January 2015

Digital Games For 21st Century Learning: Teacher Librarians' Beliefs And Practices

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DIGITAL GAMES FOR 21st CENTURY LEARNING: TEACHER LIBRARIANS' BELIEFS AND PRACTICES

by

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A Thesis

Submitted to the Graduate Faculty

of the

University of North Dakota

in partial fulfillment of the requirements

for the degree of

Master of Science

Grand Forks, North Dakota

May, 2015

This thesis, submitted by Amanda S. Hovious in partial fulfillment of the requirements for the Degree of Master of Science, Instructional Design and Technology from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done and is hereby approved.

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Department Instructional Design and Technology

Degree Master of Science

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May, 2015

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ABSTRACT

Digital games as tools for learning in K–12 have been a topic of intense discussion over the last 15 years. One area of focus has been on the integration of commercial off-the-shelf games in lesson plans. A predictive factor for the adoption and integration of digital games is the attitudes or readiness of teachers. Yet, while many studies have examined this with teachers themselves, teacher librarians (TLs) have largely been ignored, despite the key role they play in education and technology adoption in schools. This study attempted to determine TLs' beliefs and practices about digital games as 21st century learning tools, to examine similarities and differences with those of classroom teachers, and to see if and how TLs' pedagogical beliefs impacted their perceptions of barriers toward digital game adoption. The Teachers' Attitudes Toward Games (TATG) Survey measured TLs' perceptions of barriers to using digital games. Findings suggest that TLs tended to use digital games to address discrete library skills—a behaviorist practice—despite the fact that they tended to hold constructivist pedagogical beliefs. Though, evidence showed that some were using games to integrate 21st century skills into classroom lessons. Similar to findings on classroom teachers, TLs perceived lack of time, lack of infrastructure, and lack of support as barriers to using digital games. Furthermore, TLs with behaviorist beliefs tended to perceive greater barriers to using digital games as compared to TLs with constructivist beliefs.

CHAPTER I

INTRODUCTION

Even prior to the new millennium, 21st century learning was already a topic of conversation among scholars, educators and policymakers. The underlying premise being that in order for students to be career and life-ready in the information age, new models for learning needed to be adopted (Abbott, 1997; Longworth & Davies, 1996). One such model is the Partnership for 21st Century Skills' (P21) Framework for 21st Century Learning. The P21 Framework emphasizes critical thinking, communication, collaboration, and creativity (4Cs) as essential learning outcomes for the 21st century. Information, media and technology skills are integral to the development of the 4Cs, giving teacher librarians (TLs) an important role in supporting 21st century learning.

Both the American Association of School Librarians (AASL) and the International Society for Technology in Education's (ISTE) special interest group for media specialists (SIGMS) advocate for TLs to support 21st century learning by: (a) teaching to a cross-section of learning standards that reflect the P21 Framework, including the Common Core State Standards (CCSS), and AASL and ISTE Standards; (b) evaluating existing and emerging technologies; (c) teaching information literacy skills; (d) collaborating with classroom teachers; (e) serving in leadership roles (e.g., technology planning committees); (f) and developing library collections and administering library programs that promote 21st century learning (AASL, 2007; ISTE-SIGMS Executive Advocacy Committee, 2010). Furthermore, today's school libraries function as 21st century learning spaces where students can access technology and work together on collaborative projects (ISTE-SIGMS Executive Advocacy Committee, 2010).

TLs are already embracing these roles and becoming technology leaders in the process. In 2013, *School Library Journal* conducted a technology survey of U. S. school libraries and found that out of 761 TL respondents, 72% reported being viewed as technology leaders in their schools, 56% reported introducing technology at the classroom level, 42% reported serving on their schools' tech teams, and 34% perceived themselves as having a school-wide impact on technology adoption. These findings illustrate the significance of TLs' potential roles as advocates for the kinds of technologies that support 21st century learning—technologies such as digital games (Greenfield, 2009; Hayes & Games, 2008; Shute, Rieber, & Van Eck, 2012).

Research has found digital games to be potentially beneficial learning environments for supporting 21st century skills, including critical thinking and problem solving skills (Gee, 2007; Hung & Van Eck, 2010; Van Eck, 2006), communication and collaboration (Kirriemuir & McFarlane, 2004; Prensky, 2006; Squire, 2003), and self-regulation (Blumberg & Ismailer, 2009; Rieber, 1996). Moreover, a growing body of evidence is creating the consensus that digital game-based learning (DGBL) results in significantly greater learning outcomes when compared to non-game conditions (Clark, Tanner-Smith, & Killingsworth, 2014; Sitzmann, 2011; Vogel et al., 2006; Wouters, van Nimwegen, van Oostendorp, & van der Spek, 2013). One caveat to DGBL is that digital games must be well-designed in order to improve learning outcomes. Well-designed digital games share similar features with well-designed learning environments, namely that they are active, goal oriented, contextualized, adaptive, and provide ongoing feedback (Shute, Rieber, & Van Eck, 2012).

A connection between the literacy practices of digital gameplay and school-based literacy practices has also been made by a number of scholars (Abrams, 2009; Apperley & Walsh, 2012; Beavis & O'Mara, 2010; Gee, 2007; O'Brien & Scharber, 2008). Because of this, experts on gaming and literacy have identified libraries and librarians as uniquely suited to promote and support literacy and learning through digital games (Gee, 2012; Squire & Steinkuehler, 2005). Squire and Steinkuehler (2005) drew a connection between digital gameplay and information literacy in particular. Problem solving lies at the foundation of information literacy, and problem solving is considered one of the learning benefits of digital games (Gee, 2007; Griffiths, 2002; Van Eck, 2006). Digital games can also increase a student's interest in a topic, which triggers questions (Harris, 2010), leads to information seeking (Nicholson, 2010), and develops research skills (Squire & Steinkuehler, 2005). Digital games themselves are environments where information seeking and meaning making take place, and Adams (2009b) suggests that digital gameplay in the library can improve information seeking skills. Furthermore, there is now an emerging recognition that digital games play a role in serving the primary purposes of libraries: social, democratizing and educational (Adams, 2009a; Buchanan & Elzen, 2012; Nicholson, 2010; Werner, 2013).

TLs can play a pivotal role in digital game adoption because they already support and promote 21st century learning through the skills of inquiry-based research that form the bigger picture of information literacy (AASL, 2007; Asselin, 2004). TLs interpret information literacy within the context of 21st century literacies, which are characterized by an individual's proficiency in using technology tools (e.g., technology literacy, ICT literacy), in multimedia navigation and creation (e.g., digital literacy, multimodal literacy), and in the ability to analyze and synthesize multiple forms of information (e.g., media literacy, information literacy, visual literacy; NCTE, 2008). The concept of 21st century literacies, rooted in sociocultural theory, has changed the very definition of literacy from one of reading and writing print text to one of literacy as a group of multiple social practices that can change in response to cultural, social, and communicative influences (Barton, Hamilton, & Ivanic, 2000; New London Group, 1996). If literacy is a social practice, then social practices such as digital gameplay are also a form of literacy (Gee, 2007; Squire, 2008; Steinkuehler, 2010).

While enthusiasm for digital games as 21st century learning tools continues to grow, it is tempered by barriers to digital game adoption in the classroom. Fullan and Stiegelbauer (1991) first proposed the concept of barriers in their theory of first- and second-order educational change. Brickner (1995) extended Fullan and Stiegelbauer’s work by describing first- and second-order barriers to change in the computer usage of mathematics teachers. Ertmer (1999) continued Brickner’s work by applying first-order and second-order barriers to the technology integration practices of teachers. First-order barriers are the external factors (e.g., equipment, support) that impact technology integration, and second-order barriers are the internal factors (e.g., personal beliefs) that impact technology integration. Multiple studies have examined barriers to technology integration, with findings citing lack of time (Beggs, 2000; Bunch & Broughton, 2002), lack of support (Brown et al., 2002; Schoepp, 2005), and lack of awareness of policy issues (Maddux & Johnson, 2010; Russell et al., 2007) as having a significant impact on teachers’ technology practices. A recent study by Ertmer, et al. (2012) found that teachers’ pedagogical beliefs about the relevance of technology to student learning were highly correlated with their technology practices in the classroom.

Similar results have been found in studies specifically examining barriers to digital game adoption. Commonly cited barriers to digital game adoption include lack of time (Ertzberger, 2009; Gros, 2003; Ketelhut and Schifter, 2011; Takeuchi & Vaala, 2014), lack of infrastructure (Ertzberger, 2009; Farmer & Murphy, 2010; Kenny & McDaniel, 2011; Rice, 2007) and lack of support (Baek, 2008; Kenny & McDaniel, 2011; Ketelhut & Schifter, 2011; Takeuchi & Vaala, 2014). Beliefs about lack of curricular relevance are also common findings in studies on digital game adoption (Bourgonjon et al., 2013; De Grove, Bourgonjon, & Van Looy, 2012; Gros, 2003; Kenny & Gunter, 2001; Proctor & Marks, 2013). While plentiful studies have examined classroom teachers' beliefs about digital game adoption, TLs as a group are largely missing from the scholarly discussion.

Statement of the Problem

No research to date has examined TLs' beliefs and practices concerning digital games, despite the pivotal role they play in education and technology adoption in schools. Because TLs and classroom teachers share a number of similarities, TLs may face the same barriers to using digital games as their classroom counterparts. Both are subject to the same experiences that shape their pedagogical beliefs, including personal experience as a student, professional training and teaching experience (Raths, 2001; Prestridge, 2012). TLs' pedagogical beliefs may impact their use of digital games because perceptions about the relevance of technology to student learning are highly correlated with technology practices in the classroom (Ertmer, et al., 2012). TLs face similar institutional constraints as their classroom counterparts. For example, Farmer and Murphy (2010) found that lack of equipment, lack of funding, lack of physical access, lack of time, and lack of support are all impediments to digital game adoption in libraries. These are the same barriers that classroom teachers face in digital game adoption (Ertzberger, 2009; Kenny & McDaniel, 2011; Ketelhut & Schifter, 2011; Takeuchi & Vaala, 2014).

Differences between TLs and teachers exist as well. One difference is that of teacher identity. In particular, misperceptions about the library profession and negative stereotypes held by faculty, administrators and students may impair recognition of TLs' roles as teachers of information literacy and as co-teachers of classroom-integrated literacy instruction (Hartzell, 2002; Polger & Okamoto, 2010; Walter, 2008). If TLs are not recognized for their teaching role, they may be less likely to serve on decision making committees, act as technology supporters, collaborate with teachers, and teach students information literacy skills; roles that create opportunities for supporting and promoting digital games (Adams, 2009b; Van Eck, 2006).

Another difference between TLs and teachers lies in potentially conflicting perspectives on collaboration. Today, the concept of teacher-librarian collaboration is a standard in the core curriculum of school librarianship programs (ALA/AASL, 2010), and is based on collaboration models of school librarianship (Loertscher, 1988; Montiel-Overall, 2005). On the other hand, teachers often struggle to collaborate (Piercey 2010) despite decades of research on its benefits (Friend & Cook, 1990; Marks & Printy, 2003; Goddard, Goddard & Tschannen-Moran, 2007). Differing perspectives may make collaboration difficult for TLs and teachers, subsequently hindering opportunities for TLs to support and promote digital games in schools.

A third difference between TLs and teachers is one of scheduling. Unlike teachers who work within a fixed schedule, TLs often operate on a flexible scheduling basis for the purpose of being able to collaborate with teachers at their students' points of need (AASL, 2014; McGregor, 2006) Flexible scheduling may create opportunities for TLs to promote digital games if it improves their abilities to collaborate with teachers. Considering the unique position of TLs to support digital games through any number of the roles they play in supporting 21st century learning, it is important to understand what perceived barriers exist that may prevent them from promoting and supporting digital games in education.

Purpose of the Study

The purpose of this mixed methods study was to determine TLs' beliefs and practices about digital games as 21st century learning tools, to examine similarities and differences with those of classroom teachers, and to see if and how TLs' pedagogical beliefs impacted their perceptions of barriers toward digital game adoption. The Teachers' Attitudes Toward Games (TATG) Survey (Van Eck, 2013) was used, which was based on previous research about first- and second-order barriers to educational change (Ertmer, 1999; Fullan & Stiegalbauer, 1991). The following barriers were examined: a) infrastructure (e.g., accessibility; resource availability; support); b) training (e.g., professional development); c) beliefs about using games in education (e.g., complexity; quality; cost); d) personal beliefs about digital games; and e) beliefs about the value of games for literacy and learning. Additionally, demographic data was gathered, including gender, age, qualifications, type of library, and gaming experience. Open-ended questions were included in the study to identify TLs' experiences with, and reasons for using games. Those experiences were compared to data derived from the TATG survey and the research on teachers' beliefs and practices.

A convenience sampling of the TL population was used for the study, which was taken from a pool of K—12 librarians that participate in the following American Library Association-sponsored e-mail discussion lists: the AASL Forum (aaslforum@lists.ala.org), the Information

Literacy Discussion List (infolit@lists.ala.org), and the Reference and User Services Association list (rusa-l@lists.ala.org). Additional participants were recruited from the Library Media Network LISTSERV (LM_NET@LISTSERV.SYR.EDU), an e-mail discussion list for media specialists hosted by Syracuse University. TLs were recruited through the lists' discussion forums. The survey was distributed electronically via *Qualtrics*.

Significance of the Study

The evolving roles of TLs as supporters of 21st century learning make this study particularly significant. Today, TLs serve any number of roles that put them into the position of supporting and promoting digital games: they may serve on decision-making committees and make suggestions about technology purchases, they may support and coordinate educational technology within the school, they may collaborate with teachers to integrate 21st century learning into lessons, they may teach information literacy skills to students, or they may develop library collections and administer programs that support 21st century learning (AASL, 2007; ISTE-SIGMS Executive Advocacy Committee, 2010). Any barriers due to external and/or internal beliefs about digital games could prevent TLs from taking the opportunity to support or promote digital games through these varied roles. This study will inform the research by providing insight into the current state of TLs' beliefs and practices regarding digital game adoption. The results of this study will offer a blueprint for ways in which TLs' roles in supporting 21st century learning can be made more successful.

Definition of Terms

In this study, the following terms must be described for clarification: teacher librarians, digital games, first- and second-order barriers, and pedagogical beliefs.

Teacher Librarians

Teacher librarians (TLs) refer to credentialed librarians who work in school and/or academic libraries. Credentialed school librarians work in the K—12 school libraries, and hold state certification as media specialists at the minimum. Credentialed academic librarians work in college or university libraries, and hold an ALA-accredited master's degree in library and information science at the minimum. The term librarians refer to librarians in general (i.e., including public librarians).

Digital Games

Digital games refer to any type of game that can be played on an electronic device (e.g., console, PC, mobile device), and digital gaming refers to the practice of playing digital or video games. These include, but are not limited to, popular games, serious games and/or games specifically designed for the education market. Digital game-based learning (DGBL) refers to the body of research on digital games as learning tools.

First- and Second-Order Barriers

Barriers refer to the critical barriers that impact technology practices in the classroom (Ertmer, 1999). First-order barriers are the external factors that impact technology practice, such as adequate equipment, adequate budget, and administrative and technical support. Second-order barriers are the internal factors that impact technology practice, such as pedagogical beliefs, classroom management style and the beliefs about the role of digital games in the classroom.

Pedagogical Beliefs

Pedagogical beliefs refer to the beliefs that teachers hold about teaching and learning, and the resultant interactions between teachers and students. They are often categorized as behaviorist (e.g., direct instruction) or constructivist (e.g., knowledge construction), though a continuum exists between the two. Pedagogical beliefs may act as second-order barriers to digital game adoption if they impact teachers' perceptions about the value of games as learning tools.

Theoretical Framework

The theoretical framework informing this study is Fullan and Stiegelbauer's (1991) theory of first-order and second-order educational change, where first-order change is external (e.g., systems, processes) and second-order change is internal (e.g., beliefs). This was further described by Brickner (1995) as first- and second-order barriers to change. Brickner (1995) described first-order barriers as the external factors (e.g., equipment, support) that impact technology integration, and second-order barriers as the internal factors (e.g., personal beliefs) that impact technology integration. Ertmer (1999) used this theory to create the Barriers Model, which looks at first-order and second-order barriers to teachers' technology integration practices. The TATG survey used Ertmer's (1999) Barriers Model as a foundation for its development.

Assumptions, Limitations, and Scope

This thesis examines TLs' beliefs and attitudes about the value of digital games for 21st century learning and literacies, and the barriers that prevent digital game adoption in classrooms and libraries. The assumption was made that because TLs represent a similar population to classroom teachers, the factors impacting TLs' adoption and integration of technology will also be similar. Research questions and hypotheses were based on this assumption, and the TATG survey, which was developed for teachers, was applied to TLs in this study. There is a limitation to that assumption, as additional, unexplored factors may also exist as barriers to TLs' technology integration and adoption.

The scope of this study was wide-reaching, geographically. The nature of the e-mail discussion lists used to recruit participants made it possible to reach a large number of TLs across the United States and abroad. The subscribership size of the four discussion lists allowed for recruitment of a potentially large pool of participants.

Research Questions

The research questions for this study were developed out of work on the barriers to teachers' technology practices in the classroom (Ertmer, Addison, Ross, & Woods, 1999). Hypotheses were drawn from the research described in the literature review.

RQ1. How are TLs using digital games?

RQ2. What are TLs' pedagogical beliefs?

RQ3. How do TLs' uses of digital games reflect their pedagogical beliefs?

RQ4. What barriers do TLs perceive for using digital games?

RQ5. How do TLs' pedagogical beliefs shape perceptions of barriers to using digital games?

Organization of the Study

This research study is presented in five chapters. Chapter I includes the background of the problem; statement of the problem; purpose of the study; significance of the study; definitions of terms; theoretical framework; assumptions, limitations and scope of the study; and research questions.

Chapter II presents a review of the literature, which spans 21st century learning, the role of TLs in 21st century learning, digital games as 21st century learning tools, digital games and literacy, digital games in libraries, barriers to digital game adoption, and TLs and digital game adoption;. Chapter III describes the methodology used in this research study, including the selection of participants, instrumentation, data collection, and data analysis procedures.

Chapter IV presents the study's findings, including descriptive statistics and testing of the five research questions and their hypotheses. Chapter V presents a summary of the entire study, discussion of the findings, implications of the findings, and recommendations for future research.

CHAPTER II

LITERATURE REVIEW

This chapter presents the rationale for studying the attitudes and beliefs of TLs about the value of digital games for 21st century learning. Over the past several decades, researchers have examined the factors that impact teachers' technology integration practices in the classroom. Ertmer's (1999) Barriers Model has been one way to conceptualize this. Based on Fullan and Steigelbauer's (1991) theory of educational change, Ertmer (1999) identified first- and second-order barriers that influence teachers' technology practices. First-order barriers are the external factors that impact technology practices and second-order barriers are the internal factors that impact them (Brickner, 1995). Research using the Barriers Model has been extended to teachers' practices concerning digital game adoption (e.g., Beggs, 2000; Kenny & McDaniel, 2011; Maddux & Johnson, 2010; Teo, Chai, Hung, & Lee, 2008).

This study seeks to further extend the research on barriers toward digital game adoption to the TL population by using the TATG survey to examine the factors that impact TLs' uses of digital games in education. TLs are in a unique position to advocate for and support digital game adoption in schools because they already support 21st century learning through information and related literacies (AASL, 2007). Digital games are a 21st century learning tool (Foreman, 2004; Prensky, 2007, 2008; Van Eck, 2006), and a number of researchers have identified digital gameplay as a literacy practice (Gee, 2007; Squire, 2008; Steinkuehler, 2010). Furthermore, school libraries have been identified as ideal spaces for connecting the informal literacy practices of digital gaming with formal school literacy practices (Adams, 2009b; Beavis & O'Mara, 2010; Farmer & Murphy, 2010; McTavish, 2009; Squire & Steinkuehler, 2005). Therefore, understanding the factors that impact TLs' attitudes and beliefs about the value of digital games for 21st century learning will inform the research on the barriers that may prevent TLs from taking on such support roles in the adoption of digital games in education.

The following review of the literature represents the research relevant to this study, specifically, a review of the literature on 21st century learning, the TL's role in 21st century learning, digital game-based learning, the connection between digital gameplay and literacy, the role of digital games in libraries, and barriers to digital game adoption. Chapter II is organized into seven sections: (a) 21st century learning, (b) the role of TLs in 21st century learning, (c) digital games as 21st century learning tools, (d) digital games and literacy; (e) digital games in libraries, (f) barriers to digital game adoption, and (g) TLs and digital game adoption.

21st Century Learning

Partnership for 21st Century Skills

In 2002, the Partnership for 21st Century Skills (P21) was founded by a coalition that included the U.S. Department of Education, and business and education leaders as a response to the recognition that the education system needed to better prepare students for the career and life demands of the 21st century (Abbott, 1997; Longworth & Davies, 1996).The mission of P21 was to develop a framework for 21st century learning. The coalition's vision of 21st learning has since evolved to focus on critical thinking and problem solving skills, communication and collaboration, and technology-related skills. While the model of 21st century learning is a response to the demands that technology has placed on work and life skills, much of it represents familiar ideas in education research (Bloom, 1956; Dewey, 1910; Piaget, 1928; Vygotsky, 1978). Figure 1 illustrates the P21 Framework.

At the core of the P21 Framework is an emphasis on teaching subjects such as language arts, math, science, and history within the context of the following 21st century interdisciplinary themes: global awareness; financial, economic, business, and entrepreneurial literacy; civic literacy; health literacy; and environmental literacy. Professional education groups have advocated for these themes to serve as relevant connections to career and life skills (Partnership for 21st Century Skills, 2007), a concept for which John Dewey (2004) also advocated.

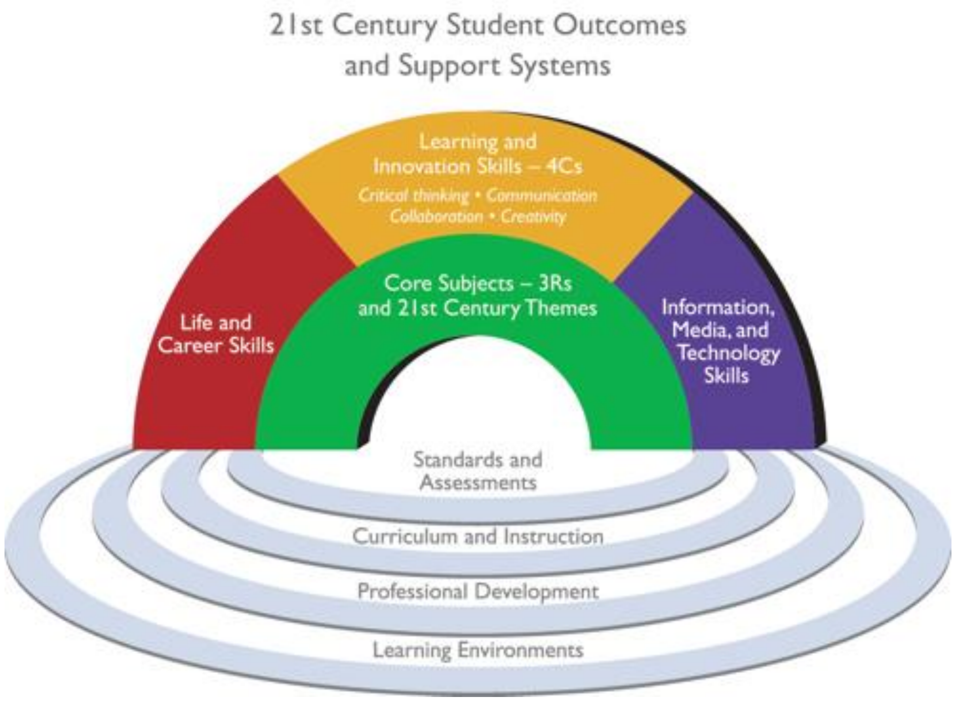

Figure 1 . Framework for 21st century learning. This framework illustrates the interrelationship between the skills, core subjects and learning environments that make up 21st century learning (Partnership for 21st Century Skills, 2011).

