ABSTRACT

Assessing the Technological Pedagogical Content Knowledge (TPACK) of Teachers in Modern Orthodox Jewish Day Schools

Teachers in Jewish day schools have made significant efforts to integrate technology into their educational methodology over the past twenty years. However, studies had not yet explored whether these teachers possess the requisite knowledge to utilize educational technology effectively to enhance learning.

Mishra and Koehler's technological pedagogical content knowledge (TPACK) is the premier framework portraying the types of knowledge required to integrate technology in teaching one's content area. TPACK is based on the interplay of three types of knowledge: content knowledge, pedagogical knowledge, and technological knowledge, which come together to form TPACK, along with other secondary knowledge constructs.

The current study seeks to ascertain the self-reported TPACK of teachers in Modern Orthodox Jewish day schools. In addition, correlations were sought between self-reported TPACK and the in-service professional development and pre-service teacher training of these teachers. Further, the study questioned whether teachers with high levels of self-reported TPACK integrated technology in notably different ways than those with lower levels of self-reported TPACK. Upon an analysis of all the data, the study sought to identify which variable among those studied was the strongest predictor of self-reported TPACK.

In analyzing the responses of 109 teachers, the results found self-reported TPACK levels to be high, with no significant discrepancies among any of the demographic variables. Correlations were found between self-reported TPACK and in-service professional development and pre-service teacher training. Teachers who report high levels of TPACK also claim to use technology in notably different ways than those who report lower levels of TPACK. Within the TPACK framework, technological pedagogical knowledge was the strongest predictor of TPACK, followed by technological content knowledge. From all the variables surveyed outside of the TPACK framework, nature of technology integration was the strongest predictor of self-reported TPACK, followed by hours of in-service professional development.

The current study aims to assist Jewish day schools by clarifying what types of knowledge teachers in Modern Orthodox Jewish day schools possess in regards to technology integration. Due to the wide scope of the study, future research is required to delve deeper into these findings. In addition, given the multitude of factors that play a role in technology integration, future research studying factors such as pedagogical beliefs, accessibility of technology, and school culture, is required to attain the complete picture regarding technology integration in Modern Orthodox Jewish day schools.

Assessing the Technological Pedagogical Content Knowledge (TPACK) of Teachers in Modern Orthodox Jewish Day Schools

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DEDICATION

Guiding my personal and professional aspirations are the values imparted to me by my grandparents.

Although I did not have the privilege of building a relationship with each one of them, I carry their stories with me every single day as a constant source of inspiration.

This work is dedicated to:

Ben & Becky Douek

Harold & Harriet Levy

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

Introduction to Technology Integration in Education

In his forward to *Mindstorms: Children, Computers, and Powerful Ideas*, Seymour Papert (1980) writes that "The computer is the Proteus of machines. Its essence is its universality, its power to simulate. Because it can take on a thousand forms and can serve a thousand functions, it can appeal to a thousand tastes" (p. viii). As soon as computers became affordable, and therefore accessible to schools in the 1970s and early 1980s (Howard & Mozejko, 2015), educational researchers have been fascinated and enthralled by their seemingly limitless potential to enhance and revolutionize student learning.

The place of technology in schools continued to grow throughout the 1980s as schools sought to increase their inventory of computers, with computer companies beginning to invest in, as well as formally study, educational innovations. One of the most thorough studies was conducted by Apple in 1985, with the aim of assessing the impact of the Apple Classrooms of Tomorrow (ACOT) project - an intensive infusion of technology, accompanied by teacher support, towards instruction and student learning (Rakes, Fields, & Cox, 2006). The results of this fundamental study were positive, and showed that technology integration allows for: 1) stronger interactions among students and between students and teachers; 2) increased student engagement in higher-order thinking; and 3) the shifting of teachers' assumptions about teaching and learning (Dwyer, 1994). In addition, it was observed that integrating technology was an "evolutionary process" (Dwyer, 1994, p. 47) - a gradual and deliberate process in which teachers progressed through a series of stages toward technology integration. This progression allowed teachers to overcome the challenges of technology integration in order to ultimately arrive at a stage in which they developed positive attitudes towards technology and attained the skills to provide higher-quality learning experiences using technology (Dwyer, Ringstaff, & Sandholtz, 1991).

During the 1980s, schools began to work diligently to obtain as many computers as possible for student use. Although currently computers are one of many technologies that make up a school's technological portfolio, Cuban (2001) points out that in the years following 1980, the measure of a school's student to computer ratio had been used as the primary statistic in judging a school's technological progress. This figure improved substantially in the 1980s and 1990s, with the national ratio decreasing from ninety-two students per computer in 1983-1984, to twenty-seven per computer in 1988-1989. By 1999, the ratio was approximately six students per computer.

Access to the internet, which became prevalent in schools by the end of the 1990s (Howard & Mozejko, 2015) proved to have powerful educational ramifications. Although the capabilities of the early internet are limited when compared to those of the present-day internet, Dillon and Gabbard (1998), note the significant offerings of the early internet for educational purposes: 1) access to a nearly endless amount of information; 2) the ability of users to access this information at any time of their choosing, at their own pace; and 3) use that is inherently appealing.

As powerful as these capabilities were, the use of technology for education transformed dramatically in early 2000 when, according to Howard and Mozejko (2015) the internet became "dynamic", implying that:

> Individuals could now interact online and online content could be created. Key aspects of this change were the capacity to search using natural language, authoring content became available to everyone, and increased social interaction… These types of interaction evolved to support… social networking, video conferencing… and cloud computing, just to identify a few. (p. 6)

In addition, users no longer needed a computer - a number of newer, mobile devices began to offer connectivity to the internet as well as to a multitude of applications that could perform an array of functions spanning personal, professional, and educational needs.

In order to harness these powerful tools for educational change and growth, significant amounts of financial investment poured into educational technology. Federal spending on educational technology increased from $21 million to $729 million between the years 1995 and 2001, coinciding with the national student to computer ratio decreasing from 9:1 to 4:1 (Russell, Bebell, O'Dwyer, & O'Connor, 2003). This growth has continued to increase substantially, with investments in educational technology reaching $9.5 billion in 2017 (Shulman, 2018). Schools have continued to improve in providing high levels of technology accessibility to teachers and students. In the 2008-2009 school year, the National Center for Education Statistics (Gray, Thomas, & Lewis, 2010) reported that ninety-seven percent of teachers had one or more computers in the classroom, with internet access available on ninety-three percent of those computers.

Coupled with financial investments, educational technology researchers and advocates have exerted significant efforts towards developing standards and guidelines to promote effective technology integration in education. With its robust educational standards for teaching and learning with technology, the International Society for Technology in Education (ISTE) guides teachers and school leaders in the creation of curricula and lesson plans to enhance student learning and provide technology-rich learning environments (ISTE, 2000). In addition, the federal government has developed the National Education Technology plan which, combined with independent initiatives by the states themselves, serves to guide the integration of technology and to set a vision for the process and steps through which this objective is achieved.

The Decision to Integrate Technology – Models and Theories

The decision to utilize technology in the classroom is undoubtedly quite complex. Educational researchers have and continue to explore these factors in a wide array of circumstances. Roblin, Tondeur, Voogt, Bruggeman, Mathieu, and van Braak (2018) found that teachers consider a number of practical factors prior to integrating tablet PCs into their teaching. Ertmer and Ottenbreit Leftwich (2010) suggest that there are four primary variables behind teacher technology change: 1) knowledge; 2) self-efficacy; 3) pedagogical beliefs; and 4) subject and school culture. To simplify the decision-making process, educational researchers have developed different models that highlight these and other relevant factors in order to guide schools in promoting effective technology integration among their teachers.

Venkatesh, Morris, Davis, and Davis (2003) review a number of different models portraying the manner in which teachers decide to integrate new technologies. One prominent example is the updated Technology Acceptance Model 2 (TAM2), which suggests that a teacher’s willingness to utilize a new technology is based on three factors: 1) ease of use; 2) perceived usefulness; and 3) subjective norm, defined as “the person’s perception that most people who are important to him think he should or should not perform the behavior in question” (Fishbein and Azjen, 1975, p. 302, quoted by Venkatesh et al., 2003). They further considered broader theories of behavioral change as they pertain towards teacher technology integration, such as the Theory of Reasoned Action, which considers an individual's attitude towards a given behavioral change as well as the subjective norm (see definition above), and the Motivational Model, which factors both intrinsic and extrinsic motivation toward a behavioral change.

After analyzing these various models, Ventakesh et al. (2003) created their own model of teacher technology integration based on those in their analysis, known as the Unified Theory of Acceptance and Use of Technology (UTAUT). This model considers a number of very important factors in a teacher's decision to integrate technology, including: 1) the belief that the technology will enhance job performance; 2) the ease of use of the technology; 3) the perception that important people would support the use of the technology; and 4) the belief that the organizational culture would support the use of the new technology. This is an important framework to guide and encourage teachers' decisions to integrate technology in the classroom, and can be utilized by school leaders to ensure that conditions are such that allow teachers to comfortably decide to integrate technology.

One of the most universal and widely-known models for educational change is the Concerns-Based Adoption Model (CBAM), first developed by Hall and his colleagues (Hall, George, & Rutherford, 1977) at the University of Texas Research and Development Center for Teacher Education (Anderson, 1997). In his analysis of the model, Anderson (1997) reviews the three primary components that make up CBAM. The first is Stages of Concern, which portray the different "feelings and motivations a teacher might have about a change in curriculum and/or instructional practices at different points in its implementation" (p. 334). The next component, Levels of Use, outlines the different stages taken by the teacher in the actual implementation process, ranging from preparation prior to implementation of the change, all the way to developing a deeper experience with the change. The last component is referred to as Innovation Configurations, which helps to conceptualize the unique ways that different teachers implement a given innovation.

CBAM can function as a practical framework to guide teachers in integrating new technologies (Chen & Jang, 2014). Shwartz, Avargil, Herscovitz, and Dori (2017) used CBAM to assess the process by which chemistry teachers implemented a technology-enhanced learning environment (TELE), which promoted the use of innovative pedagogies aided by technology. They found that the model allowed them to glean a clear picture of the innovative process, and would recommend it with the supplementation of observation and interviews. Chen and Yang (2014) conducted a study to determine whether technological pedagogical content knowledge (TPACK) and CBAM's Stages of Concern framework were connected in any way among Taiwanese teachers. They found a multitude of connections between the Stages of Concern and the different knowledge domains in the TPACK framework. Most importantly, this study allowed the researchers to ascertain some of the concerns that affected the knowledge and abilities of Taiwanese teachers to integrate technology. For example, they found that Taiwanese teachers were not concerned about the time commitment for technology use nor the prospect of collaborating with their colleagues to utilize technology. However, they were primarily concerned with how technology could affect their teaching, as well as how to best utilize technology in the classroom.

It is important for schools to consider utilizing CBAM as part of the innovation and technology integration process. Awareness of teacher concerns towards technology can allow school leaders to address the specific apprehensions that teachers may have. Considering a teacher's level of use of an innovation can serve to guide teacher support. Further, the framework reflects the notion that teachers may utilize an innovation in different ways, thus allowing teachers to take an innovation and, within reason, make it their own.

Doyle and Ponder (1978) introduced the practicality ethic as a guiding principle for educational change. Simply put, the practicality ethic suggests that teachers will only integrate changes that they deem to be “practical”. Three criteria are used in order to determine what teachers consider to be practical: 1) instrumentality: the change must include a procedure provided in active terms (as opposed to a theory or a desired outcome); 2) congruence: the change proposal must be connected and relevant to the current situation of the teacher; and 3) cost: the “cost” or efforts of integrating the change must be outweighed by its benefits. McGrail (2005) found the practicality ethic to be the guiding principle behind a study of the technology integration practices of English teachers. Mostly in line with the principle of “cost”, the participating teachers were not willing to integrate technology when they felt the challenges it presented overshadowed the potential benefits. In an assessment of the factors that motivated and hindered teachers’ adoption of new pedagogical and technological practices, Collinson and Cook (2003) found the practicality ethic to be a strong factor influencing teachers’ decision making processes.

It is evident that the decision to integrate technology is complicated, and may manifest itself differently in different schools and for each individual teacher. In considering the multiple factors that play a role in technology integration, schools must be prepared to determine what determinative elements are prevalent in their culture and among their faculty, and provide the necessary support, guidance, and resources to ensure that teachers can venture into technology integration.

Technology Integration and Enhanced Learning

Educational technology has taken a central role in educational research due to its potential to drastically alter, if not revolutionize, the traditional learning environment. In serving the population of the “industrial age”, lasting from approximately 1830 to 1960, schools had to prepare students for factory work, and therefore emphasized values such as obedience, punctuality, stamina (in this sense, the ability to continuously repeat a given task), and standardization. This paradigm of education, often labeled as the “factory model”, served this era well, and was successful in preparing the majority of people for factory work, while distinguishing gifted students for higher education and professional careers (Reigeluth & Karnopp, 2013).

However, twenty-first century technologies have fostered a significant shift in many aspects of life, and have ushered society out of the industrial age and into the information age. As such, there has been push for the educational system to adapt in order to accommodate these changes (Niess, 2005). This new paradigm of education is referred to as the learner-centered paradigm, and has been the subject of a plethora of educational research. A report by the International Association for K–12 Online Learning (Glowa & Goodell, 2016) identifies four key characteristics of the learner-centered paradigm of education: 1) learning is personalized, and reflective of the notion that students learn in different ways, at their own pace, and in pursuit of their own interests; 2) learning is competency-based, implying that students only advance when they have displayed mastery of the current content, as opposed to advancing based on age or hours in a classroom; 3) learning can occur anytime and anywhere, oftentimes beyond the walls of the classroom; and 4) students take ownership of their learning, and take leadership roles in the decision-making process behind their learning, including selecting learning topics and types of assessments.

Weimar (2002) identified five aspects of teacher-centered education that must change in order to allow learner-centered education to take place: 1) balance of power – control of learning must shift to some degree from the teacher to the student. Students should have choices and make decisions about their learning; 2) function of course content – as opposed to memorization of facts, teachers must encourage students to reflect and derive their own meaning from content (Blumberg, 2016); 3) role of the teacher – the teacher must become a facilitator of learning, rather than an expert imparting knowledge to students; 4) responsibility for learning – students should take ownership of their learning; and 5) purpose and processes of evaluation – assessments should seek to measure deep, meaningful learning, with less emphasis placed on grades.

Technology plays a crucial role in the implementation of the learner-centered paradigm. Watson, Lee, and Reigeluth (2007) explain that “the learner-centered paradigm of education cannot be effectively implemented without technology, and by the same token, technology cannot approach its potential contribution to education and learning without a learner-centered paradigm of education” (p. 70, as quoted in Yildirim, Reigeluth, Kwon, Kageto, & Shao, 2014). Glowa and Goodell (2016) refer to the type of technology needed for the learner-centered paradigm as a “student-centered learning integrated system” (p. 4). Reigeluth et al. (2015) refer to this type of technology as the Personalized Integrated Education System (PIES). This system would be able to perform four major functions: 1) recordkeeping for student learning; 2) planning for student learning; 3) instruction for student learning; and 4) assessment for student learning. In addition, this system would include capabilities to permit communication and collaboration among teachers, faculty, and parents. Although at the time of their study such a system did not yet exist, the development of such a system would allow the learner-centered paradigm to proliferate at a more rapid rate.

It is important to note that educators do not need to take an “all or nothing” approach with regards to learner-centered teaching. While many educational researchers and practitioners aspire toward a full-fledged, learner-centered educational system, and rightfully so, due to an array of considerations many teachers utilize technology to enhance instruction as part of the traditional, teacher-centered paradigm. These efforts and initiatives are valuable nonetheless, and must be supported to promote further growth in this area, and to continue the progression towards learner-centered education.

Serving as a theoretical backdrop behind the drive for a paradigm shift towards technology-based, learner-centered education is the theory of constructivism. Educational researchers regard constructivism as the theory by which “students learn through an active participation in a discovery-oriented process within a meaningful context” (Overbay, Patterson, Vasu & Grable, 2010). Webster (2011) notes that there are multiple definitions of constructivism as it pertains to education. He highlights a number of aspects that are common among these definitions: 1) the learner “constructs” knowledge through interactions with the world; 2) knowledge is not “absorbed” by the learner, but rather is constructed by actions taken by the learner; and 3) social interactions are integral to learning. Richardson (1997) adds that constructivist learning theory suggests that students learn when they combine their prior experiences and perceptions with new experiences.

Instruction enhanced by technology has the potential to greatly aid teachers in their implementation of constructivist teaching practices and pedagogy (Rakes et al., 2006).

Roschelle, Pea, Hoadley, Gordin, & Means (2000) explain that "constructive learning can be integrated in classrooms with or without computers, [but] the characteristics of computer-based technologies make them a particularly useful tool for this type of learning" (p. 79). Generally, the use of educational technology at a high level is often connected with constructivist learning (An & Reigeluth, 2012). Hermans, Tondeur, von Braak, and Valcke (2008) found that constructivist beliefs have a positive effect on teacher technology use. Further, in attaining the constructivist aim for social and genuine learning opportunities, technology allows students to collaborate and connect with other students and groups outside of the classroom and school setting, thereby providing additional authentic interactions and engagements (Pittman & Gaines, 2015).

Constructivist learning theory can serve to guide the use of technology to improve instruction and enhance learning for students. Gao, Choy, Wong, and Wu (2009) note that the implementation of constructivist ideals can lead to a "shift in the use of information technology in the classroom: from using ICT as 'instruction tools' to enhance conventional teaching, to using ICT as 'cognitive tools' to promote meaningful student learning that is active, constructive, intentional, authentic and cooperative" (p. 715). Similarly, Ravitz, Wong, and Becker (1999) found that teachers who migrated to constructivist teaching practice did so due to fundamental changes in how these teachers perceived student learning takes place.

Adopting a constructivist mindset, with the support of educational technology, has the potential to significantly alter student learning. Jonassen, Howland, Marra, and Crismond (2008) outline what this type of learning looks like in their Dimensions of Meaningful Learning, which suggest that ICT-based constructivist learning includes: 1) students being active in their learning environments, with the ability to manipulate objects and to note the effects of those actions; 2) encouragement of students to construct their own meanings from their observations; 3) engagement of students in solving real-world problems, or activities based on such problems; 4) intentional, targeted learning, with student determination of their own learning goals; and 5) a collaborative element, promoting cooperative efforts to problem solve.

Teachers do not view the transition to constructivist learning as easy, with more teachers finding traditional teaching to be comfortable in comparison to constructivist teaching (Ravitz, 1999). Nonetheless, schools have the opportunity incorporate constructivist learning indirectly as their teachers begin to integrate technology in their classes. As such, when providing teachers with training and professional development opportunities for technology integration, schools should consider how the technologies they have available can be utilized for constructivist learning, and gear these training efforts toward this objective.

A number of studies have explored the relationship between constructivist teaching practices and technological pedagogical content knowledge (TPACK). Koh, Chai, and Tsai (2014) assessed constructivist-oriented TPACK, which can be described as the knowledge required by teachers in order to use technology for constructivist educational practices. They found that improvement and growth in TPACK's intermediate constructs (as explained below) leads to greater confidence in utilizing ICT for constructivist teaching. Dong, Chai, Sang, Koh, and Tsai (2015) studied the relationships between TPACK, belief in constructivist-oriented teaching, and teacher design disposition. Although their findings suggest that teacher design disposition is positively correlated with TPACK, constructivist belief was not a predictor of TPACK, implying that possessing such beliefs is not necessarily indicative of the ability to integrate ICT for constructivist teaching.

Although a great deal of research highlights the idea that ICT integration benefits the educational field, this is by no means a universally accepted notion. On a broad level, researchers have engaged in considerable debate and discussion about the effects of technology on the social and mental wellbeing of young adults (e.g. Bell, Bishop, Przybylski, 2015). In a national study spanning a number of years, Twenge, Martin, and Campbell (2018) studied the relationship between screen time and psychological wellbeing. Their findings were clear: young adults who engaged in more screen time reported lower scores in self-esteem, life satisfaction, and happiness when compared to those who spent more time participating in non-screen activities, such as in-person social interaction, exercise, homework, and religious services.

Researchers have further considered the implications of technology in the classroom and its role in the educational system, many of whom find it to be more detrimental than beneficial. Mueller and Oppenheimer (2014) found that although students taking notes using a laptop were able to record more information, they lost out on some of the processing benefits that come from longhand notes. Yamamoto (2007) banned laptops from his courses and uncovered a number of benefits that came from this decision, including higher quality student note taking and a decrease in distractions. He described how “I could see student faces again; I had forgotten how much I missed seeing them” (p. 510), implying a stronger student “presence” in the classroom. Research has shown that students using laptops have unrelated software and applications open 42% of time, with students oftentimes highly underestimating their own use of instant messaging applications (Kraushaar & Novak, 2010). Most importantly, Fried (2008) studied the connection between laptop use and classroom performance, and found that the greater use of laptops has negative implications for student learning.

Centrality of Teachers to Technology Integration

To achieve the lofty objective of effective technology integration, schools are placing higher expectations on teachers to take the initiative in integrating ICT into their teaching methodologies and to study ICT usage in professional development opportunities (Johnson, Adams Becker, Estrada, & Freeman, 2014). It is evident that the success of technology integration initiatives rely heavily on teachers' personal abilities to utilize such technologies in their classrooms (Inan & Lowther, 2010). Teachers are the driving force behind classroom innovations and regulate their levels of implementation. Therefore, teachers determine the frequency of and the manner in which technology is integrated into the classroom (Judson, 2006). Among a number of factors, teacher choices to integrate ICT are based heavily on teacher attitudes and beliefs regarding technology (Ertmer, 2005). Due to the large role that is often played by the teacher in regards to technology integration, Kihoza, Zlotnikova, Bada, & Khamisi (2016) suggest that the development of teachers' knowledge of technology and their abilities to integrate ICT in their pedagogies are essential for the future success of the educational system.

Statement of the Problem

As stated above, the effective use of ICT can serve to foster twenty-first century learning objectives and allow for the improvement of instruction and student learning. Oftentimes, however, teachers' use of ICT is basic and supplemental in nature, rather than serving to enhance learning and redefine pedagogical methods (Ertmer & Ottenbreit-Leftwich, 2013). In exploring several factors that impede successful technology integration, Groff and Mouza (2008) note that studies have found that many teachers utilize technology in very simple and peripheral ways, lacking a more useful inculcation into teaching. Many teachers are not adequately prepared to utilize the full affordances of educational technology (Dorner & Kumar, 2016). Teachers will often use technology to store and present lessons, record grades and other data, write study guides, and communicate with parents and students (Judson, 2006). Although these tasks are important and aided by technology, they do not access the full spectrum of contributions that technology can make towards the educational environment and the learning taking place therein.

Brown and Warschauer (2006) found that beginning teachers in particular find it difficult to integrating technology into their teaching. Both Bate (2010) and Byker (2010) note that beginning teachers were unable to incorporate ICT into their lessons in a manner that connected content, pedagogy, and technology. Tondeur, Roblin, van Braak, Voogt, & Prestridge (2017) posit that this challenge for beginning teachers is due to the "reality shock" in transitioning from teacher education programs and student teaching to the demands and expectations of teaching professionally. Beginning teachers may not have the requisite experiences with educational technologies in their pre-service teacher education programs, thus limiting their future abilities to integrate technology (Koehler, Mishra, & Yahya, 2007).

Although today's teachers have unparalleled access to technology, effective technology integration is limited (Kahyaoglu, 2011). According to the Teachers' Use of Educational Technology in U.S. Public Schools report, published by the National Center for Education Statistics in 2010, ninety-seven percent of teachers have at least one computer in the classroom, with a nationwide ratio of 5.3 students per computer, on average. Only forty percent of these teachers report using their computers "often" while twenty-nine percent report that they use these computers "sometimes" (Gray, Thomas & Lewis, 2010). Oftentimes, teachers' use of technology reflects their non-technological pedagogical methods. That is to say, a teacher who is confident in the use of traditional methods of instruction may use technology as a means to further this type of instruction (Judson, 2006). Although many schools have made significant investments in ICT integration, the infusion of ICT is progressing at a relatively slow rate, primarily due to teachers' difficulty in modifying their teaching practices (Levin & Wadmany, 2008).

Teachers must be trained and given the core knowledge base for effective technology integration. Weak technological skills may explain teachers' limited beliefs in the efficacy of technology in education, which in turn often hinders teachers' ability to utilize strong applications of technology in the classroom (Groff & Mouza, 2008). Lawrence and Calhoun (2013) surveyed literacy teachers to ascertain their definitions of literacy as well as to assess their classroom practices, including their use of educational technology. The results showed that many teachers lag behind students in their ability to utilize technology, and are unable to use technology to provide better learning opportunities. They express this disconnect in noting that the "technology utilization in these classrooms does not reflect the everyday use of digital tools in our society" (p. 64) and that practice is required until technology usage is "seamlessly incorporated into the teacher's repertoire" (p. 65). Mueller, Wood, Willoughby, Ross and Specht (2008) point out that due to the constantly advancing and developing nature of technology, teachers may end up being "perpetual novices" (p. 1524), always behind the learning curve and without the most up to date skill set.

Integrating technology is particularly important for teachers of the primary grades. According to Howley, Wood, and Hough (2011), beginning at approximately third grade, students have reached a developmental stage where they are able to use technology in meaningful ways. Students at this age are impressionable, such that providing them with powerful educational experiences with technology can shape the way they view and interact with technology for the long term. This will impart to students the notion that technology can connect them with a vast wealth of knowledge as well as serve multiple functions pertaining to learning and personal growth.

Many factors are important in building the knowledge necessary for technology integration, including: 1) professional development supported by the latest research; 2) the ability to practice in educational settings; 3) access to hardware and software; and 4) adequate support in the form of backing by school administration and in addressing technical matters (Rakes et al., 2006). Although these are all important components, effective technology integration requires teachers to be taught how to use technology for effective instruction. Simply providing guidance to teachers regarding the mere operation of hardware and software programs does not suffice. As such, Harris, Mishra, and Koehler (2009) argue that specific emphasis must be placed on training teachers to use technology in the frame of a particular discipline or subject.

Harris, Mishra, and Koehler (2009) argue that technology's frequent use for substitution or augmentation in traditional class lessons, as opposed to its use as a transformative tool, is due to "the nature of how technology use in classrooms has been conceptualized and supported" (p. 394). Many of the pre-existing approaches to technology integration have been what Papert (1987) dubs "technocentric", implying that emphasis is first placed on the technology itself - its strengths, weaknesses, and skills required for its use - after which attention is devoted to determining how the technology can be used to enhance learning.

