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exploration of success criteria, concerns, and characteristics**

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Pepperdine University
Graduate School of Education and Psychology

IMPLEMENTATIONS OF TECHNOLOGY ENHANCED PERSONALIZED
LEARNING: EXPLORATION OF SUCCESS CRITERIA, CONCERNS, AND
CHARACTERISTICS

A dissertation submitted in partial satisfaction
of the requirements for the degree of
Doctor of Education in Learning Technologies

by

Rodney P Gallagher

June, 2014

Paul Sparks, Ph.D. – Dissertation Chairperson

This dissertation, written by

Rodney P Gallagher

under the guidance of a Faculty Committee and approved by its members, has been submitted to and accepted by the Graduate Faculty in partial fulfillment of the requirements for the degree of

DOCTOR OF EDUCATION

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DEDICATION

I dedicate this dissertation to my wife, Candy. We have been through so much these last four years, your unwavering support has been critical to my success with this demanding doctoral degree. Consider this dissertation as much yours as it is mine, you have certainly earned it.

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ABSTRACT

Many school districts across the United States are spending large amounts of financial and employee resources on the implementation of technology enhanced personalized learning (TEPL) tools. There is little empirical understanding of the success, concerns, and characteristics of TEPL implementations and the learning environments they enable. This exploratory study used a qualitative descriptive methodology to survey and interview TEPL administrators in an effort to understand their perspectives on TEPL characteristics, definitions of success, concerns, and a general description of how TEPL tools are implemented in their learning environments.

Along with confirming six characteristics previously identified (dual role of the teacher, diagnosis of characteristics, a student culture of collegiality, an interactive learning environment, flexible scheduling/pacing, striving for authentic assessment), this study found that administrators consider student choice and teacher comfort with technology as additional learning environment characteristics. Results also show that administrators define success through external measurement, are concerned with professional development, and how to leverage limited resources. The subjects indicated that the definitions of success and administrator concerns evolve over time. Finally, this study found that large variance exists in learning environments when considering online vs. face-to-face instruction, school size, number of users, grade level use, focus and perceived effectiveness of the tool. Recommendations were made for future research, including analysis of two newly identified characteristics, deeper exploration of learning environments, and further exploration of external measurement's sub-components. Recommendations for practitioners include considerations for their success

definitions, allowing for the two additional learning environmental characteristics, and initial allocation of resources.

Chapter 1: The Problem

Overview

Bloom (1984) found that an average student performed two standard deviations better when given individual tutoring rather than the standardized instruction that is common in the current school environment. He used the term *2 sigma problem* to describe this effect. Providing instruction through direct tutoring requires a significant amount of resources, more than is possible for the majority of students. Bloom identified the use of technology as one of the ways in which the benefits of individual tutoring could be provided to the majority of students utilizing existing teachers and available resources. The promise of technology offers the benefits of individualized tutoring without the tremendous costs present in past attempts. Implementation of technology enhanced personalized learning (TEPL) can allow all students access to the same personalized learning techniques previously only available to elite students (Tomlinson, Brimijoin, & Narvaez, 2008).

Schools are also under increasing pressure to justify the resources they are spending on educating students, as evidenced by the No Child Left Behind and Race to the Top funding programs (Lee & Reeves, 2012). Limited resources are forcing school districts to ask teachers to provide instruction to large classes, which forces teachers toward assembly line teaching (Rasberry, 1991). This style of instruction allows teachers to teach many students, but does not take into account the unique learning styles or background of each individual learner. Learning theory has shown various ways in which people learn, such as Project Based Learning, Constructivism, and Individualized instruction. The majority of these instructional methods require more resources than are available to the average teacher, leading to a profound

disconnect between the manner in which schools are managed and optimal methods in learning that the research has identified.

Learning theory suggests people learn by adapting the instruction to fit their learning styles, past learning history, and interests (Bransford, et. all, 1999). Adapting instruction to the individual is classified as personalized learning, the learning is personalized to the individual learner. The instructor identifies the manner in which the individual learns best, which may include primary and secondary modalities based on the topic at hand, and combines it with the learner's specific learning history, providing the knowledge in a manner that best fits the student's needs enhances the learning (Keller & Sherman, 1974).

In the past, integrating technology into the learning environment often focused on the number of computers per classroom or student (Cuban, 2001), a statistic that school districts reported as a measure of technology integration. This method of technology integration has not shown dramatic improvement in learning outcomes, yet is still prevalent in the still-common 1:1 programs where each student gets a computing device (Bain & Weston, 2012).

The Federal Government's Department of Education strongly encourages utilizing technology to collect and report student data through the No Child Left Behind and Race to the Top grants (Lee & Reeves, 2012). The requirements of these federal programs put into place tools to track each individual student's accomplishments, learning history, and objective achievement data. This student data can be provided to the teacher and/or student in order to provide each student a personalized learning experience. Matching the student's accomplishments, learning history, and achievement data to the learning objectives of the lesson allows the instructor to tailor the learning to the individual's needs.

A small number of schools are utilizing technology to collect the student data and provide this information to the teacher in order to create an individualized learning experience. Utilizing existing technology resources has allowed the schools to bridge the gap between resource constraints and the desire to provide an individualized learning environment. As these schools are finding success in student learning, traditional schools are exploring the implementation of TEPL tools in their own learning environment.

While TEPL may bridge the gap between limited school resources and a personalized learning environment, little is known about the tools in terms of what success looks like and what factors may impact the success of these learning tools. Past research has focused on the application of computer models to provide individualization recommendations (Scalise et al., 2007; Schiaffino, Garcia, & Amandi, 2008; Tan, Luo, Tong, Chen, & Shen, 2008; Zajac, 2009) and personalized learning in general (Bishop, 1971; Carroll, 1975; Carroll, 1963; Fuller, 1974; García Hoz, 1970; Gibbons, 1971; Keller & Sherman, 1974; Parkhurst, Bassett, & Eades, 1922), but no studies have sought to describe the success, concerns, and characteristics of a TEPL implementation. This exploratory study will provide a descriptive analysis of multiple learning environments in order to identify variables and provide an initial understanding which will facilitate future research into these environments.

Background of the Problem

Computer based technology has impacted nearly every aspect of daily life in the United States. As the impact of technology on daily life grows, there is a desire to integrate computer based technology into the K12 classroom environment (Bain & Weston, 2012; Collins & Halverson, 2009; Cuban, 1986; De Lay, 2010; Garrison, 2011; Weisgerber, 1973; Wenglinsky, 2006). This movement for the integration of technology and K12 education is not new, there is a

focus on putting technology in the classroom. Much of the research concludes that simply putting technology into the classroom has little impact on student learning (Bain & Weston, 2012). The focus of research is now turning toward how to integrate technology into the learning environment effectively rather than simply providing teachers access to technology (Andersen, 2011; Bain & Weston, 2012; Collins & Halverson, 2009; Garrison, 2011; Perera, 2008).

Adapting learning to the specific needs of the individual is not a new concept; it has been contemplated since the early days of teaching and learning (Carroll, 1975; Fuller, 1974; Gibbons, 1971). Some of the first iterations involve a direct correlation to the one-room schoolhouses of the 1800s and Dewey's classroom of the late 1800s and early 1900s. As the number of students per classroom grew, the constraints of limited resources have been a major drawback, increasingly preventing teachers from adapting learning to individual students' needs. Personalizing the learning to each student takes a significant amount of a teacher's attention and skill, attention that is also split between too many students to allow a teacher to personalize the learning effectively without specific tools (Jeter, 1980; Wilson et al., 2009). The idea of personalizing learning for each student lost favor given the difficulties in providing the teacher sufficient resources to accomplish the task.

Recent advances in computer-based technology have enabled the collection and analysis of increasingly vast amounts of student data. Teaching entities through the United States are beginning to utilize this data to collect information about the learning process as well as to analyze how the learning process may be enhanced. School districts and learning entities are implementing technology to monitor and analyze the learning process at a rapid rate. Hopkins (2004) describes this rapid move towards TEPL as the quiet revolution (Hopkins, 2004).

With the implementation of technology-based tools, there has been a resurgence in the desire to adapt instruction to the individual needs of the learner (Andersen, 2011). The ability to collect and analyze vast amounts of information about the individual learning process and present this information in a meaningful way to the instructor allows the current level of resources to be used in a manner that allows for adaptive learning. The use of technology allows the instructor to be aware of learners' individual needs and provide appropriate resources through the use of technology (Cobb, 2010; De Lay, 2010; Scalise et al., 2007; Tiene & Luft, 2001).

Many learning entities have implemented instructional technology such as course management systems, learning management systems, and content management systems. According to Herrington, Reeves, and Oliver (2005) the implementation of these technologies leads to a false sense of integrating technology into the learning process. When compared to “the authentic learning environments prompted by advances in cognitive and constructivist learning theories” (p. 356), these environments place all of the responsibility onto the teacher or system administrator rather than the student. The current iterations of these tools are little more than technology versions of the blackboard and textbooks that have been in use for many years.

Many of the common e-learning systems are making modifications that allow students to take greater control of their learning experience and personalize their learning (Scalise et al., 2007; Schiaffino et al., 2008; Tan et al., 2008; Zajac, 2009). These modifications are based on the ideas of collaborative learning, social networks, communities of practice, and personal learning styles. Wilson et al. (2009) point out that many of these e-learning systems may not continue to focus on the complete integration of a single platform, but rather may be composed of many e-learning tools working in concert with each other. Having a system with a strong

single-platform integration or a loosely coupled collection of multiple tools does not matter to the learner, as long as the system achieves the cognitive and collaborative goals of adapting the learning to the individual learner.

Statement of the Problem

Only a small number of TEPL tools have been in place for more than a few years. As such, there are relatively few instances of a TEPL implementation available for academic study. The learning environments that have been put in place are largely in the early stages of their use and have not had reliable multi-year analysis done to understand their success or failure. Academic analysis has been done on a few topics, largely focusing on the technical adaptation of tools for prescribing learning resources rather than the learning environment in which the tool is being implemented (Chen, 2011; Dawei et al., 2008; Garner, Tsui, & Lukose, 2009; Li, Chang, Chu, & Tsai, 2012; Styliadis et al., 2009; Zhuhadar, 2010).

School districts are spending a significant amount of time and money implementing technology tools (Bain & Weston, 2012), yet little is known about how the school learning environment influences the success and integration of learning tools into the classroom environment. Furthermore, many school districts are obtaining grants and or setting aside a significant portion of their school budget to implement a TEPL tool (Horn, 2012).

The problem studied is that there is no empirical understanding of the success, concerns, and characteristics of TEPL implementations. A large amount of resources are used to integrate the tool into the learning environment based on the promise of personalized learning. Lacking an understanding of the integration of the tool and learning environment can cause resources to be wasted. An understanding of these issues allows for a more comprehensive understanding of the TEPL implementation and the issues that may be encountered with the use of TEPL tools.

Statement of the Purpose

The purpose of this exploratory study is to explore how TEPL tool administrators define the success, concerns, and learning implementation factors that impact the success of a United States K-12 learning environment from the point of view of the administrators who have a broad view of the learning environment. This study also attempted to identify the manner in which TEPL tools are implemented in K12 learning environments and provide a description of TEPL implementations. TEPL tools change how students are taught in a meaningful way, students are prescribed learning resources that are specific to their learning styles and subject mastery rather than working through a pre-defined curriculum. Providing a basic understanding of how administrators view these learning environments gives an initial understanding that may be applicable to future TEPL tool implementations.

This study consisted of a web-based survey sent to a volunteer population of TEPL implementation administrators. This study was a mix of slider-based, Yes/No, and open-ended questions to gather their descriptive data. The following research questions were considered in this study:

RQ1: How is the success of a Technology Enhanced Personalized Learning Implementation defined by the administrators of the learning environment?

RQ2: What are the concerns of administrators when managing a Technology Enhanced Personalized Learning Implementation?

RQ3: What factors impact the implementation of a Technology Enhanced Personalized Learning tool as reported by the site administrators?

RQ4: How is Technology Enhanced Personalized Learning implemented in K12 learning environments?

Key Definitions

Learning Environment Administrator: A learning environment, whether traditional or technology-enhanced, has someone in charge to set the standards and guidelines. These standards and guidelines include the rules that the teachers follow, the learning resources that are available, and the type of teaching that occurs. In a TEPL environment, many of these same characteristics are present. The administrator of the environment is the one who is in charge of the learning characteristics and how the schools will instruct students. Common titles for this function are Technology Coordinator, Director of Learning, Assistant Superintendent of Instruction, or Learning Coordinator. Each learning environment may have a different position title, but in all cases someone will be responsible for the learning environment.

Technology Enhanced Personalized Learning Tool: The definition of the TEPL tool that is used in this study is a technology tool that enables the personalization of learning and is utilized in a formal learning environment. Ideally, the tool is used in a blended learning scenario where the students utilize the tools for learning both in the formal classroom and for work done outside the classroom. The teacher and students utilize the tool for a critical portion of the learning, with the tool enabling the teacher to provide individual lessons for each student. The student's mastery of the topic will be measured and students will progress at their own pace with the appropriate resources provided to them.

Although there are numerous learning tools that have been adapted to provide differentiation of student learning, this study considered them all the same in terms of discovering the success, issues, and characteristics of the learning environment. Many tools have been created by the specific learning entity, others are commercial programs that may have been modified for the specific learning environment.

Key Assumptions

The key assumption made in this study is as follows:

Administrators: The administrators of the learning environment were assumed to have the broadest understanding of the TEPL implementation. They routinely work with teachers, students, and other stakeholders in the learning environment and are responsible for the success of the learning environment within the schools requirements. Other studies may explore the point of view from other stakeholders, including how other stakeholders' perspectives may differ from the administrator. This study focused on the administrator's perspective as a basis for future research.

Limitations of Study

There are several limitations to this study. The first of these is that personalized learning as a learning methodology was not examined. A discussion of the theoretical framework is found in a review of the literature, but any discussion of the merits of a personalized learning environment is beyond the scope of this study.

This study relies on self-reporting by the people who are responsible for the success of the learning tool implementation. As such, they might be invested in the tool implementation and the learning environment they manage. Their view of the environment will be biased toward success, therefore, their answers may exhibit a bias in this direction.

Collecting descriptive data on one type of personalized learning may incorporate differences that otherwise would be identified if a descriptive study separated the sub-types of adaptive learning. There may be differences between personalized, individualized, and differentiated learning environments. There also may be differences between the types of

technology tool employed in the environments. This study did not attempt to identify these differences, it only acknowledges that they may exist.

Socio-economic factors also were not be explored. The nature of K-12 education in the United States is that different resources are made available to students based on their socio-economic status (Boondao, Hurst, & Sheard, 2008; Glennan & Melmed, 1996). In some cases, those higher on the socio-economic scale receive more resources, while in other cases the federal government and education foundations provide additional resources to those schools lower on the socio-economic scale. This study did not attempt to identify differences in characteristics based on the socio-economic status of the subject environments due to the size of the sample pool.

The process to implement a TEPL tool can take many years. In many cases, the learning entity may decide to provide this tool to a specific grouping of schools in a Magnet or Charter school situation. In other cases, the learning entity may implement the tool for all students in the district, a process that may take several years to accomplish. The scope of this study was to obtain data from TEPL implementations at any stage in the implementation process where teachers and students are actually using the tool in their learning process. The number of students using the tool was not critical to the subject pool. Future research can provide further clarification on differences between implementation stages.

TEPL implementations are relatively new to the learning process. As such, little data exists to define success or failure of these learning environments in terms of longitudinal student data. The focus of this study will be on obtaining a description of the current perceptions of success, issues and concerns, and characteristics of the TEPL environment. Future research will be performed to identify long-term success of the TEPL tools in learning enhancement.

Summary

School districts across the United States are considering the implementation of TEPL tools, yet little is known about the factors that influence the success, issues, and characteristics of the learning environments. Only a few TEPL tools have been implemented, and no longitudinal research has been conducted regarding the tools' success. Even without a large number of implementations, many learning entities are exploring the use of technology in order to create a personalized learning environment for their students and will benefit from an understanding of the issues explored in this research. Learning entities exploring the use of personalized learning tools will be able to utilize the data gathered in this research to assist in the decision making process or to set appropriate expectations for what can be accomplished with personalized learning tools.

The research questions in this research explore the success of, issues with, and characteristics of the implementation of TEPL tools. This task was accomplished by surveying the learning environment administrators for their self-reported descriptive information. Limitations of the study include the subjects' self-reporting, socio-economic factors of the population, differences between personalized learning tools, and the small number of potential subjects. The outcomes of this study may provide much-needed insight into the environmental characteristics that impact the success of personalized learning and provide guidance toward future research.

Chapter 2: Review of Relevant Literature

Personalized learning has been used in non-traditional educational institutions since the 19th century (Gibbons, 1971). Only recently has technology advanced sufficiently to provide personalized learning without incurring a large allocation of resources. In the past, teachers had to focus on a small number of students and have access to a wide variety of resources since they did not know which learning resources would be appropriate until the students were in the classroom. Technology has allowed teachers to monitor additional students while also providing access to a wide variety of digital resources. Through technology, all of the resources in a school district can be made available to any teacher, including learning resources that other teachers or students have made.

This study explores the success criteria, concerns and issues of implementation, and characteristics that exist in a TEPL implementation. In order to better understand the components of this study, this review of the literature will present a brief history of personalized learning in education, a definition of technology enhanced learning, a discussion of the theoretical framework for personalized learning, and an exploration of the topics raised in the research questions.. This literature review aims to confer a basic understanding of the personalized learning theoretical framework and topics important to the success of a TEPL.

Traditional Schools. Traditional instructional methods focus on teaching to a standard learning style and bringing all students to an accepted minimum standard (Subban, 2006). Minimum standards are often set by the government: either a local authority, state entity, or the federal government. The movement toward the Common Core provides further evidence that all students will be taught to specific objectives and curriculum. All teachers in states accepting the Common Core will have set criteria for teaching and what is considered learning success. As a

result, teachers are focused on bringing all students to the minimal criteria rather than on meeting the learning needs of the students (Edyburn, 2004; Forsten, 2002; McBride, 2004; McCoy, 2004; Tomlinson, 1998a; Tomlinson, 2008b).