The elements of the outer arch of the P21 Framework are intricately connected to each other and inherently present within the teaching and learning process of the core subjects. P21 emphasizes depth, not breadth, promoting the 4C's of critical thinking, communication, collaboration, and creativity. Information, media and technology skills are integral to the development of the 4C's, and serve as anchors for the interdisciplinary themes of the framework (Partnership for 21st Century Skills, 2007). TLs are experts at teaching information, media and technology skills and integrating them into curriculum, so they play a central role in supporting the values of the P21 Framework. Life and career skills, such as initiative and self-direction (i.e., self-regulated learning) are further goals of P21's vision for 21st century learning.

P21 defines learning environments as more than just a place (e.g., classroom, library, online learning community), but "as the support systems that organize the condition in which humans learn best–systems that accommodate the unique needs of every learner and support the positive human relationships needed for effective learning" (Partnership for 21st Century Skills, 2009a, n.p.). P21 also emphasizes the use of technology in the development of strong education support systems, from standards and assessments, to curriculum and instruction, to professional development, to teaching and learning communities (Vockley, 2007).

Common Core State Standards

In 2009, a collaborative initiative led by governors and state education commissioners in 48 states was formed in an effort to create a single set of national college and career-readiness standards informed by exemplary state standards that were already in place, along with input from teachers, subject experts, states, organizational leaders, and the public. From that initiative, the Common Core State Standards (CCSS) were born (Kendall, 2011).

CCSS emphasizes depth over breadth; critical thinking and problem solving; communication and collaboration; and information, media, and technology driven literacies. In these ways, CCSS supports the ideals of 21st century learning and is well-aligned to the P21 Framework (Partnership for 21st Century Skills, 2011).

In 2010, the AASL released a position statement on CCSS as follows: “As students strive to meet the rigor of the standards, certified school librarians will play an essential part in ensuring that 21st-century information literacy skills, dispositions, responsibilities and assessments are integrated throughout all curriculum areas” (n.p.). This position statement reinforces the recognition that the CCSS has created new opportunities for TLs and classroom teachers to work together as partners in 21st century learning. The full statement can be viewed in Appendix E.

ISTE Standards

Formerly known as the National Educational Technology Standards or NETS, ISTE established a standard of excellence for best practices in teaching and learning with educational technology. ISTE (2007, 2014) Standards for Students describe the skills needed for technology literate students, emphasizing creativity and innovation; communication and collaboration; research and information fluency; critical thinking, problem solving, and decision making; digital citizenship; and technology operations and concepts.

In 2013, ISTE released a policy statement on CCSS, declaring that “the ISTE standards help educators build a firm foundation for teaching with technology and further the development of many of the same 21st century skills set forth by the Common Core State Standards (n.p.).” The Partnership for 21st Century Skills (2009b) recommends that ISTE Standards be used as a guide for integrating technology literacy and tools into state learning standards.

The ISTE Media Specialists special interest group (SIGMS) released a position statement on the role of TLs in supporting and promoting ISTE Standards. SIGMS stated that TLs play an important role in integrating educational technology into classrooms and curricula due to their unique position within the school (ISTE-SIGMS Executive Advocacy Committee, 2010).

AASL's Standards for the 21st Century Learner

AASL's Standards for the 21st-Century Learner address information literacy in the context of multiple literacies, including digital, media and technology literacies. The standards also emphasize critical thinking and problem solving, communication and collaboration, and technology skills -- the underlying skills of inquiry-based research that make up the broader picture of information literacy (AASL, 2007).

AASL (2011) developed a crosswalk to align CCSS with its learning standards in an effort to illustrate how AASL Standards share many of the same learning goals as CCSS. The Partnership for 21st Century Skills (2009b) recommends both AASL's Standards and CCSS for states implementing standards that emphasize depth over breadth.

Aligning Digital Games to 21st Century Learning Standards

Swanson (2013) suggests that the adoption of CCSS has created a greater need to blend literacy and mathematics together. Because digital gaming is considered a meaningful literacy experience (Gee, 2007; Squire, 2008), digital games present a new tool for bridging the CCSS for Mathematical Practice with the CCSS for English Language Arts, both of which share common goals with the AASL and ISTE Standards. Digital gameplay is an activity that aligns well with all four sets of standards, as shown in Table 1.

Table 1

CCSS-AASL-ISTE Alignment to Digital Games

CCSS Math	CCSS ELA	AASL	ISTE	Alignment
PRACTICE.MP1 Make sense of problems and persevere in solving them. PRACTICE.MP5 Use appropriate tools strategically.	CCRA.R.1-3 Key Ideas and Details CCRA.W.7-9 Research to Build and Present Knowledge	1. Inquire, think critically, and gain knowledge.	3. Research and information fluency 6. Technology operations and concepts	Player has to make sense of a problem through inquiry, exploration of the game environment, and strategic use of information in the game.
PRACTICE.MP2 Reason abstractly and quantitatively. PRACTICE.MP3 Construct viable arguments and critique the reasoning of others.	CCRA.R.7-9 Integration of Knowledge and Ideas	2. Draw conclusions, make informed decisions, apply knowledge to new situations, and create new knowledge.	1. Creativity and innovation 4. Critical thinking, problem solving, and decision making	Player must critically reason, draw conclusions, and integrate knowledge (e.g., clues) gained from the game environment to solve problems or reach new goals.

Underlying all four sets of standards is the concept of critical thinking and problem solving through inquiry-based learning. The CCSS for Mathematical Practice are broadly enough written as to be straightforwardly applied to the CCSS for English Language Arts. For example, to “make sense of problems” in math and to comprehend “key ideas and details” in language arts both require critical thinking skills. Research in language arts requires students to “use appropriate tools strategically” just as they do in math. The “integration of knowledge and ideas” in language arts requires students to “reason abstractly” and “construct viable arguments,” as they do in math. Both the AASL and ISTE Standards further expand upon the inquiry-based skills of critical thinking and problem solving through information and technology literacies, aligning them well to CCSS. Because digital games have the potential to be used as inquiry-based learning tools, they can be positioned into alignment with all four sets of standards. Table 1 illustrates how digital games in the classroom integrate the goals of all four sets of standards.

The Role of TLs in 21st Century Learning

TLs are in a unique position to support 21st century learning in schools. The emergence of digital age literacies (e.g., information literacy, digital literacy, media literacy, visual literacy) has thrust TLs into a new role that goes beyond promoting the traditional literacy of reading to promoting and supporting the multiple literacies needed in today's technology-rich world (DiScala & Subramaniam, 2011; Dotson, Dotson-Blake & Anderson, 2012; Everhart & Dresang, 2007). In fact, TLs already serve in this role to some extent since many provide technology support within their schools, and sometimes serve as their school's technology coordinator when a separate position does not exist. TLs also teach to a cross-section of learning standards, including Common Core, AASL and ISTE Standards. Furthermore, the school library provides a place where students can access technology and work together on collaborative projects (ISTE-SIGMS Executive Advocacy Committee, 2010). Because digital games are educational technology tools, this position gives TLs an opportunity to take on the role of supporting and promoting digital games in classrooms and curricula.

Evident in the ISTE-SIGMS position statement is the idea that educational technology has caused an evolution in the role of TLs (see section on ISTE Standards). The AASL also recommends new roles for TLs in response to 21st century learning. In 2009, the AASL crafted a description of the roles and responsibilities it envisioned for 21st century TLs. Multiple roles in the guise of leader, instructional partner, information specialist, teacher and program administrator were described (Ballard, 2009), with the underlying goal of these roles as supporting the development of critical thinking and problem solving, communication and collaboration, and technology skills -- the foundational skills of inquiry-based research that make up the broader picture of information literacy (AASL, 2007). Because digital games are tools for these 21st century skills, each role envisioned by AASL serves as an opportunity for TLs to promote digital game adoption.

As leaders, TLs might serve on decision making committees (Everhart, Mardis, & Johnston, 2011), enabling them to offer advice and suggestions on specific digital games that engage and enhance learning. As instructional partners, TLs might collaborate with teachers (Cooper & Bray, 2011) to integrate digital games, such as *Inanimate Alice*, into lessons that support multiple literacies (Fleming, 2013). As information specialists, TLs might develop gaming collections that support the curriculum (Farmer & Murphy, 2010); collections that include digital games such as *Minecraft* (Gauqier & Schneider, 2013). As teachers, TLs might use digital games, such as *Admongo*, to teach media and information literacy skills (Ribble, 2012). As program administrators, TLs might design and develop library-based programs that incorporate digital games, such as after-school gaming clubs or maker programs (Bland, Hughes, Willis, & Elliott Burns, 2013).

A recent technology survey by *School Library Journal* (2013) suggests that TLs are already serving in technology leadership roles. In the survey of 761 respondents, 72% of TLs reported being viewed as technology leaders in their schools, 56% reported introducing technology at the classroom level, 42% reported serving on their schools' tech teams, and 34% perceived themselves as having a school-wide impact on technology adoption. These findings illustrate the significance of TLs' potential roles as advocates for the kinds of technologies that support 21st century learning—technologies such as digital games (Greenfield, 2009; Hayes & Games, 2008; Shute, Rieber, & Van Eck, 2012).

Digital Games as 21st Century Learning Tools

According to the Entertainment Software Association (2013), 58% of Americans play digital games and the average U.S. household owns at least one game console, PC or smart phone. Digital gaming is now a ubiquitous part of society and a phenomenon that has led researchers to explore the impact of digital games on learning. Digital games-based learning (DGBL) research aims to connect the design of successful gaming environments with the design of successful learning environments (Gee, 2007; Rieber, 1996; Shute, Rieber, and Van Eck, 2012; Van Eck, 2006).

The Learning Benefits of Digital Games

Shute, Rieber, and Van Eck (2012) contend that good digital games and good learning environments share similar features, namely that they are active, goal oriented, contextualized, adaptive, and provide ongoing feedback. Research has found digital games to be potentially beneficial learning environments for supporting critical thinking and problem solving skills (Gee, 2007; Hung & Van Eck, 2010; Van Eck, 2006); communication and collaboration (Kirriemuir & McFarlane, 2004; Prensky, 2006; Squire, 2003); and self-regulation (Blumberg & Ismailer, 2009; Rieber, 1996); findings that suggest that digital games make good tools for 21st century learning.

Critical thinking and problem solving. Critical thinking and problem solving are generally considered domain-specific, making transfer of skills notoriously difficult. One strategy for enhancing transfer across domains is repeated practice (Halpern, 1998). Shute, Rieber, and Van Eck (2012) believe that the engagement value of well-designed digital games makes them prospective tools for providing learners with the kind of repeated practice needed for the development of critical thinking and problem solving skills.

Digital games are characterized by different types of gameplay, which in turn require different types of critical thinking and problem solving skills. Hung and Van Eck (2010) developed a classification system to align problem solving to gameplay using Jonassen's (2000) typology of problems and Mark Wolf's (2006) grids of interactivity. Jonassen's typology correlates 11 different problem types with a continuum of knowledge and cognitive processes.

Of the knowledge and cognitive processes associated with different problem types, metacognitive thinking is a particularly important skill because it acts as an important path to critical thinking and problem solving (Berardi-Coletta, Buyer, Dominowski, & Rellinger, 1995; Magno, 2010). It is also a primary component of self-regulated learning.

Hung and Van Eck (2010) identified simulations, strategy games, and action, roleplaying and adventure games for supporting problem types that require metacognitive thinking. Metacognitive thinking is also an underlying skill for information and related literacies (Dewald, Scholz-Crane, Booth, & Levine, 2000), making those types of digital games particularly relevant to TLs in their roles in supporting 21st century learning. Table 2 provides examples of the problem and game types that exercise metacognitive thinking skills.

Table 2

Metacognitive Problem Types with Related Game Types and Examples

Problem Type	Examples	Game Type	Examples
Diagnosis-solution	Medical diagnosis and treatment; how to study for a test; developing an IEP for a student	Simulations; Strategy	*Citizen Science; Elizabeth Find, M.D.: Diagnosis Mystery*
Strategic Performance	Flying an airplane; teaching a live class; pleading a legal case in court	Action; Roleplaying; Simulations; Adventure	*Left 4 Dead; Borderlands*
Case Analysis	Harvard business cases; analyzing a stock portfolio; developing an organizational policy	Strategy	*SimCity; Civilization*
Design	Writing a story; designing a game; composing music	Strategy	*SimCity*, *Minecraft*
Dilemma	Moral issues; negotiating a peace treaty; developing a bipartisan bill	Strategy; Roleplaying	*Darfur is Dying; September 12*

Hung and Van Eck (2010); Jonassen (2000)

Communication and collaboration. In well-designed constructivist learning environments, communication and collaboration function as social negotiation tools to promote the generation of new knowledge and to expose learners to a diversity of viewpoints (Driscoll, 2005). Research has found digital games to be potential arbiters for the development of communication and collaborations skills, and relatedly, group decision making and negotiation skills (Kirriemuir & McFarlane, 2004; Prensky, 2006; Squire, 2003).

Contrary to popular belief, digital gameplay is not a socially isolating activity. Greenfield (2014) found that children who frequented video game arcades were just as likely to use the arcade space for socialization as they were to actually play the games. Vered (1998) studied the interactivity of a group of boys (Blue Group Boys) in an elementary school setting as they played the digital game, Incredible Machine, during recess. She observed several levels of interactivity: social interaction during group play, negotiation skills in giving and taking instruction, and communication and collaboration as the boys analyzed and strategized the game. Gee (2007) proposed that one of the learning principles of digital games is the Affinity Group Principle. Affinity groups are similar to communities of practice in that they share a common goal, are holistically organized, share knowledge through networks, and are facilitated by leaders who help members turn tacit knowledge into explicit knowledge that can be shared outside the group. Elements of Gee's Affinity Group Principle were displayed in Vered's (1998) observations of the Blue Group Boys, suggesting that the affordances of digital games might be useful for supporting collaborative learning in the classroom.

Self-regulated learning. Three primary characteristics are present in self-regulated learners: (1) metacognitive awareness, (2) use of appropriate strategies, and (3) motivational control (Zimmerman, 2002). Metacognitive awareness enables learners to self-reflect on their own learning, set goals accordingly, and identify the best strategies to reach their goals. Motivational control allows learner to maintain the effort needed to reach their goals. In short, self-regulated learning is effective learning.

Rieber (1996) used Piagetian Learning Theory and Flow Theory as frameworks to illustrate the conditions of self-regulated learning, situating it within the constructivist concept of the microworld. Microworlds are small environments where learners build knowledge through play (Hadzilacos & Koutlis, 1993). Digital games are examples of microworlds.

According to Piagetian Learning Theory (Piaget, 1997, 2000), learning occurs within a state of conflict. Self-regulation is necessary to resolve the conflict. Because the goal of almost any digital game is to resolve some sort of conflict, digital game environments are natural contenders for supporting self-regulated learning (Blumberg & Ismailer, 2009). Through gameplay, learners are able to experience conflict on a small scale and work towards an understanding of it. The process of resolving conflict in digital games mimics the process of self-regulation.

Flow Theory (Csikszentmihalyi & Csikszentmihalyi, 1992) describes the state that people enter into when they become so absorbed in an activity that time passes without notice and all other distractions disappear. Flow, like self-regulation, requires a high level of motivational control to maintain attention and concentration. Shernoff, Csikszentmihalyi, Schneider and Shernoff (2003) studied student engagement in high school classrooms from the Flow Theory perspective, and found that increased student engagement resulted when task challenge and student skill were well-balanced, when instruction was relevant, and when students felt in control of their learning environment. The concept of flow has been used to describe the experience of playing digital games (Chen, 2007; Gee, 2007; Rieber, 1996), showing that digital games are highly engaging tools. From that perspective, it can be argued that digital games have the potential to provide the conditions necessary for increased student engagement and self-regulated learning.

The Learning Effectiveness of Digital Games

Despite the wealth of research on DGBL, many educators still question the learning effectiveness of digital games. Empirical evidence is mixed. While some studies clearly show significant increases in learning outcomes as a direct result of DGBL (Anderson & Barnett, 2013; Hickey, Ingram-Goble, & Jameson, 2009; Spires, Rowe, Mott, & Lester, 2011), other studies suggest that increased learning outcomes may be the result of the motivation and engagement factors of digital gameplay (e.g., Annetta, Minogue, Holmes, & Cheng, 2009; Huizenga, Admiraal, Akkerman, & Dam, 2009; Liu & Chu, 2010; Papastergiou, 2009; Yang, 2012). In research showing decreased learning outcomes, increased cognitive load caused by game interactivity was cited as a possible cause (deHaan, Reed, & Kuwada, 2010).

Four recent meta-analyses of DGBL studies sought to clarify the impact of digital games on learning outcomes by conducting media comparisons of game conditions to non-game conditions (Clark, Tanner-Smith, & Killingsworth, 2014; Sitzmann, 2011; Vogel et al., 2006; Wouters, van Nimwegen, van Oostendorp, & van der Spek, 2013). In addition to media comparisons, Clark et al. (2014) also examined the effect of learning design in digital games, with the hypothesis that digital games employing augmented learning designs would perform better than standard versions of the games.

In terms of media comparisons, overall findings in all four meta-analyses showed greater learning outcomes with digital games versus their non-game counterparts:

- Vogel et al (2006) found significantly higher learning gains ($z = 6.051$, $p < .0001$) and attitudes ($z = 13.74$, $p < .0001$) in digital game conditions as compared to traditional teaching methods.
- Sitzmann (2011) found significantly greater gains in self-efficacy ($d = 0.52$, $p < .05$), declarative knowledge ($d = 0.28$, $p < .05$), procedural knowledge ($d = 0.37$, $p < .05$), and

retention ($d = 0.22$, $p < .05$) in digital game conditions as compared to various other groups in non-game conditions.

- Wouters et al. (2013) found significantly higher learning gains ($d = 0.29$, $p < .01$) and retention ($d = 0.36$, $p < .01$) in digital game conditions, but did not find digital game conditions more motivating ($d = 0.26$, $p > .05$) than non-game learning conditions.
- Clark et al. (2014) found significantly greater cognitive, interpersonal and intrapersonal learning outcomes ($d = .33$) in digital game conditions when compared to non-game conditions.

Additionally, Clark et al. (2014) found that digital games with augmented learning designs were associated with greater learning outcomes ($d = .37$) in relation to their standard counterparts, a finding that emphasizes the important role of instructional design for effective learning. Though limitations do exist with any study, the largely consistent findings across all four meta-analyses add to the growing evidence that well-designed digital games are effective learning tools.

Designing Digital Games for Learning

In a review of studies on digital games, Tobias, Fletcher, Dai and Wind (2011) concluded that while games appear to engage and improve cognitive processes in a number of ways, it is the affordances of the game itself that determine what cognitive processes will be impacted. DGBL research suggests that learning transfer is optimal when game and task share common cognitive processes (Anderson & Bavelier, 2011; Greenfield, 1998; Subrahmanyam & Greenfield, 1994). Consequently, Tobias et al. (2011) emphasized the need for analyses of game and task in order to ensure they share common cognitive processes. Hung and Van Eck’s (2010) alignment of problem types to digital game types serves as a good starting point for tackling such analyses.

However, there is a limitation in aligning digital game affordances to related cognitive processes. Analysis of that nature requires subjective interpretation, so there is no guarantee that good learning will result from digital game choice. A more sustained approach to effective learning from digital games lies in instructional design. The findings from Clark et al. (2014) on augmented learning design in digital games demonstrates the importance of instructional design as a key factor in the development of good digital games for learning.

How does instructional design fit into the game design process? Van Eck recognizes similarities between the game design process and the ADDIE process, beginning with the establishment of an overall goal during the *analysis* phase, to mapping out the product during the *design* phase, to the process of testing the product during the *evaluation* phase (Hirumi, Appelman, Rieber & Van Eck, 2010a). Appelman believes that effective digital game design requires a movement away from the traditional instructional design process toward a constructivist model that focuses more on experiential learning processes. Rieber advocates for a more creative, non-analytical approach to designing digital games for learning (Hirumi, Appelman, Rieber & Van Eck, 2010b). All agree that the design and development of good digital games for learning will require a collaborative process between instructional designers and game designers (Hirumi, Appelman, Rieber & Van Eck, 2010c).

Reese (2010) developed an instructional game design and embedded assessment approach called CyGaMEs. The CyGaMEs approach is based on the idea of native learning technology and attempts to simulate the natural learning processes through inquiry and analogical reasoning. CyGaMEs borrows from the instructional design process by focusing on alignment, task analysis, and prior knowledge. Embedded assessments measure player progress toward game goal, player interaction with the game world, and player's level of flow. *Selene* was the first CyGaMEs-designed learning product, developed with the goal of teaching lunar science concepts. A quantitative analysis of the use of *Selene* as a learning intervention found its primary effect for learning as statistically significant (F (1, 20) = 358.73, $p < .001$; Reese & Tabachnick, 2010).

Another example of a successfully designed game-based learning environment comes from a living model of game-based learning -- Quest to Learn (Q2L). Q2L is an experimental public school in New York City, which opened in 2009 for grades 6-12. A collaborative effort between the Department of Education, New Visions for Public Schools, and the Institute of Play, Q2L offers an immersive, participatory curriculum based on the principles of game design. Students are given increasingly complex challenges (e.g., games, quests) in each learning domain, which they attempt to resolve through the components of gameplay, such as roleplaying, interactivity, knowledge sharing, reflection and feedback (Salen et al., 2011). Shute and Torres (2012) took an evidence-centered design approach (ECD) to assess Q2L student performance on three competencies: systems thinking, teamwork and time management. Preliminary results showed significant gains among students in time management (t53 = 5.74; p < .01.) and systems thinking (t59 = 3.31; p < .01). However, students showed no significant gains on teamwork skills.

Digital Games and Literacy

The concept of literacy has changed from one of reading and writing print text to one of literacy as a group of multiple social practices that can change in response to cultural, social, and communicative influences (Barton & Hamilton, 2000; New London Group, 1996). Today, fluency in 21st century literacies is characterized by an individual's proficiency in using technology tools (e.g., technology literacy, ICT literacy), in multimedia navigation and creation (e.g., digital literacy, multimodal literacy), and in the ability to analyze and synthesize multiple forms of information (e.g., media literacy, information literacy, visual literacy; NCTE, 2008).

If literacy is a social practice, then social practices such as digital gameplay are also a form of literacy. Gee (2007) argues that when people are learning to play digital games, they are essentially learning a new literacy. Steinkuehler (2010) sees games as a "digital literacy practice through and through" (p. 61). She suggests that both reading and writing take place within a digital game. Players must read a game's meanings, and then respond by writing back into the game. The literacy is multimodal in nature. Players read words, sounds, and images in order to learn how to play the game, and those words, sounds and images are situated specifically within the context of the game's domain (Gee, 2007). Avid gamers belong to a community of practice, and become experts in gaming through participation in the practices surrounding the gaming culture. Game literacy is a literacy of expertise (Squire, 2008).

A connection between the literacy practices of gaming and the literacy practices that take place in schools has been made by a number of scholars (Abrams, 2009; Apperley & Walsh, 2012; Beavis & O'Mara, 2010; Gee, 2007; O'Brien & Scharber, 2008). O'Brien and Scharber (2008) advocate for bridging the digital literary practices outside school with those inside school to better engage learners and close the gap that exists between advantaged and less-advantaged children. DGBL is one avenue for this (Caperton, 2010; Gee, 2007, 2010; Holmes, 2011).

Recognition of the need to merge multimodal literacy practices into school-based literacy practices has been established among groups in Australia, the UK and the US (Bearne &

Bazalgette, 2010; Beavis & O'Mara, 2010; NCTE, 2005; Walsh, 2009). Beavis (2012) believes that digital games are a valuable avenue for bringing multimodal literacy practices into the English curriculum. She argues that games provide students with a new way to tell stories. They bring "literacy into action" (Apperley & Beavis, 2011, p. 130) by bridging text with game action through paratexts (Apperley & Walsh, 2012), and can help to cultivate critical perspectives about the elements that come together to make texts work (Beavis, 2012). Beavis, et al. (2009; Apperley & Beavis, 2013) developed a model for critical games literacy that can be used for integrating games into the English curriculum.