Given all the emphasis placed on ICT integration, and its significance for student learning, educational researchers in the early 2000s expressed discontent regarding the scarcity of conceptual frameworks to direct teachers in navigating the increasingly complicated task of technology integration (Angeli, Valanides, & Christodoulou, 2016). Miles and Huberman (1994) define a conceptual framework as either a graphic or narrative that takes the primary concepts, variables, or factors under scrutiny and portrays them in a manner that conveys their relationships. According to Maxwell (2012), a framework can take on two different forms, each of which serving a different function. First, a framework can serve as a “coat closet” - allowing for the organization of the different concepts and relevant data in a format that is easy to view and access. From this viewpoint, it is easier to notice connections between concepts and relevance to one’s own area of interest. Second, a framework can serve as a “spotlight”, highlighting different concepts and relationships that otherwise may not have been picked up upon. Herring, Koehler, Mishra, Rosenberg, and Teske (2016) point out that despite these positive functions of frameworks, their generality and broadness often leave them lacking in regards to specific details and implications for practice. Nonetheless, well-designed conceptual frameworks can serve to elucidate complicated processes and clarify relationships between different ideas.

A number of frameworks were developed in order to guide the knowledge, attitudes, and techniques necessary for successful technology integration in education. The most prominent of these frameworks is technological pedagogical content knowledge (TPACK), created by Mishra and Koehler (2006). Mishra and Koehler’s TPACK is the interaction of three knowledge domains: technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK). The relationships between these domains generate different forms of knowledge, which will be explained below in further detail (see Figure 1). The combination of all three knowledge domains form technological pedagogical content knowledge - the knowledge set for effective technology integration in teaching one’s content area. The TPACK framework seeks to simplify and clarify the knowledge structure that is necessary for effective technology integration, and is straightforward in its portrayal of the relationships between content, pedagogy, and technology

(Herring et al., 2016). Since its introduction, TPACK has become quite popular in the field of educational technology. The decade following the creation of TPACK has resulted in an abundance of research and studies seeking to explore and develop the framework (Herring et al., 2016). TPACK has formed the basis of many approaches towards building teacher competency in the integration of technology (Chai, Koh, & Tsai, 2013). In addition, TPACK can serve to assess ICT-integrated lessons and to aid in the development of teacher education programs (Polly, Mims, Shepherd, & Inan, 2010).

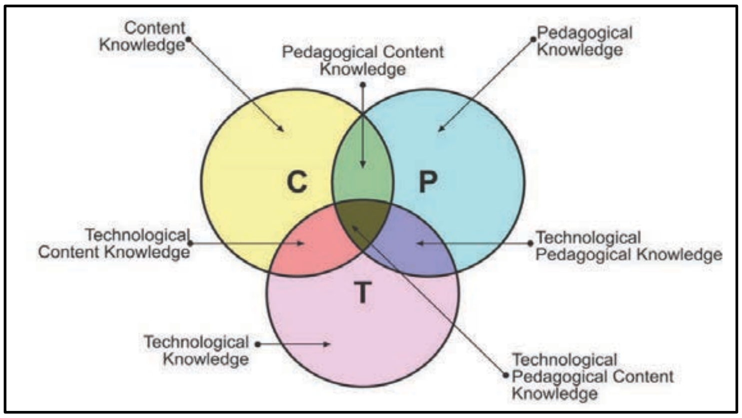

Figure 1. Technological pedagogical content knowledge (Koehler, Mishra, & Yahya, 2007)

Statement of Purpose

Jewish day schools spend a considerable amount of time, effort, and funds in striving towards efficient and meaningful technology integration. Further, a number of charitable foundations pour additional funding into providing Jewish day schools with new technologies in pursuit of promoting twenty-first century learning and preparing Jewish day school students to enter the broader community and make relevant contributions.

Obtaining the necessary funding and acquiring new technological hardware are both important factors contributing towards a school's usage of educational technology. Undoubtedly, additional factors such as school culture, effective leadership, and teacher beliefs play important roles as well. Yet without a core set of knowledge specifically geared towards effective teaching with technology, namely, TPACK, it is unlikely that technology integration will be executed and will result in enhanced learning opportunities. Ultimately, teachers possessing high levels of TPACK have the potential to utilize educational technology to its fullest, to engage in the paradigm shift towards student centered learning (Aslan & Reigeluth, 2016).

There is a need, therefore, to assess whether teachers in Jewish day schools have the requisite knowledge set to effectively integrate technology into the classroom. The number of iPads present in a school, for example, is irrelevant if the teachers do not know how to use them for instruction in their specific content area. With an understanding of teacher TPACK in Jewish day schools, educational leaders can better direct their efforts to ensure that school investments in technological hardware, software, and professional development opportunities are productive and serve to transform student learning.

Therefore, the current study seeks to aid Jewish day schools in their efforts for technology-enhanced learning by answering the underlying question: do teachers in Modern Orthodox Jewish day schools have the requisite knowledge to effectively integrate technology in teaching their subject areas?

To further this objective, this study will explore TPACK as it correlates to a number of important variables, including pre-service teacher training, in-service professional development, and the nature of technology integration. In doing so, the study will provide school leaders with valuable information as to which factors may promote higher TPACK levels among teachers, as well as which factors may profoundly affect the nature of a given teacher’s technology integration.

CHAPTER 2

REVIEW OF RELATED LITERATURE

Theoretical Framework - TPACK

Shulman's PCK - The Basis for TPACK

TPACK is based on Shulman's (1986) pedagogical content knowledge (PCK), with the addition of the construct of technological knowledge as it relates to content and pedagogical knowledge (Schmidt, Baran, Thompson, Mishra, Koehler, & Shin, 2009). Shulman (1986) suggests that it is not enough for a teacher to simply master a given content area. Rather, a teacher must have a knowledge combining the constructs of content and pedagogy, called pedagogical content knowledge. Shulman described PCK as "that special amalgam of content and pedagogy that is uniquely the province of teachers, their own special form of professional understanding" (p. 8). A teacher must have a deep knowledge of the pedagogical methods and tools best suited to teach a given content area. This knowledge allows for greater student learning as the pedagogical methods are geared directly to the specific content area. In Shulman's own words, teachers must have the knowledge and ability to take the content of their subject area and present it using "the most powerful analogies, illustrations, examples, explanations and demonstrations - in a word, the ways of representing and formulating the subject that make it comprehensible to others" (Shulman, 1986, p. 9).

Researchers differ as to how to understand the concept of PCK, particularly with regard to whether PCK is a unique or constructed body of knowledge (Graham, 2011). The "integrative" approach defines PCK as the integration or combination of its two secondary constructs, content knowledge and pedagogical knowledge. Conversely, the “transformative” approach defines PCK as a new and distinct form of knowledge that, although formed from the different knowledge constructs, is unique and “cannot be explained by the sum of its parts” (Graham, 2011, p. 1956). Due to its foundation in PCK, researchers apply the same approaches to TPACK, which is explored below. As the basis and foundation of TPACK, Shulman’s (1986) PCK is inextricably linked to TPACK and they share a number of traits, strengths, and weaknesses.

Frameworks Predating TPACK

Since the emergence of educational technology as an important factor of successful education, researchers have engaged in considerable discussion and debate regarding what forms of knowledge are necessary in order to use such technologies to teach effectively. Zhao and Conway (2001) explored state educational technology plans and found a wide discrepancy in how these plans viewed teachers, students, technology, and educational goals. In addition, a lacking in theoretical frameworks aimed at providing direction and guidance for technology integration made the task all the more challenging (Mishra & Koehler, 2006). Prior to Mishra and Koehler’s (2006) exposition and elucidation of TPACK (at the time, TPCK), and in pursuit of a framework for technology integration, other researchers had explored the notion of a knowledge structure for technology integration and effective teaching with technology.

Keating and Evans (2001) studied a group of pre-service teachers through interviews and surveys to determine how they integrated technology into their pedagogical content knowledge (PCK). They acknowledged that a grasp of technology permitted the educator to expand technology use beyond personal purposes and into the classroom in an integrated format with the subject matter. However, knowledge of how to use technology for personal use did not necessarily translate into a knowledge of how to integrate technology into the classroom. Therefore, they found, a separate type of knowledge was required for the integration of technology in educational settings.

Other researchers had already defined concepts similar to TPACK in earlier works. Pierson (2001) explored the relationship between technology, content, and pedagogy as she studied the practices and methods through which teachers integrated technology into their classrooms. She noted that "the intersection of the three knowledge areas, or technological-pedagogical-content knowledge… defines effective technology integration" (p. 427). Angeli and Valanides (2005) formulated the concept of ICT-related PCK, which they define as "a special amalgam of several sources of teachers' knowledge base including pedagogical knowledge, subject area knowledge, knowledge of students, knowledge of environmental context, and ICT knowledge" (p. 294). Teachers that possess a strong ICT-related PCK have the ability to teach with ICT in a manner that utilizes the ICT to make significant contributions to student learning. Similarly, Niess (2005) termed this relationship "technology-enhanced PCK" (p. 511). Niess observed a small group of pre-service teachers for an entire year, recognizing that not all of the teachers grasped the connection between technology and course content. Over the duration of her study, it became apparent that effective integration of technology required a unique knowledge set that included technology's relationship to content and pedagogy.

What distinguished Mishra and Koehler's (2006) TPACK from its predecessors was Mishra and Koehler's placement of technological knowledge as a third knowledge construct, alongside content and pedagogy. This allowed for the realization of two more "middle constructs" – technological content knowledge (TCK) and technological pedagogical knowledge

(TPK), in addition to the pre-existing PCK (Abbitt, 2011). Mishra and Koehler’s unique portrayal of the relationship between the three knowledge constructs, along with good timing and a bit of luck (Herring et al., 2016) led to their TPACK framework taking root as the premier framework guiding effective teaching with technology.

Definitions of TPACK

In formulating TPACK, Mishra and Koehler (2006) studied the collaborative course design practices of teacher educators and graduate students, and watched as they attained a deeper understanding of the connections between content, pedagogy, and technology. After extensive research, Mishra and Koehler rendered TPACK as “a conceptualization of the knowledge base teachers need to effectively teach with technology” (Voogt, Fisser, Pareja Roblin, Tondeur, & van Braak, 2012, p. 4). While technology integration had previously been the subject of much research, the arrival of TPACK narrowed the focus of the research on the integration of content, pedagogy, and technology (Herring et al., 2016).

Abbitt (2011) describes Mishra and Koehler’s TPACK as a “representation of the knowledge required to use technology in an educational setting in ways that are contextually authentic and pedagogically appropriate” (p. 281). In stressing TPACK’s nature as a composite of the different knowledge constructs, Chai, Koh, and Tsai (2013) describe TPACK as a “synthesized form of knowledge” (p. 32) that serves teachers in integrating ICT into their teaching, and consequently into student learning. Dexter, Doering, and Riedel (2006) describe TPACK as “content-specific technology instruction”, the implication being that effective teachers have the ability to utilize technology in ways pertinent to a given content area. While all the knowledge domains are important, the TPACK domain is most significant in regards to a teacher’s actual integration of technology in the classroom (Koehler, Mishra, Kereluik, Shin, & Graham, 2014).

Technological knowledge, as envisioned in the TPACK framework, must be firmly integrated into the flow of student learning, and not seen as a lesson supplement (Abbitt, 2011). Koehler and Mishra (2009) reinforce this point in stating that TPACK:

> …allows teachers, researchers, and teacher educators to move beyond oversimplified approaches that treat technology as an ‘add-on’ instead to focus again, and in a more ecological way, upon the connections among technology, content, and pedagogy as they play out in classroom contexts. (p. 67)

In an earlier study, Koehler and Mishra (2005) explain that “technology alone does not lead to change” (p. 134) - having a knowledge beyond the mere use of technology allows for completely new approaches, directions, and instruction. TPACK serves to ensure that the transformative nature of technology promotes a new and improved educational product.

As mentioned above, in addition to the newly formed TPACK construct, Mishra and Koehler’s (2006) TPACK framework also includes two new intermediary constructs: 1) technological content knowledge, which is the “knowledge about the manner in which technology and content are reciprocally related” (p. 1027); and 2) technological pedagogical knowledge, defined as the “knowledge of the existence, components, and capabilities of various technologies as they are used in teaching and learning settings, and conversely, knowing how teaching might change as the result of using particular technologies” (p. 1028). Technological knowledge, also newly created for use in the framework, is explored below in greater detail.

Although the framework was originally spelled “TPCK”, it was renamed “TPACK” to ease its pronunciation, as well as to express that TPACK is the “Total PACKage” required to successfully integrate technology in teaching (Thompson & Mishra, 2007). Some of the earlier works still use the TPCK acronym, although an overwhelming majority of the more recent studies have migrated to the use of TPACK.

Concept Development

Since its formulation by Mishra and Koehler, TPACK has grown in popularity and has become a mainstay at the forefront of the educational technology field. With this increased exposure and presence, researchers have sought to better understand TPACK and how it relates to its intermediate constructs.

Educational researchers are divided as to how to conceptually perceive TPACK. Three distinct views regarding the structure of TPACK have emerged (Voogt et al., 2012): 1) TPACK as a technological extension of PCK; 2) TPACK as a distinct and separate knowledge, unique from its underlying constructs; and 3) Mishra and Koehler's TPACK, which can be defined as "TPACK as the interplay between the three domains of knowledge and their intersections and in a specific context" (Voogt et al., 2012, p. 113).

An earlier section of this chapter discussed the debate between the "integrative" and "transformative" approach to Shulman's PCK. This same discussion is applied to TPACK as well. It is important to explore the nature of the TPACK framework because a broad and unexamined framework would offer minimal, if any, benefit to teachers (Angeli, Valanides, & Christodoulou, 2016). As with PCK, two schools of thought exist - those that consider TPACK to be an "integrative" framework, and those that consider it to be "transformative". This dichotomy is expressed by Angeli and Valadines (2009) who report that: "It is not clear...

whether TPCK is a distinct form of knowledge or whether growth in TPCK simply means growth in any of the related constructs" (p.157).

The integrative view is based on Koehler and Mishra (2008), who suggest that teachers merge and connect the knowledge domains of TPACK "on the spot" during lessons. This allows teachers to make choices regarding technology integration based on their unique educational context. Similarly, the classic Venn diagram utilized by Mishra and Koehler (2006) seems to reflect an integrative model, as it portrays an interconnectedness of all the knowledge domains. It depicts TPACK as an aggregate of the other knowledge constructs, not as a separate entity. This approach is further explored in Koehler, Mishra, and Yahya (2007) as they sought to assess levels of TPACK through the analysis of data from other knowledge constructs, namely CK, TK, and PK.

The transformative view is articulated in Angeli and Valanides (2005), who posit that TPACK is far more than the combination of the knowledge domains - these domains come together and effectively "transform" into the unique knowledge construct of TPACK. Angeli and Valadines (2009) suggest that TPACK is a "distinct body of knowledge" and "goes beyond mere integration or accumulation of the constituent knowledge bases" (p. 158). Angeli, Valanides, and Christodoulou (2016) feel strongly that the transformative approach is correct, based on the notion that studies have shown that isolated instruction in content, pedagogy, and technology have not led to higher levels of TPACK. However, efforts that were placed on building the combined TPACK construct yielded results. Therefore, they suggest that TPACK cannot be generated "on the spot" when a teacher has a need to utilize some of the knowledge constructs - TPACK must be deliberately taught and cultivated with explicit instruction.

At the surface, it may not seem significant to select a position on the integrative-transformative continuum of TPACK. Yet it becomes quite relevant when one seeks to develop instruments to measure TPACK and to ensure that those instruments have construct validity (Graham, 2011). This discussion is not just about semantics - it has a number of practical implications in regards to research and TPACK development. Educational researchers may base their studies on whether TPACK is integrative (studying all secondary knowledge constructs) or transformative (placing primary emphasis on the TPACK construct and little to no attention on the secondary constructs). In addition, teacher education programs need to consider if instruction should be provided on all knowledge constructs (integrative), or if particular emphasis should be placed on the TPACK construct alone (transformative).

Context - the Eighth Construct

In analyzing and assessing teacher TPACK, researchers realized that TPACK is affected by a variety of external factors. That is to say, Koehler and Mishra (2008) found that teachers' use of technology is part of a broader context. Teachers consider a variety of factors prior to integrating technology into lessons, including: student abilities and learning styles, school resources, and school culture. A teacher will use TPACK in different ways depending on the situation in order to adapt to the particular context (Koehler & Mishra, 2008). Context, as it pertains to TPACK, can be defined as "the many physical, interpersonal, technological, social, political, economic, cultural, geographic, and other characteristics of students' and teachers' current and past experiences and attributes, both in school and outside it" (Harris & Hofer, 2017, p. 1).

Context had been considered in earlier analyses of TPACK, including a formal analysis by Angeli and Valanides (2005). Due to its significant impact on teachers' utilization of their TPACK, Koehler and Mishra formally embedded context into the framework in their introduction to the *Handbook of Technological Pedagogical Content Knowledge* (2008) as an "eighth construct", despite its existence outside of the original seven. An upgraded TPACK Venn diagram reflects the inclusion of context in the TPACK framework (see Figure 2).

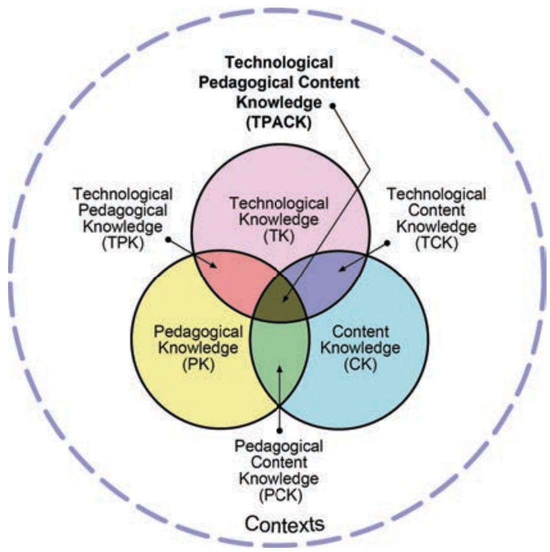

Figure 2. Updated TPACK diagram to include context (Reproduced by permission of the publisher, © 2012 by www.tpack.org)

Although Koehler and Mishra (2008) consider context to be essential for a correct understanding and implementation of one's TPACK, context does not receive a significant amount of attention from educational experts and researchers (Rosenberg & Koehler, 2015). As researchers explore TPACK, Kelly (2010) found that they often neglect to include context in their definitions and explanations of TPACK. Rosenberg and Koehler (2015) sought to re-examine the inclusion of context in TPACK research and found that although it was included more frequently (in comparison to Kelly's findings), it was still lacking in TPACK research.

Although the inclusion of context in the TPACK framework may not have a direct effect on teacher practice, an emphasis on context in thinking about technology integration can aid teachers in the challenge of providing meaningful instruction to diverse learners (Rosenberg and Koehler, 2015).

TPACK's Intermediate Constructs

An aspect that makes Mishra and Koehler's TPACK unique when compared to similar frameworks is its incorporation of the three "middle" constructs: pedagogical content knowledge (PCK), technological pedagogical knowledge (TPK), and technological content knowledge (TCK). The inclusion of the three middle constructs and providing them with clear definitions is important in differentiating TPACK from broad-based technology integration. According to Graham (2011): "These boundaries highlight the evolution of the education technology field and the growing importance of content-specific applications of technology" (p. 1958). With the prevalence of modern day educational technology integration, researchers began to place significant emphasis on technological knowledge, having little to do with content or pedagogy. Over time, this emphasis shifted to include pedagogy as it relates to technology (Graham, 2011). Now, it is imperative that content be included in the equation, and teachers should be provided with education and instruction regarding content-specific, pedagogically-sound uses of technology. This is where the utilization of the TPACK framework becomes significant.

As with the TPACK construct itself, there has been difficulty in defining the middle constructs. Cox (2008) found thirteen different definitions for TCK and ten definitions for TPK. Therefore, Angeli, Valanides, and Christodoulou (2016) suggest that instead of expending effort on trying to validate the framework, effort is better spent on determining the benefits and contributions of the different knowledge constructs, and how they contribute to the growth of TPACK.

Limitations of Koehler and Mishra's TPACK

Difficulty in Defining TPACK and its Constructs

Despite its popularity in the field of instructional technology, educational researchers have found a number of weaknesses in Mishra and Koehler's TPACK framework. Cox and Graham (2009) critiqued the vague definitions of the different TPACK constructs. Researchers have found it difficult to set the boundaries between the different constructs embedded within TPACK (Archambault & Barnett, 2010). This is particularly important for the constructs that share boundaries in the Venn diagram (e.g. PK and PCK, CK and TCK) (Graham, 2011).

The blurred lines between the knowledge constructs has led to the development of multiple definitions of each construct. This presents difficulties as researchers cannot compare their results because they define the constructs in different ways. In reviewing the literature on TPACK, Cox (2008) found eighty nine distinctive definitions of TPACK, along with a number of different definitions for the secondary constructs of TPK and TCK. Educational researchers need to set distinct boundaries between the constructs, and clarify why each of the sub-constructs are significant and helpful to teachers (Graham, 2011). Without clear and unified definitions, researchers' data and findings cannot conform to any singular standard, nor can they generate broader, meaningful outcomes (Burkhardt & Schoenfeld, 2003).

Due to the difficulty in defining TPACK, researchers have created different "types" of TPACK in their research. In focusing on information and communication technologies (ICT), Angeli and Valadines (2009) studied what they called ICT-TPCK. Lee and Tsai (2010) focused on web-based technologies and used the term TPCK-W. Doering, Scharber, & Veletsianos (2009), in their work on geographic technologies, studied what they called G-TPACK. In fact, the broad definitions supplied by many researchers have allowed some to use the terms TPACK and technology integration interchangeably, thereby missing out on some of the key elements of the TPACK framework (Graham, 2011).

Weak Foundation

Despite the prevalence of Shulman's (1986) PCK in the realm of educational frameworks, educational researchers have engaged in considerable conversations debating exactly how to define PCK (see Gess-Newsome, 2002). Baxter and Lederman (1999) point out that although the varying definitions of PCK have brought about many interesting areas of discussion, they have nonetheless proved to be inhibitive regarding PCK measurement and assessment. Further, they suggest that PCK is difficult to conceptualize due to its abstract nature - it is often challenging for teachers to put their expressions of PCK into words. As Koehler and Mishra's TPACK is built off of Shulman's PCK, the weaknesses of PCK carry over to the TPACK framework.

Complexity of the Framework

While the TPACK framework may seem to be relatively simple, researchers have found it to be far more complicated than it appears. Cox (2011) suggests that this complexity is due to the need to integrate many poorly defined constructs. Similarly, Voogt, Fisser, Pareja Roblin, Tondeur, & van Braak (2016) posit that this is due primarily to the multiple definitions and understandings of what is considered technology. As is discussed below, it has been difficult for TPACK researchers to clearly delineate survey items for each knowledge construct due to this complexity. This misconception is significant, as TPACK’s outward clarity may allow educators to make incorrect or over-simplistic assumptions about technology integration (Angeli & Valanides, 2009).

In expanding this idea even further, Koehler and Mishra (2008) describe, with great detail, the complexity of not only teaching in general, but in finding the right manner for which to integrate technology into instruction and student learning. To better illustrate this difficulty, they refer to technology integration as a “wicked problem”, borrowing the term from Rittel and Webber (1973). This term connotes a problem with numerous variables and contextual factors, such that there is never one clear and correct solution. Effective technology integration requires a grasp of a multitude of different contextual factors - technological resources, teacher beliefs and attitudes, student ability, and school culture, among many others. Therefore, there is not one correct way to integrate technology - each circumstance may require a different type of technology used in a unique way. Koehler and Mishra (2008) suggest that the solution to this challenge is building knowledge of content, pedagogy, technology, and the weaving of these types of knowledge to form technological pedagogical content knowledge (TPACK).

What is Technological Knowledge?

Technological Knowledge and Shulman’s PCK

While each knowledge construct of TPACK receives attention in the vast literature on the topic, there is an abundant amount of discussion about the definitions and parameters of the technological knowledge (TK) construct. This is not to imply that TK is any more important than any of the other domains. TPACK experts point out a number of reasons why TK is explored in such great detail. TK is the “new” primary construct relative to Shulman’s PCK (Graham, 2011).

Content knowledge and pedagogical knowledge have been explored since the development of Shulman's (1986) PCK. TK, being newly included in the framework, now receives the necessary attention to appropriate its boundaries and definitions. In addition, TK is the distinguishing factor between TPACK and PCK - it is the construct upon which the entire framework depends. That is to say, without TK we would not have anything more than PCK (Graham, 2011).

Some researchers find difficulty in Koehler and Mishra's addition of the new domain of TK in the TPACK framework, primarily because Shulman's PCK already encompassed relevant technology use. Why, then, is there a need for a separate construct of technological knowledge?

Originally, Shulman considered the use of technology as part of the pedagogical knowledge (PK) domain. Koehler and Mishra (2008) explain that due to technology's consistent and continuous development, as well as its ever-present position in daily life, technology usage can no longer be considered a component of pedagogical knowledge. Due to the unique skills and knowledge required to operate these modern technologies, a separate and distinct knowledge construct is necessary. This sentiment is shared by Cox and Graham (2009), in suggesting that although Shulman did in fact include technology in his PCK, many of the newer technologies are not ubiquitous, and therefore require TPACK for effective integration. Cox and Graham describe the "sliding nature" of TK within TPACK, as when technologies become universally accepted and their use becomes normative, "TPACK transforms into PCK" (p. 64). That is to say, when a technology's use becomes commonplace, it returns to the pedagogical knowledge domain. As long as there are emerging technologies that are not easily adapted into teachers' skill sets, and presumably there always will be, there will always be a need for TPACK, as these technologies will require a special knowledge set prior to their effective use in teaching.

Definitions of Technological Knowledge

There is a wide range of opinions among educational researchers as to how to define technological knowledge. Defining this concept is particularly challenging because determining what is considered “technology” can range from modern, digital items all the way to older tools and mechanisms created to solve specific problems, allowing processes such as irrigation to also fall under the umbrella of technology, depending on the definition used (Smaldino, Russell, Heinich, & Molenda, 2005). Technological knowledge is not necessarily the knowledge of how to physically operate and utilize technology, rather, it can also be defined as “the knowledge of the affordances of technologies to achieve personal and professional goals” (Voogt et al., 2016, p. 36). This is not to imply that technological knowledge requires one to be aware of every single technology that exists to achieve a specific goal, but rather to be aware of the possible uses of relevant and available technologies. A number of studies on the topic of TPACK suggest TK refers specifically to the knowledge of digital technologies, some preferring to focus on one specific digital technology, such as Web 2.0 tools or the internet as a whole (Voogt, et al., 2012).

In reference to educational technology, the primary differences in opinion regarding the definition of TK are based on which technologies are included therein. Many studies portray TK as a broad knowledge spanning many different types of technologies (Voogt, et al., 2012). Interestingly, in their development of the TPACK framework, Koehler and Mishra (2008) did not distinguish between different types of technology, as other researchers do (Graham, 2011).

Cox and Graham (2009) define TK as referring to the use of what they refer to as emerging technologies. Voogt et al. (2012) define emerging technologies are those that are “not yet transparent and ubiquitous in a specific context (i.e. education)” (p. 6). Transparent technologies, in contrast, are those that are used universally in classrooms without any need for training or deeper understanding, such as pencils, books, and whiteboards. Cox and Graham explain that transparent technologies are included in Shulman's PCK, and therefore the TK in TPACK must refer to emerging technologies, otherwise there would be nothing novel about the TPACK framework.

