots pops up with the correct answer and it's like 'oh man I put A and why is it this wrong/right?' and then they talk and look to each other about what is the correct answer and they don't look to me necessarily for the correct answer and explain to each other instead.

A seventh-grade teacher interviewed talked about how she does her do-now every day with a flash game: "(they are) 'universally understandable' . . . it gets to the page and boom, they can do a quick flash game. I use those flash games for my input prior to the assessment. To basically check for the learning goal" (B1). That immediacy, that routine and that quick assessment sets a tone in the classroom in her mind. A special education teacher, also of Grade 7 students, spoke to the difficult population he works with, many who lack socialization, come with high anxiety and frustration and school failure as part of their mentality, considers flash games as a way to reduce these daily challenges. He sees flash animation games as a way to buy social capital as a teacher but among the students who see games as a universal language or commonality they can share. "The (games overall) are highly addictive and fun, have intrinsic rewards built up and give all

kinds of immediate feedback" (B2). He then discussed how they can be "used for review . . . this is to quickly assess learning". All of these advantages can build esteem, reduce frustration but also allow him to manage what is understood and what needs to be addressed before building on a concept. He also spoke to the tradeoffs to flash games that he attempts to balance:

> The one we use a lot, probably too much is interactive, and is great as a collaborative activity and students can design questions and use their phones . . . I like that part but it is quick and we can get through it in a reasonable time and create a sustained focus on the activity and this is a benefit I see . . . and it serves its purpose . . . there is only some content that is there but it is quick in/out. In my co teaching we are almost overusing this to quickly assess (B2).

While games are intended to engage, teachers demand a multi-faceted use for them to make sure the engagement pairs with learning. Their conscious choice of a game type supports the type of engagement they want to guide students to for task completion that supports either a lower level of basic understanding or something more, illuminating a relationship between the ideas captured in RQ 1 (B) and RQ 2 (B).

SIMS & Serious Games

Compared with flash animation games, feedback and perceptions collected noted similarities and differences with SIMS. This dichotomy led a teacher to discuss when and why he might use a serious game or SIM in a different setting.

> here is a way to pair very strong content with a skill-based activity within a game experience; I think we are going there eventually. This one sim has great graphics and

> flash animation but requires primary source documents, they evaluate tools and apply geography as a variable . . . we are definitely NOT getting opportunities like that one above he stated.

Participant B2 who worked with varying levels of special education students noted that engagement and focus as well as motivation were areas lacking in his population. Additionally, a need for review and scaffolding were required to develop skills over time that these students took longer to master. Those skills sometimes were serviced with a flash game. However, he felt after mastering the skill students wanted the continuity of the medium, a game, for the higher order application skills. He felt there was a lack of games to provide this save one SIM he found.

Several of the science teachers interviewed who regularly use serious games in their units stated similar differences in the game type eliciting a different objective to be assessed. “The sims are not just simple vocabulary drills. SIMS let them (students) change up variables and get multiple effects, it goes beyond the drilling of another game type” (C1). Additionally, the teacher of computers who challenges students to design their own serious games as a way to demonstrate skills on coding but also critical thinking stated: “having them playing a friends game (created) to give feedback sets up skills and lets them evaluate and critique that process allowing them to evaluate what it is a good game” (C3).

Noting the game type as being a chosen avenue to elicit different types of learning allows teachers to assess students, to validate the learning, a concept continuously addressed in multiple lines of questioning in this research study. Teachers spoke to a variety of learning styles being validated, different skills and objectives being measured and that certain games prompted favorable responses in a variety of settings. The efficacy of both games serves a time and place

for the learning process of students in teacher's minds with both styles of games providing ways for teachers to assess different levels of understanding, providing value added feedback to educators and meaning to students.

The last research question, 2 (B), discussed in individual interviews and in group sessions, allow teachers the greatest freedom to support learning through games. As noted, by capitalizing on engagement as a short-term outcome to foster 21st-century skills, and providing meaningful feedback around content, coupled with content in a game, teacher's perceived they could assess learning. By choosing a game that supports 21st-century skills and keeps engagement high, the communication, collaboration and critical thinking can be observed as a way to assess and validate learning among students, all ideas discussed and explored within all of the research questions posed.

Barriers

The use of technology in the classroom by students and educators comes with benefits and barriers, a constant balance most respondents referenced. The physical device, the quality of the program and how it is used often lead to questions about the best types of pedagogical practices. Time to prepare or study games, the lack of training on various programs, and game choice were considered when choosing a game. Additionally, as a barrier, teachers noted creating balance; the addiction noted by many teachers that afflicts the digital native and the benefits of the game.

Negative influences of gaming

Teachers have recognized that the digital native has grown up with video games and the internet, causing a form of addiction in that high levels of engagement and constant feedback are hallmarks of their personality as well as their learning styles. All the teachers interviewed made some type of reference that the demand to be engaged digitally, to use the internet or some type of game and to get immediate responses is very much a common theme in the daily classroom interactions.

Teachers also referenced this medium is what kids know best and where they feel most comfortable when interacting. Throughout the dialogue they discussed as professionals they need to meet the styles and needs of learners and that games can be used, if used correctly and balanced with other forms of instruction. Teachers noted that the stigma associated with games can deter educators, however as the evidence has shared in this study, they see the value-added benefits of games for instructional learning as well.

One of the Grade 6 teachers interviewed commented on the bad rap of video games and why the district has moved into other initiatives based on the perception of games impacting teenagers; “Minecraft, yup it ruins lives by creating middle school drama . . . but the new push is away from tech into wellness/mindfulness . . . I am guessing we are now abandoning it because of the addiction to the internet” (C1). Echoing concerns, a Grade 7 special education teacher who also was a parent of several teenage boys talked about what he sees mimicking the behaviors from his classroom, “as a parent I see the time sucked in or involved in gaming that is huge and I perceive less time outside for reading, homework or academics and that their hours are largely consumed by games” (B2) as an area of concern for educators, attempt a balance.

Another teacher who uses games regularly, be it designed or packaged, stated she often has to defend to administrators that despite the press on games, she also sees benefits for creativity and critical thinking, so she continues to use them as a model on how gaming can look in a classroom when done well. Participant C3 shared: . . . gaming is what makes people afraid, or administrators afraid, because they think you are playing games? And like, what is this. . .? With these games in use and trying to explain and validate the values that the games do provide, the teachers interviewed said that the game type often makes all the difference in being able to leverage engagement to students, content to adults and learning for the educator.

Not all games are created equal

As educators, the time taken to find a good game, validate the content quality and to see if students are engaged by it, adds to the demands of the teaching responsibility of educators. "This is making it harder; there is a lot and it all comes out every day and the kids make it their life but as a professional finding something to keep them entertained but allows me to check the content is a lot" (B1). Yet, despite that, a good game in their minds still outweighs the negative perception of digital games by the average person in that the collaboration and critical thinking are regularly referenced; "this is a great opportunity for collaboration and analysis, but we are definitely not getting opportunities like the one above (in reference to SIMS)" (B2).