Apperley and Walsh (2012) argue that digital games and school-based literacy practices have far more in common than current literature suggests. They have proposed a heuristic for understanding gaming (HUG) that teachers can use to select games that support literacy and learning in the curriculum. HUG is based on the premise that reading occurs in the process of gameplay. The heuristic is built on four parameters of gameplay: actions, designs, systems and situations. In gameplay, the actions of players impact the final narrative, and the final narrative can be different each time, depending on the action of the gameplayer. Players, like readers, participate in communities that share paratexts (e.g., fan fiction, walkthroughs, mods) they have designed. However, digital games provide greater opportunities for players to design paratexts. Like books, digital games are based on systems that must be understood for meaning making. In digital games, meaning making is multimodal as the player must interpret multiple forms of media. Finally, digital games are played within a specific, situated context, which is fundamental for understanding the learning that takes place during gameplay (Apperley, 2010; Gee, 2007).

Apperley and Walsh (2012) believe that understanding the concept of situations is the key for teachers to be able to connect students' gaming literacies to school-based literacy practices

Case Studies in Digital Games and Literacy Practices

Working with digital games as texts. In a large Catholic Boys School, digital games were used in a Year 9 English class of 15 year old boys with the intention to facilitate development of close reading and critical literacy skills about the role that games played in the students' lives. Using The Simpsons Hit and Run and Grand Theft Auto IV, students were asked to review the two games for playing styles, expectations and game structure. Students successfully showed their understanding of the review genre both in print and multimodal format. They exhibited an intense knowledge of specific gaming environments, and they demonstrated an ability to predict the knowledge that would be needed by new players (Beavis & O'Mara, 2010).

In-school and out-of-school literacy practices. The in-school and out-of-school information literacy (IL) practices of eight-year old Rajan (pseudonym) were analyzed. Rajan attended third-grade at a large urban public school in British Columbia, Canada. His in-school IL practices were largely centered on non-fiction books. Computer access was minimal, as there was only one computer in the classroom. Rajan's out-of-school IL practices consisted largely of computer use for homework related research, playing games, and for instant messaging with friends. Rajan was a frequent player of digital games that required problem solving (e.g., street car racing). It was observed that the digital games he played often factored into the content of his school-based literacy practices. For example, he wrote a play about street car racing. Findings showed a disconnection between in-school and out-of-school IL practices. The author concluded

Rajan effectively participated in the global information economy outside of school, but was unable to do so in school due to a lack of multimodal sources (McTavish, 2009).

Digital literacies for the disengaged. Steinkuehler and King (2009) created an after-school program for adolescent boys based on the digital game, *World of Warcraft* (WoW). The purpose of the program was to leverage the game as a tool for connecting boys' in-school and out-of-school literacy practices. This was accomplished through (a) the utilization of WoW forum discussions to foster collective problem solving through informal argumentation, (b) the creation of a user-generated online network to develop research and synthesis skills of multimodal resources, (c) the building of individual and guild web sites to promote design thinking and digital production skills, and (d) the writing of multimodal fan fiction graphic novels. All four activities were aligned to NCTE standards. Findings showed initial success, most notably in using literacy practices to solve problems, research and put together multimodal resources, and synthesize in-game and out-of-game materials.

Close examination of the previous three case studies reveals a common theme, namely that the multimodal format of digital gaming environments serves as a tool for strengthening multiple literacy practices. In all three cases, the products and practices that resulted from the students' interactions with digital games represented the kinds of skills reflected in the P21 Framework. The Catholic Boys School students (Beavis & O'Mara, 2010) successfully demonstrated the development of close reading and critical literacy skills, very likely due to motivation from intense interest in the digital games used in the lessons. Ironically, Rajan (McTavish, 2009) more effectively participated in literacy practices *outside of school* due to greater access to multimodal sources (e.g., digital games). Finally, by engaging in literacy practices centered on WoW, the boys in the after school program were able to strengthen a wealth of skills that are applicable in school (Steinkuehler & King, 2009). For TLs, implications from these case studies exist both in the classroom and in the library. In the classroom, TLs can collaborate with teachers to create digital game-based lessons that promote multiple literacies. In the library, TLs can develop digital game collections that serve as multimodal sources for 21st century learning.

Digital Games and Information Literacy

Problem solving lays at the foundation of information literacy, and information literacy models such as Big6 are problem-solving approaches to using information for decision making. Numerous scholars have pointed to problem solving as one of the learning benefits of digital games (Gee, 2007; Griffiths, 2002; Hung & Van Eck, 2010). Gee (2007) states that digital games "situate meaning in a multimodal space through embodied experiences to solve problems" (p. 40). Squire (2006) views games as places "where learners participate in open and closed problem solving" (p. 22). Steinkuehler (2006) sees games as being made up of "overlapping well-defined problems enveloped in ill-defined problems that render their solutions meaningful" (p. 98).

Adams (2009b) studied information seeking behavior and meaning making in the online role-playing game, *City of Heroes*, using McKenzie's (2003) model of information practices to inform her analysis. McKenzie's model consists of four everyday modes of information seeking behaviors: 1) active seeking, the most direct approach; 2) active scanning, such as browsing; 3) non-directed monitoring, such as accidental discovery; and 4) by proxy, such as gaining information via an agent.

In *City of Heroes*, players took an active seeking approach when they consulted game forums or manuals outside the game; or, in the game itself, when an avatar approached a trainer (i.e., non-player character). Players took an active scanning approach when they looked for information in a likely source, such as an unofficial web page; or, in the digital game itself, when they scan the environment looking for cues or clues (e.g., pulsing sounds when an enemy is near). Players took a non-directed monitoring approach when they accidentally discovered or encountered something in the game, such as how to use the interface or how to target a villain. Players took a by-proxy approach to information seeking when they received information from the non-player characters that they did not recognize as important (e.g., backstories), or when another player in the game offered advice without solicitation. Adams (2009b) concluded that information seeking behaviors that occur in a gaming environment parallel everyday information seeking behaviors, and she suggests that gaming in libraries may be an effective tool for promoting and reinforcing information literacy skills (Adams, 2009b).

Digital Games in Libraries

Gaming is not a new concept in school libraries. The development of educational game collections (e.g., board games) to support the research and curriculum needs of teachers dates as far back as the 1920s (Nicholson, 2013). However, digital games are a more recent trend in libraries, most prominently in public libraries. According to the 2009 Library Gaming Census Report, 25% of libraries of all types circulate PC games, 19% circulate console games and 5% circulate handheld games. Of libraries that have gaming programs, the most commonly cited outcomes are improved reputation with library users, user connection to other library services, and increased social connection among users (Nicholson, 2009). Growing interest in gaming in libraries led to the first annual Gaming, Learning and Libraries Symposium being held in 2007. Keynote speakers included James Paul Gee and Henry Jenkins, both gaming and literacy experts (Peterman & Grieg, 2007). The Symposium inspired a growth in the library research literature exploring the links between gaming, literacy and learning.

Digital Games as Social, Democratizing and Educational

In the library literature, there is an emerging recognition that digital games play an important role in serving the three primary purposes of libraries: social, democratizing and educational (Adams, 2009a; Buchanan & Elzen, 2012; Nicholson, 2010; Werner, 2013).

Digital games as social. Libraries have long served as social centers, both in the community and the school (Davies, 1974; Perry, 1912). Today, gaming clubs and gaming events in libraries are one way to bring like-minded students together for socialization. Squire and Steinkuehler (2005) believe that libraries can better connect with the digital generation by providing access to digital games in libraries, set up gaming stations, and host gaming events. Neiburger (2007) and Czarnecki (2009) draw parallels between digital game events and library story times as taking something that a patron would typically consume at home, and constructing a social event around it. Public libraries have already begun to embrace digital games and gaming events, as the ALA's International Games Day has become an annual event.

Digital games as democratizing. Democratization means equity of access, and is a traditional value of libraries. The ALA (2013) defines equity of access as the ability for all people to "obtain information in a variety of formats" and to "exercise their right to know without fear of censorship or reprisal" (n.p.). Gee (2012) sees libraries as equitable providers of access in the digital age. Just as libraries have served that role for reading, Gee suggests they can also serve as the social equalizers for literacy skills of the 21st century, and they can do that by providing access to good digital games. Gee (2012) defines good digital games as “complex and challenging problem-solving spaces” (p. 63).

Democratization is also associated with civic engagement. A Pew Internet and American Life Project report titled *Teens, Video Games and Civics* found that civic gaming experiences among teens correlated strongly with youth’s civic engagement in the community (Lenhart, et al., 2008). Civic engagement in gameplay was defined as opportunities where players helped or guided other players, participated in guilds, learned about social issues or struggled with ethical issues. In two case studies involving public libraries that tracked the civic effects of gaming events on teens, researchers learned that gaming was a particularly transformational experience for underserved youth, and libraries can provide the social spaces and the support needed for gaming to improve youths’ civic engagement in a way that has not been experienced before (Levine, 2009). Civic engagement is linked to civic literacy, one of the 21st century interdisciplinary themes running through the P21 Framework. This would imply that when school libraries support civic gaming experiences, they are not only serving their primary mission of democratization, they are also supporting 21st century learning.

Digital games as educational. The most basic purpose of libraries is educational. Libraries provide access to books and other sources to promote reading and literacy. There is now a growing recognition that digital games not only promote reading within the game itself, but can also inspire students to check out library books with similar themes and genres similar to the digital games they play (Adams, 2009a; Squire & Steinkuehler, 2005). Gerber (2009) sees digital games as a ‘hook’ to help students recognize how young adult literature can be matched with their gaming interests. For example, she suggests that players of *Elder-Scrolls Oblivion* might be interested in reading *Elf Realm* by Daniel Kirk, and players of *Baldar's Gate* might be interested in reading *The Lightening Thief* by Rick Riordan. Johnson (2006) argues that digital games are a new cultural system of reading. He asserts that reading books and playing digital games share similar cognitive benefits, namely effort, concentration, attention, sense making, following narrative and imagination.

Squire and Jenkins (2003) see digital games as initiators of curiosity. Games can increase a student's interest in a topic, which triggers questions (Harris, 2010), leads to information seeking (Nicholson, 2010), and develops research skills (Squire & Steinkuehler, 2005). Digital games themselves are environments where information seeking and meaning making are taking place, and Adams (2009b) suggests that gaming in the library can improve those information seeking skills.

Digital Gaming Collections in School Libraries

Gaming collections have long existed in school libraries. The development of educational game collections to support the research and curriculum needs of teachers dates as far back as the 1920s (Nicholson, 2013). While these have traditionally been board games, TLs are beginning to consider the role of digital games in libraries. Work by Gee (2012), Squire (2005), Steinkuehler (2005) and Nicholson (2007), along with a new understanding of how digital games can support information literacy has led to an increased interest among TLs to explore the possibilities of bringing digital games into library collections. Gaming policies are being examined, gaming events are being held, and must-have digital game collection lists are being compiled (Nicholson, 2007). One avenue for justifying digital game purchases is the library's mission statement. When school libraries adopt more inclusionary mission statements that are similar to the lifelong learning and social-centered mission statements of public libraries, they broaden their ability to justify gaming collections (Farmer & Murphy, 2010).

Elmborg (2011) describes libraries as a Third Space—a technology-enabled learning space that also supports the social interactions of students. An example of this is the learning commons, which is becoming increasingly visible on school campuses (Fisher, 2010; Loertscher & Koechlin, 2014) and typically located centrally in the library. Elmborg (2011) suggests that school libraries can act as Third Spaces to bridge students' out-of-school literacy practices with their in-school literacy practices. Gee (2007), Squire (2005), Steinkuehler (2007) and others have made the same observation about digital games acting as bridges between in-school and out-of-school literacy practices (Abrams, 2009; Apperley & Walsh, 2012; Beavis & O'Mara, 2010; O'Brien & Scharber, 2008). In that respect, school libraries are uniquely suited for the role of Third Space where students can bridge their informal and formal literacy practices through gameplay. TLs can facilitate this by supporting gaming collections, gaming events, and game-based learning.

Barriers to Digital Game Adoption

While interest in digital games in schools has grown steadily over the past decade, digital game adoption has not grown quite as much (De Grove, Bourgonjon, & Van Looy, 2012). Barriers exist that may prevent teachers from changing their classroom technology practices. These same barriers may also prevent teachers from adopting digital games in their classrooms. The underlying theory behind the barriers concept comes from Fullan and Stiegelbauer (1991), who proposed the idea of first- and second-order educational change. Brickner (1995) further extended Fullan and Stiegelbauer's work by describing first- and second-order barriers to change in the computer usage of mathematics teachers. Ertmer (1999) continued Brickner's work by applying first-order and second-order barriers to the technology integration practices of teachers. First-order barriers are the external factors (e.g., equipment, support) that impact technology integration, and second-order barriers are the internal factors (e.g., personal beliefs) that impact technology integration.

Multiple studies have examined first-order barriers to technology integration, with findings citing lack of time (Beggs, 2000; Bunch & Broughton, 2002), lack of support (Brown, Davis, Onarheim & Quitadomo, 2002; Schoepp, 2005), and lack of awareness of policy issues (Maddux & Johnson, 2010; Russell, O'Dwyer, Bebell, & Tao, 2007) as having a significant impact on teachers' technology practices. Ertmer (2005) argued that second-order barriers, such as personal beliefs about the value of technology and beliefs about teaching and learning, also play a significant role in teachers' technology practices.

Past studies have found discrepancies between teachers' beliefs and their technology practices. Most notably, constructivist beliefs about teaching do not necessarily translate into constructivist teaching practices with technology (Becker & Ravitz, 1999; Lim & Chai, 2008; Liu, 2011; Ravitz, Becker, & Wong, 2000), resulting in classroom settings that remain traditional rather than technology-integrated (Ertmer, Gopalakrishnan, & Ross, 2001). Ertmer et al. (2012) described these discrepancies as barriers thresholds and speculated that they may be the result of teachers' other beliefs that weigh more strongly when making decisions about technology practices in the classroom. Ertmer (1999) suggested that the "relative weight that teachers assigned to first-order barriers" (p. 52) can critically impact the way they integrate technology into the classroom. For example, teachers who perceive lack of infrastructure as a significant problem may choose not to use technology in the classroom at all, despite their beliefs about its learning value.

Research on first- and second-order barriers to technology integration has been further extended to the DGBL literature, with findings that reflect those cited above. Discussion of those findings follows.

First-order Barriers to Digital Game Adoption

Commonly cited first-order barriers to digital game adoption include lack of time, lack of infrastructure and lack of support. Games must fit into the time constraints of lessons. This presents a challenge for both teachers and librarians. Lack of time to become familiar with the games, and to prepare lessons around them (Ertzberger, 2009; Gros, 2007; Ketelhut and Schifter, 2011; Takeuchi & Vaala, 2014) is a deterrent to digital game integration into the curriculum. Adequate infrastructure, such as hardware, software, and Internet service are needed for game access, whether in the classroom or library. Lack of infrastructure can prevent digital game adoption (Ertzberger, 2009; Farmer & Murphy, 2010; Kenny & McDaniel, 2011; Rice, 2007) or at the very least, limit game choice (Tüzün, 2007; Van Eck, 2006). Technical issues (Gros, 2003), along with a lack of technical support (Baek, 2008; Kenny & McDaniel, 2011; Ketelhut & Schifter, 2011) deters digital game use because of the disruption it can cause to the teaching and learning process. Lack of peer and administrative support (Ketelhut & Schifter, 2011) can make it difficult for collaborative problem solving to take place when implementation problems arise.

Second-order Barriers to Digital Game Adoption

A belief that games lack curricular relevance (Bourgonjon et al., 2013; De Grove, Bourgonjon, & Van Looy, 2012; Gros, 2007; Kenny & Gunter, 2011; Proctor & Marks, 2013) is a widely cited second-order barrier to digital game adoption. Kenny and McDaniel (2011) suggest inadequate teacher training underlies teachers' abilities to the see the learning relevance in games. Barbour, Evans, and Toker (2009) found this to be true for pre-service teachers, who were able to see curricular connections to games, but had difficulty seeing how they could be used for learning in the classroom. Takeuchi and Vaala (2014), Van Eck (2013, 2014) and Bourgonjon et al. (2013) echo the need for teacher training, and believe that professional development is a vital component toward greater use of digital games in education. Ertmer et al. (2012) support these findings in their research, and recommend that professional development should focus on approaches that can create changes in teachers' beliefs about technology practices in the classroom.

Barriers Thresholds to Digital Game Adoption

If barriers thresholds (Ertmer, 1999; Ertmer et al., 2012) explain the discrepancies between student-centered beliefs and teacher-centered technology practices, then they may also explain the slow movement toward digital game adoption in the classroom. Of all the commonly cited barriers discussed above, lack of curricular evidence may represent one of the biggest confounding factors in explaining discrepancies between teachers' beliefs and digital game practices. Perceptions about lack of curricular evidence can persist even in the absence of external barriers and in the presence of constructivist pedagogical beliefs, which may result in resistance to digital game adoption. As others have suggested, (e.g., Bourgonjon et al., 2013;

Ertmer, 2012; Van Eck, 2013, 2014) professional development may be the key to resolving such discrepancies.

TLs and Digital Game Adoption

Overarching Hypothesis

TLs already support 21st century learning and literacies as integrators and teachers of the underlying skills of inquiry-based research that make up the broader picture of information literacy. They serve as technology supporters and coordinators in many schools. They are information specialists who recommend and purchase materials that support the curriculum (AASL, 2007; ISTE-SIGMS Executive Advocacy Committee, 2010). These are roles that open up opportunities for TLs to support and promote digital games in schools. However, there is a gap in the research on TLs' attitudes and beliefs about the value of digital games in supporting 21st century learning and literacies. This study aims to close that gap.

The overarching hypothesis of this study is that TLs share similar attitudes and beliefs about digital games as their classroom teacher colleagues, and those attitudes and beliefs present first- and second-order barriers to digital game adoption. This hypothesis is based on the idea that TLs represent a very similar population to classroom teachers because in many states, TLs are licensed teachers with the same educational requirements as their classroom counterparts. In addition to teacher certification, TLs are also licensed or endorsed as media specialists, and some states require that they hold a master's degree in library and information science as well (Jesseman, Page, & Underwood, 2014).

TLs and Classroom Teachers: Similarities and Differences

Similarities. TLs and classroom teachers are subject to the same institutional constraints and policies. Research has shown that this can present external barriers (e.g., lack of equipment, lack of support, lack of time) to digital game adoption for classroom teachers (e.g., Baek, 2008; Ertzberger, 2009; Kenny & McDaniel, 2011; Ketelhut & Schifter, 2011; Rice, 2007). TLs face similar first-order barriers. Farmer and Murphy (2010) found that a number of issues act as barriers to the development of gaming programs in school libraries, namely lack of adequate gaming equipment, justification for purchasing said equipment, scheduling and library space availability, and policies that prevent access (e.g., filters) to digital games.

Classroom teachers and TLs are also subject to many of the same experiences that shape their pedagogical beliefs, including personal experience as a student, professional training and teaching experience (Prestridge, 2012; Raths, 2001). In terms of how that impacts their use of technology, some studies have found that teachers' pedagogical beliefs are highly correlated with student-centered technology integration practices in the classroom (Chen, 2008; Clark & Peterson, 1986; Ertmer, et al., 2012). However, other studies have found that teachers' technology practices may be influenced by institutional expectations as well (Dwyer, Ringstaff, & Sandholtz, 1991; Yocam, 1996), leading to teacher-centered technology practices even when teachers hold student-centered pedagogical beliefs. Niederhauser and Stoddart (2001) believe that providing teachers access to technology alone is not an effective way to integrate it into classrooms. They state that technology should "become a carefully integrated part of teacher training and professional development (p.29)." Ertmer (1999, 2005) has drawn similar conclusions.

Differences. One difference that has been observed between TLs and classroom teachers is that of teacher identity. In particular, misperceptions about the library profession and negative stereotypes held by faculty, administrators and students have impaired recognition of TLs' instructional roles (Hartzell, 2002; Polger & Okamoto, 2010; Walter, 2008). Such misperceptions may prevent TLs from serving on decision making committees, acting as technology supporters, collaborating with teachers, and teaching 21st century skills, all roles that create opportunities to support and promote digital games (Van Eck, 2006).

Another difference between TLs and classroom teachers lies in potentially conflicting perspectives on collaboration. The field of school librarianship recognizes that limited resources are a barrier to the increasing demands of 21st century learning. To solve that problem, Loertscher (1988) and Montiel-Overall (2005) proposed models of collaboration between teachers and TLs based on constructivist principles. Today, the concept of teacher-librarian collaboration is a standard in the core curriculum of school librarianship programs (ALA/AASL, 2010).

In contrast to collaboration models of school librarianship, classroom teachers often struggle to collaborate (Piercey 2010) despite decades of research on its benefits (Friend & Cook, 1990; Marks & Printy, 2003; Goddard, Goddard & Tschannen-Moran, 2007), and findings (Becker and Riel, 1999) that collaborative teachers demonstrate more constructivist teaching practices than non-collaborative teachers. Piercey (2010) suggested that because teachers are culturally and historically unaccustomed to collaboration, attempts by leaders to require it may only result in resistance. To improve collaboration, he recommended a servant leadership approach that focuses on relationships within the organizational structure. Disparity between the two models of teaching may make collaboration difficult for TLs and classroom teachers, consequently hampering opportunities for TLs to support and promote digital games in schools. As Piercey (2010) implied, school leadership presents an additional confounding factor that may prevent collaborative relationships between the two groups.

A third difference between TLs and classroom teachers is in scheduling. Most teachers operate on a fixed schedule basis, with classes or subjects taught at the same time each day. On the other hand, many school districts have implemented flexible scheduling for TLs which reflects the philosophy of the collaboration model of school librarianship. The theory behind flexible scheduling is that it increases TLs' abilities to collaborate and plan with teachers for classroom-integrated instruction of library skills (e.g., information literacy). However, successful implementation is key, and administrative support is essential for success (McGregor, 2002, 2006). The AASL (2014) issued a position statement on flexible scheduling as the following excerpt illustrates:

> The integrated library program philosophy requires an open schedule that includes flexible and equitable access to physical and virtual collections for staff and students. Classes must be flexibly scheduled into the library on an as needed basis to facilitate just-in-time research, training, and utilization of technology with the guidance of the teacher who is the subject specialist, and the librarian who is the information process specialist.

Summary

The development of a new model of learning for the 21st century, such as the P21 framework, is a direct response to the recognition that our education system needs to better prepare today's students for the career and life demands of tomorrow (Abbott, 1997; Longworth

& Davies, 1996). Critical thinking and problem solving, communication and collaboration, and technology-based skills are the hallmarks of 21st century learning (AASL, 2007; Council of Chief State School Officers & National Governors Association Center for Best Practices, 2015; ISTE, 2007; Partnership for 21st Century Skills, 2007). TLs support 21st century learning by integrating the underlying skills of inquiry-based research (e.g., critical thinking, problem solving, and technology skills) into the curriculum (AASL, 2007, 2010), and teaching to a cross-section of learning standards, including Common Core, AASL and ISTE Standards. TLs are also taking on technology leadership roles by introducing technology at the classroom level and serving on their schools' tech teams (School Library Journal Research. 2013). Furthermore, the school library provides a place where students can access technology and work together on collaborative projects (ISTE-SIGMS Executive Advocacy Committee, 2010).