Students are becoming increasingly diverse in their academic styles and backgrounds (Gable, 2000; Guild, 2001; Hall, 2002; Hess, 1999; McAdams, 2001; McCoy, 2004; Sizer, 1999; Tomlinson, 2004). Academic diversity is evidenced in students' backgrounds related to their "gender, culture, experiences, aptitudes, interests and particular teaching approaches" (Subban, 2006, p. 938). The majority of students do not fit a single mold, but rather are unique in their learning style and background. Teachers in the current system often fail to take these differences into account and instead focus on "teaching to the middle" (Subban, 2006, p. 938).

This is not to say that educators do not understand the diversity of the student population. Rather, they rarely accommodate this diversity in the learning environment (Gable, 2000; Guild, 2001). School administration and the objectives placed on the educator encourage instruction to be uniform across learners by (Gable, 2000; Guild, 2001; Sizer, 1999). The externally established objectives aim to identify and remedy deficiencies rather than optimize learning (Levine, 2003).

In addition to having diverse academic backgrounds, students also learn in different ways (Fischer, 2001; Green, 1999; Guild, 2001). Numerous learning theorists have outlined the diverse ways in which people attain knowledge (Brooks, 2004; Davis, 2000). Given this understanding, the current system's focus on a single teaching method for all students is not the most effective model for instruction (Subban, 2006). An individualized learning system takes the objectives of the current model and allows the educator to modify the delivery of the learning to accommodate

each student's unique needs (Lawrence-Brown, 2004; McBride, 2004; Tomlinson, 2001a, 2003; Tomlinson & Allan, 2000).

Personalized Learning Historical Background

Personalized learning has been considered since the early ages of instruction (Gibbons, 1971), yet the term *personalized instruction* was not used until 1970 by Victor Garcia Hoz (Garcia Hoz, 1970). In its early iterations it was seen as a tutor model and often done with a single instructor for each student. In some cases a small number of students would work with the instructor, but rarely were more than two to three students teamed with a single instructor. The instructor would provide instruction in a manner from which the student might best learn. This style of instruction took a large amount of resources and typically was reserved for the elite.

In the 1920s, Helen Parkhurst described the Dalton Plan and its importance to education (Parkhurst et al., 1922). The objectives of this plan were to tailor instruction to the student's needs/interests/abilities, to encourage the student to be independent in his/her learning, and to promote the student's social interaction. Parkhurst's plan encompassed three parts to accomplish these objectives:

- A community of students called *The House*,
- The student's monthly learning goal called *The Assignment*, and
- A subject-based classroom (*Laboratory*) where the students would progress at their own pace rather than by age.

During the same time period, Edouard Claparède (1920) stated that students should be allowed the freedom to choose their own activities. The teachers would pre-define the activities from which the students could choose, but they would have the freedom to identify the activity that would provide the best learning opportunity. Claparède posited that this freedom of choice

would allow the students to not only learn, but also improve their intellectual, social, and moral growth.

In the 1960s, Fred Keller created a plan called Personalized System of Instruction (PSI) outlining principles that are critical for effective instruction (Keller & Sherman, 1974). The focus of the plan was large classrooms in higher education, but his principles had an influence on K-12 education as well. The five components of Keller's PSI plan are:

- Written materials – Keller believed content should be provided to the student in a written format. This would allow the students to learn at the time most convenient to him/her with the portability of the content.
- Units of content – Each component of the learning should be broken down into an elementary unit. These content units would build upon each other, much like Bruner and Vygotsky's notion of scaffolding (Bruner, 1990; Vygotskii & Cole, 1978). The main difference between Keller's units of content and scaffolding is the social aspect. Keller did not focus on this factor, but rather considered the unit itself to build on its preceding units.
- Self-paced instruction – Students should be allowed to move through the learning at their own pace. Keller's plan has the instructor setting the order in which the learning is presented, but the student is responsible for advancing through the learning when he/she has mastered the current unit.
- Unit mastery – Each unit has multiple levels of assessment, the students move to the next unit only when they have shown mastery of the unit. When a student has difficulty mastering the unit, he/she is given additional resources in order to achieve mastery.

- Proctors – Keller’s plan included assistance from someone who had already mastered the material. This assistance may come from outside experts or students who have already mastered the unit. The role of the proctor is to assist the student with the material and provide social reinforcement in order to help the student master the material.

John Carroll (1963) outlined a model of school learning in the mid-1960s. Carroll’s model focused on the “equality of opportunity” rather than the “equality of attainment” (Reeves, 1997). The model includes one input variable (aptitude), one output variable (academic achievement), and four intermediate variables (opportunity to learn, ability to understand instruction, quality of instructional events, and perseverance). This model emphasized the concept of providing everyone the same opportunity while allowing their personal characteristics to dictate their academic achievement. It was not a requirement that everyone achieve the same mastery levels, some students would achieve more than others.

Bloom’s (1960) Mastery for Learning model features elements that impact personalized learning. Although Bloom did not specifically focus on the method by which a student achieves mastery, personalized learning dictates that the student achieves mastery before moving to the next learning objective (Guskey, 2007). Bloom postulates that all students will achieve mastery when given the appropriate learning resources. Personalized learning environments use this idea as a core concept.

The other core concept in personalized learning is Gardner’s (1983) theory of multiple intelligences. Gardner’s theory states that there are many ways to learn and internalize the information being presented. Students may have different preferred methods of receiving and

processing information. Whenever possible each student should be given the information in the manner in which he/she is most likely to receive the learning.

Teaching students with special needs has been a driving force within the personalized learning community. In the 1970s, Anne Welch Carroll (1975), a University of Denver special educator, attempted to identify a better way of providing instruction to students with special needs (Keefe, 2007). She identified three basic elements for approaching students with special needs, which she termed personalized education (Carroll, 1975, p. 25-28):

1. The learner must be actively involved.
2. The teacher must be a learning facilitator.
3. The student's program must be a learning facilitator.

Personalized Learning Overview

Learning styles. Research continues to show that people have diverse learning styles (Guild, 2001). Learning style diversity can be identified and included in planning for instruction (Stronge, 2004). Utilizing student specific learning styles in the instructional planning is more effective than providing a single mode of instruction (Green, 1999). As such, an understanding of learning styles is important to the definition of personalized learning.

Adaptive learning. Learning adapted to an individual's learning needs has been defined in various ways based on the specific requirements of the article or study. In some cases, adaptive learning has been defined as allowing the student to choose their own path to mastery of specific learning objectives. In other cases, the definition has been narrowed somewhat, noting that learning should reduce the focus on specific learning objectives and allow learners to choose not only their path to the learning, but even what the learning might entail.

The definition of adaptive learning most commonly used when applied to classrooms in the United States depends on the usage or focus of the learning environment. In an effort to reduce confusion, The United States Department of Education (n.d.) has identified three sub-components as important to the definition of adaptive learning. These sub-components are important distinctions as many in the field are not clear on the manner to which they adapt instruction.

Individualization refers to instruction that is paced to the learning needs of different learners. Learning goals are the same for all students, but students can progress through the material at different speeds according to their learning needs. For example, students might take longer to progress through a given topic, skip topics that cover information they already know, or repeat topics they need more help on.

Differentiation refers to instruction that is tailored to the learning preferences of different learners. Learning goals are the same for all students, but the method or approach of instruction varies according to the preferences of each student or what research has found works best for students like them.

Personalization refers to instruction that is paced to learning needs, tailored to learning preferences, and tailored to the specific interests of different learners. In an environment that is fully personalized, the learning objectives and content as well as the method and pace may all vary. The concept of learning personalization also encompasses differentiation and individualization.

The differences between these sub-components of adaptive learning are used throughout the literature as a way of defining the author's position relative to other theorist's positions. For example, Barbara Bray (2013) has created a chart outlining the differences between

individualized, differentiated, and personalized (see Table 1). Her perspective is that adaptive learning should only include personalized learning, and that the other sub-components are not as effective in the learning environment (Bray, 2013). Tomlinson (1999) focuses on differentiated learning as the appropriate learning model, although both Tomlinson and Bray would indicate that adapting learning to the students’ needs is the best mode of instruction.

Table 1

Individualization / differentiation / personalization of learning.

Personalization	Differentiation	Individualization
The Learner... drives their learning.	The Teacher... provides instruction to groups of learners.	The Teacher... provides instruction to an individual learner.
connects learning with interests, talents, passions, and aspirations.	adjusts learning needs for groups of learners.	accommodates learning needs for the individual learner.
actively participates in the design of their learning.	designs instruction based on the learning needs of different groups of learners.	customizes instruction based on the learning needs of the individual learner.
owns and is responsible for their learning that includes their voice and choice on how and what they learn.	is responsible for a variety of instruction for different groups of learners.	is responsible for modifying instruction based on the needs of the individual learner.
identifies goals for their learning plan and benchmarks as they progress along their learning path with guidance from teacher.	identifies the same objectives for different groups of learners.	identifies the same objectives for all learners with specific objectives for individuals who receive one-on-one support.
		(continued)

Personalization	Differentiation	Individualization
The Learner...	The Learner...	The Learner...
develops the skills to select and use the appropriate technology and resources to support and enhance their learning.	selects technology and resources to support the learning needs of different groups of learners.	selects technology and resources to support the learning needs of the individual learner.
builds a network of peers, experts, and teachers to guide and support their learning.	supports groups of learners who are reliant on them to support their learning.	understands the individual learner is dependent on them to support their learning.
demonstrates mastery of content in a competency-based system.	monitors learning based on Carnegie unit (seat time) and grade level.	monitors learning based on Carnegie unit (seat time) and grade level.
becomes a self-directed, expert learner who monitors progress and reflects on learning based on mastery of content and skills.	uses data and assessments to modify teaching and provides feedback for groups and individual learners to advance learning.	uses data and assessments to report the progress of what the individual learner learned to decide next steps in their learning.

Note. From “Personalization vs differentiation vs individualization (chart)” by B. Bray, 2013, Retrieved from rethinking learning Web site: <http://barbarabray.net/2012/01/22/personalization-vs-differentiation-vs-individualization-chart/>. Reprinted with permission.

Tomlinson (2005) focuses primarily on differentiated learning and considers adaptive learning as a philosophy that is “based on the premise that students learn best when their teachers accommodate the differences in their readiness levels, interests and learning profiles” (Subban, 2006, p. 940). Tomlinson’s focus on the teaching environment and allowing differentiation to occur encompasses a philosophy of teaching rather than a single set of techniques. The teacher engages in differentiation across all activities in order to provide the students with a more effective teaching practice (Tomlinson, 2004; Tomlinson & Allan, 2000). Tomlinson (1999) outlines the following principles a teacher should include for the differentiation of instruction:

(1) The teacher focuses on the essentials, (2) The teacher attends to student differences, (3) Assessment and instruction are inseparable, (4) The teacher modifies content, process, and products, (5) All students participate in respectful work, (6) The teacher and students collaborate in learning, (7) The teacher balances group and individual norms, and (8) The teacher and students work together flexibly.

Mulroy and Eddinger (2003) explore the cultural differences that enable differentiated learning. Student are increasingly culturally diverse, with a variety of learning expectations coming from this cultural diversity. Mulroy and Eddinger posit that providing differentiated instruction allows the educator to provide information in a culturally appropriate manner. When an education entity follows a differentiated philosophy, the teacher works with the support staff to provide an optimized learning environment.

Keefe (2007) views adaptive learning as a “systematic process for organizing a school for success” (Keefe, 2007, p. 221). Keefe builds on Tomlinson’s idea of adaptive learning as a philosophy of teaching by focusing on the conscious and systematic effort the school must put forth in order to ensure student success. Schools not only provide the learning to the students in a unique manner, but also help students assess their own talents and aspirations, plan a pathway to meet their own purposes, work cooperatively with others on challenging tasks, maintain a record of their explorations, and demonstrate their learning against clear standards in a wide variety of media.

Teachers and support staff act as mentors during this process, similar to Vygotsky’s notion of the More Knowledgeable Other (MKO; Vygotskii & Cole, 1978). Tomlinson would acknowledge the validity of these criteria, but focused more on the practice of the teacher rather than the specific process as Keefe has outlined.

Jeter (1980) takes a broad approach to the definition of adaptive learning as “adapting instructional procedures to fit student’s individual needs and characteristics” (Jeter, et al., p. 1). He goes on to note that children of the same age or grade level may have different cognitive and affective characteristics. This broader definition will be used for the purposes of this study. The differences between individualized learning, differentiated learning, and personalized learning may be important to specific implementations and pedagogical discussions, but are not critical to the learning environmental characteristics in this study. There are not enough TEPL tool implementations to provide meaningful differences between the types of adaptive learning.

Studies Supporting Use of Differentiated Instruction

As previously stated, little research has been completed exploring the effectiveness of adaptive instruction (Edyburn, 2004). Edyburn (2004) argues that differentiated learning is assumed to be effective based on analogy, using ancillary concepts such as the zone of proximal development, readiness, and other learning concepts demonstrate the efficacy of the philosophy of adaptive learning.

Subban (2006) has identified multiple studies that explore the use of differentiated instruction in a classroom environment, none of which used technology to enhance the adaptive nature of the learning. Johnsen (2003) investigated undergraduate teachers using differentiated instruction in order to accommodate different ability levels, focusing on student teachers who were encourage to use differentiated practices in their classrooms, specifically with reading materials. Johnsen found that the student teachers benefited from the process, but were not able to differentiate for all learners. Learners with “exceptional needs” continued to require external support from specialists.

Tomlinson (1995) focused her research on middle school students and the expectations of the teachers when presented with a differentiated philosophy. Initially, the teachers opposed the modification of instruction based on student ability. Administrative barriers also added to the teachers' sense of self efficacy by forcing them to identify paths around the barriers.

Unsurprisingly, Tomlinson identified the teachers' attitude toward change as a major factor in teacher acceptance of a differentiated strategy. Teachers who embraced change were more likely to accept the differentiated strategy. Tomlinson concluded that teacher resistance to new models should be investigated before implementing a differentiated philosophy.

Hodge (1997) investigated standardized test scores of students who were exposed to differentiated instruction. He also looked at the teachers' perceptions of their ability to meet student needs in the differentiated environment. The students showed an increase in scores on mathematics tests, but scores on reading tests showed no gains. Teacher perceptions showed no change from traditional teaching techniques. The study raises the question of the applicability of differentiated instruction to non-mathematics topics.

A study by Tomlinson, Moon, and Callahan (Tomlinson, 1998b) explored middle school teachers' use of instructional practice when confronted with an academically diverse population. The researchers found that teachers rarely modified lesson planning for student interests, learning profiles, or cultural differences. The teachers expressed frustration about the diverse population, but continued to focus on a *one-size-fits-all* approach. The findings of the study suggest that a model for training teachers in adaptive learning techniques might enhance teachers' ability to work with a diverse student population.

Teachers require "continuous and consistent" (Blozowich, 2001) professional development in order to implement a differentiated learning environment effectively. Blozowich

(2001) found that teachers continued to prepare lessons in a traditional manner even though they may have utilized adaptive techniques in the delivery of instruction. Many teachers expressed concern with the increased time required to prepare lessons in a differentiated environment, therefore they continued to utilize traditional lesson planning techniques.

Rockwood School District in Missouri implemented a rigorous training program for the teachers in its differentiated learning environment and required all of the stakeholders to support the instructional change. A study of this program showed significant improvement on standardized test scores by the lowest scoring students. The study also emphasized the requirement for the entire school or district to support the change for it to be successful and for a multi-year effort. The results can be seen only over a multi-year program as the early years must be used to overcome initial barriers (McAdamis, 2001).

Along with enhanced professional development, teachers accepting deeper levels of adoption of differentiated learning techniques showed greater self-efficacy. Teachers with more experience with the curriculum were more willing to favor differentiated instruction, particularly when they experienced greater levels of professional development. Having experienced teachers and providing them with significant professional development led to greater adoption of differentiation techniques (Affholder, 2003).

A limited amount of research has been conducted regarding personalized learning. The studies that have been completed show that adaptive learning is beneficial to students when teachers implement appropriate practices. Training teachers and providing appropriate resources has an impact on their likelihood using adaptive learning techniques in student instruction.

Theoretical Framework of Personalized Learning

Personalized learning is built upon the theories of constructivism, self-directed learning, and situated learning. Each of these learning theories intertwines with the others, constructivism theorists would acknowledge the impact of the situation while also allowing for motivation to impact the student's learning. A brief look at each learning framework follows, integrating the concept of personalized learning into each one as well as general notions of how people learn.

Constructivism. Many adaptive learning proponents view Vygotsky's learning theories as a theoretical basis for providing individualized learning. They primarily point to the zone of proximal development (ZPD) and role of the teacher as a more knowledgeable other (MKO) as important components of individualized learning environments (Nyikos & Hashimoto, 1997; Riddle & Dabbagh, 1999; Rueda, Goldenberg, & Gallimore, 1992). The social interaction between the learning and the teacher in a specific social context allows the learner to reach his/her learning potential (Kearsley & Lynch, 1992; Riddle & Dabbagh, 1999; Scherba de Valenzuela, 2002).

Zone of proximal development/More knowledgeable other. Vygotsky focused his research on how learning is transmitted in a school setting (Attwell, 2010). He created the notion of the zone of proximal development (ZPD) to describe the gap between the learner's developmental level and the potential level he/she may achieve (Vygotskii & Cole, 1978). This gap is bridged through active participation within the teaching environment and is accomplished through meaningful interaction with a teacher or other expert (Kearsley & Lynch, 1992; Riddle & Dabbagh, 1999; Rueda et al., 1992). The ZPD describes the potential learning that the learner may gain through interaction with external sources.