A number of the definitions of technological knowledge are based on the degree of skill one has in operating different types of technologies. According to Polly (2011), TK refers to the knowledge of how to use both "standard" technologies (i.e. book and chalk) as well as "advanced technologies" such as ICT (p. 40). Angeli and Valanides's (2009) definition of TK includes knowing how to use a computer, utilize various programs, and how to troubleshoot in order to solve problems.

After a lengthy review of the discussion in this area, Mishra and Koehler (2009) define TK as the knowledge that:

> …requires persons to understand information technology, broadly enough to apply it productively at work and their everyday lives, to recognize when information technology can assist or impede the achievement of a goal, and to continually adapt to changes in information technology. (p. 64)

Of particular note is that this definition includes the knowledge of determining when it can be detrimental to use technology. This supports Mishra and Koehler's earlier rationale for TPACK, in that its primary function is to serve as a framework for technology to enhance learning. This may mean, at times, to intentionally decide to not use technology if it is not beneficial for the given circumstances.

Theoretical Extensions of Mishra and Koehler's TPACK

As TPACK has become a mainstay within the field of educational technology, researchers have sought to encompass other relevant areas by expanding the framework to include a number of different concepts and variables. In the *Handbook of Technological Pedagogical Content Knowledge for Educators*, Angeli, Valanides, and Christodoulou (2016) analyze and outline a number of these important expansions of TPACK, many of which appear below.

Yeh, Hsu, Wu, Hwang, & Lin (2014) developed a TPACK framework that is based on the practical knowledge and experiences of teachers, referred to as TPACK-practical. This elaborated framework is based on the notion that greater experience as a teacher leads to different expressions of TPACK (see Figure 3). Further, different parts of the teaching process, such as planning, management, and evaluation, require the use of different technologies and thus require unique TPACK (Ay, Karadag, & Acat, 2015).

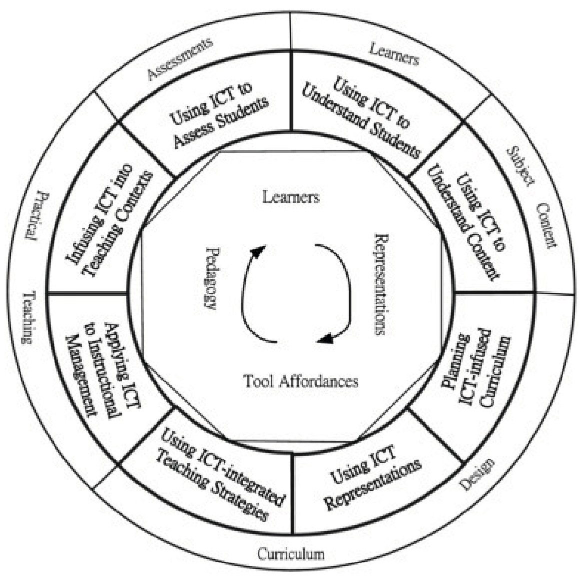

Figure 3. TPACK-practical (Yeh et al., 2014)

Porras-Hernandez and Salinas-Amescua (2013) acknowledge that context, which was incorporated into TPACK a few years after its introduction (Koehler & Mishra, 2008), can be quite complex and can refer to a few different factors, such as: 1) nature of the students; 2) school culture; and 3) teacher beliefs. Therefore, they adapted the TPACK framework (more specifically, the ICT-PCK framework of Angeli and Valadines, 2005), adding different levels of context, as well as a recognition of the current level of the students and the self-knowledge of the teacher (see Figure 4).

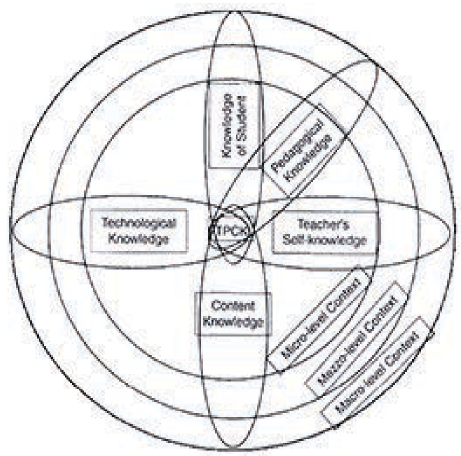

Figure 4. Multiple levels of context in ICT-PCK (Porras-Hernandez & Salinas Amescua, 2013)

Benton-Borghi (2013) further adapted the TPACK framework to incorporate concepts from Rose and Meyer’s (2002) Universal Design for Learning (UDL) framework. The principles of UDL suggest that teachers create lessons and learning environments that allow all students to learn, regardless of any learning differences. This is accomplished through multiple means of engagement, representation, and expression. As technology plays a crucial role in this process, it becomes important to train teachers in acquiring the necessary knowledge to utilize technology for these objectives. Thus, Benton-Borghi merges UDL with the TPACK framework (see Figure 5).

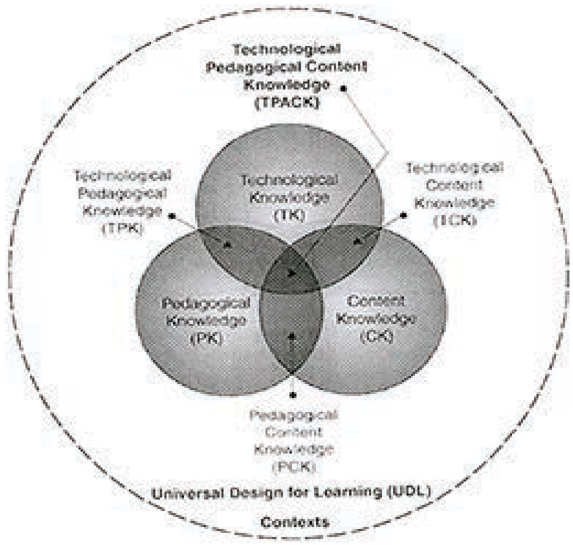

Figure 5. TPACK framework merged with UDL (Benton-Borghi, 2013)

Significance of TPACK

Since its introduction by Mishra and Koehler, the TPACK framework has had a profound impact on the field of educational technology as well as on education in general (Ritzhaupt, Huggins-Manley, Ruggles, & Wilson, 2016). The term TPACK appears in the title of over fifteen hundred articles and studies as of August, 2017 (Google Scholar, 2017). This prevalence may be due to the practical applications of the TPACK framework. As discussed above, the TPACK framework details the knowledge set one must possess to effectively integrate technology in a twenty-first century education setting, and provides a structure through which allows for the visualization and development of teachers' technology integration (Kopcha, Ottenbreit-Leftwich, Jung, & Baser, 2014). Given the challenges faced by teachers in effectively integrating technology, the TPACK framework is highly significant to those seeking to use technology to enhance learning. In defining TPACK, Koehler et al. (2014) mention that the knowledge constructs of TPACK are specifically necessary for effective technology integration in learning environments. The framework shows teachers what types of knowledge they must possess in order to integrate technology (Schmidt, et al., 2009). TPACK was created as a conceptual framework to guide technology integration in addition to portraying what teachers have to know in order to teach with technology (Angeli, Valanides, & Christodoulou, 2016).

As technology is constantly changing and improving, teachers must continuously learn new technological skills in order to better utilize technology in the classroom (Abbit, 2011). Given the uniqueness of every educational moment, be it due to the intellectual nature of the students, grade level, or subject matter, teachers cannot be taught one or a set of technological solutions to handle every circumstance. As such, a strong TPACK fluency will provide the teacher with the creativity and knowledge-base to determine the correct interaction of content, pedagogy and technology necessary for a given situation (Harris, Mishra, & Koehler, 2009). Technology integration requires more than technological knowledge - it entails possessing the knowledge of how technology usage properly interacts with relevant pedagogy and course content. It is important to note that TPACK, ideally, allows for flexibility, creativity, and fluidity in integrating technology. There is no one correct way to integrate technology, and a teacher with strong TPACK should be able to adapt as necessary (Harris, Mishra, & Koehler, 2009).

Mishra and Koehler (2006) highlight an important issue with regards to educational technology - the “technocentric” mindset (Papert, 1997) - as described above. They explain that:

> One of the most frequent criticisms of educational technology is that it is driven more by the imperatives of the technology than by sound pedagogical reasons… The TPACK framework, we argue, has given us a language to talk about the connections that are present (or absent) in conceptualizations of educational technology. In addition, our framework places this component, the relationship between content and technology, within a broader context of using technology for pedagogy. (p. 1044)

Lux, Bangert, & Whittier (2011) echo this concern, pointing out that without an emphasis on TPACK, teachers may select technology based on "convenience or faddishness" (p. 428) as opposed to purposely selecting technology as a means to enhance learning.

The knowledge constructs in TPACK can play an integral role in improving student learning opportunities. Teachers with a strong level of TPACK have a deep knowledge of technological tools that are geared for elucidating and portraying relevant skills and content to their subject area (Lux, Bangert, & Whittier, 2011). Koehler and Mishra (2009) point out that an understanding of the TPACK constructs allows teachers to design ICT lessons specifically geared to meet student learning objectives. As expressed by Chai, Ng, Li, Hong, and Koh (2013), fluency with the TPACK constructs gives teachers the ability "to draw from relevant aspects of [TPACK] and synthesize them for a particular group of students with a specific focus on some content knowledge" (p. 43). Teachers must pull from all the constructs of TPACK and combine resources, content, and skills in forming their lessons. This is idea is summarized well by Drummond and Sweeny (2017), who point out that the goal of the TPACK framework is to guide teachers in attaining the knowledge to "best integrate technology, teaching practices and specific content in order to create the most effective learning experience for students" (p. 930).

Measuring TPACK

Why Measure TPACK?

As TPACK has become a prominent and core framework in the field of education, there have been significant efforts made to develop research instruments to measure it (Abbitt, 2011a; Voogt et al., 2012). On a broad level, assessing teachers' TPACK levels allows for insights regarding their competencies with technology integration (Lux, Bangert, & Whittier, 2011).

Dalal, Archambault, and Shelton (2017) note that researchers have conducted assessments based on the TPACK framework to explore three primary areas: 1) technology perceptions and beliefs of in-service teachers; 2) the necessary skills or knowledge domains upon which to formulate pre-service teacher education courses and curricula; 3) as a means to evaluate the levels of technology integration of in-service teachers.

Many researchers share these notions regarding TPACK assessment. Studying the TPACK levels of pre-service teachers can serve to inform teacher education programs of areas that require particular emphasis (Lux, Bangert, & Whittier, 2011). TPACK measurement studies play a large role in planning professional development programs for in-service teachers. Such research is necessary in order to elicit any relevant conclusions or applications for professional development and teacher training (Scherer, Tondeur, & Siddiq, 2017). This, in turn, allows for school leaders to create meaningful professional development experiences that are geared towards the knowledge constructs that may be lacking (Schmidt et al., 2009). It is therefore important that reliable and valid research instruments be developed in order to assess TPACK and its constructs (Mishra & Koehler, 2006). As the TPACK domain is most significant for actual technology integration, research studying levels of TPACK in both pre-service and in-service teachers has become quite critical, allowing for the development of effective teacher training opportunities (Koehler et al., 2014).

Since Mishra and Koehler (2006) introduced the TPACK framework, educational researchers have begun to develop tools and instruments, both quantitative and qualitative, to assess TPACK levels. These instruments vary in focus, with many being developed to study TPACK within a specific content area. While most quantitative instruments are geared for pre-service teachers, there are many studies that study in-service teachers as well. In the decade since

TPACK has been introduced, surveys have been the most frequently used research instrument to measure TPACK (Koehler, Shin, & Mishra, 2012). Chai, Koh, & Tsai (2016) categorize these instruments as either surveys that measure TPACK in general or surveys that pinpoint either specific content areas, pedagogies, or technologies. The section below follows their categorization and highlights some of the instruments in each category.

A Review of TPACK Survey Instruments

Many of the more prominent TPACK survey instruments, as well as some of the early studies of quantitative TPACK research, seek to measure TPACK on a general level (that is to say, without placing emphasis on a particular content, pedagogy, or technology). In one of the earlier studies of TPACK research, Koehler & Mishra (2005) used a survey instrument to measure teachers' perceptions of their pedagogy, content, and technology as they engaged in "learning by design", a process in which education students collaborate and use technology to design solutions to authentic problem-based scenarios. The study found that engaging in this cooperative and student-centered method led to the development of TPACK. The survey instrument was only applicable to teachers participating in the given program, and was therefore non-transferable to other contexts (Abbitt, 2011). However, this early study is significant as it showed that survey instruments could be used to assess teachers' TPACK (Chai, Koh, & Tsai, 2016).

Perhaps the most commonly used instrument for quantitative research of TPACK is Schmidt et al.'s (2009) Survey of Preservice Teachers' Knowledge of Teaching and Technology. This instrument has served as the backbone of quantitative measurements of TPACK - it has been translated into numerous languages and has served as a basis from which other researchers have constructed their own surveys. Schmidt et al. intended their survey to be relatively quick to complete, while at the same time, having the ability to measure all seven knowledge constructs of TPACK. As their original sample size was small, a factor analysis could not be conducted on the entire instrument, although analyses were conducted on each knowledge domain subscale. Schmidt et al. created the instrument to serve as a starting point for further TPACK research, and as such it has been updated since its initial development. The survey instrument was built to be robust and have the ability to "extend to general contexts" (p. 128).

Although many researchers have developed their own survey instruments, the Survey of Preservice Teachers' Knowledge of Teaching and Technology has maintained its prominence among general TPACK surveys. Abbitt (2011) describes it as "among the more mature tools designed specifically based on the TPACK framework" (p. 290). As it has been the subject of much research and has undergone a number of revisions, the Survey of Preservice Teachers' Knowledge of Teaching and Technology "has been demonstrated to be valid and reliable and provides an efficient tool for research and evaluation relating to TPACK" (Abbitt, 2011, p. 291).

Yurdakul et al. (2012) formulated a TPACK survey to measure what they refer to as TPACK-deep, a TPACK construct geared to assess four unique factors: design, exertion, ethics, and proficiency (the initials of which spell "deep"). They sought to measure only the TPACK construct, while avoiding the others due to difficulties in defining the different knowledge domains of TPACK. Drummond and Sweeney (2017) used Yurdakul et al.'s (2012) instrument to study pre-service teachers self-reported TPACK, and to compare the results to that of an objective-TPACK assessment instrument, which utilized a series of true-false questions to determine levels of objective TPACK. The results showed a weak correlation between the subjective TPACK-deep instrument and their objective-TPACK instrument. They recommended that future TPACK research could be enhanced by including items to determine objective TPACK abilities. However, given the vast and wide-ranging nature of technology, it is difficult to create such instruments.

Lux, Bangert, and Whittier (2011) developed their own TPACK survey for pre-service teachers, which they refer to as PT-TPACK. Their assessment determined that the instrument was reliable and valid and was capable of measuring six out of the seven constructs. Chai, Ng, Li, Hong, & Koh (2013) built on a prior survey developed by Chai, Koh, & Tsai (2011) by making a number of important modifications, such as reducing the CK construct to focus on only one subject (unlike Singaporean teachers, Chinese and Taiwanese teachers are trained in only one subject), and ensuring that each construct had at least four corresponding items to heighten validity. In addition, while much of Chai et al.'s (2011) instrument was adapted from Schmidt et al.'s (2009) instrument, this new survey included original items intended to enhance relevance to genuine ICT integration. A factor analysis performed on the results of the survey conducted using this instrument produced seven distinct factors for each of the seven TPACK constructs, which had proven to be difficult to achieve in prior research.

Another widely used TPACK survey is the instrument developed by Sahin (2011), which has been used by other researchers and adapted into other surveys. Sancar, Yavuz, and Yanpar (2013) studied the TPACK self-efficacy perceptions of pre-service teachers in Turkey using the TPACK Self-Efficacy Scale (TPACK SES). They found teacher self-perceptions to be high, irrespective of grade level or gender. Gomleksiz and Fidan (2011) conducted a similar study, also in Turkey, using Schmidt et al.'s (2009) TPACK survey instrument translated into Turkish by Ozturk and Horzum (2011). They, too, found high levels of perceived TPACK with no difference between teacher gender, but did find varying levels of TPACK among teachers of different educational backgrounds. A very similar study by Can, Dogru, and Bayir (2017) found that pre-service teachers' TPACK was not affected by gender or grade level.

Researchers have developed a number of surveys that focus on specific technology types. Lee and Tsai (2010) developed a survey instrument to measure teacher's self-efficacy in regards to TPACK, with a particular emphasis on web-based learning, which they dubbed TPACK-W. They found their survey to be both reliable and valid, and identified strong correlations between self-efficacy and teacher beliefs towards web technologies. Jang and Tsai (2012) examined the relationship between TPACK and the use of interactive whiteboards (IWB). They developed a survey to measure what they referred to as TPACK-IWB, and surveyed Taiwanese elementary school mathematics and science teachers.

To assess the TPACK of online educators, Archambault and Crippen (2009) created their own instrument reflecting the unique pedagogy required of online education. Their instrument is highly developed as it has been used multiple times and updated on numerous occasions, many revisions focused specifically on enhancing its relevance to online K-12 education. In conducting research using their instrument, Archambault and Crippen found that most teachers of online education were confident in their traditional teaching abilities, but less confident in their ability to use technology to enhance instruction. Learning new technologies, as well as adapting to the frequently changing field of educational technology, proved to be most challenging. This can be attributed to their prior experience in traditional teaching as well as the likely nature of their preparation in teacher education programs.

Pedagogical concepts have also served as the basis for TPACK derivatives. Koh, Chai, and Lim (2017) formulated TPACK for 21st century learning (TPACK-21CL) as a "specialized form of TPACK for engendering 21st century learning" (p. 173). Chai et al. (2013) developed a

TPACK survey with revised pedagogical knowledge items that reflected the principles of Howland, Jonassen, and Marra’s (2012) Meaningful Learning with Technology. These principles include: 1) active learning (student engagement with tools and objects in the local environment); 2) constructive learning (student articulation and reflection on concepts learned); 3) authentic, real-world learning experiences; 4) intentional (goal-oriented) learning; and 5) cooperative learning.

A wide array of TPACK surveys have been developed to focus on specific content areas. Most of these surveys pertain to science, although others do exist for different content areas. Graham et al. (2009) and Bilici, Yamak, Kavak, & Guzey (2013) each formulated a survey to assess science-related TPACK. Akman and Guven (2015) developed an instrument to assess TPACK in social studies teachers. A number of studies explore the TPACK of English as a foreign language (EFL) teachers (e.g. Ersanli, 2016; Baser, Kopcha, & Ozden, 2016), while there are less that examine TPACK as it pertains to English language instruction (e.g. Spires, Hervey, & Watson, 2013). Zelkowski, Gleason, Cox, & Bismarck (2013) created a TPACK survey based on Schmidt et al. (2009) to measure mathematics-related TPACK, and found it to be a “proficient instrument” (p. 191), as well as unique in its focus on the specific skills and knowledge necessary for effective mathematics instruction with technology.

Self-Efficacy Surveys

Self-efficacy can be defined as the “belief in one’s capability to accomplish a task” (Bandura, 1977, as quoted in Hughes, 2013, p. 494). Self-efficacy is an important predictor of future behavior and persistence. An individual with a higher self-efficacy will often set more significant goals and maintain higher expectations for personal accomplishments (Bandura, 1993). Research has shown that one’s self-efficacy beliefs do in fact serve as an indicator of future practice (Multon, Brown, & Lent, 1991). Teachers who are self-efficacious in their ability to utilize technology are more likely to integrate it into their classrooms (Anderson, Groulx, & Maninger, 2011). Further, Ertmer, Ottenbreit-Leftwich, and York (2006) noted that a strong self-efficacy towards technology usage made teachers more likely to overcome obstacles hindering technology integration.

Abbitt (2011) studied the relationship between self-efficacy in technology integration and TPACK, and found that technological knowledge was positively correlated with self-efficacy beliefs, both before and after a technology integration course (other knowledge constructs showed to be more predictive only after the course). In addition, he found that an increase in any of the technology-oriented knowledge constructs resulted in reports of higher self-efficacy towards technology integration. Thus, measuring teachers’ self-efficacy regarding the knowledge and use of educational technology is significant.

Conversely, Drummond & Sweeney (2017) point out that although self-efficacy can be reflective of actual ability in many areas, such as academic ability, it is not necessary reflective of accurate competence in all areas. As an example, they refer to a study by Kruger & Dunning (1999), who found that people who had low scores on assessments of humor, grammar, and logic, amplified their own skills and did not accurately portray their true capabilities. While many teachers do, in fact, have the necessary knowledge to integrate technology, this does not always translate into actual technology integration. This is due to teacher beliefs towards the efficiency of technology integration (Swain, 2006). Therefore, conducting a test or exam to assess objective teacher knowledge may not be the best means to predict future practice.

Nonetheless, TPACK-measuring instruments primarily focus on teachers' self-perceptions of their own knowledge (Graham et al., 2009). In all likelihood, this may be the common practice due to the difficulty in creating an objective assessment of one's actual knowledge given the array of technologies and the multitude of skills and knowledge sets required to use them in the classroom. The constantly-developing nature of technology makes crafting such an objective assessment even more challenging to produce. Therefore, studying TPACK self-efficacy has proven to be among the most reliable and frequently-utilized methods of ascertaining this important information, despite its shortcomings.

Limitations of Quantitative TPACK Research

Researchers have pointed out a number of limitations and challenges facing quantitative TPACK research. On a general level, self-reporting surveys, which comprise of the majority of quantitative TPACK studies, are easy influenced by individual biases (Spector, 1994). Tschannen-Moran and Hoy (2007) suggest that an individual's context has a great deal of influence on self-efficacy. Teacher self-efficacy is often higher in schools that maintain cultures of innovation and positivity. School qualities such as poor educational climate, low morale, and even low salaries can cause self-efficacy to decrease. As such, contextual factors can have a significant impact on survey results.

More specifically, TPACK research encounters unique challenges that are related directly to the framework. A number of researchers have questioned the validity and reliability of TPACK measurement methods (Cavanagh & Koehler, 2013). Many of the critiques are based on the varied definitions of the knowledge constructs. Different researchers have produced multiple definitions for the seven knowledge domains. The addition of technological knowledge (TK) to the PCK framework, with its many definitions, proves to make the framework more complex. This blurs the boundaries between the domains as well as presents challenges when identifying each one in exploratory factor analyses (Archambault & Barnett, 2010). Lux, Bangert, & Whittier (2011) suggest that it may be difficult to measure TCK because of its comparability to PCK. Teachers may not have the ability to consider the synthesis of technology and content without also considering pedagogy as well.

There has, however, been success in overcoming these obstacle. Cox and Graham (2009) stress that in studying TPACK, researchers must place significant attention towards the clear delineation of each construct. Chai, Koh, and Tsai (2011) were able to identify each knowledge construct in a factor analysis after making a number of changes and revisions to an earlier survey. Another successful method has been to focus exclusively on the TPACK construct, and conduct research that does not gather data on any of (or a limited number of) the other knowledge domains (e.g. Yurdakul et al., 2012). If one were to take the “transformative” approach to TPACK, that is, considering it a unique knowledge disconnected from the other knowledge domains, this type of research becomes feasible (Drummond & Sweeney, 2017). Others have suggested using a mixed methods form of research as a means to avert these challenges (Dalal, Archambault, & Shelton, 2017).

Pre-Service Teacher Education, TPACK, and Technology Integration

Introduction

With educational technology becoming increasingly prevalent in the classroom, teacher education programs have made considerable efforts to prepare pre-service teachers for successful technology integration (Kimmons, Miller, Amador, Desjardins, & Hall 2015). To assist in these efforts, the federal government has implemented a number of important initiatives, such as Preparing Tomorrow's Teachers to Use Technology (PT3), which sought to incentivize the efficient utilization of technology in conjunction with professional development and modified curricula (Duffield & Moore, 2006). In addition, the International Society for Technology in Education (ISTE) has created a series of standards to guide teachers in integrating technology, as well as to aid teacher education programs in providing appropriate instruction in technology integration. These programs and guidelines have undoubtedly had a transformative effect on teacher education programs and the methods they employ to promote technology integration in pre-service teachers (Brenner & Brill, 2016).

In order to teach technology integration to pre-service teachers, teacher education programs often utilize the TPACK framework to guide instruction and the development of curricula. Teacher education programs have a profound impact on developing pre-service teachers' TPACK and ultimately their integration of technology in the classroom (Can, Dogru, & Bayir, 2017). It is evident that the teaching of mere technological knowledge does not suffice - teacher education programs must guide pre-service teachers in the use of technology to "effectively connect with practice and employ critical thinking to support effective learning experiences in real-world contexts" (Kimmons et al., 2015, p. 811).

Format of Teacher Education Programs

Much research has been devoted to determining the best practices of pre-service teacher education programs towards promoting technology integration and TPACK. In assessing teacher education programs, Mouza (2016) categorizes the methods utilized to promote TPACK development as either: 1) a sole course in educational technology; 2) the integration of instructional strategies within technology and content area courses; or 3) the integration of instructional strategies throughout the entire program.

Since the 1990s, it has been quite common for teacher education programs to have one specific course devoted entirely to technology integration (Niess, 2012). However, research shows that it is far more effective for instruction in technology to be included in all education courses (Hofer, 2005). Duhaney (2001) suggests that technology usage should be covered and embedded in all courses of teacher education programs, and that technology integration should be a required component of student teaching. Further, with the introduction of mobile devices into the realm of educational technology, the field has become more complex and thus the one course approach often lacks deep connections and relevance to a specific content area (Friedman & Kajder, 2006).

Mouza (2016) explains that some researchers have maintained the one-course method, but have sought to improve its curriculum. Wetzel, Foulger, and Williams (2009) enhanced their technology integration course by utilizing the TPACK framework to guide their curriculum as well as to generate the requirements of course assignments. Similarly, Chai et al. (2011) created a twelve week course to teach ICT integration, which was designed based on the TPACK framework, and tested the course's success using a survey instrument.

Utilizing an integrative approach, Mouza, Karchmer-Klein, Nandakumar, Yilmaz Ozden, & Hun (2014) paired a technology course with a methods course that included technology instruction, coupling both with relevant field experience for practice. The course curriculum was based on the TPACK framework, and Schmidt et al.'s (2009) Survey of Pre-service Teachers' Knowledge of Teaching with Technology was used to assess TPACK levels both before and after the course. The results showed a general increase in all TPACK domains. Parenthetically, the notion of connecting relevant field experience is supported by Gronseth et al., (2010) who point out that grouping technology instruction with fieldwork and practicum components allows for genuine opportunities for pre-service teachers to put instruction on educational technology into action, as well as to solidify technology integration skills for use later on in their own classrooms.

Despite these successes with technology courses in one form or another, Hughes (2013) highly recommends an integrated approach to technology and TPACK instruction for teacher education programs, which she describes as “an ongoing, integrated learning approach that infuses technology across the curriculum, including content and methods coursework, field experiences, and student teaching” (p. 492). Utilization of this integrative format aids pre-service teachers in understanding the role that ICT can play in their pedagogical choices, as well as enhancing their knowledge base.