Training

To assist with this argument on using games as a benefit to learning, educators noted, specifically, that the time to learn about 'good games' is lacking. One teacher mentioned, "we

(the district) spend hours on PD: writer's workshop model, standards and yet none is on technology" (C2). And another noted the frustration that the district spent time educating staff on technology hardware and platforms and not necessarily using it or being able to model good practices for use with students:

> We wanted money for concrete, validated tech . . .something that is not a fad. . .we have platforms and all the games and then the subscriptions come out and it's like, please, I have to learn the tech platform and another thing comes out and it's like, is it worth it? I got used to one thing and now you gave me another (B1).

Further support of this was a teacher who shared that once they become comfortable with the device and then the platform, after grading, lesson plan design that there then has to be time to find quality games. She commented that she often feels it's at the bottom of her list after the mandated other professional developments and requirements by administrators. "I have what I hear from kids on what they need and want and bosses who tell us what I have to do and then I have to decide where that comes together as a professional" (C1). With teachers mentioning time, and a need for training, she often found that given the specificity of game content to validate a good game, she would need a team to help her with that as not all teachers are working on that specifically in their free time. She stated that more often than not, newer educators or her teammates are still struggling to balance the devices, games and user into meaningful balance, which she feels she has mastered, but knows she is in a minority.

> I took a class on universal design and I like how the professor approached it. She was like, ok put your screen halfway, eyes on me . . . based on my experience, I have a personal plan and no one approached me and I think it will work for me . . . there are

> people who may want or need it and strategies as there are things they probably didn't think about . . . I have been taking courses awhile and I take away nuggets and based on my personality, some things are things I will use but I can see teachers afraid to use technology (B3).

Conclusion

The take-aways for teachers who use games still outweigh the benefits of use over non-use. Citing a lot of time and dedication to find a good quality serious game or SIM, and balancing it with using a flash animation allows them to have the best of both worlds in terms of buy-in and engagement. By observing peer interactions and based on the feedback provided to them by students, they can validate the learning process and assess the content level analysis of those students during gaming.

Teachers interviewed discussed engagement as a factor in the learning process but not necessarily as a precursor to the learning that comes inherently with this generation, both concepts previously cited in the literature. Given teachers understand that the technology is here to stay, they also believe that "it is coming" that a game with paired content can be expected similar to the few SIMS they have used as part of a constructivist learning paradigm.
Their requests to administrators and vendors are that the needs be defined within the design; that games have an intent and purpose, so SIMS and flash games can be noted for their objective and then teachers will know what to expect. Their requests for a need for training in identifying quality games as a resource, professional development with colleagues and time to find games that are engaging and meaningful to the learner would be a fruitful endeavor in the areas of technology.

Teacher belief that games leverage 21st-century skills like collaboration and cooperation were noted and captured as well as their observations on feedback between peers and between the student and themselves are new to the literature as a form of assessment on learning with games. Additionally, their identification of the barriers on how to use games in a meaningful way were documented. Teacher's lack of games and understanding, the time provided to see what a good game is, how to use it and how to find it, is an area that can assist with the positive use of games for instructional learning moving forward.

Listening to teachers, it was evident that they did not know the terms cited in the literature, i.e. edutainment games and serious games. Additionally, with a request for more training, an unexpected theme was mentioned as a way to identify games of quality. Teachers mentioned that schools have given extensive training on devices and platforms, but as many educators noted, not on how to use the device in a way that supports games positively and diminishes the fears associated with overuse. As a former educator and now as an educational administrator, these notes provided perspective from a teacher's point of view to consider beyond what the research questions posed.

In summation, the research questions posited, despite barriers such as a need for game quality to be defined and supported as well as the overall mindset of others on the negative impact of gaming overall, enhanced the understanding of games in the current literature. Teachers were able to assess learning during the gaming process as well as cite evidence to its efficacy in the areas of critical thinking, collaboration and cooperation. Additionally, areas around engagement were supported within the current literature and new areas for further study in terms of focus, motivation and feedback with gaming were identified.

Currently, educators in this study were not aware of games in reference to a definition of edutainment versus constructivist gaming deeply or profoundly enough that it has become part of the teacher's repertoire for discussion. Additionally, the scholarly literature is in its infancy validating any potential links between engagement and motivation of learning (desire to forge through tasks that are challenging) and motivation for learning (desire to master content) as gaming still is a new concept within the realm of a pedagogical practice.

Chapter 5: Conclusions and Recommendations

Discussion

Within an increased globalization of corporations and businesses, the need for trained, skilled leaders as part of a productive future is an immediate challenge. The worldwide workforce notes that today's learners must come endowed with 21st-century skills beyond their content knowledge and a solid technological skill base. These 21st-century skills in the educational sector are concepts like creative thinking, cooperation and collaboration, allowing future leaders to transition within roles, job settings and even different scopes that require integration unlike what has existed before. Technology adapts at an unprecedented rate and a need to have skilled workers comfortable in this medium, adapting with the technology and pushing it beyond its creative limits will require today's generations to prepare today for that challenge in our future, now. The global job market is in demand for creative thinkers and problem solvers to tackle impact projects in the areas of medicine, environmental crises, government, finance and the economic structure, hence the push for 21st-century thinking in the education sector (Brookings, 2017).

Known as the digital native, this generation of students is pliable and malleable, going outside the constraints or norms of practiced solutions to solve challenging problems. They are not ageists, working with a variety of learners and workers cognizant that each brings a skill set and enters the conversation with expertise and experience equitably. Furthermore, they are experts at obtaining and collecting information; looking at every question, every attempt at an answer and every means by which a problem has been tackled using technology and social media. They are a tech savvy generation being able to obtain information from a variety of

sources online to contribute to their perspective. These natives tackle global problems like climate change, gun control and immigration before their first vote.

The global workplace is attempting to meet these budding job seekers where they are and in their medium, employing them with the skills they have acquired, but realizing they must teach them others. Public education has focused on standards of learning, led by data driven assessments to create mindsets for a college-ready workforce. Yet, as the demands of society change, the need for students who can realistically problem solve, use technology to creatively tackle problems and work with a variety of experts in and out of their field, a need for what education refers to as '21st-century skills', including technology readiness, is in high demand. With the initiation of the P21 consortium in 2002, the ISTE Standards and PISA, a call to add technology standards around educational standards to address these learners developed.

As states have begun to adopt technology and/or career ready standards, few have increased activities that are problem-based within their community. The development of internships and programs for apprenticeships to help prepare students to be future ready also lags behind. Other states have yet to adopt technology initiatives or 21st-century skills. Without adoption of goals or standards, may find themselves adding to the disconnect from public education to the outside world. Today's high school students often do not wish to pursue a college path for a host of reasons and wander from high school to the workforce often unprepared. While schools will never have time to prepare every student for every type of job setting with every required skill set, using technology to promote learning, setting standards for technological use in problem solving and equipping students with mindsets of adaptability will certainly allow for a more successful transition (Boss, 2019).