The ZPD focuses on individual learning, with subject matter expertise providing the assistance to the learner while taking into account the learner's previous knowledge (MacGillivray & Rueda, 2001). Subject matter expertise typically comprises an adult in an instructional role or more capable peers, allowing the learner to achieve a higher level of cognitive development than might otherwise have occurred through a social environment (Riddle & Dabbagh, 1999). The social environment becomes critical to the learner's ability to maximize his/her potential; it assumes that the learner internalizes the assistance of the social environment and internalizes the processes for future learning potential (Kearsley & Lynch, 1992; Riddle & Dabbagh, 1999; Scherba de Valenzuela, 2002).

Vygotsky and Cole (1978) termed individuals with subject matter expertise more knowledgeable others (MKOs). The MKO's specific function within the ZPD is to help the learner move from the knowledge he/she currently holds to the potential he/she may achieve (Vygotsky & Cole, 1978). The MKO is not able to move the learner beyond the learning he/she would have achieved on his/her own through purposeful instruction, mediation of activities, and substantial experiences (Subban, 2006). Assuming the MKO is able to continue providing guidance, the learner can continue to scaffold to higher levels of learning by building upon the previous levels (Riddle & Dabbagh, 1999).

In Vygotsky's view, learning is not based solely on instruction from a MKO. The learner is expected to be an active participant in the learning process and utilize various tools. Any instruction or tools used by the learner are culturally specific and may or may not be appropriate to that learner's specific needs. Instruction from the MKO is intended to begin the learning process and allow the learner to become engaged through an active role in the learning (Attwell, 2010). The learning occurs in a social and cultural context, with the learner's active role

occurring via social interaction (Riddle & Dabbagh, 1999; Rueda et al., 1992; Shambaugh, 2001).

The MKO attempts to provide appropriate instruction and tools to engage the learner's interest (Riddle & Dabbagh, 1999), but the learner has a responsibility to assist in the learning process: an important component of a personalized learning environment. A personalized learning environment can be used as a tool for the learner to interact with the MKO in a manner that allows him/her to receive specific direction and instruction. The environment in which the student and teacher interact include the physical space, meaningful instruction, student-teacher engagement methodology, student ability, and content. The role of the teacher is to utilize each of these areas to provide a meaningful learning environment that is individualized for the learner (Subban, 2006).

Self-directed learning. In an adaptive learning environment, the student has a greater responsibility to directing his/her own learning (Ley, Kump, & Gerdenitsch, 2010). The teacher works collaboratively with the student to provide learning that is appropriate for the learner, given his/her academic history, learning styles, and social/cultural context (Subban, 2006). The student's responsibility is to participate with the teacher and peers in order to achieve the learning objectives. The collaborative nature of the learning relationship requires the student to direct his/her own learning to achieve the learning goals. Papert (as cited in Ackermann, 2001) describes a cycle of self-directed learning, where students identify the tools that best support the topics about which they are most concerned.

Self-directed and self-regulated learning both are impacted by the learner's level of motivation (Perry, Hutchinson, & Thauberger, 2008). The learner's motivation is evident in the tasks and skills that he/she chooses for engagement (Schunk, 2014). The learner will identify

how he/she approaches tasks and activities based on his/her motivation, focusing on the tasks and activities that fit his/her learning profile (Perry et al., 2008). Learners find greater academic success when they engage in academically effective forms of self-directed and self-regulated learning (Berliner, 1996; Zimmerman, 1990).

In the seminal work *Self-Directed Learning*, Knowles (1975) explores self-directed learning and how to create and motivate self-directed learners, those who initiate, plan, organize, and conduct their own learning. The learning is typically accomplished without assistance from others; the learner has access to the appropriate resources and utilizes those resources as required for learning. Knowles reasoned that self-directed learners were more active in their learning and therefore were more likely to retain knowledge than their passive counterparts.

The issue outlined by Knowles (1980) is that motivation for self-direction of learning conflicts with the traditional mode of learning in which students are passively and given direction for their learning. Students are taught from a young age to receive instruction from the expert rather than to actively direct their own learning. To combat this learned mode of learning, Knowles (as cited in Smith, 2002) outlines a five step model of self-directed learning: (1) Determine learning needs, (2) Formulate learning needs, (3) Identify resources to meet learning needs (4) Select appropriate learning strategies, and (5) Assess outcomes.

Situated learning. Personalized learning is based on the premise that learning is influenced by the social and cultural context (MacGillivray & Rueda, 2001; Tharp, 1988). Learning can not be separated from the context in which the student exists (Papert, 1993); personalized learning attempts to bridge the situated nature of learning with the student's social and cultural needs. Taking into account the social and cultural needs of the student allows him/her to develop higher order learning (Subban, 2006).

Papert (1980) adds to the *situatedness* of learning by discussing the varied approaches to learning and development. Formal thinking is not the most powerful method of learning for all students, but rather each student may have his/her own way of thinking and learning based on the situation. Providing the student with the approach most suited to his/her situational learning needs yields the most effective learning for the student. Personalized learning allows the teacher to take the student's situation into account when helping identify resources that are appropriate for his/her learning objectives.

The theoretical framework for personalized learning includes a constructivist perspective, with the teacher functioning as the MKO and assisting the students through the ZPD by keeping in mind the students' academic background and learning styles. Thus, situational learning is also important to the theoretical background of personalized learning. The student's situation and approach to new learning is taken into account with personalized learning structures. Finally, personalized learning relies upon the students desire to direct their own learning. The teacher is responsible for providing learning resources that are appropriate to the students' development, but the student must take some accountability to direct their own learning. The students' desires must be enhanced in order for them to be motivated to participate in the learning process.

Enhancing Personalized Learning with Technology

E-learning as a learning platform. The American Society for Training and Development (ASTD) defines e-learning as encompassing "a wide set of applications and processes, such as web-based learning, computer-based learning, virtual classrooms, and digital collaboration. It includes the delivery of content via Internet, intranet/extranet (LAN/WAN), audio- and videotape, satellite broadcast, interactive TV, and CD-ROM" (ASTD Glossary, n.d.). This broad definition outlines the difficulty in narrowly defining an e-learning tool. Wagner

(2008) defines e-learning as pedagogy empowered by digital technology. E-learning can be used to describe nearly any learning that utilizes technology in its delivery, but is commonly used when learning is delivered with computer technology, often via the World Wide Web (Dawei et al., 2008; Marshall & Rossett, 2011).

E-learning via the Internet has become an accepted method of content delivery (Cuban, 1986; Dawei et al., 2008). Teaching with web-based technology is considered at least equal to, if not better than, traditional teaching methods. This is particularly true when the e-learning tool identifies the specific historical knowledge and habits of the learners for analysis (Dawei et al., 2008).

Muilenburg (Muilenburg & Berge, 2005) identifies eight barriers to online learning: “(a) administrative issues, (b) social interaction, (c) academic skills, (d) technical skills, (e) learner motivation, (f) time and support for studies, (g) cost and access to the Internet, and (h) technical problems” (p. 29). Teachers utilizing an online learning tool need to compensate for these barriers when considering the content planning process. Creating lesson plans with online tools requires the teacher to consider the method by which the students will use the content (Wenglinsky, 2006).

E-learning with personalization. The first attempts at integrating individualized learning and technology based tools were made in the 1990s (Cuban, 2001). As e-learning tools became more powerful, a natural progression brought individualization to the existing tools (Cobb, 2010; Hsieh & Cho, 2011; Jeong, Choi, & Song, 2012; Zhang, 2004). The implementation of these tools beyond pilot learning environments is even more recent (Cuban, 2001; Schargel & Smink, 2001). The initial focus of research was on how to integrate technology into the classroom (Cuban, 2001), recently the focus has shifted toward the actual

modification of the technology for personalization (Cobb, 2010; Hsieh & Cho, 2011; Jeong, Choi, & Song, 2012; Zhang, 2004). This shift in research leads to recent e-learning with personalization references being primarily focused on technical matters and earlier references focused primarily on justification of personalization or the utilization of technology with personalization in the learning environment.

Cook (2005) compared the impact on a teacher's time requirements when using an e-learning with personalization tool versus a traditional teaching method. The initial lesson planning and setup was greater when using the technology-enhanced individualized learning tool. Once the lesson plans were in place, the e-learning tool allowed for greater time efficiency. By the end of the comparison, the teacher utilizing the e-learning tool spent less time on administrative tasks than the teacher utilizing traditional methods. The teacher utilizing the e-learning tool was able to devote more time to teaching and less time performing non-teaching tasks.

Zajac (2009) found little difference in exam scores when comparing an in-person class with an online course. The in-person class allowed the instructor to identify the students and modify instruction accordingly. With a non-personalized e-learning tool, the instructor would not have such feedback. The convenience of the e-learning tool benefited the students such that their test scores were on par with those of an in-person class. Zajac indicates that adding personalization to the e-learning tool provides convenience to the student while allowing the instructor to modify instruction based on student requirements.

Theoretical Definition of Success

Little has been written about the success criteria of a TEPL environment. Instead, more focus has been placed on the success of a specific algorithm in presenting appropriate learning

resources to the learner (Acampora, Gaeta, & Loia, 2011; Benjamin, 2005; Esmahi, 2007; Ferguson, 2001). There are numerous examples of research into computer based algorithms that provide suggestions to the user regarding which learning resources are most effective for their learning objectives.

Busilovsky et al. (Brusilovsky, Karagiannidis, & Sampson, 2004) identified a framework for evaluation of an adaptive learning system's overall success. The proposed model outlines a layered solution where the evaluation process is broken into two parts: the user layer and adaption layer. The user layer focuses on the user's effectiveness in using the system. The adaption layer identifies the appropriateness of the material being presented to the user. The layered evaluation framework allows for the interchange of both ideas while combining the layered success criteria to identify a system success.

There are numerous ways of measuring the success of a learning environment, each of which varies based on the specific school district's needs. The U.S. Department of Education requires reporting of various student related items on a regular basis and publishes the resulting analysis publicly through its School District Demographics System (U.S. Department of Education, n.d.b). The No Child Left Behind Act provides funding for schools, but also requires the reporting of standardized test scores. These standardized test scores are often used to indicate the success of a learning environment, although they may not be an effective predictor of learning (Lee & Reeves, 2012).

E-learning tool success. The bulk of the literature related to the identification of a successful personalized learning environment focuses on the success of the e-learning tool itself (Agostinho, Oliver, Harper, Hedberg, & Wills, 2002; Hiltz & Wellman, 1997; Marold, Larsen, & Moreno, 2000; McCloskey, Antonucci, & Schug, 1998; Zhang & Nunamaker, 2003). Although

not directly measuring the success of a TEPL implementation, the measurement of the e-learning portion of the tool may provide some indication of the success of the overall TEPL implementation.

Delone and McLean (1992) created a model that is widely considered to be the seminal framework for evaluating information services (IS) success. They outline five conclusions that are important to the evaluation of IS success:

1. The multidimensional and interdependent nature of IS success requires careful attention to the definition and measurement of each aspect of this dependent variable. It is important to measure the possible interactions among the success dimensions in order to isolate the effect of various independent variables with one or more of these dependent success dimensions.
2. Selection of success dimensions and measures should be contingent on the objectives and context of the empirical investigation, but, where possible, tested and proven measures should be used.
3. Despite the multidimensional and contingent nature of IS success, attempts should be made to reduce significantly the number of different measures used to measure IS success so that research results can be computed and findings validated.

More field study research should investigate and incorporate organizational impact measures. The model also includes six interrelated IS success categories or dimensions: (1) System quality, (2) Information quality, (3) Use, (4) User satisfaction, (5) Individual impact, and (6) Organizational impact. This success model clearly needs further development and validation before it can serve as a basis for the selection of appropriate IS measures .

After 10 years, DeLone and McLean (2003) proposed an update to their IS success model after evaluating the original model in regards to the dramatic changes that had occurred in IS practice, particularly with the enhanced usage of the Internet and Internet-enabled applications. They maintained six interrelated dimensions by adding service quality and combining the impact dimensions into a single category called net benefit. As such, the updated six categories are: (1) Information quality, (2) System quality, (3) Service quality, (4) Use/intention to use, (5) User satisfaction, and (6) Net benefits.

Wang (2007) built on the IS model put forth by DeLone and McLean (1992, 2003), focusing on the implementation of an e-learning tool within an organization. Six success dimensions were identified as important for measurement in an e-learning environment: (1) Information quality, (2) System quality, (3) Service quality, (4) System use, (5) User satisfaction, and (6) Net benefit. Wang's framework focuses on the perspective of the e-learner and attempts to measure his/her perception of the tool's success. Wang did not attempt to identify or measure the perspective of the e-learning tool administrator or the overall organization.

Critical success factors (CSFs) are used within organizations to identify and measure success (Ingram, Biermann, Cannon, Neil, & Waddle, 2000; Selim, 2007). Freund defined CSFs as "those things that must be done if a company is to be successful" (Freund, 1988, p. 20-25). Papp (2000) took the concept of a CSF and applied it to e-learning in an effort to identify and measure the factors of a successful e-learning environment. These factors include: (1) Intellectual property, (2) Suitability of the course for e-learning environment., (3) Building the e-learning course, (4) E-learning course content, (5) E-learning course maintenance, (6) E-learning platform, and (7) Measuring the success of an e-learning course.

With an e-learning system, the success of the students' learning is critical to the success of the tool. The learner's perspective is not the only critical component of the system, however. All stakeholders are critical to the success of the e-learning tool implementation (Hassanzadeh, Kanaani, & Elahi, 2012; Moore & Kearsley, 2011). Each of the models outlined in this literature review measures success from the learner's perspective, but also from the perspective of other stakeholders, including tool administrators, teachers, financial administrators, and other people impacted by the e-learning tool.

Theoretical Definition of Concerns and Issues

As with the success of a TEPL implementation, little has been written about the concerns and issues administrators face with a TEPL implementation. The relevant literature describes concerns and issues with e-learning environments, which are outlined in this section.

Moore and Kearsley (2011) describe a distance learning system as one that consists of multiple subsystems such as learning, teaching, communication, design, management, history, and institutional philosophy. Each of these subsystems has its own systems and subsystems while also needing to relate to one another. As such, an issue in one of the subsystems can have an impact across the entire distance learning implementation. The identification of issues within any subsystem is critical to the success of the entire system.

Valentine (2002) identifies eight areas of concern within an e-learning implementation. These areas are not the subsystems outlined by Moore and Kearsley (2011), but rather are general categories of concern. These areas include: (1) Quality of instruction, (2) Cost effectiveness (3) Misuse of technology, (4) Role of the technician, (5) Problems with equipment, (6) Attitudes toward distance learning, (7) Instructor concerns, and (8) Student concerns.

Sherry (1995) summarizes 10 potential concerns with distance education with more generality than Valentine (2002). Sherry's areas of concern include: (1) Redefining the roles of partners in distance education teams, (2) Technology selection and adoption, (3) Design issues, (4) Methods and strategies to increase interactivity and active learning, (5) Learner characteristics, (6) Learner support, (7) Operational issues, (8) Policy and management issues, (9) Equity and accessibility, and (10) Cost/benefit tradeoffs.

Theoretical Characteristics of a TEPL Implementation

Tomlinson (as cited in Edyburn, 2004) describes differentiated learning as modifying instruction based on individual student differences. These modifications occur in a traditional learning environment, although the traditional environment encourages only slight modification to instruction. Individualized instruction encourages broader changes to instruction based on the specific needs of a student. Modifying instruction for the needs of the learner embraces the notion of changing instruction in a significant way (Edyburn, 2004). Tomlinson outlines eight principles that inform the manner in which instruction is modified when differentiated teaching practices are in use (Tomlinson, 1999): (1) The teacher focuses on the essentials, (2) The teacher attends to student differences, (3) Assessment and instruction are inseparable, (4) The teacher modifies content, process, and products, (5) All students participate in respectful work, (6) The teacher and students collaborate in learning, (7) The teacher balances group and individual norms, and (8) The teacher and students work together flexibly.

Keefe and Jenkins (2008) take Tomlinson's focus on the characteristics of personalized instruction and expand them to include additional characteristics that should be found throughout a school that employs personalized learning (Jenkins & Keefe, 2001a, 2002a, 2002b; Keefe & Jenkins, 2000, 2008; Keefe, Jenkins, & National Association of Secondary School, 1991). The

majority of the identified characteristics are similar, with Tomlinson taking a teacher point of view while Keefe and Jenkins broaden the scope of their characteristics (Keefe & Jenkins, 2008). A summary of the characteristics can be found in Table 2 and will be explored in greater detail subsequently.

Table 2

Personalized learning characteristics

Characteristic	Description
Dual Teacher Role	The teacher is encouraged to be a facilitator of learning (direct instruction or assigning resources), work with students on career and personal-social goals, or function as the chief in-school contact for all persons concerned with the student
Diagnosis of Characteristics	Developmental characteristics of the students are identified and measured, teachers are encouraged to identify each student's learning style, and the students learning history is available to the teacher
Culture of Collegiality	Teachers and students work together to accomplish learning goals and students work together with or without teacher guidance
Interactive Learning Environment	Organization of classroom interactions encourage thoughtful questions, students participate actively in learning activities, and student output is tied to the real-world.
Flexible Scheduling/Pacing	The school day does not have set periods of time with set topics for all students in class, technology is used to enable learning anytime and anywhere the student has access, and students are allowed to progress at their own pace.
Authentic Assessment	Student assessment focuses on the student's mastery of the topic, the public is often involved with a student's final work output, and students are encouraged to learn how to rate their own work and revise as needed.

Dual teacher role. In a personalized environment, Jenkins and Keefe (2002a) identify two roles for the teacher to perform. The teacher performs the role of *Teacher-Coach* and *Teacher-Advisor*. Each of these roles has a specific function in regards to the learner's experience.