Best Practices

Educational researchers have sought to determine the qualities that make for more efficient teacher education in regards to TPACK and technology integration. Niess (2005) describes four items that teacher education programs should impart to their students for the effective development of TPACK: 1) a deep understanding of how to teach a specific subject using technology; 2) instructional methods and practices for specific topics that include the use of technology; 3) the understanding of how students interact, learn, and engage with technology in a particular subject area; and 4) a fluency with the curriculum and curricular materials that can be utilized in conjunction with technology.

Brenner and Brill (2016) conducted an extensive review of the literature pertaining to the best practices of teacher education programs regarding technology. On a broad level, they identify three primary qualities representing best practices in teacher education models for technology integration: 1) content-specific instruction coupled with faculty modeling of technology integration; 2) use of technology projects initiated by pre-service teachers themselves, with appropriate opportunities for reflection; and 3) access to robust technological resources, with assistance and support provided by technology specialists, university professors, and peers.

Upon reviewing the above qualities, Brenner and Brill (2016) point out that due to the difficulty in preparing pre-service teachers for the variety of contexts they may encounter, researchers have studied which qualities are most likely to have “transfer effects” (p. 137), that is to say, are most likely to lead to actual technology integration in practice. Based on the relevant literature, they list seven qualities of teacher training programs that best promote the transfer of technology integration to the classroom: 1) “hands-on, authentic and meaningful activities incorporating technology” (p. 138); 2) effective use of field work opportunities; 3) faculty modeling of technology for particular content areas; 4) collaboration with peers and faculty; 5) reflection on technology usage and integration; 6) student practice and experimentation with technology; and 7) support for students by experts in the field.

Hughes (2013) notes that teacher education programs that utilize the TPACK framework must “highlight the importance of experiences and/or modeling of content-specific, technology-supported lessons to develop pre-service teachers’ TPACK” (p. 495). When such experiences push pre-service teachers to contemplate how technology can play a role in fulfilling a given instructional objective, growth in TPACK occurs. Hughes lists a number of important qualities that should be present in a successful teacher education program: 1) availability of and ability to use digital technologies, with relevant upgrades to ensure the most up to date resources are available; 2) technical support to ensure technology functions correctly; 3) faculty members who possess an expertise in technology integration for specific content areas. Such faculty members can model such integration for education students; 4) university partnerships with local schools to allow for meaningful field placements with an emphasis on technology; and 5) content-specific professional development opportunities.

It is important to note that Hughes considers these factors the starting point for building TPACK in pre-service teachers. Once these qualities have been established in a teacher training program, the development of TPACK can commence. As pre-service teachers become in-service teachers, TPACK must be actively and deliberately maintained. Hughes suggests the use of a program whereby cohorts of content-area or grade-level teachers who, in conjunction with technology experts, collaborate to solve authentic, real-world problems that may arise in using educational technology.

Due to the constantly developing nature of educational technology, Wetzel, Foulger and Williams (2009) suggest that long-lasting technological knowledge lies not with what skills are taught in any particular class, but rather with the molding of pre-service teachers into lifelong learners. Thus, the key for teacher education programs is to provide a foundation through which pre-service teachers know how to learn about new technologies and determine what new innovations are relevant to their subject-areas. Hughes (2013) recommends this approach as a means to combat pre-service teacher reliance on productivity tools and to promote higher levels of TPACK.

Challenges in Teaching TPACK and Technology Integration

Teaching pre-service teachers how to integrate technology into their teaching is a complex and difficult process (Graham, Tripp, & Wentworth, 2009a). Providing effective instruction in technology education has been challenging for teacher education programs due to teacher educators' reliance on traditional methods despite the advancements of technology (Stanford & Reeves, 2007). Kimmons et al. (2015) compare this challenge to hitting a moving target. Due to the "complex, contextual, and multifaceted" (p. 812) nature of effective technology integration, they abstain from giving a specific definition for "effective technology use". To overcome this obstacle, teachers must engage in self-reflection and self-assessment. Such introspection will allow teachers to ascertain whether their technology integration methods are effective and in line with the most up to date technological practices (Kimmons et al., 2015).

It is generally assumed that incoming classes of pre-service teachers already possess certain levels of technological knowledge due to their having grown up in a generation replete with technology, and therefore are better prepared to integrate technology in the classroom (Kumar & Vigil, 2011). This notion is disputable because: 1) as in any group, pre-service teachers will undoubtedly have a varied skill set and possess different degrees of technological knowledge; 2) knowledge of technology for personal purposes does not necessarily carry over to knowledge of technology for educational objectives; and 3) an array of contextual elements will have an effect on teachers' integration of technology, such as limited access to technology or school culture (Kimmons et al., 2015).

In addition, despite the current generation of students being dubbed "digital natives", studies show that although they are proficient in the use of instant messaging, email, and web browsing, nonetheless, many prefer a learning environment with little to no technology (Kvavik, 2005). Similarly, studies have shown that although students may be adept at certain personal technologies, this does not translate into a proficiency in more specialized technologies (Caruso & Kvavik, 2005). In reference to educational use, So, Choi, Lim, & Xiong (2012) found that proficiency in computer usage for personal purposes does not necessarily predict the use of computers for educational objectives. It would therefore be mistaken to assume that the current generation of students has an innate ability to utilize educational technologies such as wikis, blogs, and Web 2.0 programs. Teacher education programs must be certain to avoid any assumptions that the current generation of pre-service teachers are naturally more skilled in utilizing technologies for teaching and learning.

In surveying the types of technology that teachers valued most, Hughes (2013) was troubled to find that most teachers valued productivity software (such as Microsoft Word and PowerPoint) and basic hardware (such as iPads and laptops), as opposed to content-specific technologies. Due to the rapid advancements of technology, it would seem logical to assume that teachers would have adapted to new tools and incorporated them into their teaching. However, Hughes reports that these results are echoed not only by a study conducted five years prior to her own (Kay, 2007), but also by an even earlier study conducted twelve years earlier (Moursund & Bielefeldt, 1999). This is noteworthy as it emphasizes the immense challenge that teacher education programs face in preparing teachers to access the most up to date technological resources to improve quality of instruction and provide student-centered learning opportunities.

Professional Development, TPACK and Technology Integration

Significance of Professional Development

Modern educational philosophies, pedagogies, and technologies have brought significant changes to the field of education. To allow these reforms to take root, teachers have been provided with a wide array of professional development opportunities (Mouza, 2009). The availability of professional development is integral for building teacher TPACK and promoting technology integration. After discovering teachers' unfamiliarity with content-specific technological tools, Hughes (2013) came to the conclusion that development of TPACK must be considered a "life-long learning pursuit" (p. 508). It follows, then, that pre-service teacher training alone does not suffice - teachers require relevant and engaging professional development opportunities to further their TPACK throughout their careers. Due to the ever-developing nature of educational technology, it is imperative that professional development opportunities continue to be offered in alignment with the most up to date technological resources. In addition, professional development programs must allow teachers to reflect on their practices and give them the confidence to tackle new technological tools that they may be unaccustomed to (Mouza, 2009).

The TPACK framework has served to guide professional development for teachers, particularly in advising teachers how to effectively integrate ICT in their lessons. A number of studies have shown that use of the TPACK framework has been correlated with stronger and more efficient teacher integration of ICT (Chai, Ng, et al., 2013). Angeli and Valanides (2009) found that developing TPACK becomes more feasible when teachers are provided with specific competencies for which they should strive to attain. Some examples include the ability to: 1) identify teaching topics that can be enhanced by ICT; 2) determine technological representations of content that is hindered by traditional representations; and 3) utilize pedagogical methods that would not be possible using only traditional means.

It would seem self-evident that greater access to technology would lead to immediate and better integration of technology by teachers in their classrooms. The research has shown that much of the technology brought in by schools is not maximized to ensure a higher educational product (Bauer & Kenton, 2005). Hixon and Buckenmeyer (2009) explain that “technology integration is not synonymous with technology access, or even technology use” (p. 132). They wonder why many teachers who have strong technological knowledge lack the ability to integrate technology effectively in their teaching. Simply put, Hixon and Buckenmeyer question why teachers with access to technology and possession of technological skills still are unable to integrate technology into their teaching.

Hixon and Buckenmeyer (2009) suggest a novel solution to this problem by providing an analysis of some of the general hindrances to technology integration. They note that Hew and Brush (2007) found six obstacles that hinder technology integration: 1) limited access to technological resources; 2) lack of knowledge and skills necessary to integrate technology; 3) institutional limitations, which can include poor leadership and inappropriate planning for technology integration; 4) teacher attitudes and beliefs; 5) pressure due to standardized assessments and curricular requirements (teachers are less inclined to experiment and explore with technology out of fear of low student output affecting their professional performance); and 6) subject culture (it may be challenging for teachers to deviate from accepted norms and teaching practices associated with their subject area).

In formulating and evaluating barriers to technology integration, Ertmer (1999) distinguishes between two different categories, in which Hew and Brush’s six obstacles to technology integration can be grouped. “First order barriers” refer to factors that are extraneous to the teacher, such as a lack of resources and institutional limitations, while “second order barriers” exist innately within the teacher, and refer to factors such as teacher beliefs and knowledge.

Based on these concepts expressed by Hew and Brush (2007) and Ertmer (1999), Hixon and Buckmeyer (2009) suggest an explanation as to why there is often a lack of technology integration among teachers that already possess technological knowledge and relevant skills. Although most of the professional development opportunities for technology integration address first order barriers, the primary barriers to technology integration are Ertmer's second order barriers. For example, bringing in new hardware or hiring supportive administrators will not be helpful if the teachers do not believe in the benefits of technology and are resistant to change. Some teachers may feel that a reliance on technology will remove the "human" factor from education. Despite this, an abundance of the professional development opportunities offered to teachers regarding technology aim to address first order barriers, although in actuality these efforts would be better suited addressing second order barriers.

Hixon and Buckmeyer (2009) lament over the emphasis placed on first order barriers, which often cement negative teacher beliefs towards education. This can occur when teachers are required to participate in training about a technological topic that has no relevance or connection to any particular content area. Teachers may sit through sessions covering skills that they already possess. Mishra and Koehler (2006) share this sentiment and add that many professional development programs address certain technological skills with no reference to content or pedagogy, as the assumption that mere technological knowledge will automatically lead to effective technology integration. However, these types of development opportunities fail to address second order barriers to technology integration.

Best Practices

Wang (2001) considers mentoring by experienced teachers to be among the most significant methods of guiding beginning teachers in the earlier parts of their careers. Due to the ever-difficult task of integrating technology into education, particularly among teachers who are the sole instructor in a given class, having a mentor to aid in this regard can prove to be a tremendous source of support for a teacher (Dorner & Kumar, 2016). Grove, Strudler, and Odell (2004) found that the presence of influential mentors can serve an array of helpful functions, including: one on one tutoring in technology uses, modeling technology use, and promoting reflection and discussion. For teachers that are first starting to integrate technology in the classroom, Levin and Wadmany (2008) suggest that direct and formal training from experts is ideal. As teachers become more advanced, a more fitting approach would be the use of collaborative and cooperative development groups to assist teachers in working together to address authentic problems through the use of technology.

For professional development to be successful in aiding the integration of technology, it must lead to the creation of "rigorous technology-enhanced activities" in the classroom (Mouza, 2009, p. 1237). As teachers reflect on the outcomes of these activities, they will note the significance of technology to education which could, in turn, promote positive attitudes towards technology. Further, in her longitudinal study on the effects of a professional development program for technology integration, Mouza found that follow up was integral for sustained technology integration. Hew and Brush (2007) outline three traits for professional development geared towards technology integration: 1) an emphasis on technology usage towards teaching course content; 2) opportunities for teachers to engage in interactive and "hands-on" activities; 3) a focus on the classroom needs of teachers.

Another prevalent theme appearing in the research on professional development for technology is collaboration among teachers and other colleagues. Tondeur, Kershaw, Vanderlinde, & van Braak (2013) note that collaboration and cooperative learning with fellow teachers and colleagues is a crucial component in developing technology integration skills. Liu, Tsai, and Huang (2015) studied the development of technology integration skills in both pre-service and in-service teachers using the mentoring style of van Velzen, Volman, Brekelmans, & White (2012), in which pre-service teachers and their in-service teacher mentors learn from one another. This relationship proved to be beneficial for all, as the mentors shared their pedagogical expertise, while the pre-service teachers brought an innate technological knowledge that pushed the mentor teachers to change the way they used technology in the classroom.

Koehler, Mishra, and Cain (2013) categorize the approaches to TPACK professional development into three different subsets. The PCK to TPACK approach entails utilizing prior PCK, after which determining which technologies may be utilized to achieve learning objectives. Conversely, the TPK to TPACK approach requires teachers to build on their prior knowledge of technology and to select specific content that could benefit from useful and pedagogically-relevant technologies. The third approach requires the simultaneous development of PCK and TPACK, which is accomplished through projects that involve lesson design and creative solutions using the knowledge of content, pedagogy, and technology.

Oftentimes, when in-service teachers are taught about a particular technological tool, they are taught about the operational functions of the tool and not about its pedagogical implications (Angeli & Valanides, 2013). In addressing this challenge, and in promoting general growth of TPACK, Angeli and Valanides (2009) suggest using a process called technological mapping (see Figure 6), by which groups of educators review a technological tool and assess it for its pedagogical affordances. This is complemented by a collaborative design process, in which the groups discuss authentic problems they encounter and determine how educational technology can assist in solving these problems. Due to the varying contexts in which education takes place, it is important that the solutions developed are particular to the challenges that teachers face. In a later study, Angeli and Valanides (2013) describe technological mapping more succinctly as “the process of establishing connections or linkages among the affordances of a tool, content, and pedagogy in relation to learners’ content-related difficulties” (p. 204). This method of TPACK development would fall under the simultaneous PCK and TPACK approach due to its project and problem based framework integrating all knowledge types.

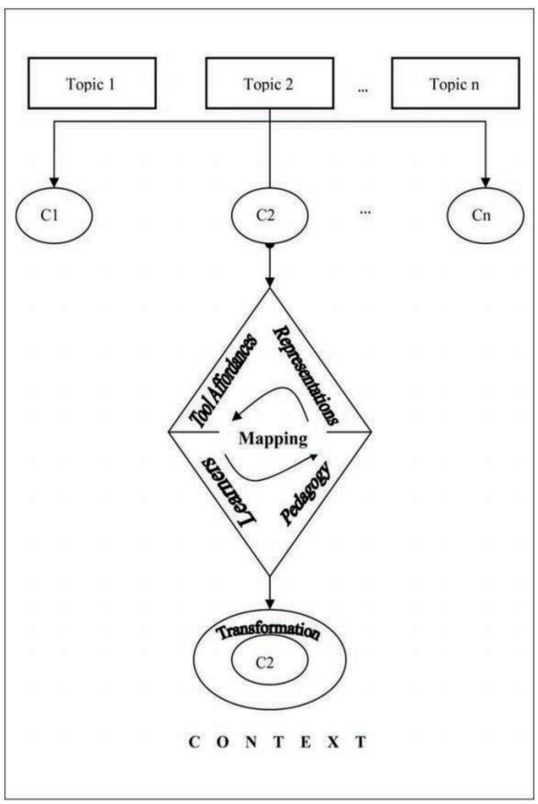

Figure 6. Technology mapping (Angeli & Valanides, 2009)

Harris (2016), in reviewing the literature pertaining to TPACK development for in-service teachers, found that professional development opportunities for TPACK have become highly context-specific, reflective in nature, and collaborative. These findings bear similarities to patterns uncovered in professional development for general technology integration. In addition, Harris points out that these trends suggest that “shorter-term, larger-group, top-down, and technocentric approaches are being eschewed in favor of more personalized, curriculum based, and authentic-to-the-classroom methods, given researchers’ and teacher educators’ growing awareness of TPACK as a highly contextualized construct” (p. 197). She further points out that teacher knowledge constructs, such as PCK and TPACK, are profoundly individualized in nature, and therefore manifest themselves differently in each teacher. As such, the types of professional development opportunities that will develop TPACK will inevitably vary from teacher to teacher.

Technology in Religious Education

Research regarding the use of technology in religious or parochial K-12 schools is scant. Yet there are studies that examine the role technology should play in Christian education seminaries and how it pertains to the growth of church communities (e.g. Markham, 2010). Thematically, studies concerning technology integration in religious studies tend to focus on how modern technology interplays with traditional and longstanding pedagogical practices and school culture (Swallow, 2017). Steve Delamarter, of George Fox Evangelical Seminary, has written extensively on the integration of technology into Christian seminaries (higher education). While many religious educators are seeking ways to enhance religious education with technology, many are concerned that technology can change the core nature of religious education

(Delamarter, 2004). He posits that religious educators "cannot… isolate matters of pedagogy and technology from theology… We believe that attention to pedagogy and technology in theological education carries with it a specialized set of *theological* challenges that must be named and addressed" (Delamarter et al., 2007, p. 65). One such challenge is the difficulty in deviating from traditional methods of instruction, as Delamarter (2006) explains, "the inability to think outside the box created by our prior commitments to traditional models" (p. 11). Due to the strength of tradition in religious instruction, this is likely an issue in all religious educational institutions. In addition, the interweaving of technology, pedagogy, and theology is significant for religious educators of all faiths who seek to effectively integrate technology into religious studies courses.

Researchers have only begun to explore technology integration in Catholic schools. The few studies that assess technology in Catholic schools refer to the limited literature on the subject (e.g. Gibbs, Dosen, & Guerrero, 2008; Cho, 2017). In a study of Catholic school principals in Illinois, Gibbs, Dosen, & Guerrero (2008) found that teachers in Catholic schools use technology primarily for preparatory work, as well as to create teaching materials. Swallow (2017) conducted a case study and observed a number of teachers in a K-8 Catholic school, and found that the teachers she observed were hesitant to integrate technology into their religious classes. As this is only one study assessing only a handful of educators in one school, it does not allow for generalizations to the broader Catholic school network. However, Swallow's analysis does suggest a need to pursue stronger technology integration in religious studies classes.

While minimal research exists providing specific details of the emphasis Jewish educational institutions have placed on technology, there are other ways to discern its significance. SMART Boards seem to be present in nearly every Modern Orthodox Jewish day school. It is common for Jewish day schools to have a faculty member devoted entirely to educational technology on staff. While schools of different denominations may view technology differently, the perspective of many Jewish day schools is that technology has the ability to enhance Jewish communal life, and thus can play a significant role in the classroom (Bor, 2013). Many leaders within Jewish education feel that Jewish education must embrace the “disruptive” nature of technology in regards to education, and allow technology to shift the educational culture to a student-centered paradigm (Woocher, Rozenfeld, Colton, & Levine, 2010).

A number of Jewish non-profit organizations run programs and offer grants towards technology integration in Jewish day schools of all denominations. The Avichai Foundation has invested considerably in Jewish day school technology. It has promoted blended learning models in Jewish day schools and has created the DigitalJLearning Network, which allows for cooperation between participating schools and provides support to Jewish day schools seeking to better their educational technology, blended learning programs, and online course offerings. In addition, Avichai partners with Bar Ilan University to produce the Lookstein Virtual Jewish Academy, an online school offering a wide array of online Jewish studies courses. Among its many science-oriented initiatives, the Center for Initiatives in Jewish Education (CIJE) offers support and teacher training to schools regarding technology. Quite a large number of submissions for the Kohelet Prize in Jewish Education pertain to technology in one form or another, with, as of February 2018, one hundred and twelve submissions in the blended learning category,

The above represents just a portion of the initiatives that have been created to promote the integration of technology in Jewish day schools. It is evident that there is a strong drive to inculcate educational technology into the fabric of Jewish day schools with the goal of shifting the educational paradigm towards student-centered, twenty-first century learning.

Yet despite this push towards a technology-infused learning environment, the hard data on technology in Jewish day schools is lacking. A number of doctoral dissertations have begun to generate valuable data in this important field. Greene (2015) sought to ascertain what student-centered technologies Jewish day schools used, and how Jewish day schools progress in their overall integration of technology. Findings showed that a number of factors led schools to advance further along the spectrum of technology integration, such as: 1) having and implementing a technology plan; 2) the presence of administrators that motivate faculty and drive the process; 3) the use of professional technologists to make relevant technological decisions; and 4) the maintaining of a continuous faculty. Glatt (in progress) studied the attitudes of Jewish day school teachers towards the use of technology in their classes. These studies are quite significant and will begin the formulation of an aggregate of data on technology integration in Jewish day schools.

The current study will make significant contributions to this developing corpus of research, acquiring data on self-reported TPACK, in-service professional development, and pre-service teacher training in Modern Orthodox Jewish day schools as they pertain to technology. Although a formal and objective assessment of teachers' technology integration practices, and their correlation to self-reported TPACK, is beyond the scope of the current study, it would nonetheless be informative to study whether teachers with higher levels of self-reported TPACK integrate technology in notably different way than those with lower levels. Thus, the current study will explore how teachers perceive their own technology integration in comparison to their self-reported TPACK levels. In addition, this study will be unique in its uncovering of relevant data for Judaic studies teachers, particularly their TPACK, which heretofore has not been researched. This will prove to be a highly beneficial addition to the field of Jewish educational research. As Modern Orthodox Jewish day schools continue to invest time, funds, and resources towards technology, it is imperative that relevant data is acquired to guide them in how to best pursue and promote the integration of technology in order to improve instruction and redefine learning.

CHAPTER 3

RESEARCH QUESTIONS & HYPOTHESES

In exploring the self-reported TPACK of teachers in Modern Orthodox Jewish day schools, the following research questions will be explored.

Research Questions

1. What is the current level of self-reported TPACK in Modern Orthodox Jewish day school teachers?
2. To what degree is self-reported TPACK correlated with in-service professional development and pre-service teacher training?
3. Do teachers with higher levels of self-reported TPACK report integrating technology in notably different ways than teachers with lower levels of self-reported TPACK?
4. Is there a discrepancy between the levels of self-reported TPACK of general and Judaic studies teachers?
5. Which of the surveyed variables is the best predictor of high levels of self-reported TPACK?

Hypotheses

The corresponding research hypotheses are as follows:

1. Higher levels of self-reported TPACK are directly proportional to the frequency and nature of relevant professional development.

2. Higher levels of self-reported TPACK are directly proportional to the frequency and nature of relevant pre-service teacher education.
3. Teachers with higher levels of self-reported TPACK will report integrating technology in notably different ways than teachers with lower levels of self-reported TPACK.
4. General studies teachers will report higher levels of self-reported TPACK when compared to Judaic studies teachers.
5. Teaching experience will not have a strong correlation to self-reported TPACK.

CHAPTER 4
METHODOLOGY

Study Design

The current study utilizes a quantitative research method to understand the correlations between self-reported TPACK, in-service professional development, pre-service teacher training, and the nature of teachers' technology integration, among a number of demographic variables. Quantitative research in education entails an approach in which "the natural science model of research [is applied] to investigations of the educational world" (Scott and Morrison, 2006, p. 185). The data in quantitative research is collected in numeric form from many people in a specific population or setting (Creswell, 2012). Although quantitative research has been the primary track for inquiry in the field of educational research, in recent years qualitative research has seen a resurgence. While there was tension between the proponents of each method, the current view is that the two forms of research can complement one another quite well (Ary, Jacobs, & Sorensen, 2010).

Morrison (2002) points out a number of important characteristics of quantitative research: 1) special consideration is given towards taking theoretical concepts and formulating them into measurable variables using surveys and other instruments; 2) results should be able to be generalized and applied to other populations beyond the sample population; 3) attention is given to both cross-sectional and longitudinal forms of research, each of which aims to show relationship and/or causality between variables; and 4) quantitative surveys should be replicable by other researchers.

A number of different types of research fall under the umbrella of quantitative analysis. Creswell (2012) explains that correlational research is used to determine whether a relationship exists between two or more variables. As the current study aims to determine any correlations between TPACK, professional development, and pre-service teacher training, it can be classified as a correlative study. Further relevant to the current study is what Creswell (2012) describes as explanatory correlational research. Such a research design seeks to provide explanations for correlations found between variables. The objective is to determine the degree to which different variables are related, and to consider how different levels of one variable result in changes in another (if any). Creswell (2012) identifies six characteristics of an explanatory correlational study: 1) the correlation of two or more variables; 2) data collection at one point in time; 3) all participants in the study are considered as one group; 4) a score for each variable is obtained for each participant; 5) the correlation statistical test is used to analyze and assess the data; and 6) the data is used to come to relevant conclusions and interpretations. The current study will take these steps to determine correlations between self-reported TPACK and the other variables studied.

Instrument Development, Reliability & Validity

Creswell (2012) describes survey research as a form of quantitative research in which a survey is used to ascertain specific qualities, skills, attitudes or behaviors of a certain group or population. The current study utilizes a cross-sectional survey, which seeks to collect data for a specific point in time, namely, the time at which the survey is administered. The survey instrument for the current study was developed through the integration of items from a number of reliable and valid instruments pertaining to different aspects of educational technology.

All surveys utilized for the development of the research instrument have shown reliability and validity in prior studies. In addition, the Standards for Educational and Psychological Testing (1999) list evidence based on test content as a source of statistical validity. Such evidence is based on obtaining feedback and reviews from experts in the field being studied (Ary, Jacobs, & Sorensen, 2010). The survey instrument for this study has been reviewed by three experts in the field of TPACK and broader educational technology, with the intent of examining survey items for relevance and their ability to correctly measure their intended variable. These experts include: 1) Dr. Judith Harris, professor and Pavey Family Chair of Educational Technology at the College of William and Mary, an expert in TPACK research who has co-authored a number of studies with Mishra and Koehler; 2) Dr. Nicholas Lux, associate professor at Montana State University, an expert in the field of educational technology who has conducted TPACK research; and 3) Rabbi Gershom Tave - educational technologist at Joseph Kushner Hebrew Academy, who provided additional context and insights due to both his expertise in educational technology as well as his professional experience in Jewish day schools. Broad changes as well as textual revisions were made to the instrument based on the feedback received from these experts.

The TPACK section of the instrument contains a number of subsections, each corresponding to a different knowledge domain of the TPACK framework. An item pool was collected of survey items from four different studies: Sahin (2011), Schmidt et al. (2009), Lux, Bangert, and Whittier (2011), and Chai, Koh, and Tsai (2011). These survey instruments were selected due to a number of different factors. Each displayed the necessary reliability and validity based on Cronbach's alpha, factor analyses and other statistical measures. Schmidt et al. (2009) is perhaps the most commonly used TPACK survey - countless TPACK measurement instruments in multiple languages are based off of it. Chai, Koh, and Tsai (2011) was used due to its ability to clearly delineate between each of the knowledge constructs in a factor analysis conducted following administration of the survey. Sahin (2011) and Lux, Bangert, and Whittier (2011) each provided unique items that made for a more robust instrument.

A number of other research tools and surveys were utilized to form sections to assess other variables. In determining respondents' participation in professional development opportunities related to technology, items were drawn from two instruments created by the National Center for Education Statistics: Teachers' Use of Educational Technology in U.S. Public Schools (Gray, Thomas & Lewis, 2010) and Public School Teachers' Use of Computers and the Internet (United States Department of Education, 1999). To assess the quality and influence of pre-service teacher education programs, items were adapted from Brenner and Brill's (2016) Technology Integration Knowledge and Skills of Early Career Teachers Survey. Items from this survey were also used to measure the nature of teacher technology integration, along with items from Greene (2015).