Research has found digital games to be potentially beneficial tools for supporting 21st century learning (Blumberg & Ismailer, 2009; Gee, 2007; Hung & Van Eck, 2010; Kirriemuir & McFarlane, 2004; Prensky, 2006, 2007, 2008; Rieber, 1996; Squire, 2003 Van Eck, 2006), with a growing body of evidence showing greater learning outcomes in DGBL when compared to non-game conditions (Clark, Tanner-Smith, & Killingsworth, 2014; Sitzmann, 2011; Vogel et al., 2006; Wouters, van Nimwegen, van Oostendorp, & van der Spek, 2013). Integral to 21st century learning is the concept of literacy as a social practice, prompting recognition of digital gameplay as a literacy practice (Gee, 2007; Steinkuehler, 2010; Squire, 2008). Additionally, a connection between the literacy practices of digital gaming and the literacy practices that take place in schools has been made by a number of scholars (Abrams, 2009; Apperley & Walsh, 2012; Beavis & O'Mara, 2010; Gee, 2007; O'Brien & Scharber, 2008). Adams (2009b) and Squire and

Steinkuehler (2005) have drawn a connection between digital gaming and information literacy in particular, making TLs and school libraries uniquely well-suited to promote and support digital games (Adams, 2009a; Buchanan & Elzen, 2012; Gee, 2012; Nicholson, 2010; Squire & Steinkuehler, 2005; Werner, 2013).

While the benefits of digital games are increasingly acknowledged, barriers to digital game adoption exist. Barriers that are commonly cited by classroom teachers include lack of time (Ertzberger, 2009; Gros, 2003; Ketelhut and Schifter , 2011), lack of infrastructure (Ertzberger, 2009; Farmer & Murphy, 2010; Kenny & McDaniel, 2011; Rice, 2007) and lack of support (Baek, 2008; Kenny & McDaniel, 2011; Ketelhut & Schifter, 2011). Beliefs about lack of curricular relevance are also common findings in studies on digital game adoption (Bourgonjon et al., 2013; De Grove, Bourgonjon, & Van Looy, 2012; Gros, 2003; Kenny & Gunter, 2001; Proctor & Marks, 2013). No studies have examined TLs' beliefs about barriers to digital game adoption, creating a gap in the research. This study aims to close that gap.

The overarching hypothesis of this study is that because TLs represent a population similar to classroom teachers, they are also likely to share similar attitudes and beliefs about digital games and face similar barriers to digital game adoption. Both TLs and classroom teachers are subject to the same institutional constraints and policies, and thus experience similar external barriers to digital game adoption (Baek, 2008; Ertzberger, 2009; Farmer & Murphy, 2010; Kenny & McDaniel, 2011). Classroom teachers and TLs are also subject to many of the same experiences that shape their pedagogical beliefs (Raths, 2001; Prestridge, 2012), which correlate highly with their technology practices in the classroom (Ertmer, et al., 2012).

One difference that may act as a barrier for TLs to support and promote digital games is misperceptions about the library profession and negative stereotypes held by faculty, administrators and students have impaired recognition of TLs' instructional roles (Hartzell, 2002; Polger & Okamoto, 2010; Walter, 2008). Classroom teachers and TLs may also differ in perceptions about collaboration. Professional training of TLs is based on collaboration models of school librarianship (Loertscher, 1988; Montiel-Overall, 2005) and flexible scheduling to support collaboration (AASL, 2014), while classroom teachers often struggle to collaborate (Piercey 2010). These differences may make collaboration difficult for TLs and classroom teachers, subsequently hindering opportunities for TLs to support and promote digital games in schools.

CHAPTER III

METHODOLOGY

A mixed methods approach was used to test the research questions for this study. Chapter III describes the methodology used, and is organized into four sections: (a) selection of participants, (b) instrumentation, (c) data collection, and (d) data analysis.

Selection of Participants

Target Population

The target population of this study consisted of a convenience sample of K—12 teacher librarians (TLs) who actively participate in library-related professional e-mail discussion lists. TLs were recruited through several discussion lists managed by the American Library Association: the AASL forum (aaslforum@lists.ala.org), the Information Literacy Discussion List (infolit@lists.ala.org), and the Reference and User Services Association List (rusa-l@lists.ala.org). Additional participants were recruited through the Library Media Network LISTSERV (LM_NET@LISTSERV.SYR.EDU) sponsored by Syracuse University.

These discussion lists were selected because they focus on issues that TLs face (e.g., library instruction, teacher collaboration, technology), they include a high subscriber rate of librarians, they have a high activity rate, and they presented an opportunity for wide geographical distribution of the survey to the target population. Wide geographical distribution to a high subscribership of TLs increased the opportunity to obtain a population sample representative of the general TL demographic group. Table 3 provides a detailed description of the discussion lists.

Table 3

Description of Discussion Lists Used to Recruit Study Participants

List	Description	Subscribers
AASL Forum (aaslforum@lists.ala.org)	A forum for discussing and sharing issues and new developments in school librarianship. Open to AASL personal members only.	493
Information Literacy Discussion List (infolit@lists.ala.org)	The Information Literacy Discussion List is focused on the exchange of ideas for information literacy programs and practices that establish a shared relationship between K—12 and higher education institutions.	2694
Reference and User Services Association List (rusa-l@lists.ala.org)	The Reference and User Services Association List is a forum for librarians of all types to discuss issues related to the delivery of library services, such as collection development, reference services, readers' advisory and resource sharing.	2001
Library Media Network LISTSERV (LM_NET@LISTSERV.SYR.EDU)	A forum open to media specialists and others involved with the school library media field school to discuss school library practices and seek advice.	12,000

Population Demographics

Demographically, TLs are predominantly female (91.7%), and the largest percentage fall into the 45-55 age range (56.7%) Table 4 displays the most recently available demographic data on school librarians in the United States, representative of the target population for this study. Data was taken from the latest update of the ALA's *Diversity Counts* study (ALA, 2007) on gender, race, age and disability among library professionals, which was based on an analysis of available U.S. data derived from the Census and the American Community Survey. Table 4 only includes national data for credentialed librarians, which is defined as the minimum of a state-approved media specialist certification.

Table 4

National TL Demographics

Gender	%	Age	%
Male	08.3%	Under 35	06.1%
		35-45	12.8%
Female	91.7%	45-55	56.7%
		55-64	21.7%
		65 or older	02.7%

Instrumentation

The primary instrument that was used for this study was the Teachers' Attitudes Toward Games (TATG) Survey (Van Eck, 2013), a 5-point Likert-type scale that measures attitudes and beliefs that may act as barriers for digital game adoption by teachers. This instrument was chosen to test the overarching hypothesis that TLs and classroom teachers represent similar populations in terms of their perceptions of barriers to using digital games.

Additionally, one section of the Teaching, Learning and Computing (TLC) Survey (Becker & Anderson, 1998) was utilized to help identify TLs' pedagogical beliefs. A demographic survey was also used to gather data on age, gender, state or country, qualifications, job duties, learning standards used, and gaming habits. Finally, a series of open-ended questions were included in the instrument for the purpose of gathering qualitative information on how TLs are using digital games in the classroom and library. See Appendices C, D, E, and F to view the instruments.

TATG Survey

The TATG survey is based on Fullan and Stiegelbauer's (1991) theory of first-order and second-order educational change, where first-order change is external (e.g., systems, processes) and second-order change is internal (e.g., beliefs). Ertmer (1999) extended this theory to first- and second-order barriers to teachers' technology integration practices. The TATG survey used Ertmer's (1999) work as a foundation, and subscales and questions were derived from numerous existing, validated instruments as shown in Table 5.

Table 5

Validated Instruments Used as a Basis for the TATG Survey

Study	Instrument	Validity
Kenny and McDaniel (2009)	The Video Games Preference Inventory measured teachers' game habits, and their perceptions about the value of games.	Cronbach's alpha was .73 and Spearman-Brown coefficient was .85.
Mueller, Wood, Willoughby, Ross, and Specht (2008)	Set of measures examining computer-related and general constructs regarding teachers' use of technology in the classroom.	Cronbach's alpha ranged from .66 to .83. Constructs with highest reliability coefficients were computer use (.83), computer integration (.82) and teaching philosophy (.80).
Russell, O'Dwyer, Bebell, and Tao (2007)	Individual scales to measure teachers' technology use, based on research by Bebell, Russell, and O'Dwyer (2004).	Cronbach's alpha ranged from .73 to .84 for the individual scales.
Schoepp (2005)	Likert scale survey that measured the degree of faculty perception to technology barriers.	Cronbach's alpha reliability score of .80, indicating a high level of consistency.
Teo, Chai, Hung, and Lee (2008)	Based on scales developed by Chan and Elliot (2004).	A high overall reliability coefficient (.84) was reported.

The instrument consists of 83 items, and takes approximately 20 minutes to complete. Questions in the survey were the result of outcomes in current research (e.g., Kennedy-Clark, 2011; Maddux & Johnson, 2010; O'Hanlon, 2009), and were divided into first-order and second-order barriers to change. First-order barriers include perceptions about lack of infrastructure, such as technology access, technology support, and budget; and perceptions about lack of time. Second-order barriers include perceptions about teaching (e.g., philosophy), lack of confidence, and perceptions about lack of curricular relevance.

Equal numbers of items per subscale were created, and items were expressed both negatively and positively to ensure authentic responses and prevent skewing of the data. At this time, preliminary testing with 90 students has taken place, with 58 of those students taking it in pre-test/post-test form for a study relating to math games in education. Once sufficient data on the instrument has been gathered, principal components analysis will be conducted (R. Van Eck, personal communication, November 19, 2013). This study provides an opportunity to gather the additional data needed for the principal components analysis.

Teaching, Learning and Computing (TLC) Survey

Item J3 of the TLC survey was used to identify TLs' pedagogical beliefs, and consists of five pairs of bipolar statements about teaching philosophies ranging from behaviorist to constructivist. Given the statements and a continuum scale, TLs were asked to select the statement that most closely aligned to their beliefs.

The TLC survey was a nationwide survey of over 4000 teachers in more than 1,100 schools conducted by the Center for Research on Information Technology and Organizations to measure teachers' pedagogical beliefs, their teaching practices, their uses of technology in teaching, and their school environments. Statements about pedagogical beliefs were validated through in-depth interviews with 72 teachers in 24 schools encompassing several geographical areas of the United States. The items chosen for the TLC survey were those that the interviewers felt most closely aligned with the teachers' actual pedagogical beliefs (Becker, 2000).

Framework for Categories of Classroom Practices

Ertmer et al.'s framework for Categories of Classroom Practices, located in Appendix B, is a set of criteria that outlines student-centeredness in both teaching and technology practices. It was originally developed for a study examining how well the pedagogical beliefs of K—12 classroom teachers aligned with their award-winning technology practices; and was adapted from prior research on the differences between behaviorist and constructivist classroom environments (Ertmer, Gopalakrishnan, & Ross, 2001; Grabe & Grabe, 1996). For this study, it was used to assess the alignment between TLs' pedagogical beliefs and their digital game practices.

Past studies have found misalignments between teachers' beliefs and their technology practices. (Becker & Ravitz, 1999; Lim & Chai, 2008; Liu, 2011; Ravitz, Becker, & Wong, 2000). Ertmer et al. (2012) described these as barriers thresholds and speculated that they may be the result of teachers' other beliefs (e.g., first-order barriers) that weigh more strongly when making decisions about technology practices in the classroom.

Data Collection

The first step in data collection was to gain permissions from the University of North Dakota's Institutional Review Board. As the study involved the use of a survey, an exemption certification form was completed and submitted as required. Additional permissions were needed from the discussion list owners in order to gain agreement for recruiting study participants from those lists. Permission was granted for the following discussion lists: AASL Forum, INFOLIT, RUSA-L, and LM_NET. Letters of agreement were submitted to the Institutional Review Board.

To recruit TLs from the discussion lists, a letter of invitation was posted to the forums. It explained the purpose and benefits of the study, the amount of time required to complete the study, and the steps taken to ensure participant privacy. The survey was electronically distributed, and data was collected using *Qualtrics*' survey software. Recruitment of participants took place over a three month time frame, with reminders posted to the forums at two week intervals in order to improve participation rate. During that time period, 221 discussion forum members took part in the survey. Upon completion of the study, a letter was posted to the forums thanking participants for their time and contributions to the research, with assurance that results would be shared at a later date.

Data Analysis

This study utilized both a qualitative and quantitative methodology for data analysis. The two methodologies are described individually.

Qualitative Analysis

Question 1: How Are TLs Using Digital Games? The qualitative analysis for research question one consisted of cross-tabulating the open-ended responses from the 7 questions related to digital game-based lessons into a single, separate Excel sheet with column headings for each open-ended question. Each set of TL responses was organized across rows, and each category of responses was organized by column and under its designated heading. Reponses were analyzed for keyword patterns and common themes, and then classified and color coded by categories that reflected terminology found in the school librarianship and DGBL literature (e.g., library instruction versus classroom-integrated instruction; TL as collaborator, facilitator, or designer of lessons; engagement, interactivity, enjoyment in games). Research question one was exploratory, though the results were also used in the analysis of research question three.

Question 2: What Are TLs' Pedagogical Beliefs? Data for research question two was gathered using question J3 from the TLC survey, located in Appendix A, which measures teaching philosophy. Use of an excerpt from the TLC survey was chosen due to the survey's background and validity. Responses from the TLC survey were tabulated to reflect the degree of TLs' pedagogical beliefs from behaviorist to constructivist on 5 separate bipolar statements: (a) explainer/facilitator, (b) content/"sense-making," (c) breadth/depth, (d) content/interest, and (e) whole class activity/multiple activities. Statements were reverse coded where necessary. Possible total scores ranged from 5 to 25, with higher scores indicating a more constructivist philosophy. Results were compared to the TATG data to determine if TLs' reported pedagogical beliefs were reflective of their attitudes and beliefs about barriers to digital game adoption.

Question 3: How do TLs' uses of digital games reflect their pedagogical beliefs?

Ertmer et al.'s (2012) Framework for Categories of Classroom Practices, located in Appendix B, was used to analyze how well TLs' reported uses of digital games identified in research question one were aligned with their pedagogical beliefs identified in research question two. Constructivist beliefs do not necessarily translate into constructivist teaching practices with technology (Becker & Ravitz, 1999; Lim & Chai, 2008; Liu, 2011; Ravitz, Becker, & Wong, 2000). Ertmer et al. (2012) described these discrepancies as barriers thresholds and speculated that they may be the result of teachers' other beliefs that weigh more strongly when making decisions about technology practices in the classroom.

According to Ertmer et al.'s Framework, constructivist classroom practices are those that foster communication, collaboration, problem solving or higher-order thinking. Behaviorist classroom practices are those that focus on isolated skills, standards or independent learning. TLs' digital lesson objectives and digital game choices were assessed using Ertmer et al.'s Framework. Results were organized and tabulated by lesson objective, game title or description, game role (e.g., direct instruction; knowledge construction), game content (e.g., skills taught in isolation; emphasis on thinking skills), and type of practice (e.g., teacher-centered; student-centered).

Quantitative Analysis

Question 4: What barriers do TLs perceive for using digital games? Quantitative analysis of the data examined numerical scores obtained from the Likert scale items in the TATG survey. Responses on each statement ranged from scores of 1 to 5, with lower scores indicating more negative attitudes. Reverse coding of negatively worded items was done to ensure all statements pointed in the same direction. Individual Likert statements for each barrier construct were combined to create new variables. Frequencies, mean scores, and standard deviations for each of the new variables were calculated using SPSS data analysis software.

Question 5: How do TLs' pedagogical beliefs shape perceptions of barriers to using digital games? Scores from the data analysis in research question two were divided into two groups, creating a new variable. Total scores of 20 and higher were used to represent constructivist TLs (n = 29). Total scores of 16 or lower were used to represent behaviorist TLs (n

= 26). The middle scores were eliminated. Using the variables from research questions two and four, a Pearson's product-moment correlation was calculated to determine if there was a relationship between TLs' pedagogical beliefs and their perceptions of barriers to using digital games. To define and describe differences between the two groups, independent samples *t*-tests were run against dependent variables consisting of overall attitude toward digital games, as well as attitudes toward first- and second-order barriers as a whole. Independent samples *t*-tests were also used to calculate differences in attitudes for each individual barrier subscale.

Summary

The target population of this study consisted of a convenience sample of TLs who were subscribers to discussion lists managed by the ALA and/or a discussion list for media specialists sponsored by Syracuse University. The nature of the discussion lists enabled wide geographical distribution, which facilitated generalization of the study's results to the general TL population across the United States. The primary instrument used for this study was the TATG survey, a 5-point Likert-type scale that measures perceptions of barriers to using digital game. Additionally, item J3 of the TLC survey was used to identify TLs' pedagogical beliefs. Also, a series of open-ended questions were asked in order to learn about TLs' experiences with using digital games as learning tools.

The survey was distributed through the discussion forums via the electronic survey software, *Qualtrics*. A mixed-methods approach was used to analyze data both quantitatively and qualitatively. Results of the data analysis will be presented in the next chapter.

CHAPTER IV

RESULTS AND IMPLICATIONS

This study aimed to extend the research on perceptions of barriers to digital game adoption to TLs. TLs were invited to participate in an online survey in order to examine their beliefs and practices about using digital games in schools. A 60% retention rate was achieved, with 133 out of 221 TLs completing the survey. Of those who completed the survey, 117, or 53% of the total pool, were TLs who worked in school libraries. Data from that group was analyzed for the study. This chapter presents the descriptive statistics first, followed by the results of the data analysis. Data analysis findings are arranged by the five stated research questions.

Descriptive Statistics

Demographic Variables

Age and gender. Age and gender demographics were collected to determine the degree by which the sample population represents the national TL population, and as a means to compare subgroups within the sample. According to the most recently available statistical data on K—12 media specialists, the ratio of female to male TLs is more than 10 to 1 and the majority of TLs are 45 or older (ALA, 2007). The TL population for this study reflects a similar profile, with females comprising 94.87% of the survey sample, males comprising 4.27% of the survey sample, and the remaining percentage not indicated. Likewise, the greatest representation of TLs in this study were in the age groups of 45 and older, though the age distribution across those groups was more evenly spread than in the national data. Figure 2 shows a comparison between the survey sample and the national TL population. Differences may be reflective of changes in the national TL population (e.g., aging, retirement) since the *Diversity Counts* survey (ALA, 2007) was conducted. However, in both sets of data, evidence of an older TL population is clear. This may be due in part to the tendency of the profession to attract mid-career changers, making school librarianship—and librarianship in general—a second career for many of its professionals (Jones, 2010).

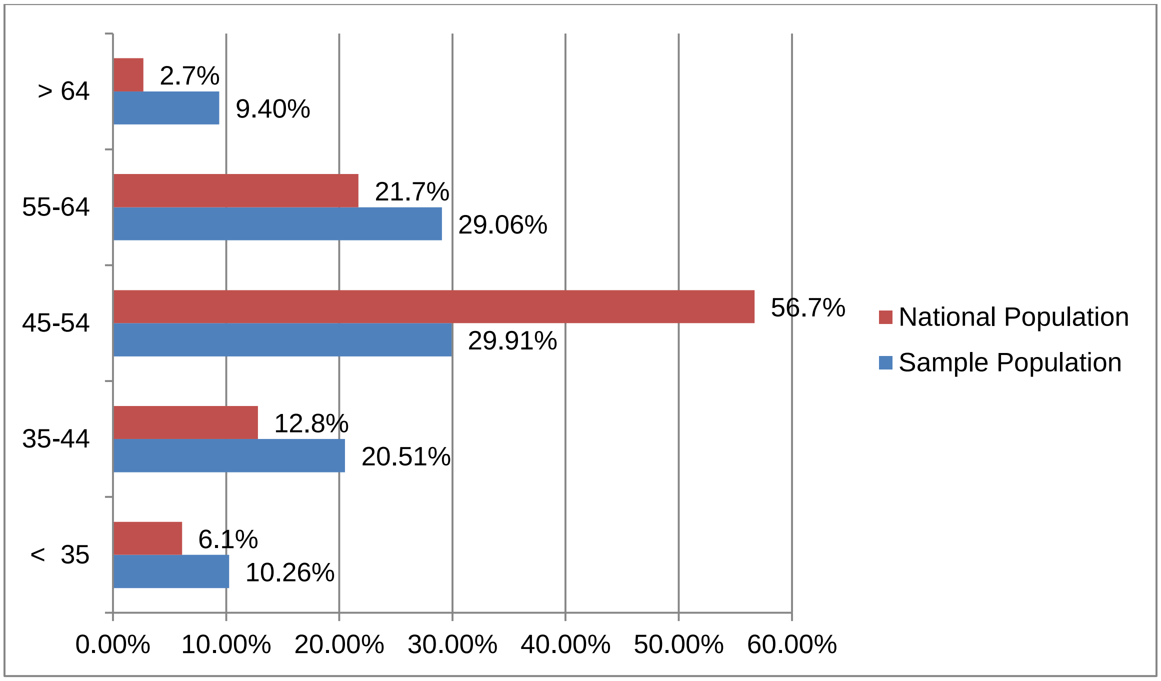

Figure 2. Age distribution comparison between the sample and national TL population. National TL population data was derived from the *Diversity Counts* study (ALA, 2007).

TL population by state. Survey participants were also asked to identify their state or country for the purpose of determining the geographic spread of the sample population. Represented in the survey sample were 32 states and two countries—Australia (n =1) and Canada (n = 2). Texas and New York had the highest representation, likely reflecting the large populations of those states. Other states, such as Indiana and South Carolina also had higher than average representation, which could simply be the result of TL groups in those states sharing the survey within their networks. Figure 3 compares the populations by state.

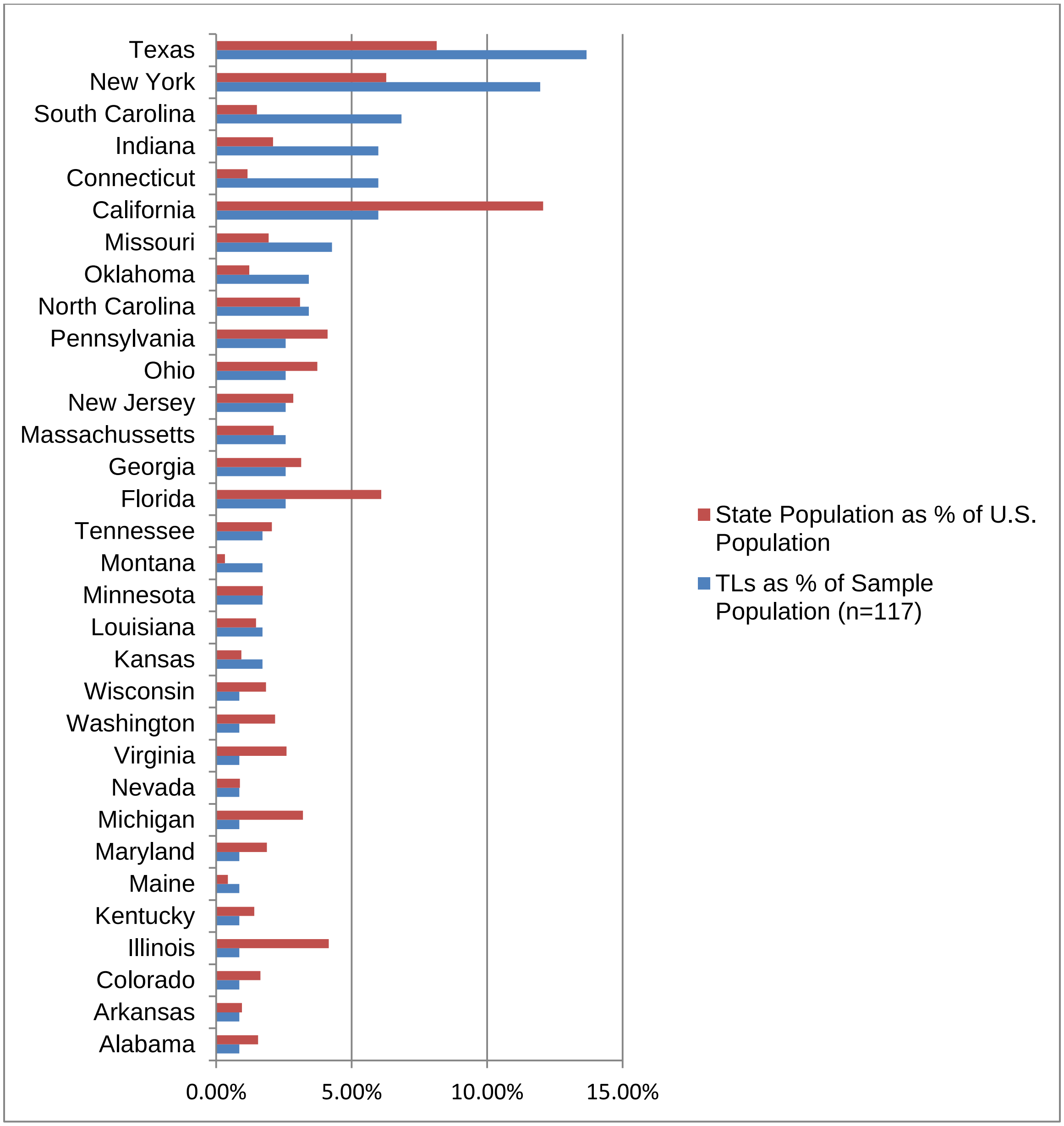

Figure 3. Comparison of TL Sample Population to Overall TL Population and U.S. Population by State. State population data was taken from the U. S. Census Bureau's *Annual Estimates of the Resident Population: April 1, 2010 to July 1, 2014* (http://factfinder.census.gov/).