Middle school teaching symbiotically merges content with developmental growth to yield a student who can learn more effectively on a variety of topics as they grow and mature. Today's teens use technology, games in particular, as a medium to communicate and learn. Students use game play as a way to articulate their rationale for their learning. Constructivist learning in digital games fosters a way to connect, build relationships, increase communication and support social-emotional nuances. As engagement becomes an ever-increasing demand by students and teachers alike, digital natives, particularly middle school digital natives, can use digital games to connect. Teachers in this study referenced the various influences that promote motivation in play, be it focus or competition, to add to teacher's perceptions that game play has many benefits to the learning environment. This study also references that teacher's perceptions of serious games and SIMS promote critical thinking and analysis expressed through communicative feedback. Teacher's noted that student feedback, be it between peers or with their teacher, assessed the learning objectives. The teacher's perceptions furthermore added to the idea that high engagement paired with rigorous content, noted in SIMS and serious games, could be assessed through this feedback and communication as well as validate learning. Digital gaming as a pedagogical approach has the potential to assist in the bridge toward knowledge acquisition and career readiness, the origin of what is driving the idea of a 'whole child' for students in the middle grade years.

Findings

In this study, interviews were conducted to better understand *what are teachers' perceptions of the influence of gaming to promote student learning of 21st-century skills in*

middle school students? Teachers were asked questions to speak to a larger understanding of the research questions:

RQ 1:

What are teachers' perceptions of the learning process when using digital gaming?

1) What do teachers perceive in reference to digital gaming and 21st-century skills?
2) What do teachers perceive in reference to motivation and learning when using digital games?

RQ 2:

How do teachers assess the effectiveness of gaming in instruction for the learning process?

1) How do teachers measure and assess student learning when using games?
2) What kinds of games are being used, with what efficacy and with what frequency?

This study attempted to address gaps in the literature and explore perceptions of digital games as a pedagogical strategy from a teacher's viewpoint. A case study of two middle schools in the same district, both utilizing games in instruction, were questioned. Thirteen middle school teachers in Grades 6-8 from all content backgrounds shared their experiences and perceptions on young learners when gaming in the classroom. Many teachers commented on the potential of games as a means of integration between teachers and 21st-century learners, without any prior knowledge of the literature associated with concept, or terms. Their evidence spoke to the ability to measure a learning objective using 21st-century skills and observations as part of the learning process.

Educational gaming has had a limited adoption despite the increase of technology availability in schools due to a variety of influences expressed by teachers as well. These

potential barriers require targeted and reliable strategies to assist teachers and engage them in meaningful dialogue about effective practice in the realm of gaming, an area expressed by teachers. School leaders, as well as teachers and policy makers, should explore and support a variety of professional development in this area. The conversations on digital gaming should promote ways that digital gaming best practices validate the efficacy from data and research of learning beyond engagement.

In response to the research questions, the data indicated teachers being able to validate learning in a variety of ways that support critical thinking as well as communication and collaboration. All teachers spoke to the engagement of students while gaming, hence previously noted in the literature (Kafai, 2006, 2015; Kebritchi 2008, 2010; Squire, 2005, 2006, 2011), and indicated that this engagement set a certain amount of buy-in by students when gaming, which teachers felt was "disguised learning" but positive to its end. Additionally, the buy-in teachers spoke of increased focus and motivation towards the task when gaming, an additional benefit for teachers.

The current literature previously validated engagement from gaming, hence the use of engagement as an intermediate outcome in the framework. The focus on 21st-century skills directed the parameters of this study as teacher's perceived them in respect to learning (Kafai, 2006, 2015; Kebritchi 2008, 2010; Squire, 2005, 2006, 2011). According to the perceptions of thirteen middle school teachers, they perceived students' lack of focus and long-term sustainability on a task as an inherent issue, regardless of the pedagogical technique. Teacher's also perceived a lack of rigor in content in certain games being used in education currently. Teachers see these characteristics of both games and students as an impediment to the learning

process that could be linked in a way to yield positive results. These same teachers recognize games do come with high levels of interest and engagement and can show the development of 21st-century skills such as collaboration, communication and cooperation as well as healthy competition. These educators noted digital natives provide rich feedback to their peers from the learning experiences and overall process when involved with learning during serious games. Teachers in this study all utilized digital games as part of their practice. These teachers' observations and commentaries were obtained and noted for their need to validate good question design as part of the learning process. Teachers spoke to the need to alter objectives within a game, offer students the ability to design their own questions and questions exchanged back and forth as valuable, and a way to validate digital game use. With both content and feedback in digital games paired with high engagement, teacher's perceived a worthwhile amount of time dedicated to this task was meaningful.

Throughout the course of the data collection, the district was undergoing a philosophy shift. With large initiatives being discussed in K-12 education around mindfulness, the director of technology post was eliminated and a director of wellness appointed. This shifted resources, focus and professional development into that realm and potentially from technology. Additionally, the director of instructional data collected iPad to shift into the high schools and initiated a full Chromebook model at the two middle schools. Teachers spoke to the collection of middle school devices as a substantial limitation to their use of games and technology overall. As the devices shifted up to the high schools, carts of one class set were now housed by department; often shared between 6-8 grade teachers within a department, a huge shift from the prior practice and were forced into using more traditional approaches rather than their prior immersive

technological practices, from their perspective. This limitation may have influenced teacher participants within the study and notes that perspectives of teachers who did not use games were not obtained. Teachers in this study, as well as outside did not then speak to greater conversation about the balance of learning, technology and mindfulness working in conjunction.

Limitations to the study were noted by both the researcher and participants. From a research perspective, there was a reduced teacher sample size. Implications could be a resultant response to the district initiative away from devices, or time of year as data was collected in the summer months through to fall, a busy time for staff. Despite the small sample size, representatives equated from both schools, and a variety of disciplines. While many teachers were in science, math, computer science and special education, there was a teacher from ELA and a teacher from Social Studies who shared perceptions, however more teachers in this area would enhance the perspectives collected. Another reason that may have contributed to the small sample size may be due to misperceptions. In speaking with teachers during the study, many stated they thought this study was focused solely on commercial video games. Others stated they could only think of Minecraft as a digital game (in their mindset) that as educators they could see teachers using. During the interview protocol, many shared that terms like digital games, serious games, off the shelf games, etc. were not in their purview as ‘game terms’ nor in their knowledge base. Without knowing the teachers extent of professional development, teachers spoke to the games that were part of teaching repertoire. Furthermore, since participants in this study utilized a variety of games, they made references to their perceptions as games they have heard of or utilized once but not with frequency.

Many, if not all teachers in the study, made mention to the inconveniences of signing up

for carts, planning around their availability and the limited access of devices in their room. Several spoke to the use of cell phones as a device for flash animation games in the absence of the device, violating the school policy on cell phone use. Another teacher noted the district shift to wellness as a validation of the digital native being "addicted to immediate feedback" and mindfulness being presented as the emerging need. Teachers noting a balance using devices, were areas of perceived concern a shift too far in another direction away from technology use.