Upon closing the survey, Chronbach's alpha was conducted to measure the reliability of each of the following scales: technological knowledge, pedagogical knowledge, content knowledge, pedagogical content knowledge, technological content knowledge, technological pedagogical knowledge, and TPACK. Chronbach's alpha varied from .81 to .92, which are values deemed more than sufficiently reliable.

Participants

Studies conducted using surveys assess a sample or subset of a given population, and, at the conclusion of the study, the relevant results and implications are applied to the broader population (Creswell, 2012). The quality and nature of the sample used for a study can often be more significant than the data itself. Admittedly speaking somewhat figuratively, Gorard (2001) expresses that selecting a good sample population is “the basis of all research” (p. 9). He supports this point by referring to an anecdote from Huff (1991): during the Spanish-American War, the death rate among Navy sailors was nine per thousand people, while the death rate among residents of New York City during the same time period was sixteen per thousand. Although U.S. Navy recruiters used these figures to suggest that serving in the Navy was safer than living in New York City, the numbers in this instance are misleading. A multitude of factors account for this discrepancy, such as the overall good health of the sailors and the inclusion of the elderly and ill in the New York City population, who generally have a higher death rate. Thus, it is important to collect a high quality sample to ensure that the gathered data is reflective of the actual skills, opinions, or beliefs of the population in question.

Teachers employed at Modern Orthodox Jewish day schools served as the target population for this study. The Modern Orthodox movement has its foundations in nineteenth century Western Europe as a response to the Enlightenment as well as to Jewish emancipation. Generally, the Modern Orthodox movement seeks to “adhere to traditional religious commitments including observing the Jewish code of law (Halakha), while at the same time seeking to embrace many aspects of modern culture” (Guterman, 2006, p. 92). Although there is some discrepancy and variety among schools that classify themselves as Modern Orthodox, the current study was open to respondents from all schools that fall under this umbrella.

Any teacher at a Modern Orthodox Jewish day school qualified as a participant in this study - both general and Judaic studies teachers, as well as teachers of all grade levels, from elementary school (beginning with kindergarten) through middle school and high school. Ideally, the sample for a research study should be selected at random (Gorard, 2001), although complete randomization was difficult in this instance. Given the specificity of the target population, as well as the limited number of people that are a part of this population, all appropriate respondents were sought after.

The survey instrument was disseminated to educators at Modern Orthodox Jewish day schools throughout the United States, all via digital communications. The survey was uploaded to SurveyMonkey, an online surveying platform, and therefore all responses were received in digital format. As the survey was approved for distribution at the end of the school year, the primary researcher sought school administrators who might be willing to circulate the survey to their faculty members at their end of year meetings, in exchange for a light breakfast for the faculty and TPACK information materials to distribute. However, due to time constraints and other factors, all administrators declined this offer.

In order to gather survey responses, the primary researcher contacted peers, colleagues, and acquaintances that are currently teaching in Modern Orthodox Jewish day schools on an individual basis. It is important to note that nearly all of the respondents are educators that have or had a relationship with the primary researcher at one point or another. As mentioned above, since school administrators were generally unwilling to disseminate the survey, the social and professional network of the primary researcher was crucial towards obtaining the necessary survey responses.

In order to promote honest and authentic responses, no identifiable information was requested from the respondents. Due to this anonymity, it is impossible to obtain data as to the geographic location of the respondents. Teachers were contacted from the following cities: New York (including Long Island, the five boroughs of New York City, and New Jersey), Cleveland, Columbus, Boca Raton, Los Angeles, Atlanta, Dallas, and Philadelphia. Being that most of the primary researcher's contacts are located in the New York metropolitan area (as well as the largest aggregate of Modern Orthodox Jewish day schools), it is highly likely that a majority of the respondents are based there.

To better illustrate the results of the survey, brief interviews and conversations were conducted with select survey respondents. These discussions shed some light on different aspects of the study, and insightful quotes have been integrated in the analysis of the results. Included passages often relay personal experiences of the respondents that correspond to conclusions drawn from the research. Their purpose is to highlight and demonstrate different insights and understandings that may not be readily apparent from the data alone.

In order to determine the necessary sample size for this study, power analysis was conducted. Cohen (1988) defines a small effect size as 2% and a medium effect size as 15%. In educational research, 10% has been an accepted level of effect size, or margin of error. In calculating the appropriate sample .10 was used as the effect size. The estimated population of all of the teachers in Modern Orthodox Jewish day schools in the USA was set to 6,000, the significance level was set to equal .05, which corresponds to a confidence level of 95%. Therefore, to have optimal power, a minimum of 95 respondents was required. As 109 respondents completed the survey, this study has met the minimum requirements set by the power analysis.

CHAPTER 5

RESULTS

Demographics

There were a total of 109 responses to the survey. Of the responses, 45% were female and 55% were male. The years of experience as a formal classroom teacher varied among the respondents, with 7% serving less than 3 years; 29% between 3 and 6 years, 17% between 7 and 9 years, 31% between 10-15 years, 7% between 16 and 20 years and 10% over 20 years. Figure 7 depicts the number of years the participants have served as a formal classroom teacher.

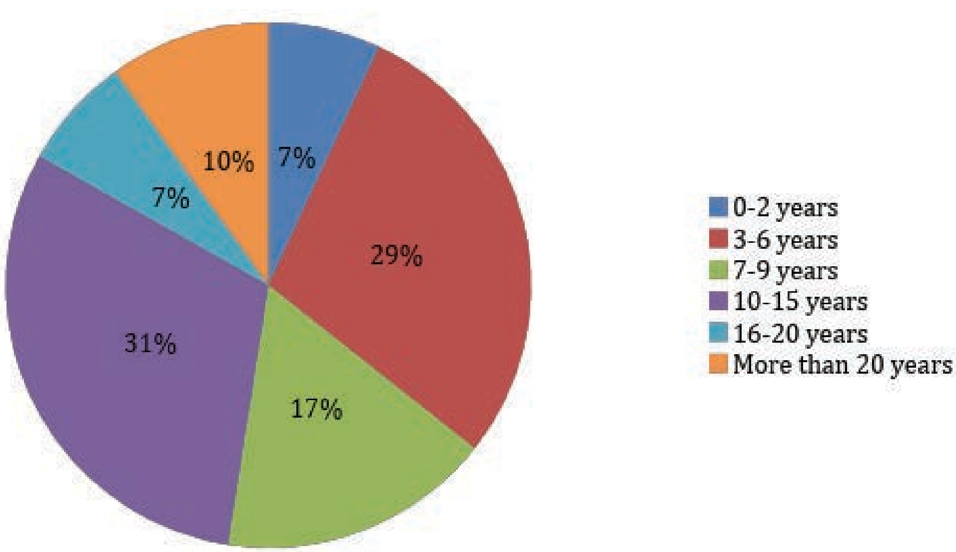

Figure 7. Number of years as a formal classroom teacher for survey respondents

Respondents were asked to report on the grade levels they currently teach. 23% of respondents teach elementary school, 36% teach middle school and 55% teach high school.

Since teachers may teach multiple grade levels, and were asked to check off all grade levels that they currently teach, there could be some overlap and percentages add up to more than 100%. The subjects taught by the respondents varied and the percentages for each subject area are displayed in Figure 8. The respondents were allowed to choose as many options as applied to them, thus the percentages add up to over 100% due to teachers of multiple subject areas.

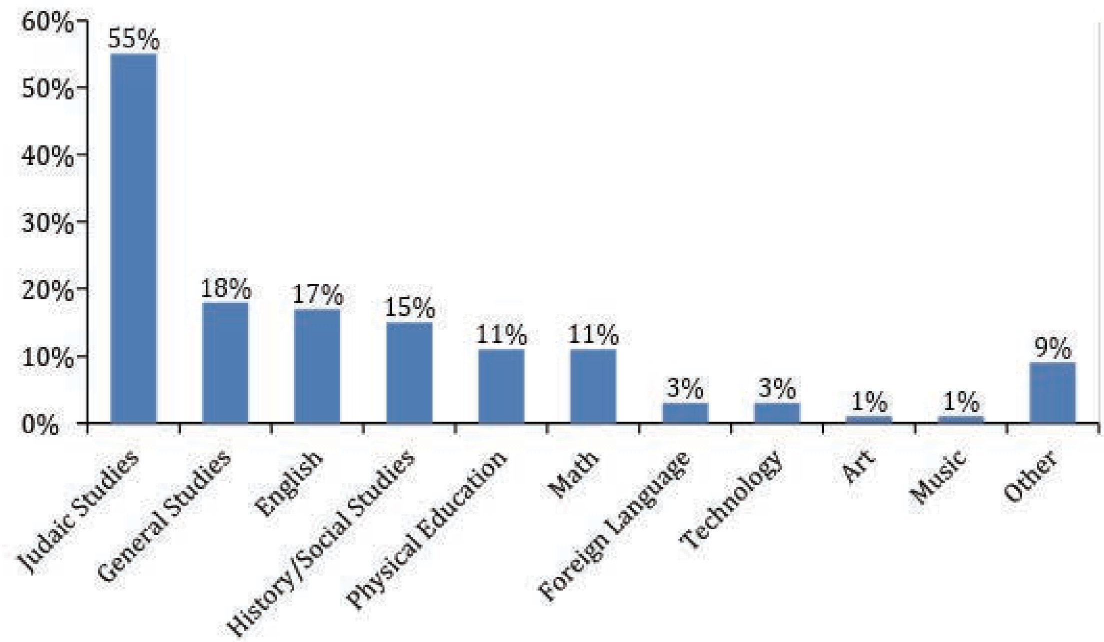

Figure 8. Subjects taught by survey respondents

Most of the respondents are very educated with 70% having a masters degree, 12% with a doctoral degree, and 1% with a post-doctoral degree. The remaining 175 respondents have a bachelors or post-baccalaureate degree.

In order to ascertain considerations of school culture, respondents were asked to classify their school in regards to its overall approach towards educational technology. The results show that 44% of respondents state that educational technology is utilized frequently in their school, 29% state that educational technology is utilized occasionally, 21% state that educational technology and/or blended learning play a very central and prominent role in student learning, 5% state that educational technology is utilized rarely and only 1% state that educational technology is not utilized.

A one-way ANOVA was conducted to determine whether there were differences in teacher's TPACK scores based on their school's overall approach to educational technology (ET). There was a significant difference in teacher's scores depending on the school's overall approach to educational technology, $F(4, 100)=4.62$, $p<.01$. Post-hoc follow up tests were conducted to see where the significance lies. Respondents who selected “Educational technology and/or blended learning play a very central and prominent role in student learning” have significantly higher self-reported TPACK scores (M=4.04, SD=.62) than: ET is utilized frequently (M=3.65, SD=.71); ET is utilized occasionally (M=3.42, SD=.92); and ET is utilized rarely (M=2.80, SD=.73). Also, Teachers who said that ET is utilized frequently in their school have significantly higher TPACK (M=3.65, SD=.71) scores than ET is utilized rarely (M=2.8, SD.7.3)

Other than school approach to educational technology, none of the other surveyed demographic variables – gender, teaching experience, subject area, and grade level – showed any correlation to self-reported teacher TPACK.

Research Question 1

What is the current level of TPACK in Modern Orthodox Jewish day school teachers?

The breakdown of TPACK and all of the knowledge domains of TPACK were looked at for the sub-population of Modern Orthodox Jewish day school teachers. Each domain was measured on a scale from 1-5 with 1 being the least amount of knowledge and 5 being the most.

The areas where the participants scored the lowest were in technological content knowledge and TPACK, both with an average of 3.63. The area with highest score was content knowledge with a mean of 4.57. Table 1 and Figure 9 depict the means and standard deviations for each of the TPACK sub-areas.

Table 1

Descriptive statistics for TPACK and sub concept areas in ascending order

Knowledge Area	Minimum	Maximum	Mean	SD	N
1. Technological content knowledge	1	5	3.63	.88	106
2. TPACK	1	5	3.63	.82	106
3. Technological Pedagogical Knowledge	1	5	3.69	.83	106
4. Technological Knowledge	1	5	3.95	.79	106
5. Pedagogical Knowledge	3	5	4.29	.52	106
6. Pedagogical Content Knowledge	3	5	4.43	.50	106
7. Content Knowledge	3	5	4.57	.54	106

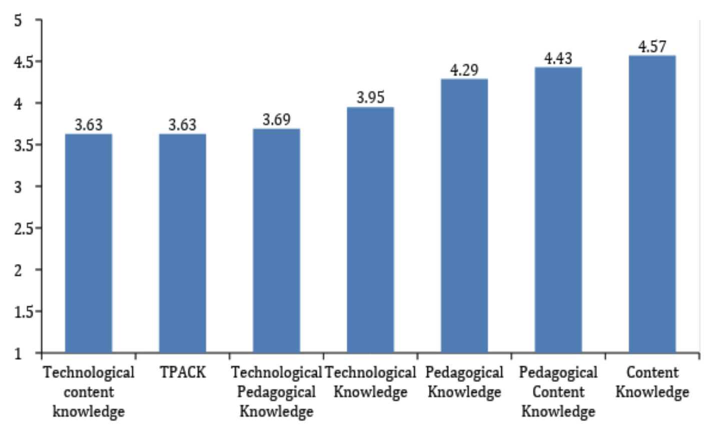

Figure 9. Means of TPACK and sub concept areas in ascending order

Research Question 2

To what degree is TPACK correlated with in-service professional development and pre-service teacher training?

A pearson product moment correlation matrix was conducted to determine whether there is a relationship between TPACK and in-service professional development and pre-service teacher training.

TPACK was correlated with the overall quality of pre-service training, $r(89)=.30$, $p<.01$. This indicates that ratings of higher quality pre-service training towards technology integration were correlated with higher levels of self-reported TPACK. In addition, there were significant relationships between TPACK and individual pre-service training items. The items that are significantly related to self-reported TPACK are depicted in Table 2:

Table 2

Relationships between TPACK and survey items for pre-service teacher training

Pre-Service Training Item	TPACK	p	N
1. The faculty member(s) who taught my content-area methods courses modeled how to effectively integrate technology into instruction for K-12 students.	.26	.05	89
2. I had many opportunities in my teacher education courses to practice creating learning activities that incorporated	.27	.05	89

Digital technologies.			
3. I was required to reflect upon the uses of technology in the classroom during my preservice teacher education program.	.27	.05	89
4. Overall, the technology integration training I received in my teacher education program prepared me to utilize technology in the classroom effectively.	.33	.001	89

A pearson-product moment correlation was conducted in order to determine whether the number of years the teacher has been working in formal education were correlated with pre-service training in regards to technology. There were significant differences in; I had many opportunities in my teacher education courses to practice creating learning activities that incorporated digital technologies, $r(88)=-.21$, $p<.05$; During my coursework and/or field experiences, I had access to expert guidance (e.g. peers, faculty, teachers, etc) with regard to learning about the use of technology in K-12 instruction, $r(88)=-.21$, $p<.05$; I had opportunities to practice integrating technology in my instruction in real K-12 classrooms during my program through field experiences (e.g. internships, student teaching, special projects including students, etc), $r(87)=-.29$, $p<.01$; I was required to reflect upon the uses of technology in the classroom during my preservice teacher education program, $r(88)=-.27$, $p<.05$; and Overall, the technology integration training I received in my teacher education program, prepared me to utilize technology in the classroom effectively, $r(88)=-.30$, $p<.01$. Each of the above have a negative correlation, implying that the more years the respondent had been teaching, the lower the scores they obtained in pre-service teacher training pertaining to technology.

TPACK was correlated with overall in-service professional development time, $r(103)=.41$, $p<.001$. There was a significant positive relationship between TPACK and the amount of hours spent in professional development activities that focus on educational technology over the past twelve months, $r(103)=.26$, $p<.01$ as well as *prior* to the past twelve months, $r(101)=.39$, $p<.001$. The more time teachers spent engaged in professional development recently or prior to the past twelve months, the higher their reported TPACK score.

In addition, two one-way ANOVAs were conducted to determine whether there were differences in teacher's TPACK scores depending on the number of hours spent in professional development activities that focus on educational technology over the past twelve months and prior to the last twelve months. There were differences in teachers' TPACK scores depending on the number of hours spent in professional development activities that focus on educational technology over the past twelve months, $F(4,98)=3.08$, $p<.05$. Those who spent no hours (M=3.03, SD=1.05) had lower levels of TPACK when compared to those who spent between 1-8 hours (M=3.63, SD=.75), between 9-16 hours (M=4.06, SD=.72) or between 17-32 hours (M=3.97, SD=.48). There were also differences in teachers' TPACK scores depending on the number of hours spent in professional development activities that focus on educational technology prior to the last twelve months, $F(4,96)=5.46$, $p<.001$. Those who spent no hours (M=3.18, SD=.84) had significantly lower TPACK scores than those who spent 17-32 hours (M=4.00, SD=.56) or more than 33 hours (M=4.58, SD=.35). In addition, those who spent more than 33 hours (M=4.58, SD=.35) had significantly higher TPACK scores than those who spent 1-8 hours (M=3.56, SD=.73).

TPACK was positively correlated with a number of survey items pertaining to the nature and availability of professional development opportunities offered. The specific areas of professional development that were correlated with TPACK are depicted in Table 3 below.

Table 3

Individual in-service professional development areas with significant correlations to TPACK

In-Service Professional Development Item	r (TPACK)	p	N
1. It applied to technology available in My school	.35	.001	99
2. It was available at convenient times And places	.29	.01	99
3. Learning management systems (e.g. Canvas, RenWeb, Moodle)	.23	.05	73
4. Educational software	.32	.05	58
5. Use of specialized or specific Technology devices	.28	.01	88
6. Integration of technology into the Curriculum/classroom instruction	.32	.01	87

One-way ANOVAs were conducted to determine whether there were differences in self-reported TPACK based on the availability and participation of in-service professional development items. Availability and participation were measured by “No, not available”, “Yes, but I do not participate", or "Yes, and I participate." The individual in-service professional development items are: use of computers in general or basic computer training, software applications, learning management systems, educational software, use of specialized or specific technology devices, use of the internet, use of other telecommunication devices, and integration of technology into the curriculum/classroom instruction. There were significant differences in educational software, $F(2,55)=3.72$, $p<.05$, use of specialized or specific technology devices, $F(2,85)=3.89$, $p<.05$ and integration of technology into the curriculum/classroom instruction, $F(2,84)=6.71$, $p<.01$. Figure 10 depicts the differences for each of those significant areas of in-service professional development. In each case, those who have such opportunities available and participate in them had higher levels of self-reported TPACK than those who reported the unavailability of such opportunities or the inability to participate in them.

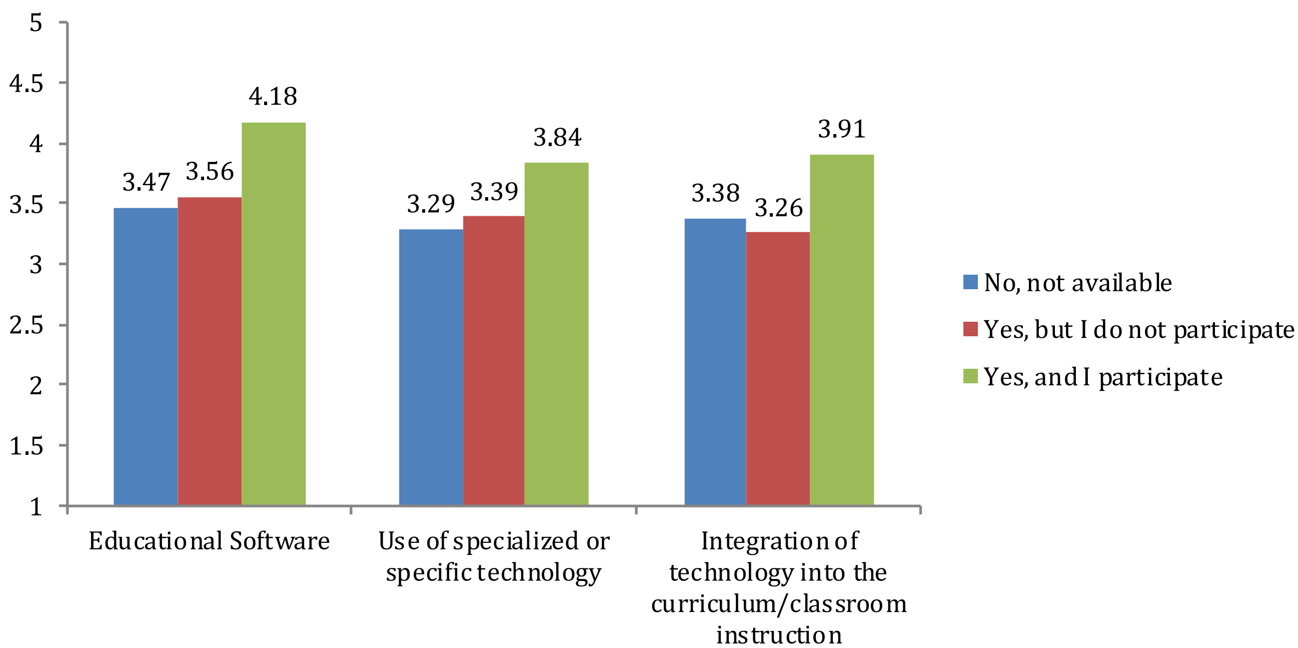

Figure 10. *Differences on self-reported TPACK depending on availability and participation of in-service professional development items.*

Research Question 3

Do teachers with higher levels of self-reported TPACK report integrating technology in notably different ways than teachers with lower levels of self-reported TPACK?

A pearson product moment correlation was conducted to determine if there is a relationship between teachers' levels of self-reported TPACK and 1) the ways teachers report that their students use technology; as well as 2) the way they report that they themselves integrate technology in their teaching.

Regarding student use of technology, there was a significant positive relationship between TPACK levels and "utilize productivity tools (word processing, spreadsheets, databased)", r(103)=.29, p<.01; "conduct research online including use of K-12 Online Database Resources (such as EBSCO and Worldbook)", $r(102)=.23$, $p<.05$; "engage in self-directed learning" $r(102)=.30$, $p<.01$; "work online on collaborative projects" $r(101)=.31$, $p<.01$; "engage in project based learning," $r(102)=.22$, $p<.05$; and "access content-specific software or Web-based resources," $r(102)=.27$, $p<.01$. In each of the above cases, as teachers report higher levels of TPACK, they report that their students use technology more frequently.

Concerning the ways the teachers report their own technology integration practices in teaching, there are strong significant positive relationships between self-reported TPACK levels and "I integrate activities that utilize technology into the curriculum," $r(102)=.67$, $p<.001$; "Technology use supports content learning in my classroom," $r(101)=.66$, $p<.001$; "students work collaboratively on technology-based activities in my classroom," $r(103)=.47$, $p<.001$; "I locate and evaluate educational technologies including software, hardware, and online resources that students use in my classroom," $r(103)=.54$, $p<.001$; "I require students to use a variety of software tools and digital resources to support their learning," *r*(103)=.52, *p*<.001; "I use technology to support project-based and problem-based learning activities in my classroom," *r*(103)=.58, *p*<.001; "I use technology to help me meet the individual needs of a variety of students in my classroom," *r*(103)=.65, *p*<.001; "my students use technology to demonstrate their knowledge of content in non-traditional ways (e.g. by creating websites or multimedia products)," *r*(103)=.48, *p*<.001; and "I use technology and its unique capabilities to design new learning experiences for students," *r*(103)=.62, *p*<.001. In each of the above cases, with higher levels of self-reported TPACK, comes higher quality, self-reported technology integration in teaching.

To further elucidate this finding, self-reported TPACK findings were divided into two categories, high and low. High self-reported TPACK corresponded to those who scored an average of a four or above on the five survey items about TPACK, and low self-reported TPACK corresponded to any score that averaged less than a four. Independent samples t-tests were conducted to determine if there were noticeable ways in the ways the teachers integrate technology based on whether they have higher or lower values on self-reported TPACK. There were significant differences for all nine ways that teachers integrate technology. Table 4 and Figure 11 depict these differences.

Table 4

Nature of technology integration for teachers of high and low TPACK

Integration method	Low/High	M	SD	p
1. I integrate activities that utilize technology into the curriculum.	Low	2.76	.61	<.001
	High	3.27	.45	<.001
2. Technology uses supports content learning in my classroom.	Low	2.83	.67	<.001

	High	3.35	.48	<.001
3. Students work collaboratively on technology-based activities in my classroom.	Low	2.58	.79	<.01
	High	2.98	.70	<.01
4. I locate and evaluate educational technologies including software, hardware, and online resources that students use in my classroom.	Low	2.55	.69	<.01
	High	2.98	.70	<.01
5. I require students to use a variety of software tools and digital resources to support their learning.	Low	2.35	.78	<.001
	High	2.81	.53	<.001
6. I use technology to support project-based learning activities in my classroom.	Low	2.49	.74	<.001
	High	2.96	.62	<.001
7. I use technology to help me meet the individual needs of a variety of students in my classroom.	Low	2.53	.66	<.001
	High	3.15	.55	<.001
8. My students use technology to demonstrate their knowledge of content in non-traditional ways.	Low	2.42	.79	<.01
	High	2.90	.69	<.01
9. I use technology and its unique capabilities to design new learning experiences for students.	Low	2.56	.81	<.001
	High	3.13	.49	<.001

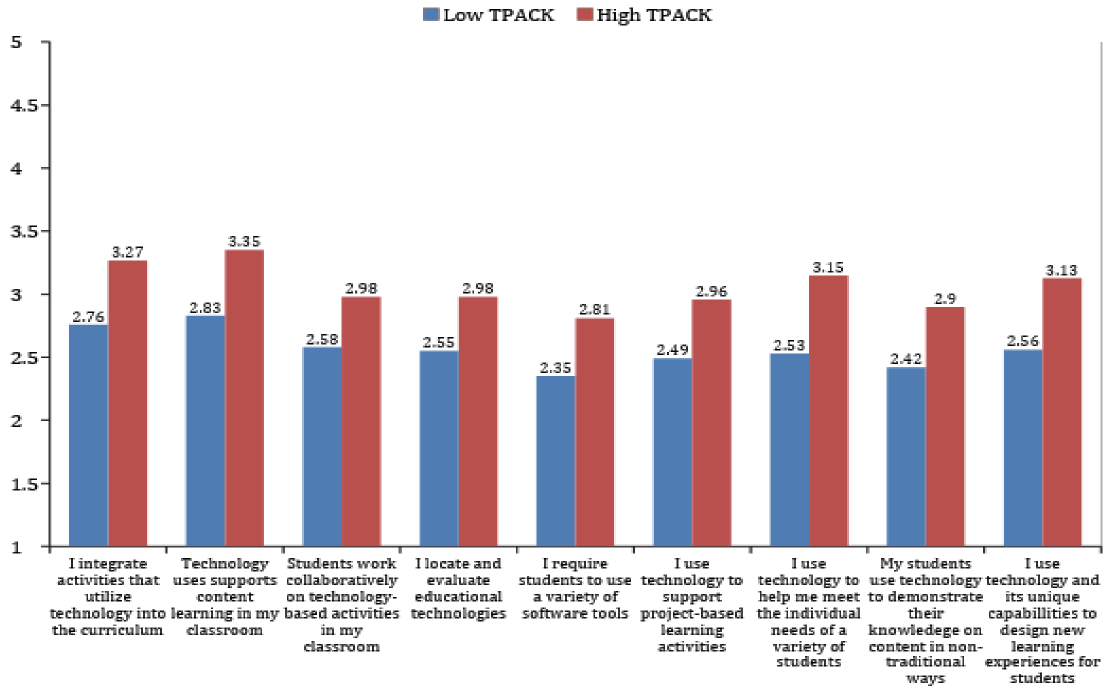

Figure 11. *Nature of technology integration for teachers of high and low TPACK*

Research Question 4

Is there a discrepancy between the levels of TPACK of general and Judaic studies teachers?