Qualifications. To determine how well the survey sample represents the TL population, participants were asked to identify their professional qualifications. While qualifications differ from state to state, all 50 states require media specialist licensure in the form of either a media specialist certification or endorsement. In 45 states, teacher licensure is a required *prerequisite* for pursuing media specialist licensure. A master's degree in library and information science is only required in 16 states (Jesseman, Page, & Underwood, 2014). Detailed data on TL qualification requirements for each state can be found in Appendix A1.

In the survey sample, 76.1% of the participants reported holding media specialist licensure and 52.1% of the participants reported holding a master's degree. As shown in Figure 4, these characteristics are in line with the national data on media specialists in public schools (Bitterman, Gray, & Golding, 2013), indicating that the survey sample is representative of the national TL population in terms of qualifications.

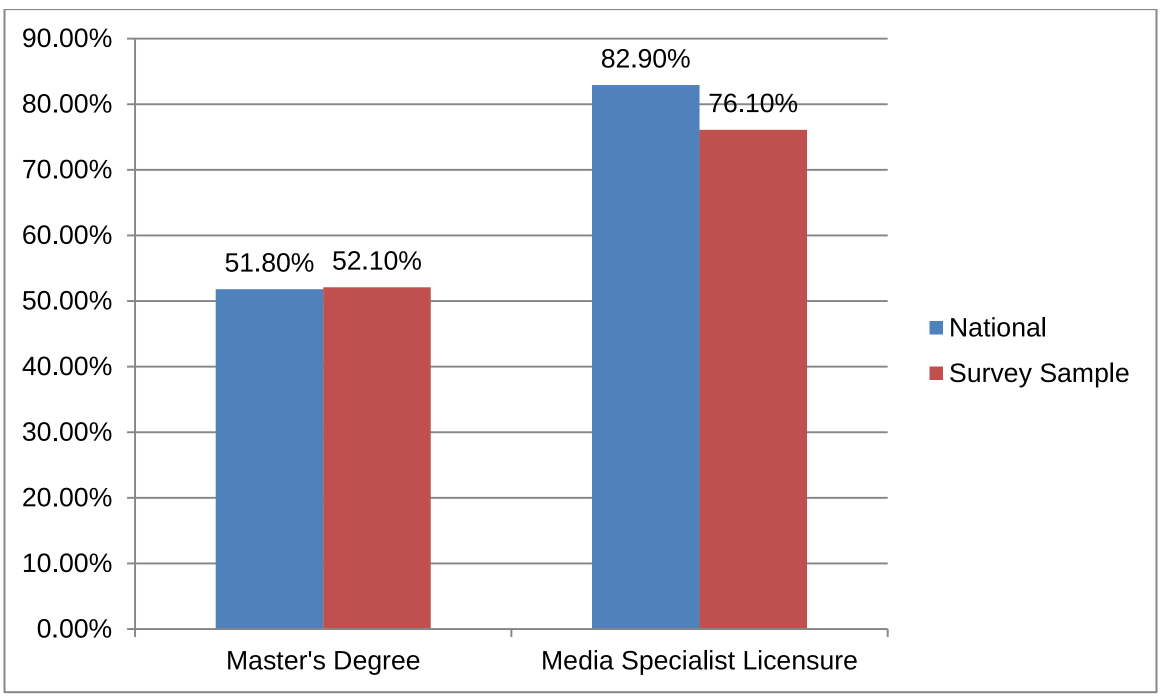

Figure 4. Comparison of TL survey sample to national data on TL qualifications.

Job duties. To gain insight into how the current job practices of TLs might create new opportunities for them to support and promote digital games, participants were asked to identify their primary job duties. Job duties were derived from a sample job description based on the AASL's position statement on the role of TLs in supporting 21st century learning, which is included in Appendix D. Table 6 shows the percentage of TLs who reported performing each job duty.

Table 6

Job Duties that TLs Reported Performing

Job duty	N	%
Develop and maintain library materials	116	99.15%
Promote reading	114	97.44%
Teach research skills	112	95.73%
Ensure equitable access to library materials	107	91.45%
Teach ethical use of information	106	90.60%
Collaborate with teachers to integrate multiple literacies (information, media, visual, digital, technological) into teaching and learning	99	84.62%
Provide professional development opportunities for teachers and other staff	91	77.78%
Evaluate existing and emerging technologies that support teaching and learning	88	75.21%
Serve on a decision making team in the school	80	68.38%
Participate in the curriculum development process to ensure the full range of literacy skills (information, media, visual, digital, technological) is integrated into curricula	68	58.12%

Not surprisingly, the top two primary job duties performed by TLs are collection development (99.15%) and reading promotion (97.44%), both being traditional responsibilities for the profession. Teaching research skills (95.73%) was the third most reported job duty, reflecting the importance of information literacy as an academic skill. Collaborating with teachers was also a job duty reported by the majority of TLs (84.62%), and may be a good indicator of the changing role of TLs in the educational landscape of 21st century learning.

In addition to identifying their primary job duties, participants were asked to indicate how often they performed selected duties that are particularly relevant to 21st century learning (i.e., duties involving information and related literacies, as well as technologies), and consequently to DGBL. Table 7 shows the results of the reported frequencies of job duties.

Table 7

TLs' Reported Frequencies of Job Duties Related to 21st Century Learning

Job duty	Often	Sometimes	Rarely
Teach research skills	71.79%	20.51%	7.69%[1]
Evaluate existing and emerging technologies that support teaching and learning	60.68%	29.06%	10.26%
Teach ethical use of information	55.55%	29.06%	15.39%
Collaborate with teachers to integrate multiple literacies (information, media, visual, digital, technological) into teaching and learning	45.30%	42.74%	11.97%
Provide professional development opportunities for teachers and other staff	33.33%	42.74%	23.08%
Participate in the curriculum development process to ensure the full range of literacy skills (information, media, visual, digital, technological) is integrated into curricula	23.93%	33.33%	42.74%

[1]All 9 in this grouping reported *rarely* teaching research skills.

TLs reported teaching research skills "all the time" or "often" with the greatest frequency (71.79%), which indicates that the TL's role in information literacy instruction is well-established. Of the TLs who identified evaluating learning technologies as a primary job duty (75.21%), more than half reported performing that duty "all the time" or "often" (60.68%). This places TLs in a central position for evaluating and recommending digital games that will support teaching and learning in the classroom. Collaborating with teachers and providing professional development "all the time" or "often" were reported by less than half the TLs, suggesting that fewer opportunities may presently exist for TLs in supporting and promoting digital games through those avenues.

Learning standards. To provide a snapshot of the degree of 21st century learning initiatives within the TLs' school environments, participants were asked to identify the learning standards that their school districts recognize. Table 8 shows the learning standards that were identified by TLs in the survey.

Table 8

Learning Standards Represented in the Study

Standard	State	Promote 21st Century Skills[1]
Common Core (CCSS)	Adopted by 43 states[2]	Yes
ISTE Standards	Adopted or adapted by 49 states[3]	Yes
AASL Standards	May be adopted at the school district level[4]	Yes
ACARA	Australian National Curriculum	Yes
CA Model school library standards	California	Yes
Diocese of Charleston standards	South Carolina	No
Empire State Information Fluency Continuum	New York	Aligned with AASL Standards for the 21st Century Learner
Growing Success	Ontario, Canada	Yes
Indiana Academic Standards	Indiana	Yes
NAIS	Independent Schools	Supports Common Core
PASS skills	Oklahoma	Yes
TEKS	Texas	Yes

[1]The P21 Framework specifically refers to critical thinking, problem solving, communication and collaboration as essential 21st century skills.
[2]Common Core was identified by 69 participants representing 29 states in the study.
[3]ISTE Standards were identified by 34 participants representing 20 states in the study.
[4]AASL Standards were identified by 60 participants representing 25 states in the study.

Five states and two countries represented in the study – Texas, Oklahoma, Indiana, Virginia, Minnesota, Canada and Australia – have not adopted Common Core, though Minnesota did adopt its ELA standards (Achieve, 2013). It appears that some of the TLs may not have been aware of their state's connection to Common Core, as they identified their standards by another name (e.g., Kansas College and Career Readiness Standards, Georgia Performance Standards, PDE SAS) rather than selecting the Common Core option. This may be due to the renaming of Common Core standards in an attempt to distance the state from any politics surrounding Common Core adoption. Those instances were not included in the table. All of the additional learning standards cited in Table X, with the exception of the Diocese of Charleston standards, promote or support 21st century learning. This determination was made by examining their verbiage in regards to 21st century skills as defined by the P21 Framework (Partnership for 21st Century Skills, 2007).

ISTE Standards have been adopted or adapted by 49 states, but were only identified by 34 TLs in the survey. This may be due to the fact that many states do not refer to their technology standards as ISTE standards, leading to unfamiliarity with the ISTE acronym as the source of the standards. Regarding AASL Standards, 60 TLs identified that their school districts recognized the standards. Fewer states have required curriculum standards in place for libraries, so AASL Standards are more frequently adopted at the local level (Council of State School Library Consultants).

It should be noted that in states that do have required library curriculum standards, some have combined their library and technology standards together in recognition of the common goals that both share. At least four states represented in the survey have such standards: (1) Connecticut's Information and Technology Literacy Framework, (2) Kansas' Model Curricular Standards for Library Media and Technology, (3) North Carolina's Information and Technology

Essential Standard, and (4) Wisconsin's Model Academic Standards for Information and Technology Literacy. Though the sample is small, both ISTE and AASL Standards were recognized by TLs from those states, which may suggest that combined library and technology standards place TLs in a better position to both recognize and address 21st century skills in schools.

Type of library. To determine the distribution of the sample population, TLs were asked to identify the type of library in which they worked. An even distribution of TLs across the K—12 spectrum is likely to provide a more complete picture of how TLs think about and use digital games at all levels of learning. Figure 5 illustrates the findings.

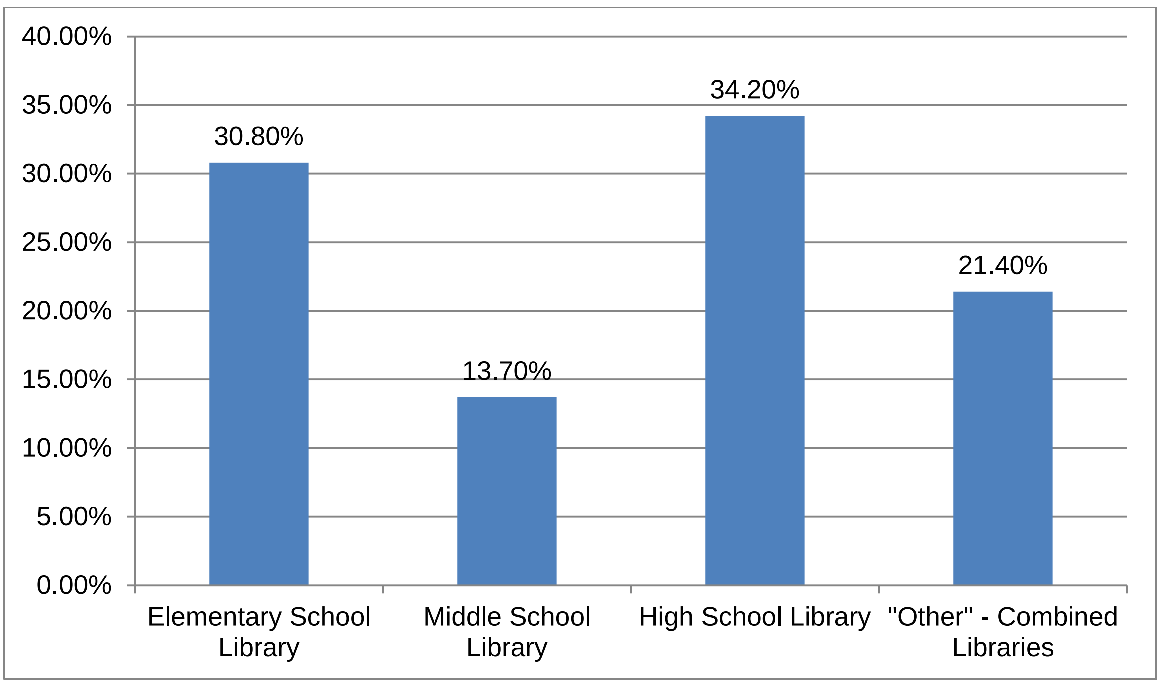

Figure 5. Type of libraries represented in the survey sample.

As Figure 5 shows, elementary and high school libraries were fairly equally represented in the study. While it may seem like middle school libraries were underrepresented, TLs in "other" libraries indicated primarily elementary/middle or middle/high school combinations, meaning that the “other” category captured a lot of middle school libraries. When adding the combined libraries with the middle school library category, the effect of an even distribution of TLs across the K—12 spectrum results, suggesting that the sample population in this study serves as a good representation of TLs at both the primary and secondary levels.

Gaming habits. To determine whether gaming experience is correlated with attitudes about digital games as learning tools, participants were surveyed about their personal gaming habits. They were asked to estimate the number of hours per week that they play different types of digital games (e.g., sports, casual, action, role playing). Additionally, TLs were asked to respond to the statement, “I would rather do other things than play videogames.” Results from that statement show that most TLs would rather do other things than play digital games. Thus, the prospect of devoting time to digital gameplay was viewed negatively ($M = 2.15$, $SD = 1.019$). This supports the results of data on the TLs’ personal gaming habits, as shown in Table 9.

With the exception of casual games, the majority of TLs reported less than one hour’s worth of digital gameplay. These results reflect the research on gaming demographics. According to the Casual Games Association (2013), the majority of casual gamers are females over the age of 30, and most casual gameplay occurs in short increments of 5 to 20 minutes. The description of casual gamers mirrors the demographics represented by the TLs in this study. That is, a predominantly female (94.87%) population that is over 30 (> 97%), and who plays primarily casual games. This may have implications for TLs’ beliefs about digital games, as well as the choices of digital games that they choose for use in the library or classroom.

Table 9

Gaming Habits of TLs

Type of game	Time per week	N	%
Sports games (e.g., *Madden 09*)	<1 hour	115	98.3%
	1-2 hours	2	01.7%
Online roleplaying games (e.g., *World of Warcraft*)	<1 hour	112	95.7%
	1-2 hours	2	01.7%
	3-5 hours	2	01.7%
	>5 hours	1	00.9%
Strategy games (e.g., *Civilization*, *SimCity*)	<1 hour	100	85.4%
	1-2 hours	9	07.7%
	3-5 hours	5	04.3%
	>5 hours	2	01.7%
	"None, but would like to play these types of games"	1	00.9%
Casual games (e.g., *Solitaire*, *Bejeweled*)	<1 hour	46	39.3%
	1-2 hours	27	23.1%
	3-5 hours	24	20.5%
	>5 hours	20	17.1%
Arcade style games (e.g., *Tetris*, *Mario*)	<1 hour	92	78.6%
	1-2 hours	19	16.3%
	3-5 hours	4	03.4%
	>5 hours	2	01.7%
Interactive games (e.g., *Wii Sports*)	<1 hour	102	87.1%
	1-2 hours	13	11.1%
	3-5 hours	1	00.9%
	>5 hours	1	00.9%
Other types of digital games	<1 hour	83	70.9%
	1-2 hours	23	19.7%
	3-5 hours	10	08.5%
	>5 hours	1	00.9%

Although the majority of TLs in the study showed very little interest or experience with playing digital games, 16 TLs did indicate playing strategy games for one or more hours a week. In that category, one TL also indicated wanting to "play these types of games." Strategy games are particularly well-suited for promoting problem solving skills that require metacognitive thinking (Hung & Van Eck, 2010). TLs with experience in playing strategy games may be more likely to recognize their value as learning tools, making them more likely to recommend strategy games over other types of games when collaborating with teachers.

Testing the Research Questions

Research Question One

Question 1: How Are TLs Using Digital Games?

One of the purposes of this study was to find out how TLs are using digital games. This is important because TLs are uniquely positioned to support digital games as 21st century learning tools in both the library and classroom. As the demographic data from the survey show, TLs' primary job duties include evaluating existing and emerging learning technologies, teaching information literacy skills, and collaborating with teachers to integrate multiple literacies into the classroom. These are job duties which provide opportunities for both using digital games and recommending digital games to teachers.

Gaming initiatives. Survey participants were first asked if they had offered any gaming initiatives in their library. Almost 42% of the TLs, 49 out of 117, had offered some type of gaming initiative. Table 10 displays a list of the initiatives that the TLs had offered in their school libraries.

Gaming events and gaming clubs were the most frequently cited gaming initiatives. This finding suggests that some school libraries are using digital games to serve a social function, in the same way that popular fiction and board games have long been used. Gaming collections and maker activities that featured game design were also cited more frequently than other gaming initiatives, which may reflect the evolving state of the school library into a learning commons, where participatory play and creativity are central values (Loertscher & Koechlin, 2014).

Table 10

Gaming Initiatives in School Libraries

Initiative	N
International Games Day @ your library	8
Gaming events	23
Gaming clubs	22
Maker activity (e.g., game design)	11
Gaming collections	11
Gaming clubs, but not digital gaming	2
Gaming contest	2
Game design program (school-based)	1
Games as a reward; free play	8

Game-based lessons. A total of 47 lessons were described by TLs in the survey. Data analysis began with identification of keyword patterns to signify common themes that could be used to categorize the results. Two clear themes emerged for the TLs' roles in lesson design and for the types of lessons being taught. For lesson design, the TLs either played the role of designer, collaborator or facilitator in the lessons. These three categories were derived from commonly used keywords and from interpretations of lesson descriptions. They align well with the current job duties of TLs as teachers, collaborators and technology supporters. When TLs were teaching the lessons, they generally described themselves as creating or designing the lessons. When TLs were collaborators of lessons, they often described themselves in that role, though in some instances they indicated designing the lessons. When TLs were facilitators (i.e., support), they cited such roles as trainer, game facilitator, or materials provider.

The second theme that emerged was a distinction between library instruction and classroom-integrated instruction. In library instruction, lessons were always designed by, and usually for the TL. In classroom-integrated instruction, TLs served most often as collaborators or facilitators and lessons were designed for both the teacher and TL or the teacher alone. Tables 11 and 12 are divided by library instruction and classroom-integrated instruction, and provide a summary of findings. Lessons that were not clearly digital game-based were excluded from the findings.

Table 11

Digital Game Lessons Used for Library Instruction

Objective	Game	TL Role	Used By	Length
Gain empathy for disaster victims	Game about disaster relief	Designer	TL	30 minutes
Keyboarding skills[1]	Free online typing program; keyboard game	Designer	TL	20 minutes, used as filler
Learn how to put books in Dewey Decimal order[2]	*Shelver*[3]; *Order in the Library*[4]	Designer	TL	Ranging from 10-15 minutes to 60 minutes
Learn more about a given topic; Develop fine motor skills	*Starfall* (starfall.com)	Designer	TL	43 minutes
Learn the dangers of sharing pictures online	Internet safety game	Designer	TL	45 minutes
Library orientation	*Kahoot!* (getkahoot.com)	Designer	TL	45 minutes
Mouse skills	*Scratch*[7]	Designer	TL	14 minutes
Search skills	21st Century Information Fluency (21CIF.com) search games	Designer	Teacher and TL[8]	45 minutes
Word recognition special education	Online literacy game	Designer	TL	20 minutes

[1]Lesson type cited by two TLs.
[2]The most commonly described lesson, cited by 7 TLs.
[3]Mrs. Lodge’s Library (2013)
[4]S2S Utopia (2004)
[7]MIT Media Lab (2003)
[8]Lesson took place in the library at the request of the teacher.

Table 12

Digital Game Lessons Used for Classroom-Integrated Instruction

Objective	Game	TL Role	Used By	Length
Angles and speed effect on movement and distance—formulas	Baseball game	Facilitator	Teacher	2 days
Answer questions for a review	*Know it? Show it.*[1]	Collaborator	Teacher and TL	30 minutes
Collaborative online building project	*Minecraft*[2]	Facilitator	Teacher	5 periods
Create a product that represents their knowledge of the composer/explorer they were researching	*MinecraftEdu*[3]	Designer	Teacher and TL	1 month
Economics	*Hot Dog Stand* (2Dplay.com)	Designer	Teacher and TL	1 hour
Environmental science	*Quest Atlantis*[4]	Facilitator	Teacher	Few days
How to identify cyberbullying	Not identified	Designer	Teacher and TL	2 weeks
Learn about life in Victorian England	Roleplaying game	Facilitator	Teacher	3 hours
Learn musical notes	Unidentified	Facilitator[5]	Teacher and TL	40 minutes
Learn Spanish terms; Review anatomy and physiology concepts	*Jeopardy* (jeopardylabs.com)	Facilitator	Teacher	20-30 minutes
Learn the process in initiating, presenting and bill passage or denial	Baseball format game	Facilitator	Teacher and TL	1 hour
Learn to identify a goal and prioritize resources to achieve it	City-building game	Designer	Teacher	3 days
Make a movie / Build a Japanese tea house / Build an Italian inspired set	*Minecraft / Sim on a stick*[6]	Designer	Teacher and TL	10 lessons
Parts of speech, documentation, literary devices	*Smart Board Jeopardy*	Collaborator	Teacher and TL	45 minutes

(continued)

Table 12 *continued*

Objective	Game	TL Role	Used By	Length
Reading practice; spelling practice	*Study Island*[7]; Shooter game	Facilitator	Teacher and TL	5-15 minutes
Reading reinforcement	*Starfall* (starfall.com)	Collaborator	Teacher and TL	30 minutes
Reinforce math concepts[8]	*Sumdog* (sumdog.com); other	Facilitator	Teacher	20-60 minutes
Senior seminar – ethics and videogames	*Bioshock; Call of Duty*[9]	Facilitator	Teacher	1-2 days each game
Understand insects and their "ecosystem"	*RoomBugs*[10]	Collaborator	Teacher	1 month
Work collaboratively to solve a mystery	Online art mystery	Collaborator	Teacher and TL	30 minutes

[1]Prentice Hall (2015)
[2]Mojang (2009)
[3]TeacherGaming (2011)
[4]Currently available as *Quest Atlantis Remixed* (atlantisremixed.org)
[5]TL found game and provided access to it on the library's web site.
[6]Mojang (2009) / opensimulator.org
[7]Edmentum (2014)
[8]Lesson type cited by four TLs who either found the game, assisted teachers with it, or taught teachers how to use it.
[9]2K Games (2007); Activision (2003)
[10]Barron, Moher, & Maharry (2006)

Library instruction. TLs' digital game choices for these lessons trended toward games that served the function of enabling practice of those skills. For example, shelf order lessons used digital games specifically designed for shelf order practice such as *Order in the Library* (S2S Utopia, 2004), a digital game developed by engineering students at the University of Texas in Austin between 2002 and 2004, and a similar game called *Shelver* (Mrs. Lodge's Library, 2013). Likewise, the keyboarding lesson used a digital game intended for that purpose, and the lesson on search skills used a set of tutorials with games that are discretely divided by skill and concept. On the other hand, the choice of Scratch was an interesting one for mouse skill practice because it provides a contextual basis for practicing such skills. However, it is unclear if the students were given a goal to create something during the lesson. Lesson length varied, though all fit when the time frame of a single class period.