Beyond the shift in philosophy, a shift in goals and objectives for professional development with reduced opportunities around technology was shared by teachers. Many staff members noted time needed to find quality games was often lost during department meetings and team meetings to focus on new standards, new data initiatives and mandated wellness skills as an infusion to their lessons. One teacher noted that the time to sit with colleagues for them to each find one game, play it, build objectives and activities might take a whole marking period, and with the planning and grading, it was not a priority. This same teacher noted however that the quality games that they were able to locate and share, validated that these resources exist and are highly beneficial. Her dialogue noted she hoped studies such as this would speak to administrators about the balance required to use all resources in a holistic and comprehensive way to address learning. More so, her perceptions echoed by others in the study around the quality of feedback provided, was perceived as a validation of the efficacy around digital games. The idea of high-quality feedback supports the scaffolding demonstrated in constructivist thinking paradigms, an important step in critical thinking.

While not all teachers interviewed could speak to this, a few noted that students lack focus and perseverance as digital natives. Many also perceived this mindset could be from

gaming online extensively, as a generation. If the middle school teaching philosophy seeks to merge skills and content while being cognizant of the social and emotional growth of all students, then games need to be viewed and studied for their ability to be constructivist in nature. Play of all forms build on skills and constructivist thinking layers critical thinking to build upon that. Digital games like SIMS and serious games need to be studied with students specifically to challenge and build upon student learning. Additionally, teachers need to be trained on these components of a good game and how they can be utilized to engage and support learners in the classroom environment. All teachers spoke to students who demand immediate feedback, more so than in other generations inherent in today's games be they for pleasure or education. They also said this ran hand in hand with a need for high levels of engagement; two things many perceived were hallmarks of being part of a 'video game generation'. To a positive note, they felt that the feedback students requested was also something visibly given to their peers and back to them as professionals when gaming was of high quality. Many teachers noted the rich dialogue between peers around critical thinking and analysis, and showed evidence of collaboration and problem solving. This dialogue enhanced and furthered learning between peers and gave valuable feedback to teachers as a way to validate understanding.

Teachers relayed that given the need for both engagement and feedback, students were given a certain level of immediacy, something games provided. Teachers often found through their practice that not all games were created alike and that games with deep content offered more levels for growth and learning. Overall, however, did not diminish the value associated with other games in the areas of social interaction, communication and collaboration. Consequently, teachers all requested that there was more time given to find better quality games

with deep content that could leverage all the things they see with the games they are using and that this would be a worthwhile venture from their professional development planning. Teachers were unaware of how to define a quality game without use, how to find games appropriate with both content and age-appropriateness and how to be supported with game usage for learning. These questions by teachers then direct educational leaders to ask for a greater clarity from vendors. A need to develop and improve on relationships between user and designer by which teacher, and student input, around game design as well as needs assessments on targeted skills can be an area for further exploration.

The themes elicited from the study support current literature on the topic of engagement but also add in the areas of: feedback, focus, motivation and 21st-century skills such as collaboration and critical thinking. Literature on the use of games to engage learners has been consistently emergent in the last ten years regardless if the game is paired with content or other types of skills (Kafai, 2006, 2015; Kebritchi 2008, 2010; Squire, 2005, 2006, 2011). While the literature also speaks to a variety of fields (higher education, varied professions such as medicine or military) and a variety of ages the engagement to play was noted. In reference to this study and to build upon this idea, middle school students were targeted as the bridge between social emotional development and cognitive growth. Teachers also spoke to the idea of both types of games often used in education; skill and drill flash animation games, and longer played simulation games linked to content. One participant in the study spoke to both as well as a third type of games, engineered games with the authors being the students who built the code, content and platform. A RAND corporation status report in conjunction with the ASIA society offered guidelines for 21st-century skills to educators where SIMS are mentioned as an exemplary model

to utilize in instruction based on the research of Soland, Hamilton, & Stecher (2013). And while student engagement is critical to the development of these skills as teachers noted for sustained focus and motivation in play, content was also noted by teachers in this study as a way to engage in richer dialogue, critical thinking and collaboration in the learning process. This was briefly referenced in a study looking for other implications for future research on assessing these skills (Hamari, Shernoff, Rowe, Coller, Asbell-Clarke, & Edwards (2016). This study formalized a rubric designed for educators to identify and assess 21st-century skills while in play which future implications for this and other studies should be noted. Within this investigation, teachers spoke to the positive role that feedback has as part of the learning process for both students with students and students with their teachers as games are being used. Their observation of skills was assessed during cyclical communication and collaboration. Demonstrated by students, games enhanced their higher order thinking skills to solve, adapt and manipulate elements to complete objectives. Deepening students' understanding through this critical analysis students remained engaged while being collaborative. This is an area to develop and build upon as it enhances the dimensionality of engagement referenced in the literature and allows for further depth into the timeliness of feedback, the quality of feedback and the use of cyclical feedback to continue the communication and collaboration process.

Not expected as a resultant data point from the collective narrative in this study was the hopefulness teachers have in the development of games as a learning genre to add to their pedagogy. The collected narratives show teachers have a positive viewpoint by teachers in that there is potential for quality games paired with content to continue. Teachers are hopeful that with the known factor of engagement, vendors will expand this market and provide more quality

options for teacher use. Teachers spoke to the generation demanding the type of engagement that games provide. As more resources and supplements go digital, the use of content rich highly engaging games will be in demand. The movement to support professional development and the dialogue around the use of 'good' digital games as a pedagogical practice to enhance the learning environment continue to be critical. The biggest disconnects noted on this front was from the will be detailed further in the recommendations section.

Implications for Policy and Practice

The professional dialogue on how to prepare today's students for an uncertain future in a traditional learning environment has been a discussion among educators and policy makers for the latter portion of the 21st-century. While the United States Constitution provides states the responsibility and discretion in areas of education, a nationalized curriculum with standards have been part of the educational dialogue. The Common Core initiative has challenged educators towards more rigor and as stakeholders seek to create balance between educating all children with common goals, there also is a heavy emphasis on assessments to validate standards of learning in mathematics and language arts. In stark response, magnet, private and charter schools as well as entrepreneurs have entered the public sector to present alternatives to traditional learning environments keeping rigorous goals in mind but with alternative ways to assess learning. Large research institutions like RAND and Brookings have challenged all those in the global community to invest in alternative learning solutions to meet the needs of a global learner in a 21st-century world cognizant of a 21st-century learner.

In the early 2000s, at the infancy of digital gaming, consortiums like P21, ISTE and PISA

worked to develop mindsets, readiness standards and goals as part of a global initiative to prepare today's learner. These organizations through their research attempted to integrate the digital native into an educational environment tailored around their learning. Their work took years to filter down to the states and agencies any type of "guidelines" on how to develop and assess these skills (Soland, et al., (2013). Many states have adopted Common Core Standards (CCS) for student learning that are revised on a five-year curriculum cycle. In New Jersey, the adoption of the Common Core in Math and ELA has occurred in the last ten years through revisions and waivers. However, standards 8 and 9 are newer student learning standards for technology integration. In progressive districts, these are being embedded within the core of standards taking a very limited role (New Jersey Department of Education, 2014). These newer standards, 8 and 9, seem to be presented as complements, rather than components of a core, well rounded and comprehensive curriculum. These were poorly presented in their origin in that their intent was not promoted as a way to support the digital native or 21st-century learner. The NJDOE must revisit the unpacking of Standards 8 and 9 to the professionals who are preparing 21st-century learners and engage them in dialogue about infusion in everyday practice. Similarly, as noted in the research with respect to feedback as a pedagogical tennet, professionals must engage in dialogue with students and policymakers about making these the cornerstone of practice to meet student learning styles.