A one-way ANOVA was conducted to determine whether there was a difference between teachers who taught general studies versus Judaic studies and their levels of self-reported TPACK. General studies subjects included English, math, science, history, foreign language, and general studies (elementary). No significant differences of self-reported TPACK were found when contrasting general and Judaic studies teachers.

In addition, a one-way ANCOVA was conducted to determine whether there were differences in the overall TPACK score based on the subject area of the respondent (i.e. Judaic, general or both), while controlling for the overall approach of the school toward educational technology. The teachers were allowed to choose the overall approach of their school in regards to the centrality of educational technology by the frequency of the use. The overall model was not significant, $F((2,95)=1.54$, $p=.06$, *ns*. Although there was a significant difference in the TPACK scores of teachers based on the approach of the school the teacher taught at, there was no difference based on whether the teacher taught general or Judaic studies.

Research Question 5

Which of the surveyed variables is the best predictor of high levels of self-reported TPACK?

A multiple regression was conducted to determine whether technological knowledge, pedagogical knowledge, content knowledge, and technological pedagogical knowledge predict overall TPACK scores. The overall model was significant, R2=.78, F(6,98)=59.43, p<.001, such that 78% of the variance of TPACK can be explained by the combination of technological knowledge, pedagogical knowledge, content knowledge, pedagogical content knowledge, technological content knowledge, and technological pedagogical knowledge. The strongest significant predictor was technological pedagogical knowledge (p<.001). The next strongest significant predictor was technological content knowledge (p<.05).

An additional multiple regression was conducted to determine whether a combination of time spent in-service professional development, pre-service teacher training, nature of teacher technology integration, nature of student technology use, years served as a teacher, gender, grade level, subject area (general versus Judaic studies) and level of education predict total self-reported TPACK levels. The overall model was significant, $R^2=.60$, $F(10,70)=10.56$, $p<.001$. Sixty percent of the variance of TPACK levels can be explained by the combination of the above variables. The strongest significant predictor was the nature of technology integration ($p<.001$) followed by time spent in professional development ($p<.01$).

CHAPTER 6

ANALYSIS OF RESULTS & RECOMMENDATIONS FOR PRACTICE

Demographics

As mentioned above, nearly every demographic variable showed no significant correlation with TPACK among the respondents, except for overall approach of school to technology, which had a positive correlation. This echoes Tweed's (2012) findings, as her study found no connection between demographic factors such as teacher age, teaching experience, and gender and classroom technology use. Mueller et al. (2008), in their study of the variables that differentiate teachers with strong technology integration from those with limited integration skills, found no differences based on demographic variables, which included gender and years of teaching experience. Similarly, Koh, Chai, and Tsai (2010) found minimal correlations between TPACK perceptions and teacher age, although they found that male teachers reported themselves as having higher TPACK than females.

It is interesting that none of the above mentioned studies, along with the current study, report any significant discrepancy between beginning teachers and veteran, experienced teachers. It would seem to be reasonable to assume that newer teachers would have stronger TPACK and technology integration given their extensive personal experience with technology, having grown up with it. To address this question, Mueller et al. (2008) note that beginning teachers may be categorized as what Bitan-Friedlander, Dreyfus, and Milgrom (2004) refer to as “worried” teachers, implying that due to their limited experience, they are hesitant to incorporate new innovations as they are already expounding their energies towards teaching fundamentals, such as communication with students and classroom management. Conversely, as more experienced teachers generally have a stronger handle on the basics of teaching, they have the ability to focus on innovative pursuits and the incorporation of technology.

Self-Reported TPACK of Teachers in Modern Orthodox Jewish Day Schools

The data derived from the TPACK section of the survey is positive and encouraging. Generally, teachers in Modern Orthodox Jewish day schools perceive themselves as having strong levels of TPACK and are confident in their abilities to integrate technology in teaching their subject areas (see Appendix F). It is worthwhile to note that since no teacher was required to complete the survey, it is certainly plausible that teachers who are weak in TPACK and technology integration may have chosen not to fill out the survey. This, in theory, could lead to inflated TPACK scores.

Other quantitative TPACK studies have shown similar results, in that respondents tend to report high levels of TPACK (Luik, Taimalu, & Suviste, 2018). In measuring the TPACK of Singaporean pre-service teachers, Koh, Chai, and Tsai (2010) found that respondents rated themselves slightly above average for each knowledge domain. Kazu and Erten (2014) found high levels of TPACK self-efficacy in their survey of nearly three hundred teachers in Turkey.

These findings have practical implications, as self-efficacy with regards to technology is correlated with actual teaching practice using technology (Anderson, Groulx, & Maninger, 2011). This notion is further supported by Chen (2010), who studied a number of different factors related to teacher technology integration, and found that self-efficacy was the strongest determinant of technology use. In discussing the concept of TPACK, one Jewish day school teacher noted that although she had never heard of the framework, she found it “very intuitive, as

I don't use technology the same way in teaching different subjects." This is reflective of the notion that teachers who are adept at technology use are able to weave the different knowledge domains in formulating technology-enhanced lessons.

No discrepancy in self-reported TPACK was found between general and Judaic studies teachers, even when controlled for overall approach of school to technology. It would seem feasible to suggest that Judaic studies teachers might lag behind their general studies counterparts in TPACK, as the research and literature for technology integration in general studies has grown exponentially over the past few decades, whereas research regarding technology for Judaic studies is still a budding field. This parity can be attributed to the significant strides made by Jewish educators, researchers, and philanthropists to modernize the Jewish day school network by incorporating twenty-first century learning and integrating technology. As mentioned above, the Jewish educational world is replete with non-profit organizations, subsidies/grants, and training initiatives to further the use of technology in teaching Judaic studies. The current study has shown that these efforts have borne fruit, at the very least in the self-efficacy of teachers towards their TPACK.

Teachers in Modern Orthodox Jewish day schools feel more confident in their pedagogical and content knowledge when compared to their technological knowledge. This pattern was present throughout the data compiled regarding the TPACK knowledge domains. Technological pedagogical knowledge (TPK) and technological pedagogical content knowledge (TPACK) received the lowest weighted averages among all the TPACK knowledge domains (See Appendix F). Respondents rated themselves as more proficient in all the non-technological domains when compared to any domain containing technology. It is evident from these results that teachers in Modern Orthodox Jewish day schools feel more confident about their knowledge of teaching without technology, compared to their knowledge of teaching with it. This is not to say that teachers in Modern Orthodox day schools do not have the knowledge to integrate technology effectively. As teachers have been raised and taught in traditional learning environments, with many being trained as teachers in similarly traditional settings, it is no surprise that pedagogical methods without technology come more naturally. Ertmer (2005) echoes this sentiment, expressing that teachers may be hesitant to utilize technology due to their limited opportunities to experience, or even observe, technology integration in their own K-12 education.

Pre-Service Teacher Training

The current study was able to pick up a positive correlation between those teachers with positive pre-service teacher training experiences and self-reported TPACK. Similarly, a number of studies have found a correlation between pre-service teacher training and technology integration. Franklin (2007) found that teacher training and preparation were integral components of effective technology integration. Hoy and Spero (2005) note that teachers' self-efficacy towards technology increased over the duration of the student teaching component of a teacher education program. In studying the effects of a science-methods course, Flores (2015) reported a significant increase in participants' self-efficacy. In addition, the current study found that teachers with more years of experience reported lower scores on the pre-service teacher training items. This is likely due to such teachers having conducted their pre-service teacher training at the beginning of their careers, when the technologies and methodologies of integration were much different than they exist today.

Specific characteristics of pre-service teacher training programs geared towards inculcating technology usage can increase the efficacy of such programs towards technology integration (e.g. Brown & Warschauer, 2006). In particular, data from the current study found that pre-service training programs with the following traits were most correlated with higher levels of self-reported TPACK: 1) faculty who model technology integration; 2) opportunities to practice creating learning activities using technology; and 3) programs that encourage student reflection. In discussing these areas for improvement with a Jewish day school mathematics teacher with experience in graduate coursework in education, she concurred, and noted that in her coursework:

> We focused on both software and websites that could be used to manipulate ideas, shapes, and equations in order to better understand them. The faculty taught you how to use them and how to teach the students how to use them. Some of my assignments were to come up with lesson plans using specific pieces of technology - both hardware and software.

The opportunity, and requirement, to directly practice with technology, guided by faculty members, cemented this teacher's ability to integrate technology.

Although the correlation between pre-service teacher training and TPACK is significant and has a number of practical implications, it is apparent from the survey results that on a broad level, teachers at Modern Orthodox Jewish day schools do not feel that their pre-service teacher training aided in their TPACK growth and adequately prepared them for effective technology integration (see Appendix G). Barely twenty percent of respondents felt that they had appropriate opportunities to practice creating learning activities with technology. Until pre-service training programs include technology in all courses, specific technology courses should promote collaborative, student engagement with technology toward addressing curricular challenges (Brown & Warschauer, 2006).

Only a small percentage of respondents felt that faculty members modeled effective technology integration. Approximately seventy percent of the respondents felt that they did not have access to expert guidance regarding technology, which might seem odd given that technology courses are ubiquitous within teacher training programs, and presumably all are taught by someone knowledgeable in the field. However, studies have shown that pre-service teachers have reported insufficient access to technological experts (Brown & Warschauer, 2006). Cuhadar (2018) found that pre-service teachers do not view their professors as role models in regards to technology integration. In conversing on this topic, a Judaic Studies teacher emphasized the positive effects of modeling by professors, and noted that the most meaningful instances of instruction were the "times where my professors demonstrated the skills they were teaching us through the lens of technology. Sometimes the goal was specifically about technology. Sometimes they were teaching about classroom management, and they would use technology to demonstrate their point." Just as dynamic and creative teachers can have long term effects on their students, faculty members at institutions of higher education have the same potential, and can inspire a generation of future teachers to integrate technology to enrich learning experiences.

What is interesting to note from the findings is that teachers in Modern Orthodox Jewish day schools reported high levels of TPACK *despite* the perceived low-quality of the technology training provided by their pre-service teacher training programs. Teachers in Modern Orthodox Jewish day schools are clearly confident in their TPACK, but it seems likely that pre-service teacher training programs are not the source of this knowledge nor of the technology integration skills that they possess. This is unfortunate, as studies have shown that pre-service training programs and technology integration courses have the ability to enhance teacher technology integration (e.g. Hammond et al., 2009). In addition, Chai, Koh, and Tsai (2010) warn that a failure to adequately prepare teachers may result in teachers' ultimately forgoing the use of technology in their teaching.

As mentioned above, the once prevalent stand-alone technology course may no longer suffice in preparing pre-service teachers for technology integration. Gao, Choy, Wong, and Wu (2009) note that:

> The solution to the lack of innovative use of ICT by preservice teachers lies not in more courses and standalone workshops, but in a sustained program in which preservice teachers can learn how to integrate technology into teaching and learning from observing, interacting with, and receiving targeted feedback. (p. 726)

Undergraduate and graduate programs may benefit from an integrated curricular format in which technology integration is discussed and imbued in all coursework and fieldwork (Hughes, 2013). In addition, students must be given opportunities for hands-on experiences with technology, guided by expert faculty who can serve as role models (Brenner & Brill, 2016). Anderson, Groulx, and Maninger (2011) stress this suggestion, adding that limited experiences with technology can hinder the self-efficacy of pre-service teachers. Lastly, it is critical that pre-service teacher training programs provide content-specific instruction and guidance to students of teaching (Hughes, 2013). Including content-specific instruction for technology integration can be the difference between building the TPACK of pre-service teachers instead of the technological pedagogical knowledge (TPK), a significant difference. This should not be done with isolated efforts; rather, teacher training programs should develop technology plans to create and express a vision for technology-related training (Goktas, Yildirim, & Yildirim, 2009).

The training of dynamic, incoming teachers that are knowledgeable in the use of technology for their specific content areas would be a tremendous asset for Modern Orthodox Jewish day schools, and would aid significantly in the shift towards technology-enhanced and student-centered learning. However, this presents a significant challenge, as Modern Orthodox Jewish day schools do not play any role in the pre-service training of their teachers, nor do they have the time or resources to do so. Thus, it is imperative that institutions of higher education that train teachers for Jewish day schools assess their programs to ensure that their graduates have the requisite knowledge and skills to utilize technology effectively. Jewish day schools must place their emphasis on professional development opportunities that promote technology integration among their teachers.

In-Service Professional Development

The current study has found a clear, positive correlation between hours of participation in professional development and self-reported TPACK among teachers in Modern Orthodox Jewish day schools. In addition, respondents that reported attending professional development opportunities for the use of specialized or specific technology, educational software, and for the integration of technology into the curriculum self-reported higher levels of TPACK. This is significant, as it indicates that among the many surveyed items, these three are most important towards building TPACK self-efficacy.

Survey data showed correlations between self-reported TPACK and a number of individual items pertaining to professional development. Having professional development opportunities that applied to the technologies that are available to teachers at their schools was correlated with self-reported TPACK. A correlation between the availability of such opportunities at convenient times and places with self-reported TPACK suggests that Jewish day schools must make special efforts to ensure that these opportunities are accessible to teachers. Overall, Modern Orthodox Jewish day schools must continue to offer meaningful and relevant professional development opportunities regarding technology in order to develop TPACK and technology integration skills in their teachers.

Aggregate survey results (see Appendix H) showed that approximately seventy-five percent of respondents report that their schools offer professional development opportunities for "specialized or specific technology devices" such as iPads, Chromebooks, and interactive whiteboards. Although it would have been ideal to have separate survey items for each of these types of technology, the responses for this item indicate that Jewish day schools are targeting technological devices with their professional development efforts, and that approximately fifty-percent of teachers do participate in such opportunities. The level of participation drops when respondents were asked about professional development opportunities for use of internet, general computer use, and telecommunication devices and software. It is possible that such opportunities are not offered due the general population's frequent engagement with computers and mobile devices for personal use. Thus, schools may not feel a need to offer training for basic internet and computer usage. Given their centrality in a technology-enhanced classroom, and often as part of the broader school community, it is surprising that fifty percent of the respondents either did not know about or did not have access to training for learning management systems. This may indicate that Modern Orthodox Jewish day schools do not offer enough learning opportunities about their LMS, or, alternatively, they may allow their teachers to select their own LMS for classroom use, thereby not providing formal training opportunities.

Although the current study found that Modern Orthodox Jewish day schools are providing their teachers with professional development opportunities, only thirty percent of the respondents felt that these opportunities met their professional learning goals and needs. This is in line with other studies in the field. In a survey of 126 K-12 teachers, An and Reigeluth (2012) found that many teachers perceive professional development opportunities regarding technology to be lacking. In order to improve, they found that these development programs should: 1) include “opportunities for hands on practice” (p. 60); 2) be specific to a particular content area; and 3) instead of merely talking, facilitators should demonstrate and show exactly how to create lessons that are improved through the use of technology.

In addition, An and Reigeluth (2012) suggest that professional development programs (as well as the relevant pre-service teacher courses) must adequately connect content, pedagogy, and technology as portrayed in the TPACK framework. To focus primarily on the technological aspect, without the appropriate attention given to content and pedagogy dilutes the potential of the technology and can limit its benefits entirely. Capturing the sentiment of many teachers, An and Reigeluth wittingly note that at professional development programs “teachers learn about ‘cool’ stuff, but they still have difficulty applying it for their students learning” (p. 60).

Educational researchers offer a number of important suggestions to ensure that professional development opportunities are successful in promoting technology integration. Mueller et al. (2008) add that training for technology use must be “very specific, task-relevant, and classroom-applicable” (p. 1532). Teachers’ technology integration is “a multifaceted and complex behavior” (Russell et al., 2003, p. 307). As such, professional development opportunities must be thoughtful, considerate and reflective of teacher knowledge, attitudes, and skills. Saudelli and Ciampa (2016) suggest the creation of learning communities within a school to allow for collaboration and discussion among teachers. While emphasis on skills and knowledge is undoubtedly important, schools must also pay attention to teacher attitudes and beliefs, which studies show are also significant predictors of teacher technology integration (e.g. Ravitz, Becker, & Wong, 1999). The need for personal, active experiences with technology as described above, will not only aid in developing technology integration skills, but can also lead to belief change among teachers (Ertmer, 2005).

In discussing the professional development opportunities offered at Jewish day schools, teachers expressed that oftentimes the most valuable learning takes place by observing other teachers, and not through any formal initiative provided by the school. One teacher noted that:

> The most beneficial professional development I've had was sitting in another teacher's classroom and watching how they do something - sitting during a live lesson and observing both the teacher and the students use the technology. I wish we had more time for that.

Another teacher noted that formal professional development opportunities have "never been meaningful. The best way to learn about technology is to do it organically - when it comes from people who are doing it on the ground, from people who are already incorporating it." Given the time constraints of teachers, and that teachers may be already involved in collaborative, observation-based professional development models such as lesson study (Coenders & Verhoef, 2018), promoting teachers to observe one another would be a simple yet powerful way to promote technology integration in Jewish day schools.

Similarly, one teacher pointed out time constraints prevented her from learning about new technologies during the school year, pointing out that:

> There is so much development going on continuously that it's almost a full time job in itself to stay on top of it… If I don't learn [about a new technology] over the summer, it's not getting in during the school year because it's too hectic.

Jewish day schools should provide learning opportunities for technology over the summer, as well as ensure that professional development programs offered during the year take place at ideal times to promote teacher attendance.

In fostering TPACK growth and technology integration among faculty members, Jewish day schools must offer relevant and subject-specific professional development opportunities regarding technology. The current study reaffirms the importance of professional development towards technology integration as a means towards better student learning. Whereas pre-service teacher training takes place outside of the realm of K-12 Jewish day schools, professional development opportunities can serve as a most important conduit through which Jewish day schools can build TPACK and technology integration in their faculty members. It is essential, then, that these opportunities be tailor-made to promote TPACK and content-area specific technological skills.

Nature of Technology Integration

It is evident from the results of the current study that teachers with higher levels of TPACK self-efficacy report integrating technology in notably different ways when compared to teachers with lower levels of TPACK self-efficacy. The survey results indicated a few noteworthy conclusions regarding teacher technology integration in Modern Orthodox Jewish day schools (see Appendix I). A minority of teachers have students utilize technology to create podcasts, develop podcasts, and engage in computer-assisted learning. Technology use is far more prevalent for student use in project-based learning and collaborative learning opportunities.

Although these results are not a formal, objective assessment of actual technology integration practices, it is nonetheless significant, as these results are in line with the studies that report correlations between TPACK self-efficacy and technology integration (e.g. Anderson, Groulx, & Maninger, 2011; Chen, 2010; Keser, Yilmaz, & Yilmaz, 2015; Nathan, 2009). Mishne (2012) conducted an analysis of factors that predicted technology use, and found that higher levels of TPACK were correlated with higher frequency and proficiency in technology use. Abbitt (2011) notes that the TPACK model can be used as a guide to enhance self-efficacy beliefs towards technology integration. Specifically, his research found that improvements in any of the domains in which technology blends with content or pedagogy (i.e. TCK, TPK, and TPACK) led to increased self-efficacy towards technology integration.

It should be noted that there may be additional considerations regarding technology integration that are specific to Modern Orthodox Jewish day schools. In discussing why she limits her use of technology, one math teacher explained:

> In practice, it is difficult to have the time to allow the students to do exploratory activities [with technology]. When I taught in public school, it was a 1:1 school, every student had a Chromebook... I had much more time during my actual lessons. I had twenty five minutes to explore some idea, and I could also do a fifteen minute mini-lesson and have time left to conclude and assess. Whereas now, I have forty minutes instead of fifty-five, and I meet with my classes much less than I did with the public school students. Quantifiably, I had at least an extra thirty five hours over the course of the year. This is a

> massive disadvantage to being in the Yeshiva world. Exploratory activities [with technology] get cut.

This teacher appears to have the requisite knowledge and skills to integrate technology, but chooses not to do so due to daily time constraints as well as limited teaching hours over the course of the year. Jewish day schools need to be conscientious of this factor, and provide training for technologies can be utilized quickly and seamlessly to ensure that class time is preserved.

These findings suggest that promoting the development of TPACK among teachers in Modern Orthodox Jewish day school teachers is a very worthwhile endeavor, and can have practical ramifications for technology integration. As mentioned above, TPACK can be developed via the integration of the framework into pre-service teacher training programs and in-service professional development opportunities. As teachers begin to consider the interplay of content, pedagogy, and technology as they develop their lessons and classroom activities, the integration of technology can become more accessible and prevalent in the classroom.

Strongest Predictor of Self-Reported TPACK

The results of the current study indicate that the nature of technology integration serves the strongest predictor of self-reported teacher TPACK, with time spent in professional development being the second strongest predictor. Within the TPACK framework itself, technological pedagogical knowledge (TPK) was the strongest predictor of TPACK, followed by technological content knowledge (TCK). While it is reasonable for TPK and TPACK to be closely related, it is more interesting that TCK came up as a close predictor of TPACK, particularly because Lux et al. (2011) notes that:

> …it might be challenging or impossible for a pre-service teacher to accurately assess their technological content knowledge (TCK) without being influenced by their pedagogical knowledge (PK)… In other words, a pre-service teacher might simply not have sufficient opportunities to think about and consider technology and content without contemplating how it is influenced by pedagogy. (p. 427)

Although the current study surveyed in-service teachers as opposed to pre-service teachers, it is evident that TCK is often difficult to conceptualize. It's appearance as a strong predictor of TPACK indicates that teachers in Modern Orthodox Jewish day schools have had opportunities to reflect on their technology in regards to its implications for their course content.

It is further perplexing to suggest that teacher technology integration can serve as a predictor of TPACK, as it seems more logical that the reverse would be more accurate. That is to say, TPACK (or TPACK self-efficacy) should serve as a predictor of a notably different nature of technology integration. It would make sense that having a stronger knowledge in a given area would predict better practice in that area. Interestingly, Mueller et al. (2008) suggests that this is exactly the point: "actual classroom success with computer technology is a prerequisite or catalyst for the integration of computers as an instructional tool" (p. 1532). Teachers need to "dive in" and begin using technology in their classrooms - doing so will aid in building the confidence and skills that teachers need in order to fully incorporate technology in their repository of instructional tools. Referring to educational change proposals, Doyle and Ponder (1978) express that "only after teachers have experienced the innovation in the actual classroom setting - that is, have translated the proposal into concrete procedures - does any full sense of understanding result" (p. 7). Similarly, Gao, Choy, Wong, and Wu (2009) point out that teachers develop technology-based pedagogical practices from trial and error experiences in their own teaching experiences.

Other studies have found different factors that suggest strong and more robust technology integration from teachers. Mueller et al. (2008) surveyed elementary and secondary school teachers to uncover what qualities and variables differentiate teachers that integrate computers into their teaching from those who do so in a limited fashion. Their findings point to experience with computer technology and personal attitudes towards technology as the strongest predictors of computer usage. Interestingly, they note that a majority of the factors that predict computer usage by teachers in the classroom are technologically-based factors, such as comfort with technology and higher frequency of computer use.

The current study reflects these findings in that the strongest predictors of self-reported TPACK within the framework itself were technological pedagogical knowledge (TPK) and technological content knowledge (TCK). This suggests that teachers must have the ability to link the technology they have at their disposal to both their course content and their pedagogical skills. Doing so can serve as a preliminary step towards building TPACK and ultimately towards successful technology integration.

It is important for Modern Orthodox Jewish day schools to emphasize relevant professional development and look out for notable instances of technology integration, as suggested by the results of the present study. However, promoting teacher technology integration and creating a broader culture of effective technology use requires more than a few professional development offerings, even if they are content-specific and hands-on, as described above. Teachers must see and feel the benefits of technology in the classroom, and witness first-hand as a technology provides a heretofore impossible learning experience. The key to success may even be as simple as guiding teachers towards quick and simple successes with educational technology. Mueller et al. (2008) found that positive experiences and outcomes using technology directly bolstered teachers' self-confidence with technology and led to greater usage. Pittman and Gaines (2015) found that having positive experiences with technology was the most significant variable in distinguishing between strong and poor integrators of technology.

CHAPTER 7

LIMITATIONS & DIRECTIONS FOR FUTURE RESEARCH

Limitations of the Current Study

The present study has gathered valuable information as to how teachers at Modern Orthodox Jewish day schools perceive their own TPACK, as well as informative data on their in-service professional development, pre-service teacher training, and the nature of their technology integration. Although pursuing data regarding all of these different variables was a lofty and noble objective, it came at the cost of depth and deeper understandings of any one of the given variables.

As an example, it can be inferred from the data that teachers at Modern Orthodox Jewish day schools do not feel that their pre-service teacher training programs prepared them to integrate technology in the classroom. While this is valuable information in it of itself, it would be even more valuable if the research instrument requested further details about the respondent's pre-service teacher training experience, to ascertain the reasoning of the response. This was not possible in the current study due to the already lengthy nature of the survey and the broad scope of the research. Had the study focused on one variable, and possibly included a qualitative component, the study could have provided targeted and direct feedback to allow Jewish day schools (or institutions of higher education) to immediately address specified areas of improvement. The current study is limited in that it can only speculate the reasons for the results, and provide general recommendations for improvement.

Further, in an effort to decrease the length of the survey in promoting broader participation, the survey instruments was constructed in such a way that multiple questions were oftentimes grouped into one survey item. This diluted survey results and eliminated certain opportunities for specificity in the results. As an example, the following item was utilized in the TPACK section of the survey: “I am able to utilize teaching methods that use technology to help students learn content and provide them with opportunities to interact with ideas.” Included in this item are two distinct skills: 1) using technology to help students learn content, and 2) using technology to help students interact with ideas. Suppose a respondent finds one skill to be a strength, and the other a weakness? Great care must be made when writing survey items to be sure they only seek to measure one trait, otherwise, the impact of the survey will be mitigated.

Given that the current study was based around the TPACK framework, it would have been ideal if some survey items on professional development and pre-service teacher training sought to determine whether content, pedagogy, and technology were connected in these initiatives and programs. Although from the literature it seems that the TPACK framework has thus far played a limited role in guiding teacher training and learning, it would have been informative to see if TPACK has permeated such opportunities, even if unintentionally.