Classroom-integrated instruction. Lessons designed for classroom-integrated instruction also included objectives that focused on skills practice (e.g., spelling, reading, math facts) and used digital games such as *Sumdog* (sumdog.com) and *Starfall* (starfall.com) that were developed for that purpose. However, there were a greater variety of lessons described in terms suggestive of 21st century learning (e.g., collaborate, create, research). Two lessons stand out in particular because both were designed by TLs. One TL designed a lesson that had students create a product in *Minecraft* (Mojang, 2009) that represented their knowledge of a composer or explorer they were researching. Another TL used a city-building game (not specified) to teach students the process of identifying a goal and prioritizing resources to achieve it. Both lessons took longer than a single class period (days or weeks). Both lessons also provide examples of the role TLs play in integrating multiple literacies into classroom curricula.

There were notable differences between the types of lessons and digital games used in library instruction and classroom-integrated instruction in this study, with a greater trend toward isolated skills practice in library instruction lessons. Similar uses of digital games have been found among classroom teachers, who tend to lean heavily on drill and practice (Becker, 1991; Maddux, Johnson, & Willis, 1992; Niederhauser & Stoddart, 2001). Time may be one factor that impacts TLs' choices of digital games for library instruction. TLs' typically operate on a flexible scheduling basis to be available for students at their point of need (McGregor, 2002, 2006). This may make library-specific lesson planning more challenging, possibly prompting TLs to focus more heavily on simple digital games that promote practice of isolated skills in a short period of time. On the other hand, a fixed schedule (e.g., once a week) may prompt TLs to choose digital games supportive of isolated skills practice that can be taught in a single class period.

Another factor may be in the nature of library skills themselves. While using the school library and its resources requires certain sets of skills, those skills are almost always applied in the context of a classroom-related learning goal; hence, the focus on collaboration models of school librarianship (Loertscher, 1988; Montiel-Overall, 2005). That concept is well-demonstrated in the two examples of TLs who used *Minecraft* (Mojang, 2009) and a city-building game to integrate multiple literacies into classroom instruction. Without collaborative relationships with teachers though, TLs may perceive having little choice but to teach library skills in isolation.

In that respect, choice of digital games becomes even more important for designing digital game-based lessons for library skills. Specifically, the use of roleplaying or strategy games would be particularly beneficial for addressing library skills outside of the classroom because they situate learning within problem solving contexts. Gaming experience with more complex digital games may be an important factor in proving their value to TLs for promoting the metacognitive processes that information literacy requires. In fact, the TL who used the city-building game was one of the few survey participants who had indicated playing strategy games frequently (> 5 hours per week).

Characteristics of successful lessons. All of the TLs who used digital games in lessons agreed that the games had enhanced the learning process. Analysis of responses to what made the lesson successful found mention of engagement, enjoyment, and interactivity most frequently, and mention of learning least frequently. Those who did mention learning generally perceived the digital games as effective learning tools, with the exception of one TL who "didn't see much evidence of learning" in using a game to teach students book shelf order. Table 13 displays TLs' responses from the survey. Findings suggest that TLs may be more likely to perceive the value of digital games as engaging and motivating to students, rather than recognizing the cognitive learning benefits from gameplay itself. Additionally, TLs' uses of digital games, especially in the design role for library instruction, trended toward simple drill and practice games, which may also impact their perceptions about the affordances of digital games as learning tools.

Table 13

What Made the Lesson Successful

Engagement	Learning	Enjoyment	Interactivity
Hands on	Immediate feedback	Kids liked it	"Shooting" words
Engaged at own levels	Learned concept	Fun	Manipulation of game
Engaged despite boring concept	Retained more information	Enjoyed competing with each other	Interaction with game
Engaging material	Motivated learning	Excited	Interactive role
Graphics and content	**Didn't see much evidence of learning**	Enjoyed change of pace	Interaction between two schools
Game show format			More interactive than a worksheet.

Changes to lessons. When asked what they would change about the lesson, many of the TLs either left the answer space blank or indicated that they would make no changes at all, implying that their lessons were successful. Of the 26 TLs who did mention changes, they invariably described wanting more time for preparation, practice or gameplay; more challenge; or more learning components added to the lesson. Critically reflecting on their lessons to identify changes for improvement may be an indication of those TLs' intentions to use digital games more frequently and with greater deliberation. Table 14 displays representative responses from TLs who would make changes to the lessons.

Table 14

Changes TLs Would Make to Lessons

Time	More Challenge	Add Component
More time to practice	Increase expectations	Student choice
Time to familiarize students beforehand	More competition between students	Modify for younger students
Extra time for practice and goal planning	More challenging questions	Apply to real life
		Allow turn-taking
More time for students to play	More scenarios to offer	Writing component about game experience
Longer game		
Use more often		

Wanting more time for preparation, practice and play suggests that TLs perceive the use of digital games as valuable learning tools for their students. Wanting more challenge suggests that TLs may recognize the need for more complexity in their digital game-based lessons, which may lead them to seek out more complex games for future lessons. Wanting to add more components to the lessons, such as turn-taking and application to real-life, suggests that TLs are willing to experiment with digital game-based lessons to support 21st century learning.

Research Question Two

Question 2: What Are TLs' Pedagogical Beliefs?

To test the overarching hypothesis that TLs represent a similar population to teachers, TLs' pedagogical beliefs were measured using item J3 of the TLC survey. It was important to understand TLs' pedagogical beliefs because they may act as a second-order barrier to digital game adoption. Behaviorist beliefs are more likely to prevent TLs' from adopting digital games, since teachers' perceptions about the relevance of technology to student learning are highly correlated with their technology practices (Ertmer, et al., 2012). Likewise, constructivist beliefs may increase the likelihood that TLs will adopt digital games.

In the survey, TLs were asked to respond to five different bipolar statements, located in Appendix D, to measure their pedagogical beliefs using a continuum scale of 1 to 5 for each statement. Statements were combined into a single scale measure, with a minimum total score of 10 and a maximum total score of 25. A higher score indicated more constructivist beliefs about teaching. The mean score of the scale was 18.09 (SD = 2.97), indicating an overall constructivist philosophy among the TL sample population. This reflects the findings on classroom teachers, who also tend to also share constructivist philosophies of teaching (Ravitz, Becker & Wong, 2000), and confirms the overarching hypothesis.

Research Question Three

Question 3: How Do TLs' Uses of Digital Games Reflect Their Pedagogical Beliefs?

Research has shown that teachers' pedagogical beliefs and technology practices in the classroom do not always align (Ravitz, Becker & Wong, 2000), which may also be true for TLs. To test this research question, TLs' lessons were evaluated using criteria from Ertmer et al.'s (2012) Categories of Classroom Practice. Only TL-designed lessons were included to eliminate the possibility of any influence by teachers on lesson design when TLs functioned as collaborators or facilitators. Two non-digital game lessons were omitted, resulting in a total of 18 lessons for this analysis. The results were then compared to the mean score of the teaching philosophy scale for the digital game subgroup, which was slightly higher than the mean score for the overall group (M = 3.71, SD = .62). Table 15 displays the results of the evaluation of the TL-designed lessons.

Table 15

Examples of TLs' Lessons with Type of Digital Game Practice

Game	Lesson objective	Game role	Game content	Practice
21CIF.com	Search skills	Drill and practice	Skills taught in isolation	Teacher-centered
Game about disaster relief	Gain empathy for disaster victims	Communication (collaboration, information access, expression)	Skills taught and learned in content and application	Student-centered
Internet safety game	Learn the dangers of sharing pictures online	Direct instruction	Skills taught in isolation	Teacher-centered
Kahoot.com	Library orientation	Direct instruction	Skills taught in isolation	Teacher-centered
Keyboard Scramble	Keyboarding skills	Drill and practice	Skills taught in isolation	Teacher-centered
Scratch[1]	Mouse skills	Drill and practice	Basic computer literacy	Teacher-centered
Shelver[2]	Dewey Decimal shelf order	Drill and practice	Skills taught in isolation	Teacher-centered
City-building	Learn to identify a goal and prioritize resources to achieve it	Exploration and knowledge construction	Emphasis on thinking skills	Student-centered
Hot Dog Stand[3]	Economics	Exploration and knowledge construction	Skills taught and learned in content and application	Student-centered
Minecraft[4]	Make a movie / Build a Japanese tea house / Build an Italian inspired set	Exploration and knowledge construction	Skills taught and learned in content and application	Student-centered
MinecraftEdu[5]	Create a product that represents their knowledge of the composer/explorer they were researching	Tool for writing, data analysis, problem-solving	Emphasis on thinking skills	Student-centered
Not identified	How to identify cyber-bullying	Exploration and knowledge construction	Skills taught and learned in content and application	Student-centered

[1]MIT Media Lab, 2003
[2]Mrs. Lodge's Library 2013 (representative of 7 lessons cited by TLs)
[3]2DPlay.com, 2001-2015
[4]Mojang, 2009
[5]TeacherGaming, 2011

Based on criteria from Ertmer et al.'s (2012) framework, as shown in Appendix F, TLs' game-based lessons were evaluated and categorized as student-centered (constructivist) or teacher-centered (behaviorist). At first glance, it appears that the findings are fairly evenly split between teacher-centered and student-centered digital game practices. However, with the *Shelver* (Mrs. Lodge's Library, 2013) game representing seven lessons described by TLs, the findings indicate a two to one slant toward teacher-centered practices among TLs. There appears to be a discrepancy between TLs' pedagogical beliefs, which are constructivist, and TLs' digital game practices, which are behaviorist. This discrepancy also exists among classroom teachers (Andrew, 2007; Palak & Walls, 2009; Ravitz, Becker & Wong, 2000) supporting the overarching hypothesis of this study.

Interestingly, the TLs who designed library instruction were more teacher-centered than those who designed classroom-integrated instruction. Becker and Riel (1999) made a similar observation with teachers, of whom "own-classroom oriented teachers" showed more behaviorist practices than "collaborative classroom teachers" did. It appears that this same phenomenon holds true for TLs, further supporting the overarching hypothesis that TLs and classroom teachers are similar populations. Based on this observation, the collaboration model of school librarianship may be beneficial for both TLs and teachers by moving both groups away from teacher-centered practices toward student-centered ones. In fact, the effects of the collaboration model may have been illustrated in this study based on the observation that TLs designed less than half the lessons reported, and the classroom-integrated instruction—where TLs worked with teachers in some capacity—included a greater number of student-centered lesson examples.

It is possible that TLs' lesson topics and digital game choices were prompted by the need to implement library instruction within a fixed class period, suggesting that time was at least one factor affecting TLs' digital game practices. Considering that TLs work with many students throughout the day, and often on a flexible scheduling basis, time may in fact be what Ertmer (1999) described as a barriers threshold for TLs. Barriers thresholds provide a way to explain the discrepancies between teachers' beliefs and their classroom practices. In the case of TLs, perceptions about lack of time for library instructional practices may present as too great a barrier for even the most constructivist believing TL to overcome.

On the other hand, TLs' perceptions about time as a barrier may differ when collaborating with teachers in the classroom. In fact, the flexible scheduling of TLs was developed to create more time for collaborative opportunities between TLs and teachers, though logistics can make it difficult to implement (McGregor, 2002, 2006). The *Minecraft* (Mojang, 2009) and city-building game lessons are examples of such collaboration. This finding suggests that TLs may have more time than classroom teachers for lesson planning in the context of a flexible schedule, making the collaborative role of TLs all the more significant in terms of digital game adoption.

Research Question Four

What Barriers Do TLs Perceive for Using Digital Games?

To determine if TLs share similar perceptions about barriers to digital game use as teachers, the TATG survey was used to measure 11 attitude subscales representing first- and second-order barriers to digital game use. Attitudes were measured on a Likert-type scale of 1 to 5, with mean scores closer to 1 representing negative attitudes and mean scores closer to 5 representing positive attitudes. Cronbach's reliability analysis was run on the total scale, overall first-order scale, overall second-order scale, and on each subscale. Reliability was found to be acceptable, with the exception of four subscales: access (α = .64), policies (α = .63), reliability (α = .63) and incentives (α = .37).

While the TLs did tend to perceive that digital games are beneficial learning tools, first- and second-order barriers were evident. TLs' first-order barriers were lack of support, lack of time, school policy and lack of budget (though they do not feel games are too expensive). TLs' Second-order barriers were lack of incentives and the drawbacks of digital games. Table 16 displays the TATG survey results.

Table 16

Descriptive Statistics and Cronbach's Alphas for TATG Scales

Measure	M	SD	Likert	Cronbach's α
Total barriers	284.06	31.79	3.46	.94
First-order barriers	129.83	17.96	3.51	.91
Access subscale	18.78	3.32	3.76	.64
Policies Subscale	12.71	3.31	3.17	.63
Budget subscale	12.96	3.75	3.24	.84
Support subscale	15.83	3.76	3.17	.74
Difficulty subscale	32.78	5.23	3.63	.88
Time subscale	19.39	4.18	3.24	.86
Reliability subscale	17.29	2.56	3.45	.63
Second-order barriers	142.07	18.16	3.23	.94
Incentives subscale	12.74	2.04	3.18	.37
Confidence subscale	35.35	6.55	3.54	.87
Benefits subscale	77.66	10.40	3.69	.94
Drawbacks subscale	29.01	5.22	3.23	.84

Note. Cronbach's α is a measure of scale reliability. Alpha coefficients of .70 or higher are considered acceptable in social science research.

Findings on first-order barriers for TLs were similar to those for classroom teachers, namely lack of time, lack of infrastructure and lack of support (Ertzberger, 2009; Gros, 2003; Ketelhut and Schifter, 2011; Takeuchi & Vaala, 2014). There were also similarities between TLs and classroom teachers regarding second-order barriers. While the TLs generally agreed with statements about the benefits of digital games, findings showed that the TLs also perceived drawbacks to using digital games, particularly that "games are not aligned with the testing used in schools." This suggests that TLs may see curricular connections to digital games, but are not sure how to implement them successfully within the confines of curriculum standards. Barbour, Evans, and Toker (2009) found the same to be true for pre-service teachers.

Access subscale. In the access subscale, TLs clearly agreed with one statement: "Schools don't have games for teacher librarians (TLs) to use" (M = 2.77). In the sample, 42.2% (n = 49) agreed or strongly agreed with this statement, while 30.2% (n = 35) took a neutral position. Those findings suggest that while TLs may not see access to technology within the school as a barrier to digital game use, they may either be unsure, or do not believe that schools have an adequate selection of digital games that can be currently used by TLs. Reliability of the access subscale was not acceptable ($\alpha = .64$), so the findings may not be an accurate reflection of TLs' perceptions about access to digital games.

Policies subscale. In the policies subscale, the only statement that the TLs strongly disagreed with was, "I don't know what the school policy is on use of games" (M = 4.16). In the sample, 81.2% of participants (n = 95) disagreed or strongly disagreed with that statement, suggesting they were well-versed in school policies regarding game use. Negative perceptions toward the other statements indicate TLs' tendencies to perceive blocking controls (M = 2.72) and safety policies (M = 2.48) as barriers to the use of games in schools. Reliability of the policies subscale was not acceptable ($\alpha = .63$). However, with removal of the statement "I don't know what the school policy is on use of games," reliability increases ($\alpha = .72$), confirming that TLs tended to perceive school policies as a barrier to digital game use.

Budget subscale. In the budget subscale, responses were fairly spread out among the statements, suggesting some disagreement and perhaps reflecting TLs' own budgetary experiences. The only statement within this subscale that most of the TLs strongly disagreed with was the statement that "games are too expensive to use" (M = 3.63). In the sample, 64.1% of participants (n = 75) disagreed or strongly disagreed with this statement. Results suggest that while school budget is possibly a barrier for purchasing digital games, TLs did not necessarily view digital games themselves as being too expensive.

Support subscale. In the support subscale, lack of support from technology personnel (M = 2.97) and lack of support from administrators (M = 2.95) were viewed as the greatest barriers. Parental support (M = 3.12) of games was perceived as less of a barrier. The only statement in the support subscale that did not present as a barrier by the majority was the statement, "if technology broke down, I could not get help" (M = 3.58). In the sample, 63.3% (n = 74) disagreed or strongly disagreed with that statement. Because many TLs act in the capacity of technology coordinators at their schools, those results might be an indicator of TLs' confidence in their own troubleshooting skills.

Difficulty subscale. In the difficulty subscale, TLs tended not to perceive games as too hard to play (M = 3.63), too complicated to use (M = 3.85), or too complex to learn (M = 3.69). Those findings may be a reflection of TLs' experience with technology as a part of their regular job duties. For example, TLs work with library cataloging systems and databases on a daily basis, so are accustomed to interacting with technology.

Time subscale. In the time subscale, lack of enough time to implement games (M = 2.84) was seen as the greatest barrier by TLs. In the sample, 39.2% (n = 46) disagreed or strongly disagreed with the statement, “there is enough time to implement games in a typical day.” Another 32.5% (n = 38) took a neutral position on that statement, possibly reflecting an uncertainty due to lack of experience with game implementation. The only statement in the time subscale that TLs’ did not perceive as a barrier was the statement, “games take too long to learn” (M = 3.73). In the sample, 66.6% (n = 78) disagreed or strongly disagreed with that statement, possibly reflecting their level of comfort with using technology, a consistent finding within the survey results.

Reliability subscale. In the reliability subscale, a large number of neutral responses on the statements resulted in a skew toward the middle. However, when eliminating the neutral responses altogether, the statements suggest that the TLs did not perceive reliability as a barrier to using digital games. This may be a reflection of their level of comfort with using technology. Reliability of the reliability subscale was not acceptable ($\alpha = .63$), so the findings may not be an accurate reflection of TLs’ perceptions about digital game reliability.

Incentives subscale. In the incentives subscale, while more than half the TLs (n = 67, 57.2%) disagreed or strongly disagreed with the statement, “using games would not be worth it,” they consistently agreed that there are no incentives or awards in place for using digital games in schools. Interestingly, responses to the statement, “if my school rewarded the use of games, I might consider it” were largely neutral (n = 56, 47.9%), suggesting that the use of rewards and incentives to use digital games may not necessarily increase digital game use among TLs. Reliability of the incentives subscale was not acceptable ($\alpha = .37$), so the findings may not be an accurate reflection of TLs’ perceptions about incentives to using digital games.

Confidence subscale. In the confidence subscale, TLs tended to agree with statements relating to comfort level and confidence of using digital games in school. However, more than half agreed or strongly agreed with the statements, "one reason TLs don't use games is that they are not trained for it in school" (n = 60, 51.3%) and "I think TLs should be taught about using games in school" (n = 76, 60%). This suggests that while TLs are very confident in their technical abilities to use digital games, they may be less confident about how to integrate digital games into learning.

Benefits subscale. In the benefits subscale, out of 21 statements, only one statement revealed a strong consensus of disagreement. Almost half of the TLs (n = 55, 47%) disagreed or strongly disagreed with the statement, "when you play a game, you don't have to worry about failing" (M = 2.79). This may be due to the fact that most of the TLs in this study reported little to no personal gaming experience, so the concept of continuous feedback for strategy improvement may not have occurred to them.

Drawbacks subscale. In the drawbacks subscale, 80.4% of participants (n = 94) disagreed or strongly disagreed with the statement, "there is no educational content in games" (M = 4.01). However, results from other statements in the subscale suggest concerns about digital game use, most notably in the areas of alignment to tests (M = 2.62), and inappropriate content in games (M = 2.62). These results may reflect TLs' perceptions about school policies (e.g., curriculum policies, filtering policies) as a barrier to digital game use.

Research Question Five

Question 5. How do TLs' pedagogical beliefs shape perceptions of barriers to using digital games?

Since pedagogical beliefs can present as second-order barriers themselves, this study sought to determine if TLs' pedagogical beliefs were significantly related to their perceptions of barriers to using digital games. To test this research question, a Pearson product-moment correlation was first calculated to evaluate relationships between the variables.

As shown in Table 17, there was a significant positive correlation between TLs' pedagogical beliefs and overall attitudes toward barriers to using digital games (r = .303). Significant positive correlations at the p <. 01 level were also found between TLs' pedagogical beliefs and attitudes toward first and second-order barriers to using digital games.

Table 17

Correlations for Teaching Philosophy and Perceived Barriers

Measure	Teaching Philosophy	Total Barriers	First-Order Barriers	Second-Order Barriers
Teaching Philosophy	1	.303**	.293**	.253**
Total barriers	.303**	1	.837**	.864**
First-order barriers	.293**	.837**	1	.864**
Second-order barriers	.253**	.864**	.448**	1

**p<.01

Further analysis using independent-samples *t*-tests was conducted to identify any statistically significant differences in perceptions of barriers to using digital games in TLs with constructivist pedagogical beliefs versus TLs with behaviorist pedagogical beliefs. Total overall barriers, first- and second-order barriers, and barriers' subscales were tested against two groups of TLs representing behaviorist beliefs and constructivist beliefs. Groups were determined by categorizing teaching philosophy scores such that those with scores of 20 or greater were considered constructivist (n = 29) and those with scores of 16 or less were considered behaviorist (n = 26). Middle scores were not included in the analysis. Findings from the independent samples *t*-tests were used to test the hypotheses.

Hypothesis 1: TLs with behaviorist beliefs are more likely to perceive the presence of overall barriers than do TLs with constructivist beliefs.

As shown in Table 18, TLs' perceptions of total overall barriers to using digital games indicated a statistically significant difference for TLs with constructivist beliefs (M = 3.63, SD = .36) and TLs with behaviorist beliefs (M = 3.36, SD = .39); t (53) = -2.66, p = .01. These results showed that the TL group with constructivist beliefs tended to perceive fewer overall barriers to using digital games than did the TL group with behaviorist beliefs. Findings support the alternative hypothesis, and the null hypothesis was rejected.

Table 18

Independent-Samples t-test Results for TLs' Barriers to Digital Game Use

	Behaviorist		Constructivist		
Measure	M	SD	M	SD	*t*-test
Total barriers	3.36	.39	3.63	.36	-2.66**
First-order barriers	3.35	.58	3.71	.52	-3.11**
Access	3.63	.69	3.98	.57	-2.27*
School Policies	3.22	.82	3.38	.82	-.798
Budget/Money	3.24	.85	3.39	.94	-.702
Support	3.02	.58	3.46	.72	-2.77**
Difficulty	3.45	.69	3.80	.55	-2.26*
Time	2.98	.70	3.43	.77	-2.48*
Reliability	3.34	.38	3.58	.56	-2.01*
Second-order barriers	3.15	.49	3.37	.37	-2.00*
Benefits	3.63	.53	3.85	.51	-1.72
Drawbacks	3.05	.69	3.43	.52	-.798*
Incentives	3.10	.53	3.29	.53	-1.41
Confidence	3.46	.71	3.69	.52	-1.47

*p<.05 **p<.01 M = mean, SD = standard deviation

Hypothesis 2: TLs with behaviorist beliefs are more likely to perceive the presence of first-order barriers than do TLs with constructivist beliefs.

Comparison of TLs' perceptions of overall first-order barriers showed a statistically significant difference in the scores for TLs with constructivist beliefs (M = 3.71, SD = .52) and TLs with behaviorist beliefs (M = 3.35, SD = .58); t (59) = -3.11, p = .003. At the *p*-value level, differences between the two groups were bigger for first-order barriers as a whole than they were for overall barriers. This suggests that the TL group with behaviorist beliefs tended to perceive external barriers as considerably more difficult to overcome than did the TL group with constructivist beliefs.

For subscale first-order barriers, significant differences in perceptions were found on all first-order barriers, with the exception of school policies and budget, indicating that the differences detected on the overall scale were not attributable to the undue influence of one or two items. Both groups tended to perceive school policies and budget as barriers. Such shared perceptions may indicate that TLs believe those barriers to be fixed or out of their control.