The Teacher-Coach is defined as a “facilitator or learning, a learning guide who helps students find appropriate resources and engage in suitable learning activities” (Keefe & Jenkins, 2008, p. 42). This is similar to the traditional teacher-student relationship where the teacher is responsible for providing direct instruction and providing appropriate knowledge resources. The Teacher-Coach role also has the teacher facilitating small groups and providing coaching on basic skills such as reading, writing, and speaking. These basic skills are requirements across all academic subjects, and the Teacher-Coach works with the learner to enhance these basic skills.

In the Teacher-Advisor role, the teacher joins “professional counselors in helping students plan and achieve appropriate career and personal-social goals” (Keefe & Jenkins, 2008, p. 44). This is a non-traditional role where the teacher takes a specific interest in the student’s learning path during his/her academic career at the school. The teacher will work with students to provide guidance information and help students recognize their personal aptitudes and interests (Subban, 2006). The Teacher-Advisor works with the students outside of the classroom setting. In many cases the student may not work with the teachers in an academic setting the entirety of their relationship.

Diagnosis of characteristics. In a personalized learning environment, the teacher must understand the students’ learning needs in order to provide appropriate instruction and resources (Jenkins & Keefe, 2002a; Subban, 2006; Tomlinson, 2001a). This understanding is typically gained through some form of early diagnosis and observation of individual students. Students already accept differences in each other, so the teacher should also identify and include individual differences (Subban, 2006).

Keefe and Jenkins (2008) define developmental characteristics as “those specific stages in individual maturation when certain capacities for learned behavior appear” (p. 48). A

personalized learning environment uses the individual student's developmental characteristics to understand where the student is in his/her developmental and maturation process. These characteristics include physical, psychological, and sociological aspects of the individual student's development.

The second set of individual characteristics that Keefe and Jenkins (2008) emphasize is learning style characteristics. Learning style characteristics initially were identified by Gardner (1983), but have been expanded. Diagnosis of these characteristics allows the individual to receive instruction in the manner he/she prefers.

The final set of individual characteristics that are important to diagnose is individual learning history. Keefe and Jenkins (2008) define learning history as the "aggregate of personal learning that each student brings to a particular course, class, or school program" (p. 51). Each student will come to the program with a particular set of academic experiences. The teacher will use this information along with the other characteristics to understand the learner's specific needs and preferences.

Collegial school culture. Jenkins and Keefe (2002a) identify a collegial school culture as the third characteristic of a personalized learning environment. They define a culture of collegiality as one "where students and teachers work together in a cooperative social environment to develop meaningful activities for all students" (Keefe & Jenkins, 2008, p. 52). Keefe and Jenkins do not differentiate between in-person and online interactions, but rather are focused on meaningful interaction between teachers and students as well as meaningful interaction between students themselves.

Tomlinson (Tomlinson et al., 2008) adds that teachers and principals of the school environment must embrace change for an effective differentiated environment. The school

culture must allow those providing the instruction to embrace change and the students to work together both with their peers and their teachers. Interaction between the main participants in the learning process is critical to the success of the personalized learning environment (Jenkins & Keefe, 2002a; Keefe & Jenkins, 2000; Tomlinson, 1999).

Interactive learning environment. According to Keefe and Jenkins (2008), interactive learning environments are “designed to foster collaborative learning and reflective conversation” (p. 59). The type of learning environment outlined is not critical to the definition, it can be a traditional classroom or a blended learning model. The most important factor is the encouragement of collaboration and thoughtful interaction between students and teachers.

Keefe and Jenkins (2008) also identify multiple attributes that are critical to an interactive learning environment, such as the school or group size, a thoughtful environment, active learning, and authentic student achievement in this list of critical attributes. The school or classroom size attribute can be misleading as it has often been used in popular culture as a measure of quality. The standard class size metric may be one way of measuring the attribute as outlined by Keefe and Jenkins (2008), but it is not the only way. An interactive learning environment is more focused on the learner being a part of a small group and having meaningful interaction with peers and teachers than on a student-teacher ratio. The size of the group or class with which the student interacts is the most important component to consider.

A thoughtful environment allows the learner to experience “thoughtful conversation, learning by doing, apprenticeship experiences, and authentic student achievement” (Keefe & Jenkins, 2008, p. 61). Beyer (1992) outlines four elements of a thoughtful environment: (1) Classroom that invites thinking, (2) Classroom interactions that involve information processing rather than information receiving or repeating, (3) The use of precise, thoughtful language rather

than vague terminology or generalizations, and (4) The organization of classroom study and courses around thoughtful questions. (pp. 94-95).

Active learning by the students brings real world experience and maximum sensory input to provide a richer learning experience. Students often learn better by being involved actively in the learning experience (Dewey, 1938, 1966). An interactive learning environment provides a *learning by doing* environment.

Authentic student achievement allows students to consider how their output will be used in a real world situation. Students will not be forced to create artifacts that do not make sense to their existing experiences, but rather are encouraged to create outputs that blend their real world experiences and knowledge to solidify the learning (Jenkins & Keefe, 2001a; Keefe et al., 1991; Sousa & Tomlinson, 2011; Tomlinson, 2001a, 2001b, 2005). Their output often will include resources and people from outside the classroom, either in the process of creation or in a public showing of the student output.

Flexible scheduling/pacing. One of the defining characteristics of a personalized learning environment is allowing the student to progress through the learning at his/her own pace (Jenkins & Keefe, 2001a; Keefe & Welbe, 1992; Sousa & Tomlinson, 2011; Tomlinson, 1998b, 2001a). Each learner will be focused on mastery of the content rather than a time-based metric. The student is enabled to learn on his/her own schedule, which is independent from other students in the classroom. Each of the students will achieve the same objectives, but will achieve these objectives at his/her own pace.

TEPL environments strive to enable learners to progress at their own pace through the use of blended learning (Edyburn, 2004). The classroom environment allows students to work during the normal school day, while the online technology tool allows students to continue their

learning outside the traditional school day. Their learning can continue to environments outside of the traditional classroom such as the students' homes or after-school programs.

Authentic assessment. The final characteristic outlined by Keefe and Jenkins (2008) is authentic assessment. If the environment is focused on the specific needs of the learner by providing a collegial, thoughtful, and interactive learning environment utilizing the learner's previous experience and flexible pacing needs, then assessment of the learner's progress is on mastery of knowledge. Assessment of the learner's knowledge mastery informs the student and teacher of gaps in the student's knowledge as well as when mastery has been achieved.

Wiggins (1989, 1998) outlines four common characteristics that are relevant to a TEPL implementation: (1) Authentic assessments are designed to be a representative of performance in the field, (2) Authentic assessment criteria are utilized to rate the "essentials of performance" against clear performance standards, (3) Authentic assessment attempts to help students learn how to rate their own work against published standards and to revise it as needed, and (4) Authentic assessment often demands a public product. (Wiggins, 1989, p. 84)

Scalise (Scalise et al., 2007) outlines four principles that are essential to an authentic assessment environment: (1) Assessments should be based on a developmental perspective of student learning, (2) Assessments in e-learning should be clearly aligned with the goals of instruction, (3) Assessments must produce valid and reliable evidence of what students know and can do, and (4) Assessment data should provide information that is useful to teachers and students in improving learning outcomes.

Each of these sets of principles describes an authentic assessment environment characteristic. Schools that exhibit this characteristic will be focused on the student's mastery of the learning rather than simply recording responses that may or may not measure learning.

Sergiovanni (1999) reminds us that measuring a schools success is much more than merely test scores. A focus on the students learning success goes beyond a few tests and should include evidence of content mastery.

Summary

Personalized learning has become an area of focus for school districts across the country (Hopkins, 2004). Tremendous resources are being spent by school districts and grant entities to enable the collection and dissemination of student learning data in an effort to provide a learning environment that enhances learning (Lee & Reeves, 2012). Little is known about the success criteria, concerns, and characteristics that make for a successful personalized learning implementation.

Traditional schools have forced teachers toward assembly line teaching (Rasberry, 1991), rather than providing learning specific to the students needs. Teachers have limited resources and are not able to provide individualized instruction to the number of students for which they are responsible. Traditional schools focus on providing a *one-size-fits-all* education (Rasberry, 1991) and all students obtaining satisfactory scores on standardized tests. Learning is not measured effectively. Rather, learning is measured based on student performance on standardized tests (Hopkins, 2004).

Personalized learning has been utilized for many years in small settings (Carroll, 1975; Fuller, 1974; Gibbons, 1971). Recent advances in technology have allowed teachers to provide greater individualization of instruction with the resources available (Hopkins, 2004). Providing individualized instruction to students through the use of technology allows the students to achieve greater learning and enhance their true learning as well as perform better on standardized tests (Cobb, 2010; De Lay, 2010; Scalise et al., 2007; Tiene & Luft, 2001). Many of the

technologies required for personalization of instruction are already in place within school districts and only need to be modified to allow for personalization. The more difficult part of providing personalization of learning is integrating the technology into the pedagogy rather than simply utilizing the technology as a replacement for traditional teaching methods (Herrington et al., 2005).

The theoretical framework for personalized learning is based on Vygotsky's notion of the ZPD and MKO (Kearsley & Lynch, 1992; Riddle & Dabbagh, 1999; Rueda et al., 1992). The teacher functions as the MKO, providing appropriate learning resources to the student while taking into account the learner's preferred learning style, academic background, social context, and learning objective (Riddle & Dabbagh, 1999; Subban, 2006). The learner uses learning resources to scaffold to higher levels of learning by building on his/her previous learnings.

With personalized learning, the individual takes on a greater responsibility for his/her learning (Ley et al., 2010). The teacher identifies appropriate instructional resources, but the learner is responsible for directing his/her own learning. The relationships between teacher and student becomes one of collaboration, with the student and teacher identifying appropriate resources for optimal learning (Ackermann, 2001). Technology enables this collaboration by providing data on the student's learning style, academic background, and learning progress to both the student and teacher. In some cases, technology is enabled to provide suggestions for appropriate resources and act as an intermediary to the teacher/student relationship (Cobb, 2010; Hsieh & Cho, 2011; Jeong et al., 2012; Zajac, 2009; Zhang, 2004; Zheng, Wu, & Li, 2008).

As school districts implement personalized learning tools and modify instruction to utilize these tools, it becomes critical to understand how to define a successful implementation. Although little has been written about the expectations of a successful TEPL implementation,

research has been conducted to measure success in an e-learning environment. DeLone and McLean's model to measure the success of IS (DeLone & McLean 2003) is the basis for the measurement of an e-learning implementation by Wang and Hassanzadeh (Hassanzadeh et al., 2012; Wang, 2007). Papp (2000) utilizes the idea of CSFs to identify the components of an e-learning implementation that are critical for success, but stops short of identifying a method of CSF measurement.

An understanding of the issues and concerns with a TEPL implementation are also critical. As with attempting to measure success, little has been written about issues and concerns related to a TEPL implementation. The literature speaking to issues and concerns focuses on areas of concern related to a distance learning implementation rather than specific models that measure a TEPL implementation (Sherry, 1995; Valentine, 2002).

Characteristics of existing TEPL implementations are important to understand. This review of the literature has identified multiple characteristics that are expected to be present in TEPL implementations, a deeper understanding is important for future implementations. Unfortunately, the literature has not provided a comprehensive listing of important characteristics, and understanding of the existing implementation characteristics that the site administrators deem important will provide greater direction for future implementations.

This literature review has explored the history of personalized learning, a brief theoretical background for personalized learning, how administrators might define success, concerns, and issues, and characteristics that might be found in a TEPL. This study built upon the findings from the literature review, providing a description of implementation success, concerns, and characteristics for school districts considering using a TEPL tool. The information gathered

during this study will be useful to school districts as they prepare to expend resources on a learning initiative that appears to hold great promise for the enhancement of student learning.

Chapter 3: Methodology and Procedures

The purpose of this descriptive study was to explore how technology enhanced personalized learning (TEPL) tool administrators define the success, concerns, and learning implementation factors that impact the success of a United States based K-12 learning environment. Past research has focused on the specific technology utilized in such an environment and how computer algorithms might be created in the best possible manner. In contrast, this study attempted to understand how the definitions of success, concerns, and learning implementation characteristics might be impacted by personalized learning technology. This study also attempted to identify the manner in which TEPL tools are implemented in K12 learning environments and provide an understanding of the implementations. The following research questions were explored:

RQ1: How is the success of a Technology Enhanced Personalized Learning Implementation defined by the administrators of the learning environment?

RQ2: What are the concerns of administrators when managing a Technology Enhanced Personalized Learning Implementation?

RQ3: What factors impact the implementation of a Technology Enhanced Personalized Learning tool as reported by the site administrators?

RQ4: How is Technology Enhanced Personalized Learning implemented in K12 learning environments?

Research Design

The researcher used a qualitative descriptive design with an online survey to gather data related to the research questions (Bryman, 2008; Creswell, 2008; Sandelowski, 2000).

Sadelowski (2000) describes a qualitative descriptive study as one which is “especially amenable

to obtaining straight and largely unadorned...answers to questions of special relevance” (p. 337). She goes on to point out that qualitative descriptive studies “tend to draw from the general tenants of naturalistic inquiry” (p. 337) and “offer a comprehensive summary of an event in the everyday terms of those events” (p. 336). The goals of this study align with Sadelowski’s description of qualitative methods. The reason this researcher chose to use a qualitative descriptive design is that it was the best method to gain an initial understanding into a previously under-studied topic. This study attempted to provide an initial understanding of the success criteria, concerns, and characteristics of a TEPL implementation for further research.

This purpose of this design study was to gain familiarity with an undefined area (Bryman, 2008; Creswell, 2008). An exploratory design allows the opportunity to gain insight into the success, issues, concerns, and environmental characteristics of a TEPL implementation. The information gained from this exploratory study will not be able to be generalized beyond the specific classroom environments studied. However, the results of this study provide guidance for further research.

In this study, administrators of a TEPL implementation were surveyed by a web-based open-ended survey mechanism to identify how they define success, the issues and concerns they may have, and the characteristics impacting the TEPL implementation. These data were collected through a survey that allowed the respondent to answer each item through slider-based, Yes/No, and open-ended responses.

Past studies have researched TEPL using quantitative methods to explore the optimal way to configure the technology for learner preferences (Henze, Dolog, & Nejd, 2004; Sousa & Tomlinson, 2011). While these studies have been useful in optimizing learning technology for adaptive learning, they have done little to understand the environments where the tools are

implemented. As such, the value of the past research on TEPL is limited when considering actual classroom practice.

Initially, a quantitative survey design was considered for this study. A quantitative survey design would require an understanding of the specific success criteria, issues and concerns, and learning environment characteristics in order to query the subjects on their agreement with the existence of these items or measure their attitudes and opinions. As there has been little past research identifying the information required for measurement, a quantitative survey design such as this would not answer the research questions posed in this study.

A qualitative direct or phone interview design was also given consideration. This design would accomplish the goals of gathering descriptive data in order to answer the research questions. After reviewing the subjects' time commitment, it was decided that the level of participation would improve with a short computer-based survey rather than an in-person or phone interview. The assumption was also made that the subject pool would be more comfortable with a technology-based survey rather than an in-person or phone interview. As the subjects work with technology-enhanced learning, the researcher was concerned that they would be less open with their answers when faced with a live person rather than technology-based survey.

Sources of Data

Target population. The target population for this study was administrators of TEPL K-12 classrooms in the United States. The reason this study targeted these administrators is the fact that they are the ones most directly charged with managing the learning environment and are the most familiar with the success criteria, concerns, and characteristics of the learning environment.

Dozens of school districts throughout the United States have implemented a TEPL tool. They may have implemented this learning tool for an entire school district or only with pilot or charter schools within a larger district. In each case there is a person appointed as the administrator of the learning environment, which is the data source for this study. All geographical locations within the United States were included in this study, regional differences within the data source can be explored in future research and were not be a part of this study. This study also obtained data from all grade levels and school types. This study included respondents using different types of implementations in order to discern any identifiable differences. Although the identification of these differences is not a core component of this study, any additional information that was obtained was discussed in Chapter 4.

The data source for this study was a population of convenience as the researcher is not able to identify or include all of the possible TEPL implementations in the United States. The data source is expected to be 5-10 respondents. As there is no definitive source of data to confirm the exact number of learning entities that utilize a technology tool in an adaptive learning manner, a snowball approach was used in order to identify as many data sources as possible. In order to locate the data source, the researcher utilized Internet searches and journal articles from such sources as membership in personalized learning groups, suggestions from existing respondents, and information from personalized learning organizations to contact as many data sources as possible. The data sources were asked to provide additional contacts for inclusion in the study. An anonymous link to the survey was created and distributed on the invitation email to enable the initial contacts to quickly and easily forward survey invitations as they saw fit. Invitations to participate were sent to all identified contacts with an expected response rate of

20% for a total of three to five responses. An additional two to three responses were expected from the forwarding of the survey invitation by the initial subject pool.

The target population used a common technology platform for the majority of their learning management, including the tracking and scheduling of learning resources. The technology platform differs from a traditional learning management system in that it enables personalized learning either by empowering the instructor with learner specific information or giving the instructor specific learning resource suggestions. A variety of commercial and school created tools meet this criteria. As indicated previously, Internet searches were used to identify the target population. Searches with the Google search engine provided an initial list of organizations focused on technology enhanced personalized learning. The membership schools of this organization became the first prospective respondents for this study. Additional Internet searches provided specific schools which were utilizing technology with personalized learning, allowing the researcher to add additional potential subjects to the study.

Environments that do not include this technology platform were not considered. No preference was given for the type of technology platform, the defining characteristic for inclusion were its function in managing students' learning experience. The platform's ability to provide blended learning for the students was desired, but not a requirement for inclusion in this study. A learning entity may use the TEPL tool in the classroom, in an online setting, or a combination of the two.