Despite the value in collecting data on teachers’ self-reported TPACK, this information would be all the more valuable if it could be compared and contrasted with other teacher populations. The current nature of TPACK self-efficacy research is such that an array of different research instruments are used, even for studies that assess TPACK across all content areas. Therefore, the only way to compare results would be to use the exact same survey instrument as employed by another study. Other practical considerations of research, such as sample size, demographics, and other cultural aspects, may further encumber such comparisons.

Directions for Future Research

TPACK

As mentioned above, the nature of the current study as “self-reporting” (comparable to the majority of TPACK surveys) has an inherent flaw - a teacher’s self-perception may not represent actual classroom practice (Mishne, 2012). As such, developing some sort of objective TPACK “exam” may be helpful, although would be quite difficult to produce, due to the multitude of educational contexts and the ever-developing nature of technology. Perhaps creating different subtests for different technologies and content areas would allay this concern to some degree. Drummond and Sweeney (2017) felt that adding an objective component to relevant studies could prove beneficial in portraying actual depictions of pre-service teacher TPACK.

While the goal of the current study was to assess the broader system of Modern Orthodox Jewish days schools, it may be more beneficial for a given school to assess the TPACK of its own faculty directly, with an added emphasis on professional development experiences. This will allow school leaders to learn about the specific areas in which its faculty require additional support, and thus allow for targeted interventions. With the goal of collecting constructive data to enhance professional development and provide support to teachers, it is suggested that surveys and other data collection formats retain the anonymity of the teachers, thus allowing for more authentic results.

In focusing on Modern Orthodox Jewish day schools, the current study naturally omits a vast number of Jewish day schools – including community (non-denominational) schools, Solomon Schechter (Conservative) day schools, and Haredi (Ultra-Orthodox) schools. While community day schools and Solomon Schechter day schools share many cultural aspects with Modern Orthodox day schools, Haredi schools would be of particular interest for future research given their uniquely insular culture and generally negative attitude towards technology. Studies exploring Haredi schools may provide new insights that could enhance the current understandings of technology in Judaic settings.

Pre-Service Teacher Training

It is evident from the current study that future research should be devoted to exploring the efficacy of pre-service teacher training programs in teaching technology integration and TPACK to pre-service teachers. As every institution has its own curricula, courses and instructors, it would be ideal for each individual institution to conduct its own assessments to determine areas for improvement and appropriate remediations. Institutions of higher education that train Judaic studies teachers should take the necessary steps to ensure they are preparing teachers to integrate technology in Judaic studies courses.

It is difficult to understand the place of technology in pre-service teacher training programs without studying the broader context and culture of such programs. Although not within the scope of the current study, it is plausible to suggest that pre-service teacher training programs may be lacking in additional areas other than technology. It is also possible that pre-service teacher training programs place too much of an emphasis on educational theories and philosophies. Perhaps the training in educational technologies that is provided becomes obsolete or irrelevant by the time pre-service teachers enter their teaching positions. This could be addressed by formulating practical concepts regarding technology integration that can be implemented even as technologies advance and develop. Institutions training teachers would be served well by future research exploring these notions in greater detail.

In-Service Professional Development

As the significance of TPACK towards technology integration has been established, it would be quite valuable to assess different programs, sessions, and training initiatives in regards to their facilitation of TPACK in the Jewish day school setting. Jewish day schools may benefit from conducting surveys before and after a professional development program to determine its efficiency. A number of studies have utilized the TPACK framework for such assessments, particularly programs encouraging teachers to design lessons utilizing technology (Chai, Koh, & Tsai, 2013).

With the vast amount of content available to teachers on the web, individual research, online forums, and listservs can serve as important resources for professional growth. Oftentimes, teachers may learn about new technologies, and their relevance to their content areas, from their own, personal research online. While Facebook groups, Twitter feeds, and Instagram handles are often perceived as “social” in nature, they frequently serve as platforms for teachers to share their ideas and innovations with the broader educational community. Therefore, it is plausible that teachers in Modern Orthodox Jewish day schools learn independently and casually about using technology in their classrooms in a variety of online formats. In discussing the most effective ways to learn about technology, one teacher reported that she:

> follow[s] math teachers on Twitter who are regularly showing new technologies… and ways that they use them in the classroom. I am part of AP teacher communities - multiple times a day I’m learning from other teachers. I get an [email] digest every day.

Thus, when studying technology integration and its correlates, it may be worthwhile to explore the independent efforts of teachers. As teachers are able to direct and focus their attention on personalities and platforms that suit their needs and content areas, it is very possible that teachers find this type of learning to be more effective than formal professional development opportunities. It would be interesting to explore how and when teachers engage in this type of development, and its ramifications for technology integration and TPACK. Future studies on professional development in regards to technology may benefit from exploring this area further.

School Culture & Leadership

The current study found that school approach to educational technology was correlated with self-reported TPACK. This is reflective of the significance of school culture towards teacher technology integration. Future studies would benefit by exploring the different factors that promote positive cultures of technology integration. In addition, studying the role of school leaders and administrators in the development of such cultures would guide Jewish day school leadership in taking the best actions to support their teachers in their technology integration practices.

Despite its significance towards ICT integration, many researchers neglect to place emphasis on school culture when determining the necessary factors for ICT integration (Tezci, 2011). Those that have studied the systematic orientation of ICT integration have found a number of important strategies and practical recommendations. Effective educational leaders must serve as the “architects” of their school cultures. This includes facilitating a vision for the school culture, and building a leadership team and school community that shares this vision (Bennett & Department for Education, 2017). Blau and Shamir-Inbal (2017) found a number of important predictors of positive ICT culture in schools, including teacher use of ICT in lessons, use of technology to enhance pedagogy, and the digital competence of teachers. In examining school policies with regard to ICT integration, Tondeur, van Keer, van Braak, and Vackle (2008) noticed that having a formal policy regarding ICT goals resulted in teachers using ICT in the classroom. Additionally, they found that teachers’ attendance in professional development trainings, school-provided ICT support, and student to computer ratio to be significant.

With the additional component of Judaic studies learning, Jewish day schools require unique strategies for the creation of school-wide cultures of ICT integration. Future research exploring the creation of such cultures in Jewish day schools would be highly beneficial towards the objective of utilizing technology for the purpose of higher quality instruction and learning.

Nature of Technology Integration

Future research would serve Jewish day schools well by studying whether teachers use technology to engage in learner-centered teaching or in teacher-centered teaching. Given technology’s tremendous potential to promote constructivist learning and the paradigm shift toward the learner-centered paradigm, such research would be all the more significant.

In furthering this objective, Jewish day schools would benefit from the creation of either a digital or printed resource that lists, models, and describes the uses of different technological tools in difference content areas. For example, users could view the ways in which Judaic studies teachers have used Chromebooks in teaching different Talmudic topics, or how social studies teachers use certain iPad applications to teach about the Civil War. This resource can be digital in nature, and could be built by contributions from teachers nationally. While this could be done on a macro level for the benefit of all Jewish day schools, individual schools may choose to compile their own methods and best practices which will undoubtedly enhance school culture towards technology.

Such a resource would be particularly beneficial for Judaic Studies teachers. Voogt et al. (2012) explain that if TPACK is serving as a framework for the knowledge required to teach with technology, “we need to better understand what that knowledge base is for specific subject domains” (p. 12). Given the limited attention given to Judaic studies in educational research in comparison with all of the secular subjects, it is all the more important that this particular knowledge (that is, the knowledge for teaching Judaic studies with technology) be explored and detailed. As one Judaic Studies teacher noted:

> I would want to integrate technology in my Judaic classes - there is a need to make things exciting and bring things to life. There are certain tools out there that are specifically geared to general studies, but there are not as many tools when teaching Bible or Talmud.

Not only do Judaic studies teachers need to be given the technological tools to enhance Judaic instruction, but they must be shown, with actual examples and modeling, exactly how these tools can be utilized in their specific content areas.

Conclusion

The *Handbook of Technological Pedagogical Content Knowledge for Educators* (Herring, Koehler, & Mishra, 2016) begins with a quote from American politician John Eaton: “I think one of the greatest enemies in the use of technology, however, is the idea that if you use the technology you have to throw other things out of the window”.

It is evident that teachers at Modern Orthodox Jewish day schools are confident in their knowledge of integrating technology in their subject areas. Regardless of whether teachers are actually integrating technology, this finding is promising. However, the current study provides a crucial piece of advice for technology integration and its accompanying training: technology must always be considered in conjunction with content and pedagogy. Teachers of Modern Orthodox Jewish day schools are already thinking about their content, pedagogy, and technology, and how these domains interact with one another. Modern Orthodox Jewish day schools must take the steps to encourage teachers to connect these domains deeply and in ways that have meaningful effects on their teaching.

Although the findings of the current study are significant and contribute practical information to Jewish day schools, they serve as just the beginning of the process to explore the ways in which the potential of technology is actualized and utilized in Jewish day schools. Ideally, this work will inspire others to continue down this important path and delve into other relevant avenues, such as access to technology, school culture, the role of school leaders, and learner-centered education. Amassing a collection of data will provide Jewish day schools with the information needed to target specific areas that require attention for the effective integration of technology. As such, Jewish day schools will be able to use technology to prepare the new generation of students for advanced learning, broader community engagement, and twenty-first century life.

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APPENDIX A
Permission for Use of Survey Items

Permission for Survey

Snyder, Tom <Tom.Snyder@ed.gov>
To: Hal Levy <levy.hal@gmail.com>

Mon, Feb 26, 2018 at 12:41 PM

Hi Hal,

As a federal agency, the documents residing on the National Center for Education Statistics web site are considered to be in the public domain. Specifically, the survey questions appended to the report, *Teachers' Use of Educational Technology in U.S. Public Schools: 2009* are in the public domain. You should use this web citation in your references:

https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2010040

Thanks,

Tom Snyder

Director, Annual Reports and Information Staff

National Center for Education Statistics

U.S. Department of Education

Your Dissertation Survey

Avi Greene <greene@ehillel.org>
To: Hal Levy <levy.hal@gmail.com>

Fri, Feb 23, 2018 at 8:50 AM

Hal,

I'm happy to let you incorporate survey items that I used. Please share so that I can get a bit of nachas and let you know if I found anything else about those that might help you.

Rabbi Avi Greene
[Quoted text hidden]
--

Avi Greene
Director of Judaic Studies and Hebrew Language Grades 6-12
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TPACK Survey for Dissertation

Lux, Nicholas <nicholas.lux@montana.edu>
To: Hal Levy <levy.hal@gmail.com>

Fri, Feb 23, 2018 at 8:51 AM

Hi Hal,

Thanks for reaching out about your interest in the survey. Absolutely! Please feel free to use whatever items you see best fit. As you suggested, It would be great if you could source them back to me.

Regardless, good luck and I'd be thrilled to see the outcome so of your work. I was always interested in how some of those items might look in an in-service context. Please keep me posted!

Best,

Nick

—
Nicholas Lux
Associate Professor
Department of Education
Montana State University I PO Box 172880 I
Bozeman, MT 59717-2880
Email: nicholas.lux@montana.edu
Ph. 406-994-6581 I Fax 406-994-3261
[Quoted text hidden]

Use of TPACK Survey

Crawford, Denise A [SOE] <dschmidt@iastate.edu> Fri, Feb 23, 2018 at 10:08 AM
To: Hal Levy <levy.hal@gmail.com>

Hal,

Thank you for your interest in our TPACK survey. You have our permission to use the survey for your research. Sounds interesting!

Good luck!

Denise Crawford

Denise A. Schmidt-Crawford

Director and Associate Professor

Center for Technology in Learning and Teaching

School of Education

Iowa State University

0624A Lagomarcino Hall

515.294.9141

dschmidt@iastate.edu

TPACK Survey

CS Chai <ictchai12@gmail.com> Fri, Feb 23, 2018 at 7:56 AM
To: Hal Levy <levy.hal@gmail.com>

Sure. Go ahead. I have done a review of quantitative measure in the new 2016 handbook. You need to think about new dimension. I have also published a new survey in journal of educational computing research. Do consider those points.
[Quoted text hidden]

Technology Integration Survey

Aimee Brenner <abrenner@averett.edu> Mon, Jan 22, 2018 at 2:56 PM
To: Hal Levy <levy.hal@gmail.com>

Hello Mr. Levy,

Thank you for your email. Yes, it would be fine if you used the technology survey. Just throw me some credit somewhere. I also would be happy to speak with you over the phone. I will tell you that I am currently at a small, teaching university so I do not get to do a lot of research as part of my job. It's mostly action research. I'm not sure if that would be of any interest to you? I'm usually more free on Fridays, so let me know if you'd like to set a date/time?

Take care,

Aimee M. Brenner, Ph.D.
Assistant Professor of Education
Averett University, Danville, VA
Office: 108B Danville Hall
Phone: (434) 791-5048
Email: abrenner@averett.edu

APPENDIX B
Pool of Survey Items

Technology Knowledge

Schmidt et al. (2009):
I know how to solve my own technical problems.
I can learn technology easily.
I keep up with important new technologies.
I frequently play around the technology.
I know about a lot of different technologies.
I have the technical skills I need to use technology.

Chai, Koh, & Tsai (2011):
I am able to use social media (e.g. Blog, Wiki, Facebook).
I am able to use conferencing tools (Yahoo, IM, MSN .80 Messenger, ICQ, Skype etc).
I can learn technology easily.
I know how to solve my own technical problems when using technology.
I have the technical skills to use computers effectively.
I am able to create web pages.

Lux, Bangert, & Whittier (2011):
(Participants answered to what extent they agreed with… "My teacher education prepared me with…")
The skills and understanding to decide where technology can be detrimental to achieving an objective.
The skills and understanding to decide where technology can be beneficial to achieving an objective.
The understanding needed to recognize that technology may support and improve everyday life and that it may not.
The knowledge and skills to use technology to my everyday life.

Sahin (2011):
I have knowledge in:
Solving a technical problem with the computer
Knowing about basic computer hardware (ex., CD-Rom, mother-board, RAM) and their functions
Knowing about basic computer software (ex., Windows, Media Player) and their functions
Following recent computer technologies
Using a word-processor program (ex., MS Word)
Using an electronic spreadsheet program (ex., MS Excel)
Communicating through Internet tools (ex., e-mail, MSN Messenger)
Using a picture editing program (ex., Paint)

Using a presentation program (ex., MS Powerpoint)
Saving data into a digital medium (ex., Flash Card, CD, DVD)
Using area-specific software
Using printer
Using projector
Using scanner
Using digital camera

Proposed TK Items:

1. I keep up with important new technologies. (Schmidt et al.)
2. I can learn **how to use and operate new** technolog**ies** easily. (Schmidt et al.)
3. I know how to solve my own technical problems when using technology. (Chai)
4. I have a strong understanding of the functions, features, of a SMART Board and its corresponding Notebook software. (Brenner & Brill, 2016)
5. I have a strong understanding of the functions and features of an iPad, and how to operate one. (Brenner & Brill, 2016)
6. I know how to use digital media software (such as iMovie, Windows Movie Maker, Photo Story, etc.) to create videos and other digital content. (Brenner & Brill, 2016)
7. I know how to create presentations using software such as PowerPoint, Prezi, Google Slides, etc. with graphics, transitions, media, and hyperlinks. (Brenner & Brill, 2016)
8. I have the knowledge to use and operate a learning management system (LMS), such as Google Classroom, Moodle, Canvas, etc. (Brenner & Brill, 2016)
9. I have the knowledge to create text documents (i.e. on Microsoft Word or Google Docs) with the ability to adjust formatting, page set up, and insert media. (Brenner & Brill, 2016)
10. I have the knowledge to use the basic functions of a spreadsheet tool (e.g. Excel,
11. Google Docs, etc.) to create column headings and enter and manipulate data (Brenner & Brill, 2016)

Pedagogical Knowledge

Schmidt et al. (2009):
I know how to assess student performance in a classroom.
I can adapt my teaching based upon what students currently understand or do not understand.
I can adapt my teaching style to different learners.
I can assess student learning in multiple ways.
I can use a wide range of teaching approaches in a classroom setting.
I am familiar with common student understandings and misconceptions.
I know how to organize and maintain classroom management.

Chai, Koh, & Tsai (2011):
I am able to help my students to reflect on their learning strategies.
I am able to help my students to monitor their own learning.

I am able to guide my students to discuss effectively during group work.
I am able to guide my students to adopt appropriate learning strategies.
I am able to plan group activities for my students.
I am able to stretch my students' thinking by creating challenging tasks for them.

Proposed Pedagogical Knowledge Items:

1. I know how to assess student performance in a classroom. (Schmidt et al.)
2. I can adapt my teaching based upon what students currently understand or do not understand. (Schmidt et al.)
3. I can adapt my teaching style to different learners. (Schmidt et al.)
4. I can assess student learning in multiple ways. (Schmidt et al.)
5. I can use a wide range of teaching approaches in a classroom setting. (Schmidt et al.)
6. I am familiar with common student understandings and misconceptions. (Schmidt et al.)
7. I know how to organize and maintain classroom management. (Schmidt et al.)

Content Knowledge

Schmidt et al. (2009):
Mathematics
I have sufficient knowledge about mathematics.
I can use a mathematical way of thinking.
I have various ways and strategies of developing my understanding of mathematics.
Social Studies
I have sufficient knowledge about social studies.
I can use a historical way of thinking.
I have various ways and strategies of developing my understanding of social studies.
Science
I have sufficient knowledge about science.
I can use a scientific way of thinking.
I have various ways and strategies of developing my understanding of science.
Literacy
I have sufficient knowledge about literacy.
I can use a literary way of thinking.
I have various ways and strategies of developing my understanding of literacy.

Chai, Koh, & Tsai (2011):
I have sufficient knowledge about my first teaching subject.
I can think about the content of my first teaching subject like a subject matter expert.
I am able to develop deeper understanding about the content of my first teaching subject.

Proposed Content Knowledge Items

1. **I have sufficient knowledge about my primary teaching subject.** (based on Schmidt et al.)
2. I can think about the content of my first teaching subject like a subject matter expert. (Chai)
3. I am able to develop deeper understanding about the content of my first teaching subject. (Chai)

Pedagogical Content Knowledge (PCK)

Schmidt et al. (2009):
I can select effective teaching approaches to guide student thinking and learning in mathematics.
I can select effective teaching approaches to guide student thinking and learning in literacy.
I can select effective teaching approaches to guide student thinking and learning in science.
I can select effective teaching approaches to guide student thinking and learning in social studies.

Chai, Koh, & Tsai (2011):
Without using technology, I can help my students to understand the content knowledge of second teaching subject through various ways.
Without using technology, I know how to select effective teaching approaches to guide student thinking and learning in my second teaching subject.
Without using technology, I can help my students to understand the content knowledge of my first teaching subject through various ways.
Without using technology, I know how to select effective teaching approaches to guide student thinking and learning in my first teaching subject.

Lux, Bangert, & Whittier (2011):
(Participants answered to what extent they agreed with… "My teacher education prepared me with…")
The skills and methods needed to provide multiple representations of content in the form of analogies, examples, demonstrations, and classroom activities.
The strategies I will need to adapt material to students' abilities, prior knowledge, preconceptions, and misconceptions.
An understanding that there is a relationship between content and the teaching methods I use in the classroom.

Sahin (2011):
I have knowledge in...
Selecting appropriate and effective teaching strategies for my content area
Developing evaluation tests and surveys in my content area

Preparing a lesson plan including class/school-wide activities
Meeting objectives described in my lesson plan
Making connections among related subjects in my content area
Making connections between my content area and other related courses
Supporting subjects in my content area with outside (out-of-school) activities

Proposed PCK Items:

1. Without using technology, I know how to select effective teaching approaches to guide student thinking and learning in my teaching subject. (Chai, based on Schmidt)
2. I possess the skills and methods to provide multiple representations of content in the form of analogies, examples, demonstrations, and classroom activities. (Lux, Bangert, & Whittier, 2011)
3. I possess the strategies to adapt material to students' abilities, prior knowledge, preconceptions, and misconceptions. (Lux, Bangert, & Whittier, 2011)
4. I have the knowledge to select appropriate and effective teaching strategies for my content area. (Sahin, 2011)
5. I have the knowledge to develop evaluation tests and surveys in my content area. (Sahin, 2011)

Technological Content Knowledge

Schmidt (2009):
TCK (Technological Content Knowledge) (Schmidt)
30. I know about technologies that I can use for understanding and doing mathematics.
31. I know about technologies that I can use for understanding and doing literacy.
32. I know about technologies that I can use for understanding and doing science.
33. I know about technologies that I can use for understanding and doing social studies.

Chai, Koh, & Tsai (2011):
I know about the technologies that I have to use for the research of content of first teaching subject.
I know about the technologies that l have to use for the research of content of my second teaching subject.
I can use appropriate technologies (e.g. multimedia resources, simulation) to represent the content of my first teaching subject.
I can use appropriate technologies (e.g. multimedia resources, simulation) to represent the content of my second teaching subject.

Sahin (2011):
I have knowledge in...
Using area-specific computer applications.

Using technologies helping to reach course objectives easily in my lesson plan.
Preparing a lesson plan requiring use of instructional technologies.
Developing class activities and projects involving use of instructional technologies.

Proposed TCK items:

1. I can use appropriate technologies (e.g. multimedia resources, simulation) to represent the content of my teaching subject. (Chai)
2. I have knowledge in using content area-specific computer and web applications. (Sahin)

Technological Pedagogical Knowledge

Schmidt (2009):
34. I can choose technologies that enhance the teaching approaches for a lesson.
35. I can choose technologies that enhance students' learning for a lesson.
36. My teacher education program has caused me to think more deeply about how technology could influence the teaching approaches I use in my classroom.
37. I am thinking critically about how to use technology in my classroom.
38. I can adapt the use of the technologies that I am learning about to different teaching activities.
39. I can select technologies to use in my classroom that enhance what I teach, how I teach and what students learn.
40. I can use strategies that combine content, technologies and teaching approaches that I learned about in my coursework in my classroom.
41. I can provide leadership in helping others to coordinate the use of content, technologies and teaching approaches at my school and/or district.
42. I can choose technologies that enhance the content for a lesson.

Chai, Koh, & Tsai (2011):
I am able to facilitate my students to use technology to plan and monitor their own learning.
l am able to facilitate my students to use technology to construct different forms of knowledge representation.
I am able to facilitate my students to collaborate with each other using technology.

Lux, Bangert, & Whittier (2011):
(Participants answered to what extent they agreed with… “My teacher education prepared me with…”)
28. An understanding that in certain situations technology can be used to improve student learning.
23. An understanding of how teaching and learning change when particular technologies are used.
25. An understanding of how to adapt technologies to better support teaching and learning.

24. An understanding of how technology can be integrated into teaching and learning in order to help students achieve specific pedagogical goals and objectives.
5. Knowledge of hardware, software, and technologies that I might use for teaching.

Sahin (2011):
I have knowledge in...
Choosing technologies appropriate for my teaching/learning approaches and strategies.
Using computer applications supporting student learning.
Being able to select technologies useful for my teaching career.
Evaluating appropriateness of a new technology for teaching and learning.

Proposed TPK items:

1. I can select technologies to use in my classroom that enhance what I teach, how I teach and what students learn. (Schmidt)
2. I possess an understanding of how technology can be integrated into teaching and learning in order to help students achieve specific pedagogical goals and objectives. (Lux, Bangert, & Whittier, 2011)
3. I possess the skills and understanding to decide where technology can be detrimental to achieving an educational objective.
4. l am able to facilitate my students' ~~to~~ use of technology to construct different representations of knowledge. (Chai)
5. I am able to facilitate my students' ~~to~~ collaboration with one another using technology. (Chai)
6. I have knowledge in evaluating the appropriateness of ~~a~~ new technologies for teaching and learning. (Sahin)

Technological Pedagogical Content Knowledge

Schmidt (2009):
40. I can use strategies that combine content, technologies and teaching approaches that I learned about in my coursework in my classroom.
41. I can provide leadership in helping others to coordinate the use of content, technologies and teaching approaches at my school and/or district.
I can teach lessons that appropriately combine mathematics, technologies and teaching approaches.
44. I can teach lessons that appropriately combine literacy, technologies and teaching approaches.
45. I can teach lessons that appropriately combine science, technologies and teaching approaches.
46. I can teach lessons that appropriately combine social studies, technologies and teaching approaches.

Chai, Koh, & Tsai (2011):
I can use strategies that combine content, technologies and teaching approaches that I learned about in my coursework in my classroom.
I can select technologies to use in my classroom that enhance what I teach, how I teach and what students learn.
I can provide leadership in helping others to coordinate the use of content, technologies and teaching approaches at my school and/or district.
I can teach lessons that appropriately combine my CS2 technologies and teaching approaches.
I can teach lessons that appropriately combine my CS1 technologies and teaching approaches.

Lux, Bangert, & Whittier (2011):
(Participants answered to what extent they agreed with… "My teacher education prepared me with…")
Strong technological pedagogical content knowledge (TPACK). This knowledge includes knowledge of how to integrate the use of educational technologies effectively into curriculum-based learning. (TPACK)
An understanding of how to integrate technology to build upon students prior knowledge of subject matter topics. (TPACK)
The skills and understanding needed to reconfigure technology and apply it to meet instructional needs. (TPK)
An understanding of what makes certain concepts difficult to learn for students and how technology can be used to leverage that knowledge to improve student learning. (TPACK)
Teaching methods that use technology to teach content and provide opportunities for learners to interact with ideas. (TPACK)
The knowledge and skills necessary to flexibly incorporate new tools and resources into content and my teaching methods to enhance learning. (TPACK)
The knowledge of how to effectively integrate educational technologies to increase student opportunities for interaction with ideas. (TPACK)
An understanding of not just know how to operate classroom technologies, but of the knowledge needed to incorporate technologies into my particular content area or grade level to enhance student learning. (TPACK)

Sahin (2011):
I have knowledge in...
Integrating appropriate instructional methods and technologies into my content area.
Selecting contemporary strategies and technologies helping to teach my content effective.
Teaching successfully by combining my content, pedagogy, and technology knowledge.
Taking a leadership role among my colleagues in the integration of content, pedagogy, and technology knowledge.
Teaching a subject with different instructional strategies and computer applications.

Proposed TPACK Items:

1. I can teach lessons that appropriately combine my content area, technologies and teaching approaches. (Schmidt)
2. I possess an understanding of how to integrate technology to build upon students' prior knowledge of subject matter topics. (Lux, Bangert, & Whittier, 2011)
3. I possess an understanding of what makes certain concepts difficult to learn for students, and how technology can be used to leverage that knowledge to improve student learning. (Lux, Banger, & Whittier)
4. I am able to utilize teaching methods that use technology to teach content and provide opportunities for learners to interact with ideas. (Lux, Banger, & Whittier)
5. I possess an understanding of not just know how to operate classroom technologies, but of the knowledge needed to incorporate technologies into my particular content area or grade level to enhance student learning. (Lux, Banger, & Whittier)
6. I am able to take a leadership role among my colleagues in the integration of content, pedagogy, and technology knowledge. (Sahin)

APPENDIX C
Survey Instrument

Survey of In-Service Teacher TPACK
Adapted from:
Brenner & Brill (2016)
Greene (2015)
Lux, Bangert, & Whittier (2011)
Sahin (2011)
Schmidt, Baran, Thompson, Mishra, Koehler, & Shin (2009)
U.S. Department of Education (1999)
U.S. Department of Education (2009)

Introduction and Consent

This study, conducted by Yeshiva University, is designed to learn more about an important framework for integrating technology in education known as technological pedagogical content knowledge (TPACK). In particular, this study aims to measure any correlation between TPACK and teacher education and professional development.