Traditional high schools offering a college bound program of four academics per year remain the norm. Prior alternatives to a high school diploma could be a G.E.D. or vocational programs as part of a non-traditional offering for non-college bound students. New Jersey with its adoption of certain choice legislation has opened up the way for technical high schools and

charters that are application or lotto based. Through school choice and through the adoption of NJ standards 8 and 9, different pathways for the non-college bound student are taking root. Other progressive districts are infusing their programs with local colleges to offer associate degree programs or certifications for pathways, but not in a large amount. The engagement that is required by today's learner combined with job ready skills are still lacking. The NJDOE must filter to county Superintendent's the data that supports alternative pathways, digital learning paths and technology rich initiatives that will address the 21st-century learner, and not as a vocational 'alternative' but in parallel to all levels of learners. Standards 8, 9 and the CTE elements in particular are a means by which the Common Core and Next Generation Science Standards (NGSS) can assess learning. The support of the learning process and creation of meaningful learning experiences in the areas of Math, Science and Language Arts are critical and need to be presented in a medium and manner that speaks to the digital native. Content area supervisors and district leaders need to introduce Standard 8 and 9 as not an addendum to a curriculum, or as companion standards, but as the foundation by which lessons, activities and assessments can be built around to challenge the 21st-century learner.

There has been a failure to engage professionals around standard 8 and 9; conversations that support a higher caliber of learning, theory into practice, and practical implication should be the cornerstone of regular dialogue in public education in New Jersey. The conversation must move from think-tanks and the state department into local schools. The mindsets outlined through p21.org are not in all schools in the state of New Jersey, and the conversation of the practices to address learners are left behind other initiatives. Infusing 21st-century skills into facets of curriculum for integration has resulted in a box in curriculum guides for teachers who

are told to infuse Standards 8 and 9 where relevant without background or understanding. This misguided objective comes from a lack of understanding of the big picture on how to engage today's learner. As educators speak to the lack of engagement noted among many digital natives, but also recognize a need for mindfulness by students, then further research must speak to the concept that quality digital games, engaging in nature and paired with rigorous content, can stand alone with other activities to promote effective learning. Curricular offices and professional development trainers have failed to connect the dots for principals and teachers. While ideas like technology and mindfulness appear to be ways to solve the issues of the 21st-century learner, good practices in pedagogy show us the critical feedback has the ability to address and promote higher levels of thinking. Games have not been marketed to professionals as a way to promote critical thinking. Additionally, feedback through questioning, as would be utilized in any traditional lesson, have been noted as a pedagogical technique to use within the game environment in the classroom but not adopted overall. By making standards 8 and 9 as well as CTE standards the triangulation points of content and pedagogy, rather than a checkbox, there will be greater success with the digital native. Whereas the CCS and NGSS should be infused with these standards, Standard 8, Standard 9 and CTE fall under them, even lower than speaking and writing standards. Therefore, the resulting practice is to find a lesson that can show one point under a core standard in order to comply. As educators and leaders gain a deeper understanding of the goals and ways to use the mindsets outlined in P21, ISTE and PISA, district and building goals should align to inform educators that the current pedagogy is not suiting the needs of its current learner. As educators share frustrations and increased disconnects with young people and focus more on standards linked to assessments, the divide between theorist and practitioner

spreads. If educational professionals are truly to speak to future readiness and global learning, then the standards need to be front and center, rather than in the background. Better games, games like SIMS and serious games that promote high engagement, rigorous content and meaningful feedback need to be created, presented and supported as a technique for practice. Teachers need to be guided into developing quality feedback through higher-order questioning while gaming and like all things, use this practice in complementary balance with other validated practices.

The International Society for Technology in Education (ISTE) has technology standards that elevate current NJDOE standards, speak to design thinking and 21st-century learning in that they can be applied to all curricula. The CCS in Math and ELA as well as NGSS speak to the rigor of content goals and objectives but little pathway to get students there. ISTE and P21 encourage design thinking mindsets as well as problem-based learning projects to create a robust learner endowed with technological skills, prepared to tackle global pathways. The Programme for International Student Assessment (PISA) group further guides educators on how to take standard assessments and pedagogical practices and extend them above and beyond to engage the learner and spark collaboration, communication and critical thinking. In their 2013 guidance for educators, they offer non-traditional examples of ways to assess student learning, allowing informed educators to plan backwards from that goal's end with proper guidance and support (Soland, et al, 2013). The integration of Standards 8 and 9 in the forefront of curriculum delivery through creative pedagogical practices will support the much needed 21st-century skills like collaboration, communication and critical thinking. Standards based assessments should move away from practice in favor of assessing standards into using digital games, PBLs and

collaborative projects that use technology to support and assess the learner speak to the digital native.

The greatest barrier to the implementation of the standards lies with the teacher's lack of knowledge, an experience noted by the observer in the research. While the PISA Standards, ISTE Standards and P21 Guidelines were conceptually known by myself as a researcher, it is clear that the bulk of teachers in the classroom are unaware of the philosophies, terms, goals or objectives of these initiatives. Moreover, the development in the state of NJDOE Standards 8 and 9 have not been derived in their origin as part of a needs assessment for future generations to progress substantially to at least this subset of staff.

Training on how to implement games to support soft skills, aka 21st-century skills, is critical for teachers who wish to guide and assess today's learner. Greater professional development around the ways in which to use technology and the role of games, in lieu of the hardware itself, needs to come from trained educational coaches who know how to use technology to specifically foster student learning. Education learning between vendors and educators on how to connect games of content and critical thinking for students needs further work as mentioned previously. Additionally, opening up game design for students through coding classes, technology classes and through projects that discuss the value of a good program are ways to engage these skills as well as foster 21st-century skills. Courses in middle schools and high schools on game design and coding could address the design of the game, the context embedded and the audience of digital natives around the qualities of a good game would allow for meaningful impact on 21st-century skills as well as content. As administrators roll out initiatives, there must be an understanding of the role of games, the defining of a 'good game' in

common language and ways to provide staff with quality games in their content as part of regular training. To that end, demands by educators for higher quality SIMS in education by vendors, similar to the ones provided by the United States Military are necessary. Through National Science Foundation (NSF) and private funding, scholarships and college fellowships, students could be the designers of these games for younger generations; giving them practice coding, designing and collaborating using 21st-century skills at all levels, middle school and beyond. Additionally, colleges with teacher preparation programs must expand their training on game design in the classroom; methods classes in a digital platform are absent in many of these programs. Furthermore, to enhance this, collaboration and integration with college computer science departments into the realm of education as a means of exposure for designers who might otherwise go into commercial gaming, have another audience to design for. By allowing college students to marry content and educational objectives, the expansion could not include game design for a larger audience, but for a classroom audience as well. Educational administrators as well as local school organizations must continue to dialogue with their local colleges about a P-21 curriculum rather than a K-12 curriculum as a mindful pathway for 21st-century learners.