Definition of analysis unit. The analysis unit for this study was the individual administrator of a TEPL implementation, commonly thought of as the person responsible for the learning environment in a single school or school district, although some non-traditional learning environments may not group the learners into formal schools. In all cases there was a defined

instructor(s) and students using learning resources to achieve learning objectives as outlined by a governing authority. Common titles for this function are Technology Coordinator, Director of Learning, Assistant Superintendent of Instruction, or Learning Coordinator. The tool administrators were the subjects and were asked to provide responses to the Technology Enhanced Personalized Learning Implementation Survey (TEPLIS) instrument and their titles recorded to better understand the field..

Instruments Used

Technology Enhanced Personalized Learning Implementation Survey. Little research has been done on the definition of success, the concerns, and characteristics in a TEPL implementation. There has been research on the success of a technology project in a learning environment, specifically the technical aspects of how the learning tool identifies appropriate learning resources for the student. A review of the relevant literature has yielded no suitable instrument designed to identify the success criteria, concerns, and characteristics or attributes that make up those items. The work of Jenkins and Keef (2002a, 2002b) has identified many of the characteristics and attributes, but has not identified a method of measuring them. In order to gather the qualitative data outlined in this study, the researcher created a web-based based survey consisting of three sections.

An introductory section was used to identify background information on the TEPL implementation environment. This section included check-box and range-based questions designed to capture the grade level, type of school, size of the TEPL implementation, and how the tool is used in the learning environment. No identifiable information about the user or his/her school was collected, only general classification information that might be useful in clarifying themes and how the tool is used within the learning environment.

Section 1 of the TEPLIS instrument measured the characteristics of the implementation, providing the respondent with slider-based questions early in the survey so he/she will be more inclined to provide complete answers during the open-ended portion of the survey. Jenkins and Keefe (2002a, 2002b) identified six characteristics and attributes that would be expected to exist in a personalized learning environment. Based on these principles, six questions have been created to identify the personalized learning characteristics. Each characteristic is associated with a single question that the administrator will answer using slider-based and Yes/No responses to indicate which characteristics are found in his/her environment and the extent to which they are present. A final open-ended question was added to allow the subject to respond with characteristics that may have not been identified in the literature review.

Section 2 of the TEPLIS instrument consisted of two open-ended questions designed to capture the criteria for success of the environment and if these criteria for success have changed over time. The respondents had ample space to provide answers to the questions in their own words. They were not prompted for common or expected criteria in order to avoid influencing their answers.

Section 3 of the TEPLIS instrument consisted of two questions designed to capture the concerns and issues that may be present and how these concerns and issues were mitigated during the implementation of the learning tool. Collecting these data provided an enhanced understanding of changes over the implementation of the TEPL tool. The respondent was again presented with two open-ended questions, with ample space to provide answers in his/her own words. These four sections constitute the TEPLIS instrument as outlined in Appendix A.

Validity and reliability of the data gathering instrument. As the TEPLIS instrument has not been tested in other studies, no previous validation has occurred. The portion of the TEPLIS

instrument measuring the characteristics is based on the work of Jenkins and Keefe (2002a), their work outlines the expected characteristics and attributes that are measured in the TEPLIS instrument. For the purposes of this study, validity was established by obtaining external expert validation that the survey questions measured the expected qualitative data. Four experts reviewed the survey and interview questions in order to establish their validity. Several suggestions were made by the experts and accepted by the researcher. In the case where the suggestions were not deemed appropriate for integration into the TEPLIS instrument, a fifth expert opinion was obtained to confirm the lack of inclusion in the survey.

The target population for this study is small. Only a small number of technology implementations have been performed in the United States thus far, although many schools are considering implementing TEPL (“Catching on at last”, 2013). As such, reliability will be established through future research due to the expected small number of responses. As the number of TEPL implementations increases, additional respondents will be available to provide additional data for consideration of reliability.

Procedures. Subjects completed the TEPLIS questionnaire via the Qualtrics online survey tool. An initial contact requesting participation was sent to the target population as outlined in Appendix B. The email included an introduction to the study, a request for response, and a summary of how the data will be used. Before entering the TEPLIS questionnaire, the subject was again provided an introduction to the study and a summary of how the data will be used. The subject was then presented with an online informed consent form that included the expectation that the survey will take approximately 10-15 minutes for completion as outlined in Appendix C. Subjects received confirmation that their data will be held confidential according to Pepperdine’s Institutional Review Board guidelines and that they may opt out of the survey at

any time. At the end of the survey, respondents were asked if they would agree to be contacted for further information.

Given that themes may arise from the initial survey that are not initially clear, additional clarification was gained by requesting clarification of the topic via a phone or SKYPE interview. Each respondent was asked for their agreement to be contacted via phone or SKYPE for any clarification along with an online informed consent form as outlined in Appendix D. Those who agreed to follow up questions were contacted and asked to clarify his or her comments on the survey. Their answers were used for further clarification of any themes which were unclear during the survey.

Human Subjects Considerations

Guidelines for IRB. According to the guidelines set forth by Pepperdine's Graduate and Professional Schools' Institutional Review Board (GPS-IRB) based on the exemptions set forth in 45 CFR 46.101(b)(2), this study qualifies as exempt because the research is based on regular and special education instructional strategies, protects the identity and confidentiality of the participants, and poses minimal risks to the participants of the study. A formal application was submitted to the GPS-IRB and approved as exempt.

Informed consent. Informed consent was provided and obtained online before the respondent was asked any questions from the TEPLIS instrument. The same informed consent information was used in all cases to ensure the subjects' understanding of the informed consent process. The informed consent included a description of the study and the subjects' rights as participants. For the TEPLIS instrument, the informed consent was electronic in nature, so the subjects' electronic agreement was considered consent to continue with the study. The informed consent was separated from the actual responses to maintain respondent confidentiality. The text

of the informed consent for the online survey can be found in Appendix C, the text of the informed consent for the phone/skyp interviews can be found in Appendix D.

Anonymity, confidentiality and data reporting. Respondents to the TEPLIS questionnaire had confidentiality through the use of the Qualtrics survey tool. The researcher was able to generate a list of subjects who completed the survey without revealing their individual answers. This allowed the researcher to identify subjects who have not yet responded in order to send them a second request without exposing the connection between the respondents and their specific responses. Additionally, a generic link to the survey was created in order to give subjects the ability to invite potential respondents to the study. This link allowed responses to the survey with only the respondents IP address being recorded. Approximately half of the respondents were directly invited to the study, the other half were forwarded the generic study link by study participants.

The Qualtrics tool was be used to assign identifiers to the responses in order to maintain confidentiality. Individually identifying information, such as IP addresses, was stripped from the responses and stored separately in the Qualtrics tool. The TEPLIS questionnaire had unique passwords assigned in order for the researcher to maintain data access control. Although no other researchers are expected to require access to the data, the researcher reserves the right to provide secure access to the data if the study requires additional analysis. Access to the study's data will only be granted in a specific instance where it is required for study validity or reliability.

In the case where a phone or SKYPE interview was used to clarify the themes, only those respondents who have indicated acceptance to being contacted were considered. At the conclusion of the TEPLIS instrument, the respondents were given an online consent form as outlined in Appendix D and asked for their acceptance. The respondents had the option to accept

or refuse the informed consent. If they accepted the informed consent, then they were asked for their contact information and a best time for contact. The personal information given by the respondents was kept confidential with only the researcher having access to the specific contact information. After receiving the consent and contact information, a researcher contacted the subject via their preferred method. The respondents responses were recorded, and a unique identifier was assigned for the purposes of categorizing their answers. Questions asked in the follow-up interviews varied based on the findings during the survey, expected questions were similar to the following list:

- What worked best and what would you never do again with your TEPL implementation?
- What is the frequency of student engagement with the TEPL system?
- Describe your TEPL implementation and how it is being used within the learning environment?

All reported findings were reported in aggregate and reported findings will remain confidential. Specific responses were used to highlight themes brought forth from this study, specific responses will remain confidential and are reported using labels such as subject 1, subject 2, etc.

Possible Risks and Minimization of Risk

There are minimal risks associated with participation in this study. Although the majority of the risks can be minimized, a few may still affect respondents. These include potential embarrassment, concerns about anonymity, and impact on the respondent's time.

The risk of potential embarrassment and concerns about anonymity are closely related. The nature of the subject matter (TEPL environments) is such that an educational entity may have spent a large amount of time and money implementing the environment. The participant

may be answering questions in such a way that the implementation may not be viewed as positive. Without guaranteed anonymity, the participant may be concerned that a truthful response may cause him/her embarrassment within his/her work environment or cause harm to his/her employment status. Efforts to ensure participant anonymity were described to the participants to help alleviate these concerns.

The TEPLIS questionnaire is designed to require a minimal amount of the participants' time. Participants may be concerned with the amount of their time this study will take. Providing an up-front estimate of their time investment and allowing participants to save their answers at any point will lessen their concerns about the time commitment being requested.

Proposed Analysis

This study captured qualitative data through the TEPLIS questionnaire to determine the definition of success, concerns, and existence of environmental characteristics in a TEPL implementation. The researcher used textual analysis to interpret the data (Saldaña, 2009). Based on the subjects' responses, descriptive or holistic methods were used in an iterative cycle method designed to identify major themes and topics. Additional cycles were used as additional themes emerged as the data are analyzed.

Coding of the responses to the TEPLIS instrument led to the identification of themes and topics such as the definition of success, major concerns in the environment, and description of the characteristics. These themes and topics were identified through the researcher's analysis of the data at the end of each phase to help with the interpretation of the research questions (Saldaña, 2009). The researcher used the Qualtrics reporting tools for collecting the subject responses and reporting the aggregate themes.

Where phone/SKYPE interviews were required for further clarification of specific themes, the researcher asked a minimal amount of clarifying questions. These questions provided additional insight into the specific theme(s) that required further analysis. Any data gathered during the clarification interviews was used for additional data analysis cycles.

Plan for Reporting Findings and Data Analysis

The findings of this study were organized and reported based on the research questions. The reporting included descriptive information of the study procedures, a summary of the data analysis, and excerpts from the data set to highlight areas of interest. The results were interpreted and opportunities for further research were explored in order to contribute to the understanding of TEPL implementations. The researcher conducted a textual analysis of the data gathered in this study via the web-based survey. This analysis resulted in the identification of themes for each research question. These themes were reported both in text and chart format for use in future research.

Limitations of the Study

The first limitation of this study is that personalized learning as a learning methodology was not examined. A discussion of the theoretical framework is found in a review of the literature, but any discussion of the merits of a personalized learning environment is beyond the scope of this study.

This study relies on self-reporting by the people who are responsible for the success of the learning environment. As such, they are invested in the implementation and the environment that they manage. Their view of the tool's implementation will be biased toward success, therefore their answers may have a bias toward success of implementation.

Collecting descriptive data on any type of personalized learning may incorporate differences that otherwise would be identified. There may be differences between personalized, individualized, and differentiated learning environments. There also may be differences between the types of technology tool employed in the environments. This study will not attempt to identify these differences, and will only acknowledge that they may exist.

Socio-economic factors also will not be explored. The nature of K-12 education in the United States is many different resources are available to students based on their socio-economic status (Boondao et al., 2008; Glennan & Melmed, 1996). In some cases, those higher on the socio-economic scale receive more resources, while in other cases the federal government and education foundations provide additional resources to those schools that are lower on the socio-economic scale. This study will not attempt to identify differences in characteristics based on the socio-economic status of the subject learning environments based on the size of the sample pool.

The process to implement a TEPL tool can take many years. In many cases, the learning entity may decide to provide this tool to a specific grouping of schools in a magnet or charter school situation. In other cases, the learning entity may implement the tool for all students in the district, a process that may take several years to accomplish. For this study, the researcher obtained data from TEPL implementations at any stage in the implementation process where teachers and students are actually using the tool with their learning. The number of students using the tool was not critical to the subject pool, future research can provide further clarification regarding differences between implementation stages.

TEPL tools are relatively new to the learning process. As such, little data exist to define success or failure of these learning environments in terms of longitudinal student data. The focus of this study was on obtaining a description of the current perceptions of success, issues and

concerns, and characteristics. Future research will identify long term success of the TEPL tools in learning enhancement.

Chapter Summary

This researcher has considered several design methods and chosen a qualitative descriptive methodology as the most appropriate to identify the success, concerns, and characteristics of a TEPL implementation. Administrators of the TEPL implementations were surveyed using the TEPLIS instrument in order to understand their perspectives on the TEPL implementation. Textual analysis was performed on the results to identify themes which provided insight into the research questions. In the event where the themes were unclear, follow-up interviews allowed the researcher to provide additional clarification to the identified themes.

The procedures for this study have been identified while attending to the protection of human subjects by following Pepperdine's IRB guidelines. The study's reliability will be established with future research. The study's validity was established with input from four researchers in the field. Future research may be performed in order to clarify the themes identified from this study.

Chapter 4: Results

The purpose of this exploratory study was to investigate how technology enhanced personalized learning (TEPL) tool administrators define the success, concerns, and implementation factors that impact the success of a United States based K-12 learning environment. Past research has focused on the specific technology utilized and how computer algorithms might be optimized to provide specific learning recommendations. This research primarily studied the learning suggestions for an individual learner at a specific point in time. In contrast, this study attempted to understand how personalized learning technology integrates in to the learning environment at a broader level. This study was meant to understand how the technology relates to the learning environment through the exploration of the definitions of success, concerns, and learning implementation characteristics which may be impacted by personalized learning technology. In order to understand these topics, the following research questions were explored:

RQ1: How is the success of a Technology Enhanced Personalized Learning Implementation defined by the administrators of the learning environment?

RQ2: What are the concerns of administrators when managing a Technology Enhanced Personalized Learning Implementation?

RQ3: What factors impact the implementation of a Technology Enhanced Personalized Learning tool as reported by the site administrators?

RQ4: How is Technology Enhanced Personalized Learning implemented in K12 learning environments?

What follows in this chapter is a discussion of respondent demographics, followed by the study results organized by research question. A summary of each section will identify the common themes and unexpected results, while a chapter summary will review the findings identified in this study.

Findings

In order to answer the research questions, the researcher created a survey design to collect information from targeted subject called the Technology Enhanced Personalized Learning Implementation Survey (TEPLIS). The subjects were identified as administrators of TEPL implementations and were encouraged to forward the survey to others in their field in order to gather as much descriptive data as possible. A follow-up interview was requested in order to further clarify themes found in the survey data. Table 3 maps the survey and interview items to the research questions. Research question 4 describes the TEPL implementation and is informed both by the direct RQ4 items and the respondent demographic items.

Table 3

Mapping of survey and interview items to research questions

Research Question	Survey Items	Interview Items
RQ1	20, 21	3
RQ2	22, 23	4
RQ3	13-19	2
RQ4	9-12	1
Respondent demographics	2-8	1

Survey. 57 potential respondents, were identified through Internet searches and invited to the study. These potential also were asked to forward an invitation to additional respondents

through a snowball sampling methodology. Twelve subjects responded to the participation request and completed the TEPLIS instrument. As the data collection used snowball sampling, invitees were encouraged to forward the invitation to additional subjects. Based on these additional invitations, an additional eight subjects responded to the TEPLIS instrument. There was a total of 20 responses to the TEPLIS instrument. At the close of the survey, the data were collected and analyzed in multiple phases. The questions with multiple choice and slider bar answers were analyzed individually to gain a base understanding of each topic. In some cases, such as with the respondent title, the information was analyzed for frequency of response. With other questions, such as with one of the TEPL implementation characteristics, answers were combined to help determine the overall perspectives of the respondents.

The TEPLIS instrument also asked open-ended response questions. Analyzing these data consisted of taking the subject responses and utilizing multiple iterative cycles of textual analysis to identify common themes. A data analysis key was identified based on the initial analysis of the data and used to analyze the subject responses during additional analysis cycles (see Appendix E). Each open-ended question was coded with its own key and analysis cycles.

Interview. In order to clarify themes identified during the response analysis of the TEPLIS instrument, follow up interviews via phone were conducted. Ten respondents indicated agreement on the TEPLIS instrument to be contacted for an interview. Each of these were contacted. Of the 10 survey respondents contacted, three agreed to the interview request. The interviews consisted of four questions designed to further clarify the themes identified in the TEPLIS instrument (see Appendix F). The interviews occurred via SKYPE calls to the subject's preferred phone number and were recorded and transcribed for later analysis. Key words were

identified during the initial data analysis cycle and additional cycles were used to code the responses for the key words and themes. The interview themes were compared to the themes identified in the TEPLIS instrument to provide additional clarification and identification of further themes.

Participant response profile and demographics. The subjects for the study were administrators of TEPL implementations throughout the United States. There was no focus on specific job categories or titles as little is known about who might be an administrator of these systems. The key criterion for inclusion in the study was that respondent has the primary responsibility for administering the TEPL implementation. Potential subjects were identified through Internet searches and posting to professional membership groups. As subjects were identified, they were asked to forward the invitation to others they deemed appropriate for inclusion in order to enhance the data gathered by the study.

Demographic data were collected to identify the job category and titles of the administrators to better understand who is responsible for the systems. (see Figure 1). Each of the reported titles was analyzed to identify the category and nature of the title by counting the words *director*, *teacher*, *principal*, or leader type words such as *superintendent* or *founder*. The job titles were then put into categories of *teaching* or *administrative*, with *teacher* (25%) titles categorized as *teaching*. *Director* (31%), *principal* (18.75%), and *leader* (18.75%) titles were categorized as *administrative*. seventy-five percent of the respondents' job categories were administrative in nature and twenty-five percent of the respondents' saw themselves in teaching roles.