Participation in this study is completely optional. If you decide to take part, you are free to stop participating at any time without giving a reason. You may choose to omit questions for any reason.

You will not receive any compensation for completing this survey. However, we hope you will participate because the study will generate important information about the knowledge that teachers in Modern Orthodox Jewish day schools possess about technology integration. This is significant given the emphasis placed on technology in Modern Orthodox Jewish day schools as a means to enhance student learning.

In order to protect the confidentiality of respondents, school information is not requested at any point in the survey, and items pertaining to demographic information are limited. Further, only the statistician assessing the data will have access to individual survey responses.

Should you have any questions, you can reach out to Hal Levy at levy.hal@gmail.com or at 516.375.6835.

Thank you very much for your participation.

Clicking to continue with the survey indicates your consent to participate.

Section 1 - Demographic Information

1. How many years have you served as a formal, classroom educator?
    a. 0-2
    b. 3-6
    c. 7-9
    d. 10-15
    e. 16-20
    f. More than 20
2. Gender
    a. Male
    b. Female
    c. Other
3. Subject areas you currently teach (check all that apply):
    a. Art
    b. English
    c. Foreign Language
    d. Physical Education/Health
    e. History/Social Studies
    f. Mathematics
    g. Science
    h. Judaic Studies
    i. General Studies (i.e. elementary school)
    j. Music
    k. Technology Education/Industry
    l. Other (please specify)
4. What grade level do you currently teach? (check all that apply)
    a. Elementary School (K-4)
    b. Middle School (5-8)
    c. High School (9-12)
5. Highest education degree pursued (completed and/or in progress)
    a. Bachelors
    b. Post-Baccalaureate
    c. Masters
    d. Doctorate
    e. Post Doctorate
6. How would you describe the overall approach of your school towards educational technology?
    a. Educational technology and/or blended learning play a very central and prominent role in student learning
    b. Educational technology is utilized frequently
    c. Educational technology is utilized occasionally
    d. Educational technology is utilized rarely
    e. Educational technology is not utilized

Section 2 - TPACK

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Technological Knowledge					
1. I can learn how to use and operate technologies that are new to me easily.					
2. I know how to solve my own technical problems when using technology.					
3. I have a strong understanding of the functions, features, of an interactive white board and its corresponding Notebook software.					
4. I have an understanding of the functions and features of a digital tablet, and how to operate one.					
5. I know how to create presentations using software such as PowerPoint, Prezi, Google Slides, etc. with graphics, transitions, media, and hyperlinks.					
6. I know how to operate and use and operate a learning management system (LMS), such as Google Classroom, Moodle, Canvas, etc.					
7. I have the knowledge to create text documents (i.e. on Microsoft Word or Google Docs) with the ability to edit and modify them in a variety of manners.					
Pedagogical Knowledge					
8. I can adapt my teaching based upon what students currently understand or do not understand.					
9. I can adapt my teaching style to different learners' needs and preferences.					
10. I can assess student learning in multiple ways.					
11. I can use a wide range of teaching activities in a classroom setting.					
12. I am familiar with common student understandings and misconceptions.					
13. I know how to utilize classroom management skills to ensure a structured learning environment.					
Content Knowledge					
14. I have sufficient knowledge about the content that I teach.					
15. I can think about the content that I teach like a subject matter expert.					
16. I am able to develop deeper understanding about content that I teach.					
Pedagogical Content Knowledge					

17. Without using technology, I know how to select effective teaching activities to enhance student learning.					
18. I possess the skills to provide multiple representations of content in the form of analogies, examples, and demonstrations.					
19. I can adapt content to students' abilities, prior knowledge, preconceptions, and misconceptions.					
20. I can select appropriate and effective teaching strategies for my content area.					
21. I can develop evaluation tests and surveys in my content area.					
Technological Content Knowledge					
22. I can select among technologies appropriately to help students learn particular content.					
23. I know how to use content area-specific computer and web applications appropriately.					
Technological Pedagogical Knowledge					
24. I can select technologies to use for students that enhance what I teach, how I teach and what students learn.					
25. I understand how technology can be integrated into teaching and learning in order to help students meet specific learning goals and objectives.					
26. I know when and how technology use can be detrimental to achieving an educational objective.					
27. l am able to facilitate my students' use of technology to construct different representations of knowledge.					
28. I am able to facilitate my students' collaboration with one another using technology.					
Technological Pedagogical Content Knowledge					
29. I can teach lessons that appropriately combine content, technologies and teaching/learning approaches.					
30. I know how to use technology to help students to build upon their prior knowledge of content topics.					
31. I possess an understanding of what makes certain content-area concepts difficult to learn for students, and how technology can be used to leverage that knowledge to improve student learning.					
32. I am able to utilize teaching methods that use technology to help students learn content and					

provide them with opportunities to interact with ideas.					
33. I know both how to operate educational technologies, and also to incorporate technology use into my particular content areas and grade levels to enhance student learning.					

Section 3 - Pre-Service Teacher Education in Technology
Did you take education courses at the undergraduate level? Yes/No
Did you take education ~~training~~ courses at the graduate level? Yes/No
If you answered "no" to both questions above, skip this section.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Preservice Teacher Education					
1. The faculty member(s) who taught my content-area methods courses (e.g. English, Math, Science, etc.) modeled how to effectively integrate technology into instruction for K-12 students.					
2. I had many opportunities in my teacher education courses to practice and experiment with creating activities that incorporated digital technologies activities that could be used in the classroom to support student learning.					
3. During my coursework and/or field experiences, I had access to expert guidance (e.g. peers, faculty, teachers, etc.) with regard to learning about the use of technology in K-12 instruction to support student learning during my coursework and/or field experiences.					
4. I had opportunities to practice integrating technology in my instruction in real K-12 classrooms during my program through field experiences (e.g. internships, student teaching, special projects including students, etc.).					
5. I was required to reflect upon the uses of technology in the classroom during my preservice teacher education program.					
6. Overall, the technology integration training I received in my teacher education program, prepared me to utilize technology in the classroom effectively.					

Section 4 - Professional Development for Technology

1. During the last 12 months, how many hours did you spend in professional development activities that focused on educational technology (e.g., workshops, courses, coordinated workgroups)? (Circle only one.)
   a) 0 hours
   b) 1-8 hours
   c) 9-16 hours
   d) 17-32 hours
   e) 33 hours or more

2. Please indicate the extent to which you agree or disagree with the following statements as they relate to the professional development in educational technology in which you participated during the last 12 months. (Strongly disagree, disagree, agree, strongly agree)

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Professional Development					
a) It met my professional learning goals and needs.					
b) It applied to technology available in my school.					
c) It was available at convenient times and places.					

3. Does your school make the following types of professional development available to you and, if yes, have you ever participated in these programs?

	I don't know if it is available	No, not available	Yes, but I do not participate	Yes, and I participate
Professional Development for Technology				
a) Use of computers in general or basic computer training				
b) Software applications (Word, Excel, PowerPoint, etc.)				
c) Learning management systems (e.g. Canvas, RenWeb, Moodle)				
d) Educational software (iXL Math, Spelling City, RazKids, etc.)				
e) Use of specialized or specific technology devices (e.g. SmartBoards, iPads, Chromebooks)				
f) Use of the Internet				
g) Use of other telecommunication devices (e.g. interactive audio, video, skype)				
h) Integration of technology into the curriculum/classroom instruction				

Section 6 – Nature of Technology Integration

My students use technology to:

Student Technology Use	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1. Communicate electronically with experts, peers, and others					
2. Solve real-world problems					
3. Utilize productivity tools (word processing, spreadsheets, databases).					
4. Utilize multimedia/production software (multimedia programs, concept mapping software, graphing software, etc.).					
5. Conduct research online, including use of K-12 Online Database Resources (such as EBSCO and Worldbook).					
6. Engage in self-directed learning					
7. Work online on collaborative projects					
8. Engage in computer-assisted learning (CCC, Compass, Plato, Skills Tutor, Orchard, LightSpan, etc.).					
9. Create podcasts or webcasts					
10. Project Based Learning					
11. Web Page Development					
12. Access content-specific software or Web-based resources					
13. Create reports or projects					
14. Access demonstrations, simulations, or virtual tours					
15. Learn at a distance (e.g., online classes, lessons offered through video conferencing over the Internet).					

Nature of Technology Integration	Strongly Disagree	Disagree	Agree	Strongly Agree
1. I integrate activities that utilize technology into the curriculum.				
2. Technology use supports content learning in my classroom.				
3. Students work collaboratively on technology-based activities in my classroom.				
4. I locate and evaluate educational technologies including software, hardware, and online resources that students use in my classroom.				

5. I require students to use a variety of software tools and digital resources to support their learning.				
6. I use technology to support project-based and problem-based learning activities in my classroom.				
7. I use technology to help me meet the individual needs of a variety of students in my classroom.				
8. My students use technology to demonstrate their knowledge of content in non-traditional ways (e.g. by creating websites or multimedia products).				
9. I use technology and its unique capabilities to design new learning experiences for students.				

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APPENDIX D

Survey Email for Individuals

Dear ___________________,

I hope this email finds you at the conclusion of a productive and meaningful school year.

In pursuing my doctoral degree, I am conducting a research project through Yeshiva University to determine whether teachers in Modern Orthodox Jewish day schools have the requisite knowledge to integrate technology in teaching their subject areas. This knowledge set is represented by a framework known as technological pedagogical content knowledge (TPACK) and has become widely known in the educational technology community.

To assist teachers and Jewish day school leaders in measuring this important knowledge construct, I have formulated a survey instrument geared to assess teachers' levels of TPACK, in addition to how this knowledge correlates to exposure to educational technology in professional development opportunities as well as in pre-service teacher education.

I am writing to inquire if you would be willing to complete this survey, which can be accessed by clicking here. The survey takes approximately ten minutes to complete. Please be aware that survey responses are completely unidentifiable and confidential.

Your participation will serve to develop the growing body of data on technology of Jewish day schools, and provide educational leaders with valuable information that will ultimately serve to enhance the quality of education via technology.

Feel free to email me at levy.hal@gmail.com or call at 516.375.6835 with any questions or concerns you may have.

Thank you very much for your consideration.

All the best,

Hal Levy

APPENDIX E

Survey Email for Schools

Dear ___________________,

I hope this email finds you at the conclusion of a productive and meaningful school year.

In pursuing my doctoral degree, I am conducting a research project through Yeshiva University to determine whether teachers in Modern Orthodox Jewish day schools have the requisite knowledge to integrate technology in teaching their subject areas. This knowledge set is represented by a framework known as technological pedagogical content knowledge (TPACK) and has become widely known in the educational technology community.

To assist teachers and Jewish day school leaders in measuring this important knowledge construct, I have formulated a survey instrument geared to assess teachers' levels of TPACK, in addition to how this knowledge correlates to exposure to educational technology in professional development opportunities as well as in pre-service teacher education.

I am writing to inquire if you would be willing to ask your teachers to complete this survey as part of your end of year meetings. As the survey takes approximately ten minutes to complete, the time commitment is minimal.

In expressing my gratitude for your participation, I will happily sponsor a bagel breakfast (or its financial equivalent) for your faculty, as well as provide pamphlets highlighting important ideas and concepts of the TPACK framework.

Complete confidentiality will be retained as the survey does not record the school or geographic location of respondents. Teachers do not need to worry about their supervisors reviewing their responses, and schools on a broader level do not need to be concerned about their overall results being disseminated.

Please let me know if you are interested in partnering with me to share the relevance and significance of the TPACK framework with your faculty. Feel free to email me at levy.hal@gmail.com or call at 516.375.6835 with any questions or concerns you may have.

Thank you very much for your consideration.

Hal Levy

APPENDIX F
Aggregate Results for TPACK Survey Items

Technological Knowledge	Strongly disagree		Disagree		Neither agree nor disagree		Agree		Strongly agree		Total	Weighted Average
	Percentage	Responses	Percentage	Responses	Percentage	Responses	Percentage	Responses	Percentage	Responses		
I can learn how to use and operate technologies that are new to me easily.	0.94%	1	8.49%	9	6.60%	7	41.51%	44	42.45%	45	106	4.16
I know how to solve my own technical problems when using technology.	2.83%	3	16.98%	18	25.47%	27	38.68%	41	16.04%	17	106	3.48
I have a strong understanding of the functions and features of an interactive white board and its corresponding software.	5.66%	6	16.04%	17	16.98%	18	34.91%	37	26.42%	28	106	3.6
I have an understanding of the functions and features of a digital tablet, and how to operate one.	4.81%	5	8.65%	9	10.58%	11	42.31%	44	33.65%	35	104	3.91
I know how to create presentations using software such as PowerPoint, Prezi, Google Slides, etc. with graphics, transitions, media, and hyperlinks.	3.77%	4	5.66%	6	8.49%	9	33.02%	35	49.06%	52	106	4.18
I know how to operate and use a learning management system (LMS), such as Google Classroom, Moodle, Canvas, etc.	5.71%	6	18.10%	19	11.43%	12	28.57%	30	36.19%	38	105	3.71
I have the knowledge to create text documents (i.e. on Microsoft Word or Google Docs) with the ability to edit and modify them in a variety of manners.	2.83%	3	0.00%	0	0.94%	1	21.70%	23	74.53%	79	106	4.65
											Answered	106
											Skipped	3

Pedagogical Knowledge	Strongly disagree		Disagree		Neither agree nor disagree		Agree		Strongly agree		Total	Weighted Average
	Percentage	Responses	Percentage	Responses	Percentage	Responses	Percentage	Responses	Percentage	Responses		
I can adapt my teaching based upon what students currently understand or do not understand.	0.00%	0	0.94%	1	1.89%	2	55.66%	59	41.51%	44	106	4.38
I can adapt my teaching style to different learners' needs and preferences.	0.00%	0	4.72%	5	0.94%	1	56.60%	60	37.74%	40	106	4.27
I can assess student learning in multiple ways.	0.94%	1	0.00%	0	8.49%	9	50.00%	53	40.57%	43	106	4.29
I can use a wide range of teaching activities in a classroom setting.	0.00%	0	2.83%	3	12.26%	13	47.17%	50	37.74%	40	106	4.2
I am familiar with common student understandings and misconceptions.	0.00%	0	0.00%	0	12.26%	13	52.83%	56	34.91%	37	106	4.23
I know how to utilize classroom management skills to ensure a structured learning environment.	0.94%	1	0.94%	1	7.55%	8	40.57%	43	50.00%	53	106	4.38
											Answered	106
											Skipped	3

Content Knowledge	Strongly disagree		Disagree		Neither agree nor disagree		Agree		Strongly agree		Total	Weighted Average
	Percentage	Responses	Percentage	Responses	Percentage	Responses	Percentage	Responses	Percentage	Responses		
I have sufficient knowledge about the content that I teach.	0.00%	0	0.00%	0	2.83%	3	29.25%	31	67.92%	72	106	4.65
I can think about the content that I teach like a subject matter expert.	0.00%	0	2.83%	3	9.43%	10	31.13%	33	56.60%	60	106	4.42
I am able to develop deeper understanding about content that I teach.	0.00%	0	0.00%	0	1.89%	2	31.13%	33	66.98%	71	106	4.65
											Answered	106
											Skipped	3

Pedagogical Content Knowledge	Strongly disagree		Disagree		Neither agree nor disagree		Agree		Strongly agree		Total	Weighted Average
	Percentage	Responses	Percentage	Responses	Percentage	Responses	Percentage	Responses	Percentage	Responses		
Without using technology, I know how to select effective teaching activities to enhance student learning.	0.00%	0	1.89%	2	1.89%	2	56.60%	60	39.62%	42	106	4.34
I possess the skills to provide multiple representations of content in the form of analogies, examples, and demonstrations.	0.00%	0	0.94%	1	5.66%	6	38.68%	41	54.72%	58	106	4.47
I can adapt content to students' abilities, prior knowledge, preconceptions, and misconceptions.	0.00%	0	1.89%	2	4.72%	5	44.34%	47	49.06%	52	106	4.41
I can select appropriate and effective teaching strategies for my content area.	0.00%	0	0.00%	0	5.66%	6	42.45%	45	51.89%	55	106	4.46
I can develop evaluation tests and surveys in my content area.	0.00%	0	1.89%	2	4.72%	5	36.79%	39	56.60%	60	106	4.48
											Answered	106
											Skipped	3

Technological Content Knowledge	Strongly disagree		Disagree		Neither agree nor disagree		Agree		Strongly agree		Total	Weighted Average
	Percentage	Responses	Percentage	Responses	Percentage	Responses	Percentage	Responses	Percentage	Responses		
I can select appropriate technologies to help students learn particular content.	0.95%	1	16.19%	17	20.00%	21	45.71%	48	17.14%	18	105	3.62
I know how to use content area-specific computer and web applications.	0.95%	1	12.38%	13	24.76%	26	45.71%	48	16.19%	17	105	3.64
											Answered	105
											Skipped	4

Technological Pedagogical Knowledge	Strongly disagree		Disagree		Neither agree nor disagree		Agree		Strongly agree		Total	Weighted Average
	Percentage	Responses	Percentage	Responses	Percentage	Responses	Percentage	Responses	Percentage	Responses		
I can select technologies to use for students that enhance what I teach, how I teach and what students learn.	1.89%	2	12.26%	13	21.70%	23	49.06%	52	15.09%	16	106	3.63
I understand how technology can be integrated into teaching and learning in order to help students meet specific learning goals and objectives.	0.94%	1	10.38%	11	18.87%	20	46.23%	49	23.58%	25	106	3.81
I know when and how technology use can be detrimental to achieving an educational objective.	1.89%	2	7.55%	8	15.09%	16	48.11%	51	27.36%	29	106	3.92
I am able to facilitate my students' use of technology to construct different representations of knowledge.	2.83%	3	16.98%	18	27.36%	29	39.62%	42	13.21%	14	106	3.43
I am able to facilitate my students' collaboration with one another using technology.	3.81%	4	12.38%	13	17.14%	18	44.76%	47	21.90%	23	105	3.69
											Answered	106
											Skipped	3

Technological Pedagogical Content Knowledge	Strongly disagree		Disagree		Neither agree nor disagree		Agree		Strongly agree		Total	Weighted Average
	Percentage	Responses	Percentage	Responses	Percentage	Responses	Percentage	Responses	Percentage	Responses		
I can teach lessons that appropriately combine content, technologies and teaching/learning approaches.	1.89%	2	8.49%	9	18.87%	20	54.72%	58	16.04%	17	106	3.75
I know how to use technology to help students to build upon their prior knowledge of content topics.	1.89%	2	12.26%	13	20.75%	22	50.94%	54	14.15%	15	106	3.63
I possess an understanding of what makes certain content-area concepts difficult to learn for students, and how technology can be used to leverage that knowledge to improve student learning.	1.89%	2	16.98%	18	31.13%	33	36.79%	39	13.21%	14	106	3.42
I am able to utilize teaching methods that use technology to help students learn content and provide them with opportunities to interact with ideas.	1.89%	2	8.49%	9	24.53%	26	47.17%	50	17.92%	19	106	3.71
I know both how to operate educational technologies, and also to incorporate technology use into my particular content areas and grade levels to enhance student learning.	1.89%	2	12.26%	13	19.81%	21	50.00%	53	16.04%	17	106	3.66
											Answered	106
											Skipped	3

APPENDIX G
Aggregate Results for Pre-Service Teacher Training Survey Items

Pre-Service Teacher Training	Strongly disagree		Disagree		Neither agree nor disagree		Agree		Strongly agree		Total	Weighted Average
	Percentage	Responses	Percentage	Responses	Percentage	Responses	Percentage	Responses	Percentage	Responses		
The faculty member(s) who taught my content-area methods courses (e.g. English, Math, Science, etc.) modeled how to effectively integrate technology into instruction for K-12 students.	19.10%	17	43.82%	39	17.98%	16	14.61%	13	4.49%	4	89	2.42
I had many opportunities in my teacher education courses to practice creating learning activities that incorporated digital technologies.	21.35%	19	35.96%	32	22.47%	20	11.24%	10	8.99%	8	89	2.51
During my coursework and/or field experiences, I had access to expert guidance (e.g. peers, faculty, teachers, etc.) with regard to learning about the use of technology in K-12 instruction.	15.73%	14	34.83%	31	16.85%	15	25.84%	23	6.74%	6	89	2.73
I had opportunities to practice integrating technology in my instruction in real K-12 classrooms during my program through field experiences (e.g. internships, student teaching, special projects including students, etc.).	14.77%	13	38.64%	34	17.05%	15	25.00%	22	4.55%	4	88	2.66
I was required to reflect upon the uses of technology in the classroom during my preservice teacher education program.	26.97%	24	38.20%	34	12.36%	11	20.22%	18	2.25%	2	89	2.33

Overall, the technology integration training I received in my teacher education program, prepared me to utilize technology in the classroom effectively.	25.84%	23	41.57%	37	16.85%	15	13.48%	12	2.25%	2	89	2.25
											Answered	**89**
											Skipped	**20**

APPENDIX H
Aggregate Results for In-Service Professional Development Survey Items

In-Service Professional Development	Strongly disagree		Disagree		Neither agree nor disagree		Agree		Strongly agree		Total	Weighted Average
	Percentage	Responses	Percentage	Responses	Percentage	Responses	Percentage	Responses	Percentage	Responses		
It met my professional learning goals and needs.	2.04%	2	31.63%	31	31.63%	31	29.59%	29	5.10%	5	98	3.04
It applied to technology available in my school.	4.04%	4	13.13%	13	25.25%	25	44.44%	44	13.13%	13	99	3.49
It was available at convenient times and places.	2.02%	2	15.15%	15	36.36%	36	41.41%	41	5.05%	5	99	3.32
											Answered	99
											Skipped	10

Professional Development	I don't know if it's available		No, not available		Yes, but I do not participate		Yes, and I participate		Total
Does your school provide professional development for the following technological tools and skills? If so, have you ever participated in these opportunities?	Percentage	Responses	Percentage	Responses	Percentage	Responses	Percentage	Responses	
Use of computers in general or basic computer training	20.8%	21	23.8%	24	34.7%	35	20.8%	21	101
Software applications (Word, Excel, PowerPoint, etc.)	20.6%	21	32.4%	33	30.4%	31	16.7%	17	102
Learning management systems (e.g. Canvas, RenWeb, Moodle)	27.7%	28	25.7%	26	24.8%	25	21.8%	22	101
Educational software (iXL Math, Spelling City, RazKids, etc.)	42.0%	42	29.0%	29	16.0%	16	13.0%	13	100
Use of specialized or specific technology devices (e.g. SmartBoards, iPads, Chromebooks)	11.1%	11	14.1%	14	23.2%	23	51.5%	51	99
Use of the Internet	26.3%	26	33.3%	33	16.2%	16	24.2%	24	99
Use of other telecommunication devices (e.g. interactive audio, video, skype)	30.7%	31	38.6%	39	13.9%	14	16.8%	17	101
Integration of technology into the curriculum/classroom instruction	12.1%	12	16.2%	16	20.2%	20	51.5%	51	99
								Answered	102
								Skipped	7

APPENDIX I
Aggregate Results for Technology Integration Survey Items

My students use technology to:	Never		Seldom		Occasionally		Frequently		Very Frequently		Total
Communicate electronically with experts, peers, and others	10.68%	11	4.85%	5	12.62%	13	21.36%	22	50.49%	52	103
Solve real-world problems	18.63%	19	17.65%	18	33.33%	34	16.67%	17	13.73%	14	102
Utilize productivity tools (word processing, spreadsheets, databases).	12.62%	13	8.74%	9	17.48%	18	30.10%	31	31.07%	32	103
Utilize multimedia/production software (multimedia programs, concept mapping software, graphing software, etc.).	16.67%	17	12.75%	13	27.45%	28	25.49%	26	17.65%	18	102
Conduct research online, including use of K-12 Online Database Resources (such as EBSCO and Worldbook).	18.63%	19	22.55%	23	26.47%	27	18.63%	19	13.73%	14	102
Engage in self-directed learning	5.88%	6	19.61%	20	40.20%	41	23.53%	24	10.78%	11	102
Work online on collaborative projects	13.86%	14	8.91%	9	26.73%	27	33.66%	34	16.83%	17	101
Engage in computer-assisted learning (CCC, Compass, Plato, Skills Tutor, Orchard, LightSpan, etc.).	44.12%	45	24.51%	25	24.51%	25	1.96%	2	4.90%	5	102
Create podcasts or webcasts	53.47%	54	20.79%	21	14.85%	15	7.92%	8	2.97%	3	101
Engage in project based learning	11.76%	12	16.67%	17	36.27%	37	25.49%	26	9.80%	10	102
Develop web pages	44.00%	44	22.00%	22	23.00%	23	8.00%	8	3.00%	3	100
Access content-specific software or Web-based resources	16.67%	17	16.67%	17	22.55%	23	29.41%	30	14.71%	15	102
Create reports or projects	4.90%	5	9.80%	10	14.71%	15	38.24%	39	32.35%	33	102
Access demonstrations, simulations, or virtual tours	19.61%	20	21.57%	22	33.33%	34	18.63%	19	6.86%	7	102
Learn at a distance (e.g., online classes, lessons offered through video conferencing over the Internet).	26.73%	27	27.72%	28	27.72%	28	10.89%	11	6.93%	7	101
										Answered	**103**
										Skipped	**6**

Please rate your level of agreement to the following statements about the nature of technology integration in your teaching.	Strongly Disagree		Disagree		Neither agree nor disagree		Agree		Strongly Agree		Total
I integrate activities that utilize technology into the curriculum.	2.94%	3	8.82%	9	9.80%	10	63.73%	65	14.71%	15	102
Technology use supports content learning in my classroom.	2.97%	3	7.92%	8	14.85%	15	52.48%	53	21.78%	22	101
Students work collaboratively on technology-based activities in my classroom.	8.74%	9	17.48%	18	21.36%	22	40.78%	42	11.65%	12	103
I locate and evaluate educational technologies including software, hardware, and online resources that students use in my classroom.	5.83%	6	24.27%	25	22.33%	23	36.89%	38	10.68%	11	103

I require students to use a variety of software tools and digital resources to support their learning.	8.74%	9	30.10%	31	31.07%	32	26.21%	27	3.88%	4	103
I use technology to support project-based and problem-based learning activities in my classroom.	8.74%	9	18.45%	19	34.95%	36	31.07%	32	6.80%	7	103
I use technology to help me meet the individual needs of a variety of students in my classroom.	4.85%	5	19.42%	20	22.33%	23	42.72%	44	10.68%	11	103
My students use technology to demonstrate their knowledge of content in non-traditional ways (e.g. by creating websites or multimedia products).	11.65%	12	19.42%	20	23.30%	24	38.83%	40	6.80%	7	103
I use technology and its unique capabilities to design new learning experiences for students.	7.77%	8	13.59%	14	26.21%	27	40.78%	42	11.65%	12	103
										Answered	**103**
										Skipped	**6**