It should be noted that because a factor analysis has not yet been conducted on the TATG survey, it is still undetermined whether all statement on the survey are valid, and to what extent each item loads on each construct. Therefore, results at the subscale barrier level could be subject to greater change with a modified survey. However, for overall first-order barriers, findings support the alternative hypothesis, and the null hypothesis was rejected.

Hypothesis 3: TLs with behaviorist beliefs are more likely to perceive the presence of second-order barriers than do TLs with constructivist beliefs.

Comparison of TLs' perceptions of second-order barriers showed a statistically significant difference in the scores for TLs with constructivist beliefs (M = 3.37, SD = .37) and TLs with behaviorist beliefs (M = 3.15, SD = .49); t (58) = -2.00, p = .05. Though, at the *p*-value level, differences between the groups were not as statistically significant as for first-order barriers. While the TL group with behaviorist beliefs tended to perceive more second-order barriers than the TL group with constructivist beliefs, both tended to perceive more overall second-order barriers than first-order barriers.

For subscale second-order barriers, significant differences in perceptions between the two groups were only found for drawbacks, suggesting that the differences detected for second-order barriers were attributable to perceptions about drawbacks to using digital games. The behaviorist group perceived more drawbacks to using digital games than did the constructivist group.

Interestingly, findings showed that both groups shared similar perceptions about the positive benefits of digital games. This may be due to the largely constructivist beliefs of the survey sample. The group categorized as behaviorist for the purpose of this analysis still may have held some constructivist beliefs, considering that the cutoff score for that group was 16, which at the high end falls in the middle of the teaching philosophy scale. The voluntary nature of the study could also explain these results, as TLs were able to self-select their participation. As a result, the survey may have primarily attracted TL participants with an interest in using digital games.

As was noted with the results on first-order barriers, a factor analysis has not yet been conducted on the TATG survey. Therefore, results at the subscale barrier level could be subject to greater change with a modified survey. However, for overall second-order barriers, findings support the alternative hypothesis, and the null hypothesis was rejected.

CHAPTER V

SUMMARY, DISCUSSION, AND CONCLUSIONS

Summary of the Study

The purpose of this mixed method study was to extend the research on barriers to technology adoption (e.g., Ertmer, 1999) by classroom teachers to include digital game adoption by TLs. Research on barriers to digital game adoption, or more broadly, technology adoption, is based on the theory of educational change (Fullan & Stiegelbauer, 1991). This study attempted to determine TLs' beliefs and practices about digital games as 21st century learning tools, to examine similarities and differences with those of classroom teachers, and to see if and how TLs' pedagogical beliefs impacted their perceptions of barriers toward digital game adoption. The overarching hypothesis of the study was that because TLs are a similar population to classroom teachers, the study's results should reflect the results of previous research on classroom teachers.

The TATG Survey (Van Eck, 2013) was used in this study to measure TLs' perceptions of barriers toward the adoption and integration of digital games in K—12 settings. The TATG consists of 83 Likert-type scale statements comprising 11 barrier subscales about first- (i.e., external) and second- (i.e., internal) order barriers to using digital games for learning. Additionally, TLs' pedagogical beliefs were measured using a set of five bipolar statements from section J3 of the Teaching, Learning and Computing National Survey (1998). TLs were also asked a series of open-ended questions about their experiences with using digital games in a lesson.

The study included 221 participants, with 117 participants fully completing the survey. Participation was voluntary and participants were recruited through several professional library e-mail discussion lists. Demographic data, including gender, age, and qualifications, showed that the sample population was an adequate representation of the TL population as a whole. This study sought to answer five research questions:

1. How are TLs using digital games?
2. What are TLs' pedagogical beliefs?
3. How do TLs' uses of digital games reflect their pedagogical beliefs?
4. What barriers do TLs perceive for using digital games?
5. How do TLs' pedagogical beliefs shape perceptions of barriers to using digital games?

Question one was answered qualitatively by cross-tabulating open-ended responses around categorizing theme by common themes (e.g., type of lesson, role of TL) relating to TLs' experiences with using digital games in a lesson. Question two was answered quantitatively by identifying the summative score from the statements on TLs' pedagogical beliefs. Question three was answered qualitatively by using Ertmer et al.'s (2012) Categories of Classroom Practices framework to assess if TLs' digital game practices reflected their pedagogical beliefs..

Question four was answered quantitatively by examining the individual first- and second-order barrier subscales, as well as the combined score from each of the subscales. Question five was answered quantitatively by recoding the data from research question two into a new variable consisting of two groups of pedagogical beliefs based on extreme scores: behaviorist (scores of 16 and below) and constructivist (scores of 20 and above). Middle scores were not included in the analysis. A range of quantitative measures of central tendency and inferential statistics were used to test the new variable against the data from research question four.

Discussion of the Findings

Research Question One: How TLs are Using Digital Games

Findings showed that approximately 40% of the TLs surveyed had offered library gaming initiatives, such as gaming clubs, gaming events, or gaming collections. TLs largely indicated the purpose of their gaming initiatives as recreational or award-based in nature. This may mean that TLs recognize the popularity of digital games with students and are thus willing to provide access to games in their libraries to support students' leisurely interests. After all, one of the purposes of the library is to support the social or recreational needs of patrons (Adams, 2009a; Buchanan & Elzen, 2012; Nicholson, 2010; Werner, 2013). These findings support the argument that the school library is an ideal place to promote recreational gaming as a literacy activity in the same way that the library promotes recreational reading as a literacy activity. Gaming initiatives also allow TLs to support the concept of the library as a Third Space (Elmborg, 2011) by serving as a place to bridge students' out-of-school literacy practices with their in-school literacy practices through digital gameplay (Gee, 2007; Squire, 2005; Steinkuehler, 2007).

Approximately the same number of TLs who had offered gaming initiatives had used digital games in a lesson to meet literacy or learning goals, suggesting that TLs' uses of digital games in library programs and services may transfer over to interest in using digital game-based lessons. TLs used digital games for both library instruction and classroom-integrated instruction, including math, language arts and social studies. In over half of the digital game lessons described, TLs designed the lesson or collaborated with a teacher in planning and implementing the lesson, suggesting that TLs are taking considerable initiative in using digital games as learning tools. When TLs served in the capacity of facilitator (i.e., support), they cited such roles as trainer, game facilitator, or materials provider. These findings reflect the primary job duties of the TL participants in this study, namely teaching research skills, collaborating with teachers to integrate multiple literacies into teaching and learning, providing professional development opportunities, and evaluating existing and emerging technologies. Based on these results, it can be argued that TLs are in a unique position to support and promote digital games on a school-wide level as a function of their role in supporting 21st century learning (Ballard, 2009). This sets TLs apart from their classroom colleagues.

There was a trend toward digital game uses that supported isolated skills practice in TLs' library instruction lessons, and lack of time may be one reason for choosing those types of games. In fact, when asked what they would change about the lesson, "more time" and "more opportunity" for students to play were common answers. Classroom teachers also tend to lean heavily on games that emphasize drill and practice, in no small part due to the fact that drill and practice games take less time to play (Fishman, Riconscente, Snider, Tsai, & Plass, 2014; Takeuchi & Vaala, 2014). The edutainment industry further supports the use of drill and practice games by making them readily available and easy to implement within a limited timeframe.

TLs' digital game uses may also be reflective of their scheduling. TLs typically operate on a flexible scheduling basis to be available for students at their point of need (McGregor, 2002, 2006). This may make *library-specific* lesson planning more challenging, prompting TLs to focus more heavily on simple digital games that promote practice of isolated skills in a short period of time. A fixed schedule may have the same effect if TLs only see students on an intermittent basis (e.g., once a week) and for a short period of time. Regardless, isolated library skills are of little value to students if they are not practiced within the context of a classroom-related learning goal.

On the other hand, flexible scheduling may increase the likelihood of teacher-librarian collaboration that leads to classroom-integrated instruction, which is one reason why the AASL (2014) advocates for it. This was well-demonstrated in the two examples of TLs who took on roles as lesson designers to integrate *Minecraft* (Mojang, 2009) and a city-building game into classroom instruction. In light of those examples, TLs' flexible scheduling may be of particular value to teachers in increasing the probability of using complex digital games in the classroom. In other words, if TLs are available for collaboration with teachers on a flexible basis, they may have more time for lesson planning that focuses on digital games that support complex 21st century skills (e.g., multiple literacies, critical thinking, problem solving).

Finally, TLs' responses to what made the lesson successful were of notable interest. In particular, very few TLs mentioned anything at all about learning. Most of the TLs responded with observations about the students' *experiences* with the games instead—experiences such as motivation and engagement. TLs largely felt that students had fun during the lessons and enjoyed interacting with the games. One TL mentioned that her students enjoyed the shelf order game, *Shelve*r (Mrs. Lodge's Library, 2013), though she found little evidence that learning took place. These findings may mean that learning did not occur in many of the games and therefore was not observed as a successful outcome. Conversely, TLs' observations of students' motivation and engagement during gameplay may reflect their enthusiasm for using digital games. Research on classroom teachers' formative assessment practices with games found that teachers who checked on students' engagement and motivation during the assessment process were the most frequent and enthusiastic users of digital games (Fishman, et al., 2014).

Research Question Two: TLs' Pedagogical Beliefs

Overall, the TLs in this study tended to hold constructivist beliefs. This is not an unexpected finding, as the library profession today is focused on supporting 21st century skills such as digital and information literacy (AASL, 2007; ISTE-SIGMS Executive Advocacy Committee, 2010), skills that require constructivist teaching practices such as guided inquiry (Kulthau, 2010).

This finding also supports the overarching hypothesis that TLs and classroom teachers are similar populations, since classroom teachers also tend to share constructivist philosophies of teaching (Ravitz, Becker & Wong, 2000). It is likely that both groups form such pedagogical beliefs through similar means, such as personal experience as a student, pre-service and professional development training, and teaching experience (Raths, 2001; Prestridge, 2012).

Digital games are 21st century learning tools (Foreman, 2004; Gee, 2007; Prensky, 2007, 2008), and a constructivist philosophy is necessary for supporting and promoting them within the teaching and learning process (Shute, Rieber, & Van Eck, 2012). Because the library profession focuses heavily on 21st century learning, and because TLs and teachers tend to share constructivist beliefs, TLs are well-suited for the task of supporting and promoting digital games in schools in collaboration with teachers. Professional training that uses models of teacher-librarian collaboration is a standard in the core curriculum of school librarianship programs (ALA/AASL, 2010), so TLs are already prepared to take on roles as collaborators. In fact, the potential benefits of teacher-librarian collaboration on digital game-based instruction was revealed in this study's findings on TLs' digital game uses, where digital game choices and lesson descriptions for classroom-integrated instruction were more frequently suggestive of 21st century learning (e.g., collaboration, communication, research) than were descriptions of library instruction.

Research Question Three: TLs' Digital Game Practices and Pedagogical Beliefs

TLs' digital game practices tended to be teacher-centered, reflecting the findings from research question one about their digital game uses. For library instruction in particular, of which the game-based lessons were entirely designed by TLs, isolated skills practice (e.g., shelf order, keyboarding, search skills) was a predominant lesson type, resulting in choices of drill and practice games (e.g., *Order in the Library*). Drill and practice games are designed on behaviorist principles (Niederhauser & Stoddart, 2001; Shute, Rieber, & Van Eck, 2012) rather than constructivist principles, so the findings suggest a discrepancy between TLs' pedagogical beliefs, which are largely constructivist or student-centered, and their digital game practices, which are more behaviorist or teacher-centered.

This discrepancy also exists among classroom teachers (Andrew, 2007; Becker & Ravitz, 1999; Lim & Chai, 2008; Liu, 2011; Palak & Walls, 2009; Ravitz, Becker & Wong, 2000), further supporting the overall hypothesis that TLs and classroom teachers are similar populations. Ertmer et al. (2012) described discrepancies between teachers' pedagogical beliefs and their technology practices as barriers thresholds, and speculated that they may be the result of teachers' other beliefs (first- and second-order barriers) holding greater weight when making decisions about technology practices in the classroom. Some TLs may perceive that certain barriers such as lack of time, lack of support, or lack of infrastructure are too difficult to overcome in order to use digital games.

On the other hand, it is interesting to note that the TL-designed lessons (n = 18) analyzed for this research question made up less than half of the game-based lessons described in the survey (n = 47). In the rest of the lessons—all of which fell into the category of classroom-integrated instruction—TLs worked with teachers in the capacity of collaborating on lesson design or in facilitating the lesson described (i.e., providing technology support). A greater number of student-centered lesson examples (i.e., suggestive of 21st century learning) were found in that category. This may be an indicator of the benefits of the collaboration model of school librarianship, though further research is needed to make such a determination.

A lack of training and awareness about the affordances of digital games might also impact TLs' technology practices. Research has found a lack of adequate professional development to be the case for classroom teachers, many of whom are self-taught or who rely on informal peer-to-peer methods to learn about digital games (Takeuchi & Vaala, 2014). Providing TLs with adequate professional development opportunities or pre-service training in digital game integration could be the key to expanding their use of digital games for student-centered learning. Takeuchi and Vaala (2014) similarly concluded that classroom teachers would benefit from pre-service training on digital game integration, as well as greater promotion of online resources for digital game-based teaching. In light of TLs' own job duties of providing professional development opportunities, collaborating with teachers to support multiple literacies, and evaluating existing and emerging technologies, adequate training of TLs in digital game integration may serve as an additional catalyst for improving classroom teachers' uses of digital games.

Research Question Four: TLs Perceptions of Barriers to Using Digital Games

TLs tended to perceive lack of time, lack of support, lack of budget and school policies as first-order barriers to digital game use. They tended to perceive the drawbacks of digital games (e.g., not aligned to tests, do not teach textbook content) and incentives to using digital games as second-order barriers. Classroom teachers perceive comparable first- and second-order barriers, thus supporting the overall hypothesis that the two groups are similar populations.

Like the TLs in this study, research has found that lack of time, lack of infrastructure (e.g., budget, policy) and lack of support are commonly perceived first-order barriers among classroom teachers (Ertzberger, 2009; Gros, 2003; Ketelhut and Schifter, 2011; Takeuchi & Vaala, 2014). It is not surprising that TLs perceive similar first-order barriers as their classroom counterparts. Because both groups are subject to the same external institutional constraints, it is likely that they are similarly affected by any resulting limitations, though there may be some differences in the way TLs are affected by time due to differences in scheduling. While teachers' schedules tend to be clearly structured within the confines of their classrooms, TLs' schedules tend to be flexible, requiring movement in and out of the library, between classrooms, and sometimes between multiple campus libraries. This may mean that TLs perceive having even less time than their classroom colleagues in preparing and implementing digital game-based lessons for *library instruction*. On the other hand, the purpose of flexible scheduling (at least theoretically) is to provide TLs with more time to plan and prepare for *classroom-integrated* *instruction*, which may be of benefit to digital game-based lessons. Further research should examine these differences.

There are also similarities between TLs and classroom teachers regarding second-order barriers. Lack of curricular relevance is a widely cited second-order barrier for classroom teachers (Bourgonjon et al., 2013; De Grove, Bourgonjon, & Van Looy, 2012; Gros, 2003; Kenny & Gunter, 2001; Proctor & Marks, 2013). While TLs tended to agree that digital games are beneficial learning tools, they also tended to perceive drawbacks to using digital games, particularly that "games are not aligned with the testing used in schools." This suggests that while TLs may see the value of digital games as learning tools, they may be unsure about how to implement them successfully within the confines of curriculum standards. Takeuchi and Vaala (2014) recommend the establishment of "an industry-wide framework for describing and evaluating educational games" (p. 6) for the purpose of facilitating classroom teachers' abilities to identify digital games that best align to learning standards, units and lesson plans. This type of framework would also benefit TLs in their roles as teachers of research skills, teacher-collaborators, and evaluators of existing and emerging technologies.

In this study, TLs also cited incentives as a barrier to digital game use. However, it is unclear whether they perceived lack of incentives as a barrier to digital game use or the use of incentives as a barrier to digital game use. When looking at the data for each individual statement in the incentives construct, it appeared that TLs might view the idea of incentives as an insult. This may simply mean that TLs are not motivated by rewards or incentives.

Research Question Five: **TLs' Pedagogical Beliefs and Barriers to Using Digital Games**

There were significant differences in perceptions of barriers to using digital games between the TL group with behaviorist beliefs and the TL group with constructivist beliefs. Overall, TLs with behaviorist beliefs showed substantially more negative attitudes to digital game use than TLs with constructivist beliefs, meaning that the behaviorist TLs perceived greater barriers to using digital games. This also held true for perceptions about first-order and second-order barriers separately. However, the findings on differences in degree of perception between first- and second-order barriers were particularly interesting.

Behaviorist TLs tended to perceive greater first-order barriers to using digital games than constructivist TLs. This suggests that constructivist TLs perceived first-order barriers as less prevalent or more easily overcome than did behaviorist TLs. The extent of this observed difference was unexpected because first-order barriers are external, with some existing on an institutional level (e.g., budget, policy, technical support), and thus not under the direct control of the individual. The findings suggest that, as a whole, constructivist TLs tended to perceive first-order barriers as manageable hindrances in the use of digital games. This may mean that they would be more willing to experiment with digital games as learning tools despite any external barriers they might face. The same has been found true for constructivist classroom teachers, who tend to perceive first-order barriers as smaller obstacles then behaviorist classroom teachers (Ertmer et al., 2012).

As expected, behaviorist TLs tended to perceive more second-order barriers to using digital games than constructivist TLs. However, both behaviorist and constructivist TLs tended to perceive overall greater second-order barriers than they did first-order barriers as a whole. This result was intriguing because second-order barriers are internal and may be overcome on an individual level. Further examination of the second-order barriers revealed that both TL groups perceived many of the same drawbacks to using digital games. Among the drawbacks, most TLs tended to perceive that digital games are not "aligned with the testing used in schools" and do not "teach any of the things in textbooks." It is possible that the TLs' responses to those statements were a reflection of the influence of their institutions' expectations on their technology practices (Dwyer, et al., 1991; Yocam, 1996).

That is, with the growing focus by many school districts on standardized testing, TLs may not feel they have much leeway in using digital games that do not clearly align to curriculum standards. For example, digital games that are not produced specifically for education may be overlooked by TLs if the school districts they work for expect all educational technologies to adhere to curriculum standards—and perhaps be labeled as such. Similar findings have been found among classroom teachers, who more frequently select digital games that are labeled as educational rather than commercial, possibly because they *are* easier to align to curriculum standards (Fishman, et al., 2014; Takeuchi & Vaala, 2014). These findings might also be an indication of TLs' general lack of experience with playing games, especially regarding concerns about the "content of games" and that "games are too violent." Research has found that classroom teachers share similar concerns (Kirriemuir & McFarlane, 2004; Squire, 2003).

Interestingly, both the behaviorist and constructivist TLs perceived greater benefits of using digital games. This might be the result of influence of recent media touting the learning benefits of playing games like *Minecraft* (Barron, 2013; Ossola, 2015; Szafranski, 2014). It might also be explained by the fact that the survey was self-selected and voluntary, thus primarily attracting TLs who had some interest or knowledge about digital games as learning tools—a limitation of this study's design.

The findings for research question five imply that pedagogical beliefs themselves might be a barrier to digital game use in TLs. Overall, the behaviorist TLs in this study perceived significantly greater barriers to digital game use than did the constructivist TLs, suggesting that behaviorist TLs would be less likely to use digital games as learning tools. Research on the impact of classroom teachers' pedagogical beliefs on perceptions about technology has drawn similar conclusions (Ertmer, 2005), providing further evidence that TLs and classroom teachers are indeed similar populations. Future research should identify the individual factors that impact TLs' pedagogical beliefs and to what extent those factors might impact their digital game practices.

Implications for Practice

The findings from this study hold a number of implications for TLs as potential advocates for digital games, and the implications are threefold. That is, implications exist on three levels: the library level, the classroom level, and the school level. Implications for practice are also dependent upon TLs having adequate training in digital game integration to improve their abilities to recognize, recommend and implement digital games that support the higher-order thinking skills that 21st century learning demands. Additional training might also help them overcome some of the barriers they perceive to using digital games.

The Library Level

At the library level, TLs have the opportunity to build digital game collections, provide technology for gameplay (e.g., game consoles), and offer gaming initiatives such as gaming clubs or gaming events (e.g., International Games Day @ your library). Students benefit through access to digital games that support 21st century literacy practices at an informal level. Digital game access in the library creates a Third Space effect that enables TLs to connect students' gaming practices with school-based literacy practices such as reading and information literacy (Elmborg, 2011; Gee, 2007; Squire, 2005; Steinkuehler, 2007).

Like books, digital games are based on systems that must be understood for meaning making (Apperley, 2010). TLs can use this connection to inspire students to check out library books with themes and genres similar to the digital games they play (Adams, 2009a; Squire & Steinkuehler, 2005). Connections between digital gameplay and information literacy practices also exist. By providing students with access to digital games that support complex problem solving skills (Hung and Van Eck, 2010), TLs are supporting the types of information seeking behaviors and multimodal problem solving skills that are relevant to school-based research practices (Adams 2009b).

The Classroom Level

One of the current roles of TLs is providing professional development to school personnel. Research indicates a need for better training of classroom teachers on digital game integration (Takeuchi & Vaala, 2014). TLs have the opportunity to fill this role by serving as the trainers of teachers for digital game integration, thus benefitting digital game adoption in the classroom. Additionally, as evaluators of emerging technologies, TLs would have the opportunity to recommend the types of digital games that support 21st century learning. As collaborators with teachers, TLs have the opportunity to support the kind of digital game implementation in classrooms that promotes multiple literacies.

Teacher-librarian collaboration may be the key to digital game integration that supports 21st century learning at the classroom level. In this study, TLs' uses of digital games in classroom-integrated instruction were more reflective of 21st century learning when compared to library instruction. This may be due to the affordances of flexible scheduling, or it may be the result of collaboration itself, which tends to foster more constructivist teaching practices than own-classroom orientation (Becker & Riel, 1999). Further research is needed to determine if teacher-librarian collaboration increases the types of digital game uses that support 21st century learning in the classroom.

The School Level

Some TLs serve on decision making committees that impact areas such as technology planning and curriculum development, and there is evidence that some TLs perceive themselves as having an impact on technology adoption at the school-wide level (School Library Journal Research, 2013). This creates opportunities for TLs who are knowledgeable about the affordances of digital games to advocate for and recommend digital games for integration into the curriculum, which may result in greater administrative support of digital games at the school-wide level.

While TLs' multiple roles as teachers of research skills, teacher-collaborators, technology evaluators, professional development trainers, and decision makers provides them with a plethora of opportunities for supporting and promoting digital games, their perceptions of barriers to using digital games may prevent them from doing so. The findings from this study showed that TLs do recognize the benefit of using digital games, and are already taking a lead in using them to support literacy and learning goals. However, findings also indicated specific barriers that may prevent TLs from advocating for digital games. Lack of time, lack of support, and lack of infrastructure were first-order barriers to using digital games. Lack of curricular relevance was a second-order barrier; and behaviorist pedagogical beliefs may have also acted as a second-order barrier for some TLs in the study. Overcoming these barriers is necessary in order for TLs to promote and support digital game use in schools. The most effective solution for overcoming first- and second-order barriers may be professional development for in-service TLs and the addition of digital games integration courses for pre-service TLs. Researchers who study classroom teachers' digital game practices have made similar recommendations (Takeuchi & Vaala, 2014; Van Eck, 2013, 2014).

Limitations and Recommendations for Future Research

The objective of this study was to investigate TLs' attitudes about using digital games as learning tools. Data analysis resulted in a number of significant findings. However, several limitations exist for the study. A primary limitation of this study is that no prior research is available on TLs' attitudes about using digital games. This study was the first of its kind, with the methodology based on research studies about classroom teachers' attitudes toward digital games. Hypotheses were grounded in the research on classroom teachers. While the results of this study found that TLs do indeed share similar beliefs and attitudes about digital games as their classroom counterparts, further research is warranted to build an evidence base specifically on the TL population, as it is likely that they also differ in important ways.