Research Recommendations

This study captured perceptions of middle school teachers who used digital games in their classroom and their ability to assess 21st-century skills. While the sole objective may not have been to teach 21st-century skills as an added benefit of gaming, this added to the literature on student engagement while gaming. This study, through its narrative data, elicited further insight on gaps in the literature on gaming paired with content, the influencers of the engagement

and other areas defined as 21st-century skills (collaboration, communication and critical thinking).

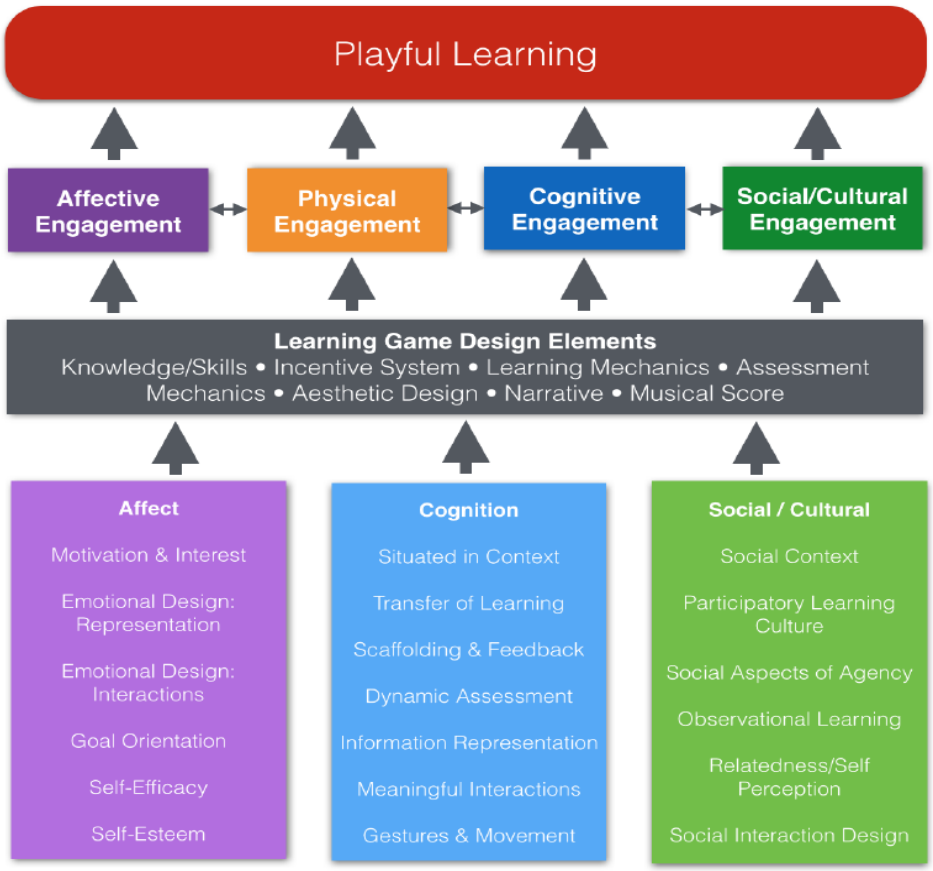
In expanding and furthering on this research, this study could be expanded to a variety of middle schools. Additionally, to expand the data window within its time frame to elicit a larger sample size as these perspectives while anecdotal, may speak to more universal conceptions and perceptions. Another recommendation would be to expose these interviews to staff members of middle schools in districts whereby devices are still in hand and being used daily. This would speak more to the volume of the experiences by the user as observed by teachers to expand on their perceptions, a comparative case study. From a researcher's perspective, looking to expand this study to schools who have more experience with foundational preparations on Standards 8 and 9 as well as the P21/ISTE/PISA philosophy would align as teachers may be more prepared with terms and vocabulary during questioning.

Given the overall insights in the areas of focus and motivation further research should be focused around what motivates the digital native. To deepen that research, it was noted that this study's small sample size yielded 21st-century learners required engagement, as well as, consistent and immediate feedback. Research focusing on student perception of how feedback and immediateness relate to engagement, focus and motivation while gaming would also prove relevant. To examine the relationships between learning and motivation through gaming is also an area of future development. Plass' (2015) work on DGBL yielded in a framework for integrated design that speaks to four pillars driving a gaming experience, with an ebb and flow between cognition and motivation as noted in the figure below. The elements of discourse, or scaffolding feedback and meaningful interactions contribute to cognition. Similarly, self-

determination, self-efficacy, interest and goal orientation contributed to motivation. Plass's framework is a complex design designed for the user in the game experience as a solo experience. However, these tenets, overlaid in the setting of user with user or user versus user in a cooperative game play experience could be further explored as the evidence collected in this study supports and strengthens the elements outlined in the framework. Given the learners utilizing these games have learned in this format their entire lives and can shed light on new forms of constructivist thinking, a way to pair cognitive growth and intrinsic motivation is suggested as well as a way to quantify and qualify that relationship.

Figure 3

Integrated Design Framework of Game-based and Playful Learning (Plass, et al., 2015).



At the time of publication, a recent development with a case study in Malaysia spoke to a sample size of 10 students and the development of a rubric for game design for 21st-century skills (Farhana, Yatim, & Nor, 2019). Research that can qualify and quantify where and how 21st-century skills are being applied in a gaming context will support the use of these mediums as value added pedagogical practices.

With clearer contexts on how to implement and apply knowledge of the assessment of 21st-century skills, staff can plan backwards into meaningful activities with games that validate the constructivist learning process. Teachers need support, training and better resources to look beyond 'edutainment' games into serious games. The jump from basic engagement via a flash animation game to skill and drill and assess the most basic levels of rote memory in Bloom's taxonomy. Serious games have provided potential and teachers see this with engagement and acknowledge this as a way to spark critical thinking. Serious games, or SIMS that allow for variables and higher levels of critical thinking with the support of leaderboards, competition, collaboration and flash animation pair engagement with critical content for learning. Teachers acknowledge the place for flash animation in a given lesson's structure to take a quick pulse and assess. However, teachers also recognized the impact for learning a serious game can have as well.

As referenced in Figure 1, the variables embedded within a game allow the objective to evolve into a realm of higher thinking, fostering critical thinking which has shown evidence from these teacher's perspectives to have a positive relationship with engagement. As noted previously, at the time of publication Farhana et al., (2019) Malaysia study looking at cognitive processes matched with gaming psychomotor influencers speak to more development on rubrics

that can assess cognitive learning with games beyond engagement. The symbiotic influence by which games are engaging and students create engagement through collaboration and communication are also further noted, supporting the themes elicited from the research questions. Further study into that process is a critical foundation to building engaging games with meaningful learning as an outcome that can assess cognitive development. Therefore, ways to assess the relationship between the actors and the outcomes need further investigation. Figure 1 indicates the actors and variables at the start of the study and end; the changes and relationship were noted as well.