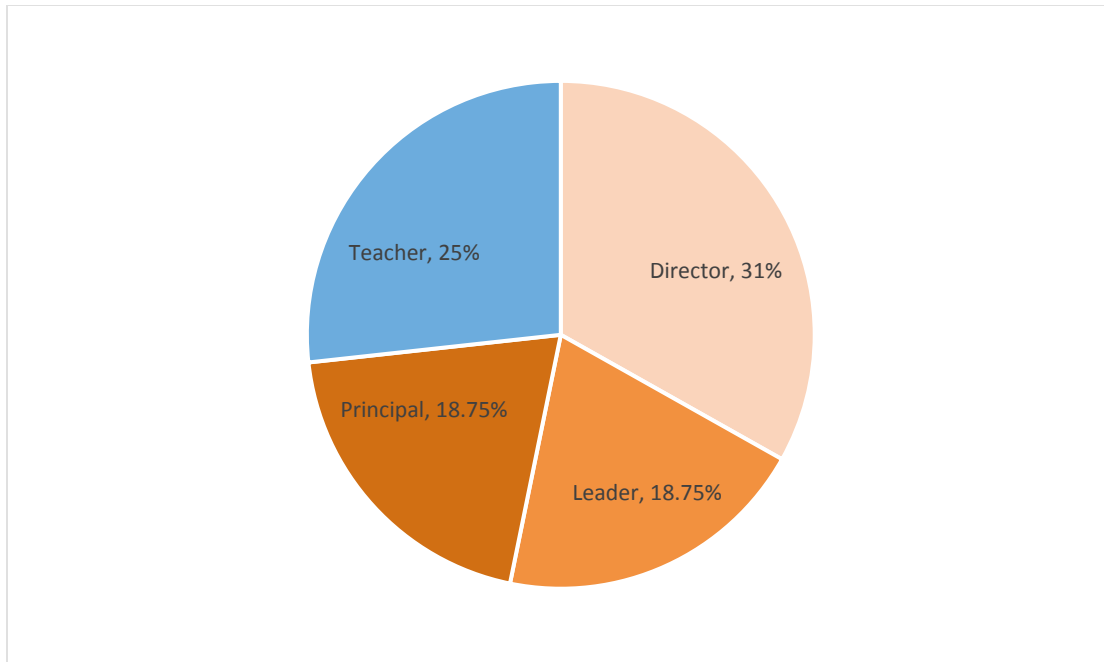


Figure 1. Respondent job title.

The TEPLIS instrument also looked at how much time the respondent spent focused on TEPL implementation. Sixty-three percent of the respondents reported spending less than half of their time focused on the TEPL implementation, which indicates that their main job function is focused on other tasks. When the respondent had the word *Principal* in his/her title, he/she responded that less than 50% of his/her time is focused on the TEPL implementation. The *teacher* job titles were split between less than 50% and greater than 50% of their time focused on TEPL implementation, with 80% of the *director* job titles spending less than 50% of their time on the TEPL implementation. Those with administrative titles tended to spend less than 50% of their time focused on the TEPL implementation, while those with teaching titles were evenly split on the amount of time they spend focused on the TEPL implementation.

Participant learning environment. Data were also gathered to identify the various aspects of the respondents learning environment.

Grade levels. Based on the data analysis, 50% of the respondents utilized the TEPL tool for *elementary grades*, 75% for *middle school grades*, 50% for *high school grades*, and 13% did not classify their students according to traditional grade levels (see Figure 2).

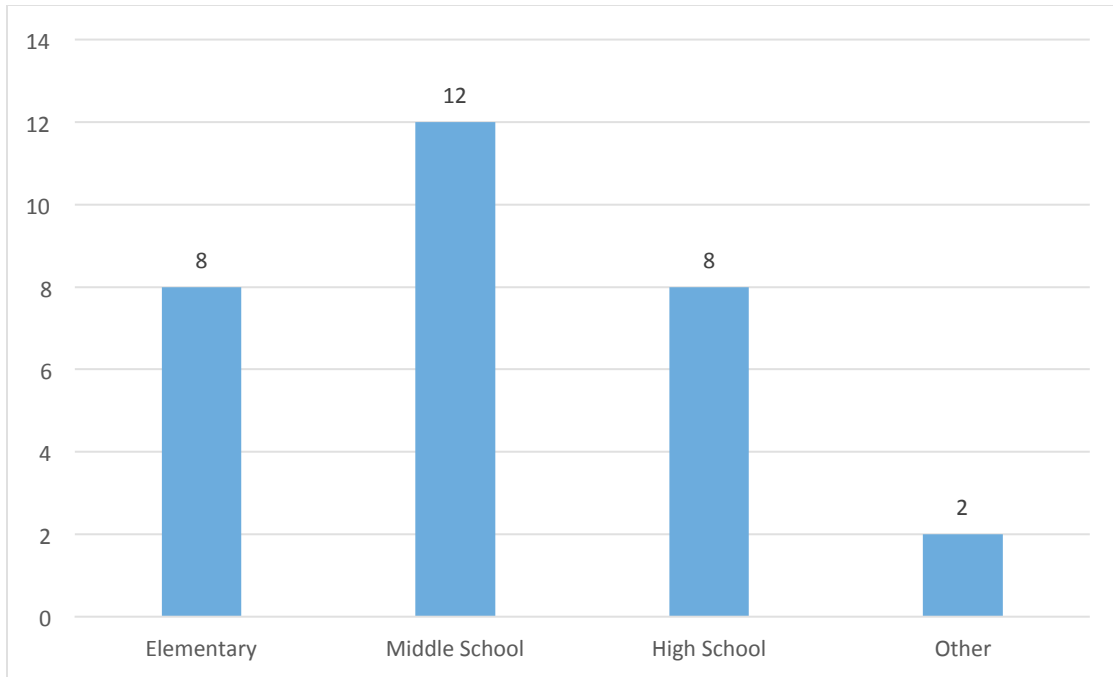


Figure 2. Grade level(s) using the TEPL tool.

Further analysis of the data showed that 33% of respondents indicated *all three grade levels* (33%), with *Middle School* being the second most common response (27%).

Elementary/Middle School and *High School* both garnered 13% of the responses, whereas *Elementary school* and *Middle School/High School* both garnered 7% of the responses (figure 3).

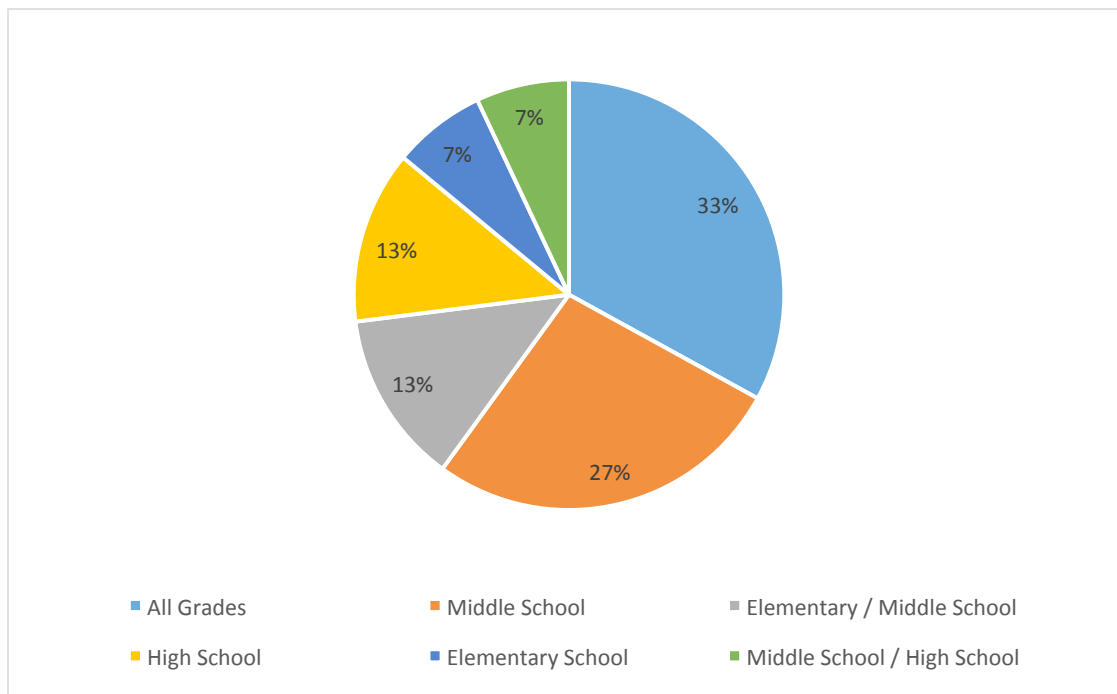


Figure 3. Further analysis of grade level(s) using

a TEPL tool.

Based on the data, the most common use of a TEPL tool is *all grades*, with the use of a tool in *middle school only* being the second most common use. Over half of the respondents used a TEPL tool in this manner, which provides insight into how the existing TEPL implementations are currently focused.

Public/private. Eighty-one percent of the respondents using a TEPL tool considered themselves to be public organizations, 13% considered themselves to be private organizations, and six percent did not classify themselves as either public or private. The interview data provided further clarification to this information, with public organizations being either public school districts or charter schools operating in conjunction with a public school district. Private learning organizations were identified as learning entities not affiliated with a specific public

school district. Many of these private learning entities either provide instruction for home-schooling families or are formal schools unaffiliated with the local school districts.

Locations. The number of locations using the TEPL tool instance varied, with 15+ locations being the most common response (31%). This was followed by 10-14 locations (25%) and one location (25%) in frequency of response (see Figure 4). The results of this question show a broad range in the number of locations per TEPL tool instance, although it is interesting to see that the most common number of locations is at the low and high end of the scale. There was a focus on single location responses and responses with greater than 10 locations. This indicates that TEPL tools are being used across a variety of locations and by a variety of entity types. Schools with single sites are common, as are large school districts with numerous sites.

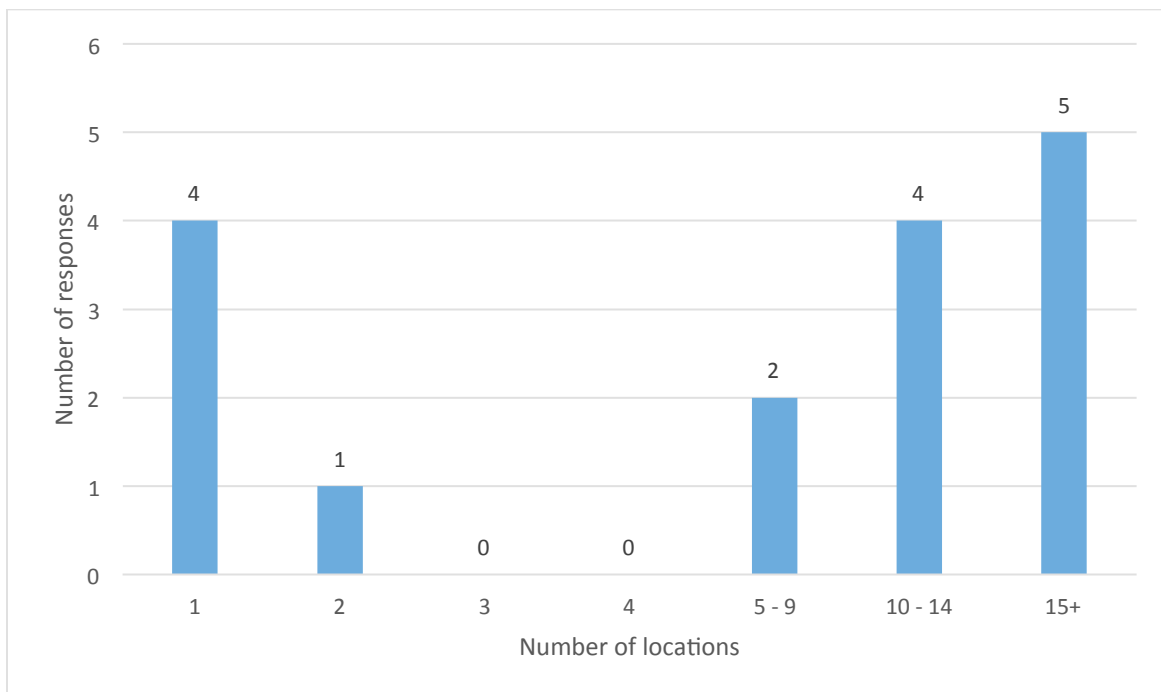


Figure 4. Number of locations using the TEPL tool implementation.

Number of students. The number of students using the TEPL tool also varied (see Figure 5), with *1-500 students* being the most common response (44%), *1,001-2,000 students* and *5,001+ students* both were the second most common responses, with 19% of the respondents' TEPL learning environments being these sizes. Aside from the *1-500 students* category, the results show a variety in the number of students using the TEPL implementation. As with the number of locations question, the spread in responses for the number of students using the TEPL implementation shows a variety.

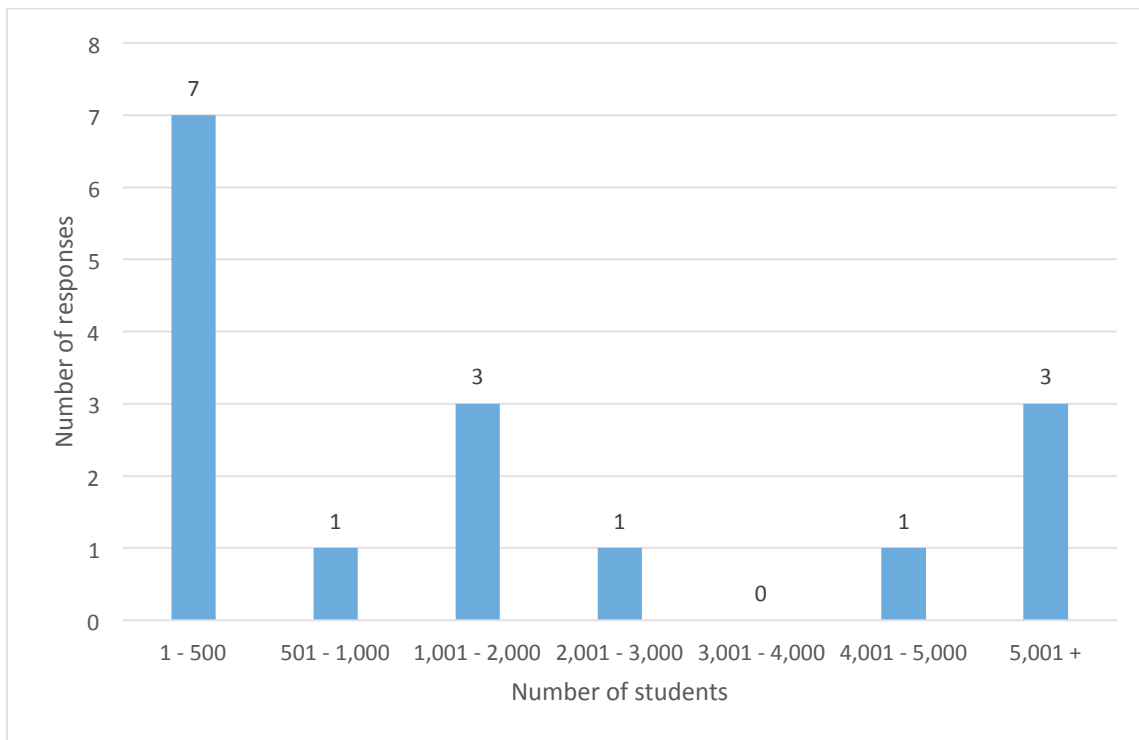


Figure 5. Number of students using the TEPL tool.

Learning environment models. A theme which emerged from analysis of the study data is the structure of the learning environment. The respondent learning environments can be categorized by two models with the first model described as a traditional model where the

students spent time in a set classroom and used a TEPL tool as a part of their learning. The TEPL tool provides information that allows the student and or teacher to manage the learning for the day. The teacher and students have face-to-face interactions on a daily basis in this model and are typically in the same location every day for their learning.

The second model that was described was independent or home-school study. The TEPL implementation allows for a blended learning model where the students do not have to be in the same physical location as the teacher. As such, several of the respondents described scenarios where the students and teachers rarely, if ever, met in person. Students accessed the TEPL tool from whatever location they desired. All of the learning was accomplished remotely with the TEPL tool providing the core learning interface. Interview Subject 1 described the model in this fashion:

Really what we're looking at is individualized learning for students so they're not having to sit in a room and listen to a teacher teach to 30 other kids in the classroom. We're really allowing students to take the opportunity in their learning to kind of dictate what level they're going to put into the program. Their grades are kind of determined by the amount of work that they put in and the quality of work that they put in.

Several of the respondents also described a learning environment where both models existed. In most descriptions the teachers and staff worked with one model or the other, and the students were offered a choice as to which model they preferred. There was little interaction between the two models. The models were set up as separate environments with students and staff being involved with one or the other. They may utilize the same TEPL tool, but did not do so in a manner that encouraged interaction between the two models. Interview Subjects 1 and 3 described their learning environments in this way:

- Interview Subject 1: There are two sides to us. One is an independent study program and the other is a homeschool program. I work primarily with the independent study.
- Interview Subject 3: About half of our kids are home study kids and half of our kids go to a site-based academy two to four days a week. For our home study kids that are about half of the population, about 1,250, we do a great deal of our learning online.

Summary. Although there was a large range in responses, the most common demographic profile of the respondents show the TEPL administrator having an administrative function with the title Director, Leader, or Principal. An analysis of the data also shows that the TEPL administrator spends less than half of his/her time focused on TEPL implementation, indicating that his/her primary job function is other than the administration of the TEPL implementation. The responses shows that public schools account for the majority of the respondents' environments, the tool is used most often across multiple grade levels and multiple locations. The size of the respondent environment varies, with under 500 TEPL students being the most common. Respondents described two learning environment models: one model were the students and teachers work in a traditional face-to-face environment and a second model where the students and teachers rarely work together in the same physical location. Several of the respondents described schools that are blending these two models to give students a choice between where they want to learn, yet not allowed students to cross between the models on a regular basis.