One limitation of this study is that it used convenience sampling with voluntary participation. While the demographic make-up of the study sample resulted in a good representation of TLs as a group, the findings may not be representative of the general TL population's attitude about digital games. It is possible that the TLs who chose to participate in the survey only represent a subgroup of TLs who have some knowledge, curiosity or interest about digital games. It is also possible that the study did not capture a strong representation of school districts across the country—questions about school district characteristics were not included in the survey. Additional research using random sampling and is recommended to determine the accuracy of this study's findings.

Another limitation is that the survey did not include questions regarding TLs' specific technology roles within their schools as compared to other technology personnel, and how those roles fit into the technology leadership picture within their schools and school districts. Future research is needed to explore where TLs fit within the structure of technology leadership at both the school and district level to identify how much impact TLs have on technology adoption at the classroom and school-wide level.

A final limitation is that the construct validity of the TATG survey has not yet been established, though it is in process. It is yet unknown whether a factor analysis will support the subscales and constructs upon which the instrument is founded. The inclusion of items which are found only weakly connected to the constructs could understate or overstate possible findings about barriers. Data analysis will be rerun with the final, revised version of the scale in the near future to establish if there are any differences in the findings.

Conclusions

This study extended the research on barriers to digital game adoption from classroom teachers to TLs. Findings showed that TLs and classroom teachers share similar attitudes and beliefs about using digital games as learning tools. In particular, both groups have identified lack of time, lack of support and lack of infrastructure as external barriers to using digital games. Both groups have identified lack of curricular relevance as an internal barrier to digital game adoption. These findings support this study's overarching hypothesis that TLs are similar to classroom teachers in terms of attitudes and beliefs about using digital games.

Though perceptions of barriers to using digital games are similar for both populations, reasons behind their perceptions may be different. In particular, TLs may diverge from classroom teachers on reasons for perceiving lack of time as a barrier to using digital games due to differences in scheduling (i.e., fixed versus flexible). Because of this, TLs may perceive lack of time as a greater or lesser barrier depending on the type of instruction that students need—library instruction or classroom-integrated instruction. Further research is warranted to delve into how much weight TLs' scheduling places on their perceptions about lack of time as a barrier to using digital games. If future research does find a relationship between TLs' scheduling and perceptions about lack of time, implications may also apply to classroom teachers. For example, if TLs on fixed schedules perceive greater barriers of time to using digital games than TLs on flexible schedules, implications for classroom teachers on fixed schedules may also exist.

Both TLs and classroom teachers share similar constructivist pedagogical beliefs, and as the research on classroom teachers has shown, their pedagogical beliefs do not always match their technology practices. In this study, TLs tended to use digital games that supported isolated skills practice for library instruction, which stood in stark contrast to the group's largely held constructivist beliefs about teaching. It is possible that these reflect institutional expectations. If so, such institutional expectations may represent a different type of first-order barrier. Future research, including possible inclusion of items about this on the TATG survey, should examine this further. It is also possible that TLs diverge from classroom teachers in their reasons for using teacher-centered digital game practices—reasons that may be reflective of their scheduling. Further research is needed to determine such differences.

Because TLs and classroom teachers do share similar attitudes about using digital games, TLs, like classroom teachers, may also benefit from training opportunities that teach them how to implement digital games within a constructivist framework. Because TLs function in roles both inside and outside the classroom, additional training will not only benefit TLs, but also the classroom teachers with whom they collaborate and the administrators with whom they serve on decision making committees. When TLs are knowledgeable about the affordances of digital games, students will benefit in both the classroom and the library.

APPENDICES

Appendix A

AASL's Position Statement on CCSS

The American Association of School Librarians (AASL) acknowledges the National Governors Association Center for Best Practices (NGA Center), the Council of Chief State School Officers (CCSSO) and the state-led Common Core State Standards Initiative in the development of the college- and career-readiness standards for English-language arts and mathematics. We encourage our members to study these standards to determine how school library programs support student success in meeting the Common Core State Standards. AASL provided feedback on the grade level bands of the public draft K—12 standards, released on March 10, 2010.

As students strive to meet the rigor of the standards, certified school librarians will play an essential part in ensuring that 21st-century information literacy skills, dispositions, responsibilities and assessments are integrated throughout all curriculum areas. AASL leads the way in addressing information literacy through the Standards for the 21st-Century Learner, and the Standards for the 21st-Century Learner in Action provide a coherent framework of development from pre-kindergarten to 12th grade. With the integration of these standards to the Common Core State Standards, students have the opportunity to be well-prepared as life-long learners facing the challenges of college and careers.

The school library professional as leader, instructional partner, information specialist, teacher, and program administrator is critical for teaching and learning in today's schools. The school librarian leads in building 21st-century skills by collaborating with classroom teachers to design engaging learning tasks that integrate key critical thinking skills, technology and information literacy skills with subject area content. In addition, the school librarian provides a library program that contains multiple instructional avenues and resources in various formats for the authentic application of information literacy skills.

As these Common Core State Standards are implemented by the states, AASL stands ready to participate in the process. A task force prepared a crosswalk from the AASL Standards for the 21st-Century Learner to the Common Core State Standards. This document guides our members as they collaborate with classroom teachers. We encourage our members to examine the Common Core State Standards and be involved at the state and local level in their implementation.

Adopted 03/01/2010

Appendix B

Letter of Assurance/Compliance

You are invited to participate in a survey titled Literacy and Learning Through Digital Games. This study is being conducted by Amanda Hovious from the Department of Instructional Design & Technology at the University of North Dakota. The purpose of this study is to explore librarians' attitudes and beliefs about the value of digital games in literacy and learning.

In this study, you will be asked to complete an electronic survey. Your participation in this study is voluntary and you are free to withdraw your participation from this study at any time. The survey should take only 30 minutes to complete.

This survey has been approved by the Institutional Review Board at the University of North Dakota. There are no risks associated with participating in this study. The survey collects no identifying information of any respondent. All of the response in the survey will be recorded anonymously.

While you will not experience any direct benefits from participation, information collected in this study may benefit the area of digital media and learning by improving understanding of the factors that lead toward greater acceptance of digital games for literacy and learning.

If you have any questions regarding the survey or this research project in general, please contact Amanda Hovious at amanda.hovious@und.edu or her advisor Dr. Richard Van Eck at richard.vaneck@und.edu. If you have any questions concerning your rights as a research participant, please contact the IRB of UND at michelle.bowles@research.UND.edu.

By completing and submitting this survey, you are indicating your consent to participate in the study. Your participation is appreciated.

Amanda Hovious, MLIS, IDT Masters Candidate, University of North Dakota

Advisor Dr. Richard Van Eck, Ph.D., Department of Instructional Design & Technology, University of North Dakota

Please click on the survey link below and provide us with your feedback no later than Month, Day, 201?

Link goes here

This invitation does not imply any endorsement of the survey research and/or its findings by UND. The survey contents and findings are the sole responsibility of the individual conducting the survey.

Appendix C

Teachers' Attitudes Toward Games (TATG) Survey

How many hours ***per week*** do you spend playing ***Action*** videogames (e.g., Halo, racing games)? Enter number here: ____

How many hours ***per week*** do you spend playing ***Sports*** videogames (e.g., Madden 09)? Enter number here: ____

How many hours ***per week*** do you spend playing ***Online Roleplaying*** videogames (e.g., World of Warcraft)? Enter number here: ____

How many hours ***per week*** do you spend playing **Strategy** videogames (e.g., Civilization, SimCity)? Enter number here: ____

How many hours ***per week*** do you spend playing ***Casual*** videogames (e.g., Solitaire, Bejeweled)? Enter number here: ____

How many hours ***per week*** do you spend playing ***Arcade Style*** videogames (e.g., Tetris, Mario)? Enter number here: ____

How many hours ***per week*** do you spend playing ***Interactive*** videogames (e.g., Wii Sports)? Enter number here: ____

How many hours ***per week*** do you spend playing ***Other*** kinds of videogames? Enter number here: ____

For the following questions, please think about games and choose a response to the right using the listed codes.

SD = Strongly Disagree D = Disagree N = No Opinion A = Agree SA = Strongly Agree

	SD	D	N	A	SA
9. I would rather do other things than play video games	☐	☐	☐	☐	☐
10. Schools don't have games for teachers to use	☐	☐	☐	☐	☐

SD = Strongly Disagree D = Disagree N = No Opinion A = Agree SA = Strongly Agree

	SD	D	N	A	SA
11. Schools don't have the necessary technology for games (tablets, PCs, Consoles, etc.)	☐	☐	☐	☐	☐
12. It is hard to access the technology that schools have (tablets, laptop carts, etc.)	☐	☐	☐	☐	☐
13. I wouldn't know how to access the technology at the					

school even if they had it	☐	☐	☐	☐	☐
14. There are no good educational games for school	SD ☐	D ☐	N ☐	A ☐	SA ☐
15. School technology has controls on it that block things like games	SD ☐	D ☐	N ☐	A ☐	SA ☐
16. I don't know what the school policy is on use of games	SD ☐	D ☐	N ☐	A ☐	SA ☐
17. School policy probably blocks the use of games	SD ☐	D ☐	N ☐	A ☐	SA ☐
18. Safety policies on bullying and social media might apply to games as well	SD ☐	D ☐	N ☐	A ☐	SA ☐
19. Schools have no budget for buying games	SD ☐	D ☐	N ☐	A ☐	SA ☐
20. Schools don't have money to buy technology to play games	SD ☐	D ☐	N ☐	A ☐	SA ☐
21. Games are too expensive for use in the classroom	SD ☐	D ☐	N ☐	A ☐	SA ☐
22. Cost is one reason teachers don't use games	SD ☐	D ☐	N ☐	A ☐	SA ☐
23. The school technology personnel will not support games	SD ☐	D ☐	N ☐	A ☐	SA ☐
24. Parents would not support the use of games in the classroom	SD ☐	D ☐	N ☐	A ☐	SA ☐

SD = Strongly Disagree D = Disagree N = No Opinion A = Agree SA = Strongly Agree

25. School administrators do not support the use of games	SD ☐	D ☐	N ☐	A ☐	SA ☐
26. If the technology broke down, I could not get help	SD ☐	D ☐	N ☐	A ☐	SA ☐
27. There is no help for using games in the classroom	SD ☐	D ☐	N ☐	A ☐	SA ☐
28. I think games are easy to play	SD ☐	D ☐	N ☐	A ☐	SA ☐
29. I do not find games complicated to play	SD ☐	D ☐	N ☐	A ☐	SA ☐
30. I don't think games are too complex to learn	SD ☐	D ☐	N ☐	A ☐	SA ☐
31. I do not think games are hard to play	SD ☐	D ☐	N ☐	A ☐	SA ☐
32. Games are not too complicated for classroom use	SD ☐	D ☐	N ☐	A ☐	SA ☐

33. Games are too complex to learn	SD ☐	D ☐	N ☐	A ☐	SA ☐
34. Game controllers make learning to use games too hard	SD ☐	D ☐	N ☐	A ☐	SA ☐
35. Games are too complicated for classroom use	SD ☐	D ☐	N ☐	A ☐	SA ☐
36. Games are too hard to use	SD ☐	D ☐	N ☐	A ☐	SA ☐
37. Games take too long to learn	SD ☐	D ☐	N ☐	A ☐	SA ☐
38. It takes too much time to implement games in the classroom	SD ☐	D ☐	N ☐	A ☐	SA ☐

SD = Strongly Disagree D = Disagree N = No Opinion A = Agree SA = Strongly Agree

39. Games take too long to play	SD ☐	D ☐	N ☐	A ☐	SA ☐
40. Games in the classroom might be feasible if they didn't take so much time	SD ☐	D ☐	N ☐	A ☐	SA ☐
41. Games are worth the time it takes to use them	SD ☐	D ☐	N ☐	A ☐	SA ☐
42. There is enough time to implement games in class in a typical day	SD ☐	D ☐	N ☐	A ☐	SA ☐
43. Games are too unreliable to use the classroom	SD ☐	D ☐	N ☐	A ☐	SA ☐
44. If I were to use games, I know they would break down at some point	SD ☐	D ☐	N ☐	A ☐	SA ☐
45. You cannot count on games working when you need them	SD ☐	D ☐	N ☐	A ☐	SA ☐
46. One reason teachers do not use games is that they don't run on different technology (e.g.,, Macs and PCs)	SD ☐	D ☐	N ☐	A ☐	SA ☐
47. Games are reliable enough to use in class	SD ☐	D ☐	N ☐	A ☐	SA ☐
48. There is no incentive for me to use games	SD ☐	D ☐	N ☐	A ☐	SA ☐
49. Using games in the classroom would not be worth it	SD ☐	D ☐	N ☐	A ☐	SA ☐
50. One reason teachers don't use games in the classroom that it is not rewarded	SD ☐	D ☐	N ☐	A ☐	SA ☐
51. If my school rewarded the use of games, I might consider it	SD ☐	D ☐	N ☐	A ☐	SA ☐
52. I don't know enough about games to use them	SD	D	N	A	SA

☐ ☐ ☐ ☐ ☐

SD = Strongly Disagree D = Disagree N = No Opinion A = Agree SA = Strongly Agree

	SD	D	N	A	SA
53. I'm not a game player, so I would find it hard to use games in the classroom	☐	☐	☐	☐	☐
54. I don't feel comfortable using games	☐	☐	☐	☐	☐
55. I would look foolish trying to use games because my students would know more about them than I do	☐	☐	☐	☐	☐
56. I would feel stupid if I tried to use games and got stuck	☐	☐	☐	☐	☐
57. When I think about playing games I get nervous	☐	☐	☐	☐	☐
58. The idea of playing games is intimidating to me	☐	☐	☐	☐	☐
59. I feel comfortable playing games	☐	☐	☐	☐	☐
60. One reason teachers don't use games is that they are not trained for it in school	☐	☐	☐	☐	☐
61. I think teachers should be taught about using games in school	☐	☐	☐	☐	☐
62. Games promote visual learning skills	☐	☐	☐	☐	☐
63. Game promote problem-based learning	☐	☐	☐	☐	☐
64. Games promote inquiry learning	☐	☐	☐	☐	☐
65. Games are meaningful experiences	☐	☐	☐	☐	☐
66. Games are good for learning new concepts	☐	☐	☐	☐	☐

SD = Strongly Disagree D = Disagree N = No Opinion A = Agree SA = Strongly Agree

	SD	D	N	A	SA
67. Games are good for learning basic knowledge (drill) and practice	☐	☐	☐	☐	☐
68. Games are effective simulation environments (a way to see how ideas are applied)	☐	☐	☐	☐	☐
69. Games can be a useful instructional tool in almost all subject areas	☐	☐	☐	☐	☐
70. Games assist the learner in developing a positive attitude toward learning	☐	☐	☐	☐	☐

	SD	D	N	A	SA
71. Games are motivating	☐	☐	☐	☐	☐
72. A student who plays games is more interested in their learning	☐	☐	☐	☐	☐
73. Games help students stay focused on learning	☐	☐	☐	☐	☐
74. Games distract students from their learning	☐	☐	☐	☐	☐
75. One reason games are good for learning is that they are very interactive	☐	☐	☐	☐	☐
76. When you play a game, you don't have to worrying about failing	☐	☐	☐	☐	☐
77. Games adapt to the individual learner	☐	☐	☐	☐	☐
78. Games keep the challenge just right for the player	☐	☐	☐	☐	☐
79. Games can appeal to many different kinds of learners	☐	☐	☐	☐	☐
80. Games support different learning styles	☐	☐	☐	☐	☐

SD = Strongly Disagree D = Disagree N = No Opinion A = Agree SA = Strongly Agree

	SD	D	N	A	SA
81. Games can assess student knowledge	☐	☐	☐	☐	☐
82. Games collect data about the player that could be helpful for learning	☐	☐	☐	☐	☐
83. Games make it difficult to know what someone has actually learned	☐	☐	☐	☐	☐
84. If students played games, I would not know what they Learned	☐	☐	☐	☐	☐
85. One challenge of games in the classroom is that the game does not test what players learn	☐	☐	☐	☐	☐
86. Games are not aligned with the testing used in schools	☐	☐	☐	☐	☐
87. Games don't teach any of the things in the textbook	☐	☐	☐	☐	☐
88. Games are too violent	☐	☐	☐	☐	☐
89. I would be concerned about the content of games if I used them in my classroom	☐	☐	☐	☐	☐
90. Games are too repetitive/boring					

	☐	☐	☐	☐	☐
91. There is no educational content in games	SD	D	N	A	SA
	☐	☐	☐	☐	☐

Appendix D

TLC Teacher's Survey, Item J3 on Teaching Philosophy

Different teachers have described very different teaching philosophies to researchers. For each of the following pairs of statements, check the box that best shows how closely your beliefs are to each of the statements in a given pair. The closer your beliefs to a particular statement, the closer the box you check.

"I mainly see my role as a facilitator. I try to provide opportunities and resources for my students to discover or construct concepts for themselves."	"Students really won't learn the subject unless you go over the material in a structured way. It's my job to explain, to show the students how to do the work, and to assign specific projects."
"The most important part of instruction is the content of the curriculum. That content is the community's judgment about what children need to be able to know and do."	"The most important part of instruction is that it encourage 'sense-making' or thinking among students. Content is secondary."
"It is useful for students to become familiar with many different ideas and skills even if their understanding, for now, is limited. Later, in college, perhaps, they will learn these things in more detail."	"It is better for students to master a few complex ideas and skills well, and to learn what deep understanding is all about, even if the breadth of their knowledge is limited until they are older."
"It is critical for students to become interested in doing academic work, interest and effort are more important than the particular subject-matter they are working on."	"While student motivation is certainly useful, it should not drive what students study. It is more important that students learn the history, science, math and language skills in their textbooks."
"It is a good idea to have all sorts of activities going on in the classroom. Some students might produce a scene from a play they read. Others might create a miniature version of the set. It's hard to get the logistics right, but the successes are so much more important than the failures."	"It's more practical to give the whole class the same assignment, one that has clear directions, and one that can be done in short intervals that match students' attention spans and the daily class schedule."

Appendix E

Open-Ended Questions on Using a Digital Game in a Lesson

For the following questions, think about your experience with using a digital game (e.g., videogame, PC game, console game, etc...) in a lesson to support literacy or learning.

1. Describe the digital game you used for the lesson.
2. Describe the lesson's topic or objective.
3. What role did you play in designing the lesson?
4. For whom was the lesson designed to be used? (Multiple choice: for the teacher, for the librarian, both teacher and librarian)
5. How long did the lesson take?
6. What made the lesson successful?
7. What would you change about the lesson?

Appendix F

Framework for Categories of Classroom Practices (Ertmer et al., 2012)

Categories of Classroom Practice	Teacher-centered (TC)	Student-centered (SC)
Teacher role	Teacher-directed Primarily didactic • Present information • Manage classroom	Student-directed Primarily interactive • Guide discovery • Model active learning • Collaborator (sometimes learner)
Student role	• Store, remember information • Complete tasks individually	• Create knowledge • Collaborator (sometimes expert)
Curricular characteristics	• Breadth – focused on externally mandated curriculum • Focus on standards • Fact retention • Fragmented knowledge and • disciplinary separation	• Depth – focused on student interests • Focus on understanding of complex ideas • Application of knowledge to authentic problems • Integrated multidisciplinary themes
Classroom social organization	• Independent learning • Individual responsibility for entire task	• Collaborative learning • Social distribution of thinking
Assessment practices	• Fact retention • Product oriented • Traditional tests • Norm referenced • Teacher-led assessment	• Applied knowledge • Process oriented • Alternative measures • Criterion referenced • Self-assessment and reflection
Technology role	• Drill and practice • Direct instruction • Programming	• Exploration and knowledge construction • Communication (collaboration, information access, expression) • Tool for writing, data analysis, problem-solving
Technology content	• Basic computer literacy • Skills taught in isolation	• Emphasis on thinking skills • Skills taught and learned in

		context and application

Appendix G

Research Questions and Methodology

Research Question	Instrumentation	Methodology
RQ1. How are TLs using digital games?	Open-ended question (Ertmer, Gopalakrishnan, & Ross, 2001)	Themes will be identified, coded and categorized. Color coding will be used to represent different themes.
RQ2. What are TLs' pedagogical beliefs?	TLC Teacher's Survey, J3	Responses will be tabulated in a range from transmissionist to constructivist for 5 categories: (a) explainer/facilitator, (b) content/"sense-making," (c) breadth/depth, (d) content/interest, and (e) whole class activity/multiple activities.
RQ3. How do TLs' uses of digital games reflect their pedagogical beliefs?	See RQ1 and RQ 2	Ertmer et al.'s (2012) Framework for Categories of Classroom Practice will be used to determine how well TLs' reported uses of digital games are aligned with their pedagogical beliefs.
RQ4. What barriers do TLs perceive for using digital games?	TATG Survey	Numerical scores will be obtained from the Likert scale items in the TATG Survey. Responses ranging from 1 to 5 will be exported into Excel for each of the participants, along with their demographic data. Reverse coding of negatively worded items will be done. Data will be analyzed using Excel's Analysis Toolpak to run statistical tests. Composite scores will be calculated for related Likert scale items, with mean and standard deviations calculated for variability.
RQ5. How do TLs' pedagogical beliefs shape perceptions of barriers to using digital games?	See RQ2 and RQ4	Data from RQ2 will be converted to a 1 to 5 response score, with 1 indicating transmissionist and 5 indicating constructivist. An overall mean score from all 5 categories will be obtained. Data from RQ2 and RQ4 will then be analyzed using Pearson's r correlation. Linear regression will be performed to compare groups.

Appendix H

TL Certification Requirements by State

State	Teacher's License	Master's Degree	Media Specialist License
Alabama	Yes	Yes	Yes
Alaska	No	No	Yes
Arizona	Yes	No	Yes
Arkansas	Yes	Yes	Yes
California	Yes	No	Yes
Colorado	Yes	No	Yes
Connecticut	Yes	No	Yes
Delaware	Yes	No	Yes
District of Columbia	Yes	Yes	Yes
Florida	Yes	No	Yes
Georgia	No	Yes	Yes
Hawaii	Yes	Yes	Yes
Idaho	Yes	No	Yes
Illinois	Yes	No	Yes
Indiana	Yes	No	Yes
Iowa	Yes	Yes (for K—12 certification)	Yes
Kansas	Yes	Yes	Yes
Kentucky	Yes	Yes	Yes
Louisiana	Yes	No	Yes
Maine	No	No	Yes
Maryland	Yes	No	Yes
Massachusetts	Yes	Yes	Yes
Michigan	Yes	Yes	Yes
Minnesota	Yes	No	Yes
Mississippi	Yes	No	Yes
Missouri	Yes	No	Yes
Montana	Yes	No	Yes
Nebraska	Yes	No	Yes
Nevada	Yes	No	Yes
New Hampshire	No	No	Yes
New Jersey	Yes	No	Yes
New Mexico	Yes	No	Yes
New York	Yes	No	Yes
North Carolina	Yes	Yes	Yes
North Dakota	Yes	No	Yes

(continued)

State	Teacher’s License	Master’s Degree	Media Specialist License
Ohio	Yes	Yes	Yes
Oklahoma	Yes	Yes	Yes
Oregon	Yes	No	Yes
Pennsylvania	Yes	No	Yes
Rhode Island	Yes	No	Yes
South Carolina	Yes	Yes	Yes
South Dakota	Yes	No	Yes
Tennessee	Yes	Yes	Yes
Texas	No	Yes	Yes
Utah	Yes	No	Yes
Vermont	Yes	No	Yes
Virginia	Yes	No	Yes
Washington	Yes	No	Yes
West Virginia	Yes	No	Yes
Wisconsin	Yes	Yes (for professional license)	Yes
Wyoming	Yes	No	Yes

Source: Jesseman, D. J., Page, S. M., & Underwood, L. (2014). School Library Media Certification by State. *School Library Monthly*. Retrieved from http://www.schoollibrarymonthly.com/cert/index.html

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