Figure 1

Conceptual Framework of Actors and Outcomes

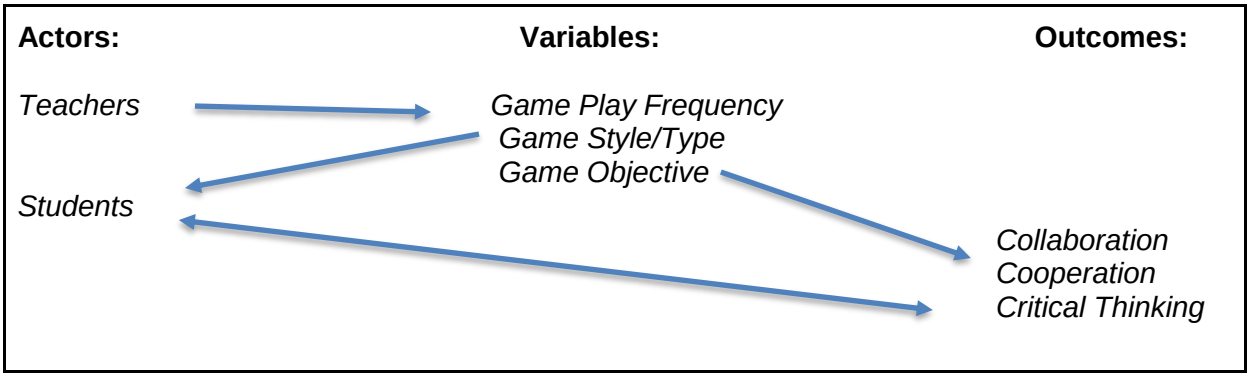
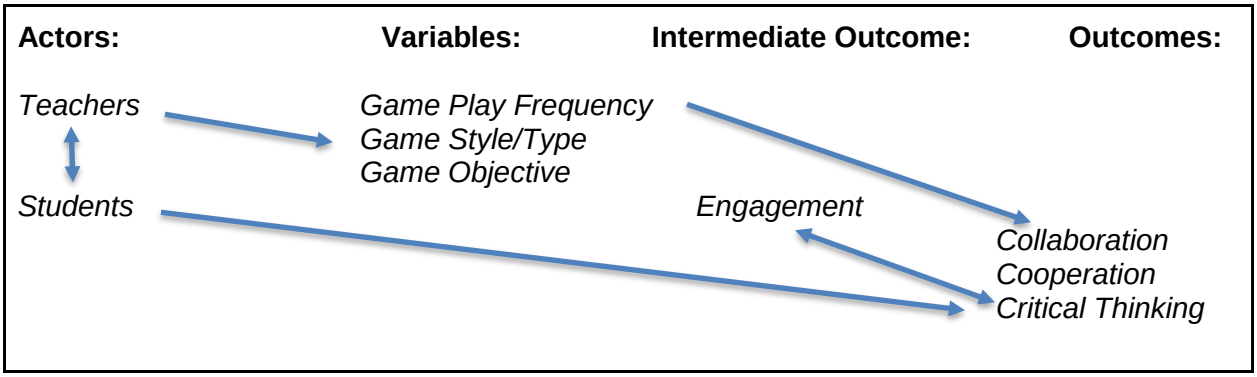


Figure 1 (Revised post data collection)

Conceptual Framework of Actors and Outcomes



Given serious games (SIMS) demonstrate constructivist approaches to learning in the classroom, further research into the design of these games as they impact the learning process is critical. With researchers examining game quality influences that lead to learning with games and the student's perspective, avenues where this could be encompassed in entirety would be to delve into research on the learning process of student game design. Cognitively, the constructivist thinker in a digital realm could speak to the motivating factors influencing play, and speak to what, and how, games are designed to give the feedback, focus and critical thinking that may or may not lead to engagement. Furthermore, teacher's observations of collaboration and communication could be captured and observed in this format by researchers. A recommended extension of this study includes teachers engaged in peer observations with a data checklist/rubric to continue to capture evidence on the procurement of 21st-century skills. Collecting narrative observations of peer on peer engagement and sharing observations on 21st-century skills could strengthen this study as well as the Farhana's et al., (2019) Malaysia study. Lastly, for researchers, observing students gaming with a serious game, could be a way to note

frequency and specificity of peer feedback as a way to observe 21st-century skills. Follow-up with students and capturing perspectives behind their dialogue, mindsets and motivations could speak to the factors influencing their actions and behaviors. Validating question rigor could then also be reviewed via document study utilizing the rubric and narrative components for validity.

Conclusion

The research findings in the areas that expand on engagement collected in this study contribute to literature from the last ten years of students engagement when gaming. However, with a very subtle angle beginning in 2015 by which cognition and motivation were studied in 1:1 user groups, the findings outlined in this study can support and expand on these ideas.

By continuing to validate the efficacy of digital games for learning over sheer entertainment, foundations for pedagogical practice can be substantiated. Research needs to continue and funnel into the practitioners who will use these games with greater confidence and knowledge.

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APPENDIX A: Request to Collect Data

Dear Dr. Sargent and Members of the Board of Education,

My name is Elizabeth Omegna, and I am a doctoral student at Seton Hall University in the Department of Education, Leadership, Management and Policy. Under the mentorship of Dr. David Reid Ph.D., I endeavor to investigate teacher perceptions on digital gaming for the purposes of learning 21st-century skills with middle school students.

The intent of this qualitative case study is to meet with teachers of middle school students who use different types of digital gaming. Using teacher perceptions on gaming, I hope to gain a better understanding on the use of games to promote or foster 21st-century skills such as critical thinking, collaboration, and cooperation.

Participants would be involved in 1:1 interviews about 45 minutes in length. The hopes are that interviews and observations will be conducted after February 2019 and on. All interviews will be conducted offsite at a time, date, and place of choice convenient for the interviewee, outside school hours. The interview protocol is included for review and there are no risks in participating. Interviewees will be chosen from a purposeful sample after a digital survey is given to all staff members at both middle schools. I am requesting the support of the building Principals to introduce myself to staff members, share the parameters of my study, and disseminate a survey; all digitally.

A small selection of interviewees, with permission by the Board, Superintendent and, at a time least intrusive to daily happenings, will be observed on site using games with students. At no time will student demographics be taken and all notes transcribed by myself will be of the teachers and their use of games as a pedagogical tool.

There is no compensation associated with the interview, apart from the shared findings to increase best practices to reach the next generation of learners for all educators.

All staff names will remain confidential during the interview and data transcribed and recorded will be stored on a flash drive with the researcher for a period of five years concluding the study until erased.

I am available to answer any further questions regarding this investigation at your convenience and look forward to working with your teaching team.

Elizabeth Omegna
omegnael@shu.edu
201.259.1541

APPENDIX B: Post-Interview Contact Summary Form

Site Location:
Date/Time:
Interviewee:

1. Main ideas with this contact noted:
    a. Point: Theme:
    b. Point: Theme:
    c. Point: Theme:
    d. Point: Theme:
    e. Point: Theme:

2. Overall Summary:

3. Additional Observations with this contact:

4. Follow-Up Questions for this contact:
    a. Better clarity on:
    b. What is meant by:
    c. Concerns expressed:

APPENDIX C: Questionnaire

Good Afternoon Staff,

I am currently a doctoral student at Seton Hall University. As a former science educator, I have become interested in the ways technology can support student learning. Many educators have discussed through PLCs and in faculty meetings and potentially with coaching cycles the need for high student engagement, the use of technology as a facilitative tool to the learning process, and the need to prepare students for the 21st-century.