Definition of TEPL Implementation Success

Success of the TEPL implementation as defined by the administrators was identified through analysis of two open-ended questions in the TEPLIS instrument and followed up with a

single question during the follow-up interview. These questions were asked in reference to the research question “How is the success of a Technology Enhanced Personalized Learning Implementation defined by the administrators of the learning environment?” The focus of the questions were specific to the administrators’ understanding of success and if that understanding has changed since the implementation began. Eleven of the 20 respondents provided an answer for how success is defined (Table 4), 10 of the 20 respondents described how the definition of success has changed (Table 5).

Key words were identified during an initial pass of the data, additional analysis of the data showed three primary themes emerging (*external measurement*, *student engagement*, and *stakeholder input*). Further analysis of the primary themes resulted in additional granularity being identified in the *external measurement* and *student engagement* themes. Analysis of the key words with these themes identified the secondary themes outlined in Table 4.

Table 4

Definition of Success Themes

Primary Theme	Secondary Theme	Mentions
External Measurement	Standardized tests	5
Student Engagement	Student Engagement	3
External Measurement	State / district measurement	2
External Measurement	School administration measurement	2
Stakeholder Input	Stakeholder input	2
External Measurement	Compare to non-TEPL students in the same school	1
Student Engagement	Student collaboration	1
External Measurement	Curriculum standards	1
External Measurement	External trade group standards	1

External measurement. Analysis of the responses shows that *external measurement* of the TEPL implementation was most commonly used to define success. This included *standardized tests, state/district measurement, school administration measurement, curriculum standards, and external group standards*. Of the 11 responses, 10 indicated some form of external measurement when considering the success of their TEPL implementation. Examples of the comments include:

- Survey Subject 1: Our district balanced scorecard and local school improvement plans.
- Survey Subject 2: If students who use mainly our online platform perform as well as our strictly classroom students on standardized assessments.

- Survey Subject 4: We have several scorecard measures including standardized assessment measures, ISTE standards for implementation, and social emotional learning assessments.
- Survey Subject 11: If students are able to take the 21st century skills needed to use the LMS and meet and exceed the standards of the curriculum

During the follow-up interview, clarification was requested on how success is measured.

External measurement was again a theme, with comparison to non-TEPL students cited as an important measure of success.

- Interview Subject 1: gauging the retention rate, how many kids are actually passing their classes compared to the regular 9-12. It's been an improvement.

Student engagement. The second most common primary theme respondents identified when defining the success of their TEPL implementation was *student engagement*. Secondary themes which make up this primary theme are *student engagement* and *student collaboration with other students*. Student engagement was most often described as the students taking control of their own learning, although there was little mention of an empirical method of measuring student engagement. Rather, the respondents indicated they looked for signs of the students learning the material creatively with their own initiative. This theme was mentioned both in the survey responses as well as the follow-up interview. Examples from the survey and follow-up interview include:

- Survey Subject 3: Students who know how to learn, who are continually making forward progress, who know how to interact in community.

- Survey Subject 4: When students own their learning, they learn to utilize tools and resources available to them to learn anywhere, any time. In addition to seeing the amazing work my students create and share, they often come to me to tell me that they “chose” to learn something on their own time, using the tools at their disposal.
- Interview Subject 2: When we go on a nature walk or something, they’ll often take their iPads with them to use to take pictures—iPhones or iPads, either one. Sometimes they’ll start creating their own little documentary. As they’re walking, they’re recording with their device, and explaining what it is that they’re seeing. I even heard, “Notice that in this tree, you’ll see blah, blah, blah.” They’re becoming little mini-filmmakers without even thinking about it. It’s just something that’s different for them. Without a device in their hand, they wouldn’t necessarily even notice those things.

Stakeholder input. The third primary theme identified by respondents was *stakeholder input*. Further analysis of the data did not identify sub-components of this primary theme. Respondents described the importance of having the parents and community involved in their definition of success. Examples of *stakeholder input* include:

Survey Subject 9: Growth of the program next year. It's our first year, we will only grow if students, parents, community and colleagues embrace this mind shift and sign up to work with us.

Change of success definition. This study also asked how the respondents’ definition of success might have changed since the environment was implemented (see Table 5). This topic was included in an effort to further understand if the definition of success with TEPL

implementations was static. Four of the ten responses indicated that there was no change in the definition of success. An additional four responses indicated that the expectations of the students had changed as the TEPL implementation was put in place. Additional responses included a *deeper understanding of success* (2 responses), *changing content expectations* (1 response), *changing assessment types* (1 response), and *changing role of technology* (1 responses).

Table 5

Change in Success Definition Themes

Theme	Mentions
No change	4
Expectations of students	4
Deeper understanding of success	2
Changing content expectations	1
Changing assessment types	1
Changing role of technology	1

Examples of the responses from the surveys include:

- Survey Subject 1: It has not really changed, but the collective understanding of effective is deepening. Leadership is the key.
- Survey Subject 2: We now expect the student to be more engaged.
- Survey Subject 8: We continue to have higher expectations... It's better than we imagined and we've only been open since August.

Interview Subject 3 clarified her responses in the survey by outlining her perspective of what has changed in her definition of success:

I think what it was is we got better at parents instruction is what happened. ... I guess in some ways you could say training of our teachers because our parents are the day to day teachers. Teacher training, we got more comfortable, we just got more comfortable across the board.

Interview Subject 3's comments outline how her organization realized the importance of including parent and teacher training with the success of their TEPL implementation. Their definition of success was tied to internal measurements, but they realized that they needed to include the parents and teachers in how they viewed a successful TEPL implementation.

The respondents indicate that many of their definitions of success have changed since the initial implementation of their TEPL tool. 4 of the respondents indicated no change, but the rest indicated that they did have a change in how they viewed success. Many of these respondents indicated that they had changed their expectations of the students and of the learning environment. It is not unreasonable to consider that the administrators were learning about their TEPL implementation and what to expect as outcomes.

Summary. In order to answer the first research question, the TEPLIS instrument provided initial data for analysis, interviews were used to further clarify the responses. Respondents indicated that the most common definition of TEPL implementation success is through external measurement. In many cases the implementations are measured in the same way as their traditional learning environments, in other cases they are measured using standards put forth by external professional organizations. The respondents also felt success is also measured by the level of student engagement.

In four out of 10 implementations, respondents also stated that their definition of TEPL implementation success has not changed. Where it has changed, expectations placed on students increased in four of 10 environments. Additional comments included a better understanding of success, changing content expectations, changing assessment types, and the changing role of

technology in their TEPL environment. Further clarification by Interview Subject 3 clarified her organization’s increased focus on parent and teacher training.

TEPL Implementation Concerns

Concerns of TEPL administrators were identified through two open-ended questions on the TEPLIS instrument and one question in the follow-up interview. The focus of these questions was to identify self-reported concerns of the TEPL implementation and how the concerns have been mitigated in order to answer the research question, “What are the concerns of administrators when managing a Technology Enhanced Personalized Learning Implementation?” Twelve of the 20 respondents submitted answers to the survey question on their concerns, and 11 of the 20 respondents’ submitted answers describing how the concerns have been mitigated. Four concerns were mentioned by 25% or more of the respondents and will be discussed subsequently. Table 6 outlines the four concerns identified by the respondents.

Table 6

TEPL Concerns

Concern	Mentions
Professional development	4
Limited resources	4
External influences	3
Student adaptation	3
Use of technology	2
Maintaining focus	1
Student measurement	1
Cheating	1
Tool becomes focus	1

Professional development. One of the two most common concern identified by the respondents was the need for professional development for the teachers and staff. This concern revolved around the teachers knowing how to utilize the technology effectively and personalize the learning rather than relying on traditional teaching methods. One of the respondents, Survey Subject 2, summarized this sentiment by saying, “Lots of PL for teachers is required or the result will be a digitized work sheet.”

Limited resources. Closely aligned with the requirement for professional development is the lack of time and resources to provide ongoing professional development. The respondents indicated that providing a personalized learning environment takes more time and resources for the teachers and staff, even with the implementation of a technology tool. Survey Subject 8 summarized the concern of providing ongoing professional development to enhance the teaching while accomplishing all of the other required tasks in the following way: “Must have continuous, effective professional learning for staff. This can be difficult with all of the other items that we are accountable for.”

Respondents also stated a concern about limited resources beyond providing for professional development. The use of technology with personalized learning requires that each student and teacher have access to computing resources along with the technology infrastructure. Administrators’ concerns included how to obtain and maintain all of these technology resources. One respondent (Survey Subject 3) wrote: “Lack of one to one computers....resources limited.”

External influences. External influence was a concern mentioned by three respondents. The respondents indicated that in contrast to a traditional teaching environment, where students and teachers interact in a classroom environment, the nature of blended learning with technology

encourages participation by teachers, students, and parents as a regular part of the learning. This additional influence is the concern of the respondents, who stated that a focus on the parents and community at large is necessary for a TEPL implementation. Responses included:

- Survey Subject 1: Parents acting as teachers.
- Survey Subject 2: Lots of community education is necessary.

Along with outside interactions, respondents also indicated a lack of outside understanding of the teaching methods used with the TEPL implementation. Many of the administrators worked in a learning environment where students specifically chose to attend the personalized learning environment, whereas others were part of a larger organization where the personalized learning environment is a subset of the broader learning environment. Respondents from both situations expressed concern about how their learning environment was viewed by outside entities. Interview Subject 1, who works with a private school specifically focused on TEPL, reported the concern by saying: “There’s the tendency to either poo-poo our systems or to not think that there’s a lot of value in our systems because they don’t have the same experience as we do.”

Student adaptation. The fourth concern cited by respondents is that of student adaptation. As indicated by the respondents, students often find it difficult to adapt to the new TEPL environment. Survey Subject 9 stated, “For the most part, students are not experienced in this learning environment and some struggle to adapt.” Responding to the interview questions, one respondent further clarified this concern by indicating that some students had an issue adapting to the freedom that comes with a TEPL implementation. Students in their learning

environment have a responsibility to further their own learning, some of the students find that they can short-change their learning in order to achieve grades without the learning work.

Interview Subject 2 described the struggle for students to adapt to self-motivating learning and how their learning organization approaches academic honesty by saying, “We like to function under the, ‘We trust you, and we expect you to do the right thing. We will have a discussion with you, a conversation with you if you abuse that privilege.’”

Additional concerns. Respondents indicated additional concerns beyond the ones that have been discussed thus far. These concerns were mentioned by a small number of respondents, but are worth mentioning given the exploratory nature of this study. These concerns were focused on how students and teachers interact with the technology itself. Subject 12 stated: “Yes, that tool itself becomes the focus of learning.” Some participants were concerned that, rather than focusing on the subject matter, students might focus simply on the delivery method and how they interact with the technology.

Interview Subject 1 discussed his/her concern with technology being the main focus of the learning rather than using technology as one of the tools available to provide a personalized learning environment. Interview Subject 1 expressed this concern in the following way:

The other one is just whenever you implement any kind of technology, having too much faith in the technology to take care of the problem when there still is a need for relationships or still a need for the personal touch.

Interview Subject 1’s focus was on how to make sure the teachers and students were focused on the learning and the best method of providing that learning. Technology may be a good tool for the learning, but there are also many other tools that might be more effective.

Additional concerns include *maintaining focus*, *student measurement*, *cheating*, and the *tool becomes the focus*. These concerns were mentioned by single respondents, with comments including:

- Survey Subject 10: Continuing to keep the focus of learning on the inquiry and creativity of the student.
- Survey Subject 7: There needs to be a uniform standard for all student to strive for. Personalized learning is not making the curriculum easier so students can be successful.
- Survey Subject 11: home cheating, depending on other students in a collaborative environment to complete another's work

Concern mitigation. As a secondary goal in order to answer the research question “What are the concerns of administrators when managing a Technology Enhanced Personalized Learning Implementation?” respondents were asked to describe how their concerns with the TEPL implementation have been mitigated. Two themes were identified by 25% or more of the respondents, and another four themes were identified by less than 25% of the respondents. Table 7 summarizes the findings from the data analysis.

Table 7

TEPL Concern Mitigation

Concern	Mentions
Professional development	3
External Interactions	3
Scheduling / additional resources	2
External standards	2
Student interaction	2
No solution identified	1

Professional development. The first topic identified by more than 25% of the respondents was providing additional professional development to teachers, staff, and parents. The administrators viewed professional development as a way to enhance the skills of parents, teachers, and staff in regards to the integration of the TEPL implementation into the learning process. Respondent comments include:

- Survey Subject 11: professional learning using the lms.
- Survey Subject 5: PD, PD, PD, and additional staff to assist with the technology when it is not working.

External interactions. The second topic identified by greater than 25% of the respondents is interaction with external entities. Understanding that one of the main concerns identified by the respondents was the influence that external entities have on the TEPL implementation, the administrators indicated that they have put programs in place to provide communication about what is happening in the learning environment. These interactions were

described as parent training, using social media for updates, and encouraging teacher-parent interaction to maintain appropriate expectations. Examples of these statements include:

- Survey Subject 1: Lots and lots of parent training and keeping in touch through social media.
- Survey Subject 8: To facilitate this mind-shift, teachers must be very open with expectations for students. Parents must be aware of the learning environment and what it takes for their child to be successful in a course that prepares students for future success.

Other mitigation strategies. Additional mitigation strategies were mentioned, such as *scheduling / additional resources, using external standards, and encouraging student interaction.* One respondent stated that she had not identified a mitigation strategy, stating that the identification of concern mitigation strategies was still a work in progress. Their organization had not yet put together a strategy that effectively mitigated her concerns.

Obtaining student feedback was mentioned as a way to encourage student interaction with the learning. Survey Subject 9 stated, “Getting feedback from students on how our learning platform can better support their opportunities to question and research and collaborate and communicate.” Their concern mitigated by allowing students to have input to potential changes which might impact the learning environment and TEPL implementation.

Survey Subject 3 summed up her mitigation processes by writing:

I am careful to balance my students' time with high tech, low tech, and no tech. Especially since they are younger, I feel it is good for them to unplug occasionally and

give their eyes a break from a screen. I want them to be good digital citizens, but I also want them to be good "face to face" citizens. Students should have a variety of experiences that allow their brains to grow and adapt to multiple learning environments. I also believe students should move and create with their hands often.

Her response to the concerns of the TEPL implementation was to schedule the time students spend with the technology with other activities. The TEPL implementation is used to manage the overall student learning experience, even when the activity does not include technology. Her opinion was that using both technology and other traditional interaction methods will provide a broader learning experience.

Summary. Respondents most commonly stated that they were concerned with professional development, limited resources for the TEPL implementation, how students adapt to the TEPL implementation, and how external entities influence the learning environment. There also was some concern with the use of technology and how much the schools should trust the students.

The respondents mentioned several mitigation strategies for these concerns, including continual professional development and a focus on external interactions. Both of these mitigation strategies consume resources, which was identified as a concern. The respondents indicated a tension between the availability of resources and providing ongoing professional development or a focus on external communications.

Factors That Impact the TEPL Implementation

Six yes/no questions on the TEPLIS instrument, one open-ended question on the TEPLIS instrument, and one interview question were used to answer the research question, "What factors impact the implementation of a Technology Enhanced Personalized Learning tool as reported by

the site administrators?” Fifteen of the respondents answered the yes/no questions, eight respondents answered the open-ended survey questions, and three respondents answered the interview question. Results of the response analysis for the literature identified factors are shown in Figure 6. The respondents agreed with factors identified in this study’s literature review (Jenkins & Keefe, 2001a, 2002a, 2002b; Keefe & Jenkins, 2000, 2008; Keefe, et al., 1991).

Results related to subject-identified factors summarized in Table 8.

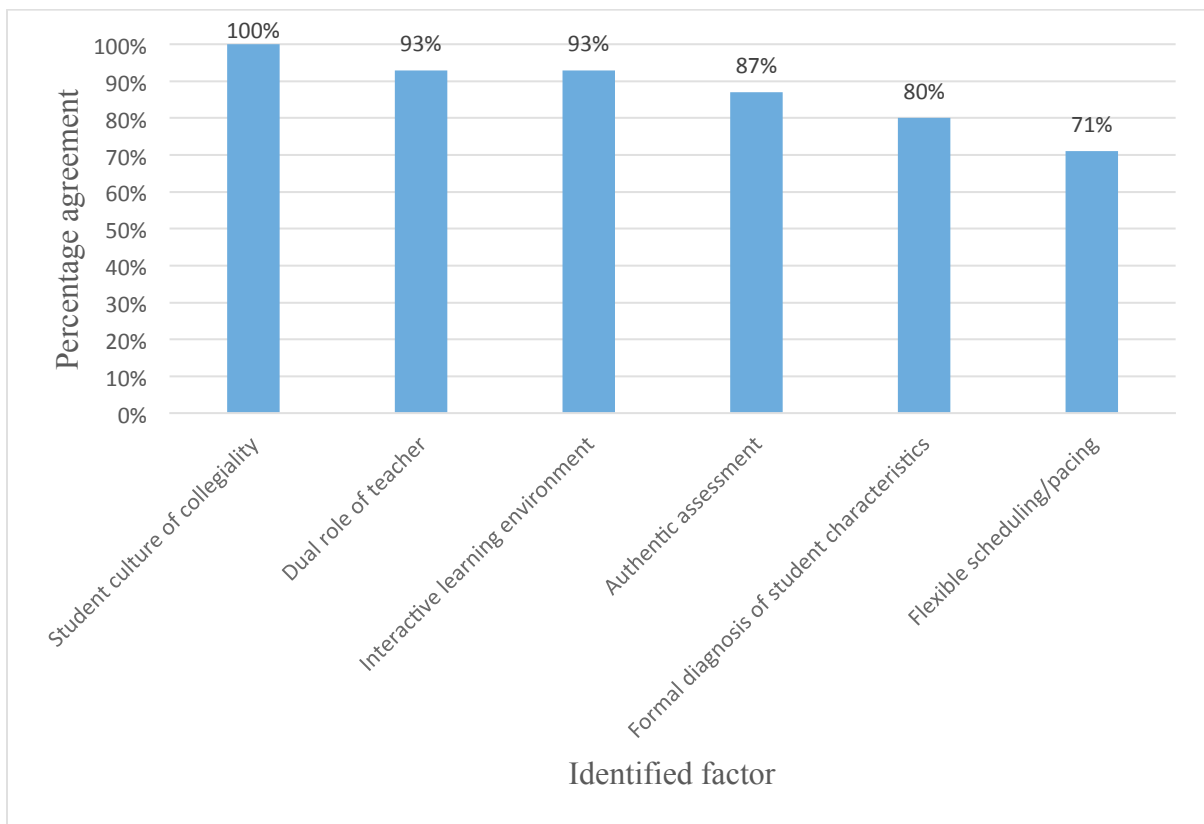


Figure 6. Agreement with previously identified factors.