I find the middle schools are technology-conscious schools, with students and staff members embracing the 1:1 initiative, the use of G-Suite tools, the use of PBLs in science and math, and utilizing the many innovative cross-curricular projects to assess the student learning process.

To that end, I am looking for your input. As educators in the classroom, I need to know more about your experiences with students using technology, particularly with gaming in lessons as a way to provide understanding of 21st-century skills.

In this email is a Google form that will ask some basic demographic information along with a release for interviews. The survey will take less than 2 minutes, and I will use this data to help me group teachers by years of experience, simply to be more manageable and organized, so we can have more discussions individually and, as a group, based on your experiences on these ideas.

I appreciate all the time and effort you put into making such a meaningful environment for students! I look forward to capturing your insight as we continue to provide the most meaningful experiences for students.

Elizabeth Omegna
omegnael@shu.edu

APPENDIX D: Interview Protocol

Hello! I know there is a lot to do in a day, so I truly appreciate the time you have taken to share with me your thoughts on this topic. As you may know, I am a doctoral student at Seton Hall and one of the things I am looking to learn more about is digital games used in the classroom setting. In particular, how are games used by teachers for instructional purposes, and how is the gaming mindset captured as a way to understand learning of 21st-century skills? I am eager to hear any thoughts or experiences you can provide me with!

To get started, could you tell me about your background?

- How long have you been teaching?
- How did you get into teaching?
- What drew you to your subject area?
- What kinds of current PD are you drawn to?

When you set up your classroom the first time as a teacher, what did you want in regard to:

- How do you assess student learning?
- How do you use technology?
- How do you see assistive technology taking place in schools?

I am trying to get to know this idea of digital gaming. Can you help me to understand from a teacher's perspective?

- What do you think of when you hear "gaming"?
- What role do you think gaming has in the classroom for instruction?
- Tell me how gaming might look in one of your lessons.

Tell me about how you see the use of games for personal learning?

- Do you think of games as teaching tools when designing instruction?
- Tell me your thoughts on the use of games as assessment tools.
- Do you feel games provide rigor for the learning process?
- When a student is struggling with content or skills, have you identified a game that you use?
- Do you think the frequency or amount of use of games have an impact on learning?
- What kinds of learning limitations are associated with gaming?

What are your observations on pupil engagement when games are a learning tool?

- How does one measure student understanding when using gaming?
- What skills are being utilized when students are gaming in the instructional process?

Is there any evidence of growth of skills when gaming is part of a lesson?
Is motivation or engagement a precursor to learning when using digital games?

Here are some examples of gaming platforms, can you tell me your experiences with:
Kahoot?
Socrative?
Quizlet?
Remind?
Duolingo?
Mango?
BrainPop Games?
Icivics Games?
Factitious?
Classroom DoJo?
Minecraft?
Civilization?

Have you used other digital games?
How have you used them in your classroom?

Using any (or all!) of the above, can you talk to me about how you use these for:
Providing immediate feedback (communication)?
As progress indicators to develop higher levels of thinking or skill mastery?
As social connections or to provide healthy competition (collaboration)?

Do you have suggestions for PD in the areas of?
You and your classroom instruction in regard to gaming?
You and your classroom instruction in regard to 21st-century skills?

From a professional experience, do you:
Feel that you have the time, resources, or training on games?
Feel that games take from your lesson? Add to it?
Feel that games make your job easier? Harder?

I cannot thank you enough for your insight today! This was a tremendously helpful experience as you provided me a snapshot into your teaching and how this tool can impact the student learning process. As my research develops, I hope we can chat again so I can get more of your input on the next phases of where this leads.

APPENDIX E: Peer Observation Checklist (For Teacher Use)

Communication

Can you talk to me about how you assessed for understanding of this skill?
Can you talk to me about how you set an objective for this skill?
Can you choose the level of mastery you feel students accomplished of this skill?
1 2 3 4 5

Collaboration

Can you talk to me about how you assessed your understanding of this skill?
Can you talk to me about how you set an objective for this skill?
Can you choose the level of mastery you feel students accomplished of this skill?
1 2 3 4 5

Critical Thinking

Can you talk to me about how you assessed for understanding of this skill?
Can you talk to me about how you set an objective for this skill?
Can you choose the level of mastery you feel students accomplished of this skill?
1 2 3 4 5

1=No Proficiency
2= Emerging Proficiency
3=Partial Proficiency
4=Proficient
5=Highly Proficient

APPENDIX F: Data Codes

Descriptor	*Code Type*	*Nickname*	*Frequency*	*Theme*
Learning	Process Code – Situational	LRN		
Designing	Process Code – Situational	DSGN		
Thinking	Process Code – Situational	THNK		
Critical Thinking	Process Code – Situational	CThnk		
Assessing	Process Code – Situational	ASSESS		
Collaborating	Process Code – Situational	COLLAB		
Feedback/Dialogue	Process Code – Situational/ In Vivo	FBK		
Evaluating	Process Code – Situational	EVAL		
Engaging	Process Code – Situational	ENGAG		
Winning	Process Code – Situational	WIN		
Focus	Process Code – Situational	FOC		
Feeling	Emotive Code – Situational	FEEL		
Motivation	Emotive Code – Situational	MO		
Competitive	Emotive Code –	COMP		

	Situational			
Communicate	Descriptive Code	TALK		
Skill	Descriptive Code	SKILL		
Peers	Descriptive Code	PEER		
Games (+, -)	Descriptive Code	GAME		
Sims	Descriptive Code	SIM		
Time (+, -)	Descriptive Code - Condition	TIME		
Preparation	Descriptive Code - Condition	PREP		
Resources	Descriptive Code - Condition	STUFF		
Immediacy	Descriptive Code - Condition	IMM		
Buy In		CAPITA		
Influence (+, -)		INF		
mindfulness?				
adaptive		ADAPT		
Disguised learning		HIDE		

(25 codes)

Roles

Relationships

Routines

APPENDIX G: Participant Information

Content Area:	Grade Level of Instruction:
Science	Grade 6
ELA/ELL	Grade 6 - 8
Science	Grade 7
Special Ed Social Studies	Grade 7 & 8
Technology and STEM	Grade 6 - 8
Science	Grade 8
Math	Grade 6
Math	Grade 6
Math	Grade 8
Math	Grade 8
Special Ed Math	Grade 6
Special Ed Math	Grade 7
ELA	Grade 7

SETON HALL UNIVERSITY
1 8 5 6

May 14, 2019

Elizabeth Omegna
[redacted]

Dear Ms. Omegna,

The IRB is in receipt of the application for your research entitled "Teacher Perceptions on Digital Gaming for Learning 21st Century Skills in the Middle School Classroom."

Your Application does not fall under the purview of the IRB because, as you describe it in your Application, it is a non-generalizable case study on teaching methodology in one school district only.

Sincerely,

Mary F. Rozicka, Ph.D.

Mary F. Rozicka, Ph.D.
Professor
Director, Institutional Review Board

Cc: Dr. David Reid