Table 8

Respondent Identified Factors

Factor	Mentions
Student choice	9
Teacher acceptance	3
Student inquiry	2
Flexibility	2
Parent involvement	1
Student motivation	1

Agreed upon factors. 80% or greater of the respondents agreed with five of the factors identified during the literature review. These factors included the *dual role of the teacher*, a *student culture of collegiality*, an *interactive learning environment*, *striving for authentic assessment*, and *formal diagnosis of student characteristics*. The agreement by 80% or greater of the respondents indicates that these factors are likely important to a broad range of the TEPL implementations. Less than 80% of the respondents agreed that *flexible student schedule/pacing* existed in their environment. This result indicates that *flexible scheduling/pacing* may not be as important to TEPL implementation as the other characteristics, but are still considered important by the majority of the respondents.

Additional characteristics. This study also asked about additional factors through open-ended and interview questions. Analysis of the responses showed *allowing for student choice* to be an important factor which had not previously been mentioned. This topic was indicated by seven of the eight survey respondents and two of the three interview respondents. The characteristic was defined in different ways, including:

- Interview Subject 3: ...flexibility is the largest factor that you have...

- Survey Subject 2: Student choice in instructional input method.
- Survey Subject 8: Having student voice be a part of every decision.

The common theme was that the student has a choice in the learning he/she will pursue.

This characteristic goes beyond *flexible scheduling and pacing* to allow the student to identify the manner in which he/she chooses to learn. Survey Subject 4 described the manner in which he/she implements this characteristic by writing:

During our inquiry morning block, students generate questions from a philosophical statement or theme, and then choose ideas to pursue through research, hands-on activities, building/creating, or devising a solution to a problem. As their teacher, I do not place learning objectives in front of them. I follow their lead, helping them to make connections, providing experiences they might not have had, and exposing them to new situations to add context.

Another characteristic that was identified by multiple respondents is *teacher acceptance of the TEPL implementation* and change that happens when technology has a central role in the learning environment. The respondents indicated that teacher acceptance of technology and the rapid change technology might bring is an important characteristic to consider. Interview Subject 1 described teacher acceptance in her learning environment by saying:

The teachers have to be willing to adapt to the change of technology. Even though you pick something you think it's going to be a stable piece, it never is. Like for the last four years we've actually changed the laptop that we've given to our students. Started with a netbook, moved to a laptop, then moved to a Chromebook this year. On top of that, we've changed our curriculum significantly twice, so the teachers have had to be able to adapt to the changes.

Other characteristics mentioned as important are *student inquiry, flexibility, parent involvement, and student motivation*. Survey Subject 4 outlined both student inquiry and student motivation when describing the characteristics present in their environment as:

We're an inquiry-based model school, and our philosophy/mission guides us to be student-centered. Standards and content are not the focus; rather, each student's individual needs, learning styles, preferences, etc. take priority. While students in my class may start with a similar activity and/or topic/skill, the individualization takes place in teacher response to student needs, as well as the type of learning evidence/output the students create. During our inquiry morning block, students generate questions from a philosophical statement or theme, and then choose ideas to pursue through research, hands-on activities, building/creating, or devising a solution to a problem. As their teacher, I do not place learning objectives in front of them. I follow their lead, helping them to make connections, providing experiences they might not have had, and exposing them to new situations to add context.

Survey Subject 5 has what they considered a unique perspective in that their students work primarily in a remote capacity. As outlined elsewhere in this study, a number of respondents utilized this learning environment, which makes Survey Subject 5's perspectives applicable across other TEPL implementations as well. Survey Subject 5's comments about their environment are:

Our students work at their pace, under the supervision and with their parents, while our teachers supervise them. The academics are facilitated by the parents. There are workshops on site, but no daily classroom attendance

Summary. A review of the literature showed that learning environments with a TEPL implementation would likely have six characteristics. Respondents to this study confirmed these factors, which include *dual role of the teacher, a student culture of collegiality, an interactive learning environment, striving for authentic assessment, and formal diagnosis of student characteristics*. The respondents had less agreement with *student flexible schedule/pacing*, but

still had a high level of agreement. When given the opportunity to identify their own characteristics, a large number of respondents stated that *allowing for student choice* in topic and method of learning was an important factor. The respondents also indicated that *teacher acceptance of technology and change* was an important characteristic.

TEPL Tool Implementation

In order to answer the fourth research question, “How is Technology Enhanced Personalized Learning implemented in K12 learning environments?” respondents were asked five yes/no questions, four slider based questions, and one interview question. Information about the respondent average learning environment was gathered by the TEPLIS instrument through the five multiple choice questions and described previously in the respondent demographic section. Information about the specific TEPL tool was identified through the four slider based questions, and a general understanding of the learning environment was obtained through the interview question.

TEPL tool.

TEPL focus. The respondents were asked to indicate the focus of their TEPL tool by moving a slider toward the word *teacher* or *technology*. TEPL implementations often focus on providing the teacher with information for decision making or on allowing the technology to make decisions about how the student might learn best. Moving the slider towards *teacher* indicated that their TEPL implementation focuses on enabling the teacher to make decisions for the individual student’s learning, moving the slider toward the word *technology* indicated that the TEPL implementation focuses on the technology making decisions for the individual student’s

learning. Obtaining the focus of the TEPL implementations allows for an understanding of how the subjects of this study use the TEPL tools.

Moving the slider completely toward *teacher* would give a value of 1, while moving the slider completely toward *technology* would give a value of 100. The middle point of the slider gives a value of 50. The respondents' average answer value was 41.13, indicating that the average answer was that the TEPL tool was focused on allowing the teacher to set the learning plans rather than technology creating the learning plans by itself. Responses ranged from a *teacher* focus of 6 and a *technology* focus of 78. The standard deviation of the answers was 19.55.

TEPL usage. The respondents were asked to indicate the usage of their TEPL tool by moving a slider toward the word *light* or *heavy*. Moving the slider completely toward *light* would indicate that the TEPL tool had little usage in their learning environment and give a value of 1 while moving the slider completely toward *heavy* would indicate that the TEPL tool would have more usage in their learning environment and give a value of 100. The middle point of the slider would indicate that the TEPL tool would have a moderate usage in their learning environment and give a value of 50.

The respondents' average answer value was 57.81, indicating that the usage of the TEPL tool was closer to a moderate usage of the TEPL tool in their learning environment and not significantly skewed toward a light or heavy use. The average answer value is on the heavy side of the mid-point, which indicates that there is slightly more use of the TEPL tool. Given that several of the respondent environments indicated a complete use of the TEPL tool (score = 100), it is reasonable that the average answers value would be above 50. Individual responses ranged

from a light use of 16 to a heavy use of 100. The standard deviation was 25.64. Based on the responses received from this survey, the TEPL implementation is an important component of the learning environment. Given the large difference in use, specific attention was given to the topic during the interview portion of the study. Interview Subject 1, who had a TEPL usage score of 78, explained the manner in which the TEPL tool is utilized in her learning environment:

What I've done is we provide a one-to-one laptop program for students and we use digital curriculum online. They have a LMS that they use to do all their homework, and then we also use Google apps for education as a collaboration tool and also for writing. Every student has a Gmail account. We use Google Hangouts for check-ins for audio conferences or to have meetings with students in different areas. We also use it with our faculty so that we can be connected at any point without having to come face-to-face.

Further analysis of the data shows that all seven of the TEPL implementations with between 1 and 500 students using the tool on a regular basis had a TEPL usage score above 50. Five of the seven responses had a TEPL usage score above 70. Only three of the nine responses where the TEPL implementation has more than 500 students using the tool on a regular basis had a TEPL usage score of 50 or above. This indicates that the smallest schools have a heavy use of the TEPL implementation, while those above 500 students tended toward a lighter usage of the TEPL implementation.

Academic content. The respondents were asked to indicate the focus of their TEPL tool by moving a slider toward the words *STEM* or *Humanities*. As outlined in the literature review, the majority of the early TEPL studies described environments where STEM topics were used within the TEPL environment. Humanities topics tended to be taught in a traditional environment rather than with the TEPL tool. In order to understand how the respondent's TEPL

implementation was used, a question was asked in order to clarify whether their TEPL implementation was used for STEM or humanities topics. Moving the slider completely toward *STEM* would give a value of 1, while moving the slider completely toward *Humanities* would give a value of 100. If their TEPL implementation served both STEM and humanities, they could leave the slider in the middle, giving a value of 50.

The respondents' average answer value was 54.81, indicating that the TEPL tool is used slightly more for humanities topics than for STEM topics. Given that past studies have shown a higher propensity for STEM topics with TEPL implementations, this was considered surprising. Academic content responses ranged from a *STEM* use of 6 to a *humanities* use of 95, with a standard deviation of 21.65. The range of scores shows a large variation in how the TEPL tools are used within the learning environments, the respondent average environment is used slightly more often for humanities topics than for STEM topics.

A closer look at the answers provided shows only one answer with a score below 39. The low score of 6, which indicates a nearly complete use of the tool for STEM topics, can be considered an outlier. There were only two responses above 75, which would indicate a very strong propensity to use the TEPL implementation for only humanities. The remaining 12 of the responses ranged between a raw score of 39 and 75, with the majority of the remaining responses close to the midpoint of 50. This spread of scores shows that the respondent average TEPL implementation is used for both STEM and humanities topics.

Effectiveness. The respondents were asked to indicate the perceived effectiveness of their TEPL implementation by moving a slider toward the words *Low Effectiveness* or *High Effectiveness*. Moving the slider completely toward *Low Effectiveness* would indicate that their

TEPL implementation was not an effective part of their learning environment and give a value of 1, while moving the slider completely toward *High Effectiveness* would indicate that their TEPL implementation was a highly effective part of their learning environment and give a value of 100. The middle point of the slider gives a value of 50.

The respondents' average answer value was 69.44 with a standard deviation of 20.71, indicating that the administrators consider the TEPL tool to have be more effective than average. Responses ranged from 24 to 94, indicating a low effectiveness for the lowest response and a very high effectiveness for the highest score. Only three respondents stated that their TEPL implementation had an effectiveness score below 49, which indicated that the remaining 13 respondents rated the effectiveness of their TEPL implementation at or above the average score of 50. Of the 13 respondents answer with an average score above 50, 11 of them rated the effectiveness of their TEPL implementation above 70. Given the amount of resources that schools expend in the implementation of a TEPL tool, the respondents' average response of 69.44 shows that they consider the implementation to be effective.

Summary. Characteristics of the TEPL implementation were gathered in order to answer the research question "How is Technology Enhanced Personalized Learning implemented in K12 learning environments?" The findings of this study show that the use of the TEPL tool was focused more on the teacher than the technology and has heavier use than average. The tool was focused more on subjects of humanities rather than STEM. The respondents also stated that the TEPL tool had high effectiveness in their learning environments. The researcher expected to find additional differences between the school size, whether the school was public/private, and the administrator title. Outside of a difference in TEPL usage related to the size of the TEPL

implementation, this study did not show significant differences between the categories of TEPL implementations. For the respondents of this study, the use of the TEPL tools is common across general categories.

Summary of Findings

The results of this study show that the respondents utilize TEPL tools in a variety of learning environments. The TEPL administrators tend to hold administrative positions and spend less than half of their time focused on the TEPL implementation. The learning environments also vary, with implementations found both in the small and large numbers of locations. Similarly, the study found that TEPL tools are used in environments with both small and large numbers of students across all grade levels. Finally, the academic focus of the tool is both on STEM and humanities subjects, with slightly more humanities use than STEM.

This study found that TEPL implementation view success through external measurement and find that their overall definition of success changes over time. The respondents tend to have higher expectations of the students, teachers, and technology when defining success as they get used to the TEPL implementation. The primary definition of success (external measures) remains constant, but the secondary measures (expectations) increase as the TEPL tool is implemented into the environment.

Based on the administrators' responses, concerns about TEPL implementation include professional development, limited resources for the TEPL implementation, how students adapt to the TEPL implementation, and how external entities influence the learning environment. There also was some concern about the use of technology and how schools should trust students in an environment requiring high self-motivation. The respondents mentioned several mitigation

strategies for these concerns, including continual professional development and a focus on external interactions. Both of these mitigation strategies consume resources, which was identified as a concern. The respondents showed a tension between the availability of resources and providing ongoing professional development or a focus on external communications.

The six characteristics of a TEPL learning environment identified during a search of the literature were confirmed by this study. The administrators of TEPL implementations that were surveyed in this study view the dual role of the teacher, a student culture of collegiality, an interactive learning environment, striving for authentic assessment, formal diagnosis of student characteristics, and student flexible schedule/pacing as factors that exist in their environments. Along with the factors identified in the literature, the administrators also indicated that allowing for student choice in topic and method of learning was an important factor found in their environments.

Chapter 5: Conclusions

Many school districts across the United States are considering the use of personalized technology and are spending a large amount of resources implementing technology enhanced personalized learning (TEPL) tools. They are doing this in either a pilot instance or an entire school district. The problem is that there is little empirical understanding of the success, concerns, and characteristics of various TEPL implementations. A large amount of a school's resources are used to integrate a TEPL tool into the learning environment with a focus on the promise that personalized learning provides. A proper understanding of the integration between a TEPL tool and the learning environment is important for proper allocation of resources. A deeper awareness of these issues will allow for a more comprehensive understanding of TEPL implementations and issues that may be encountered with the application of TEPL tools. Past research has identified characteristics expected to be present in a personalized learning environment, this study adds additional learning environment characteristics, definitions of success, concerns that the administrator might encounter, and a general description of how TEPL tools may be applied in the learning environments.

TEPL tools, as with personalized learning, are based on a constructivist theoretical framework and the ideas of self-directed learning. Utilizing a teacher and/or technology as a More Knowledgeable Other (MKO) allows the student to achieve new learning. The student has a higher level of control in directing their learning, often using a TEPL tool to identify their preferred learning method. The theoretical framework for using TEPL tools in a learning environment are covered in chapter 2 of this dissertation.

Several design methods were considered for this study. Based on the survey population and research questions to be answered, a qualitative descriptive methodology was identified as

the most appropriate methodology by which to explore the success, concerns, and characteristics of a TEPL implementation. The subjects for this study were a population of convenience as the researcher was not able to identify or include all possible TEPL implementations in the United States. This study consisted of a web-based survey sent to a volunteer population of 20 TEPL implementation administrators. The survey used a mix of slider-based, Yes/No, and open-ended questions to gather descriptive data. Telephone interviews were used to further clarify themes identified during the web-based survey. The following research questions were considered in this study:

RQ1: How is the success of a Technology Enhanced Personalized Learning Implementation defined by the administrators of the learning environment?

RQ2: What are the concerns of administrators when managing a Technology Enhanced Personalized Learning Implementation?

RQ3: What factors impact the implementation of a Technology Enhanced Personalized Learning tool as reported by the site administrators?

RQ4: How is Technology Enhanced Personalized Learning implemented in K12 learning environments?

Key Findings and Conclusions

As this study is meant to be exploratory in nature, the key findings and conclusions are important when describing this study's relevant outcomes. A discussion of key findings and conclusions are organized by research question.

RQ1: How is the success of a Technology Enhanced Personalized Learning Implementation defined by the administrators of the learning environment. The majority of study respondents defined success of their TEPL implementation through *external measurement*.

School leaders are required to measure the success of their overall learning environment through external measurement (US Department of Education, n.d.b). This is done by reporting standardized test scores and other measurement criteria to allow their learning environment to be compared to other learning environments. External measurements are also used to identify the minimum acceptable student achievement based on national requirements. The use of these external measurements in a TEPL enabled learning environment is not surprising in that this criteria is a requirement of the school leaders and is therefore likely passed down to the TEPL administrators as a measurement of success.

Recent movements in K12 have placed a focus on state and national standards, traditional school districts are commonly being evaluated based on various external standards. This study found that TEPL learning environments are measured by the same standards as non-TEPL learning environments. These external measurements can be as informal as comparing TEPL students to non-TEPL students or as formal as using national standardized testing. Additionally, administrators also may use trade standards or specific requirements set forth by their school district as measures of success. Given that both TEPL and non-TEPL learning environments are measured by the same external entities, it is probable that the measurement of both types of learning environments will change along with any external requirements. As laws and tests change, so will the learning environments. A conclusion can be drawn that external measurement is important to this study's respondents.

This study indicated that the subjects' definitions of success changed since the inception of their TEPL implementation. The most common response was *higher expectations* of their students, teachers, and TEPL tool, although the use of *external measurement* continued to be the most common way to define the success of the TEPL implementation. As such, the conclusion

can be drawn that the primary measurement of success continues to be *external measurement* with a secondary measurement of success changing over time to be an *increase of expectations* of students, teachers, and TEPL tools.

RQ2: What are the concerns of administrators when managing a Technology Enhanced Personalized Learning Implementation. Based on themes identified in this study, TEPL implementation administrators have a variety of concerns, including *professional development, limited resources for the TEPL implementation, how students adapt to a TEPL tool, and how external entities influence their learning environments*. The administrators were also concerned with how to *enable student trust* when using technology. Of these concerns, *professional development* and *limited resources* were the two most commonly identified concerns.

When asked about their mitigation strategies for these concerns, TEPL administrators indicated they use *continual professional development* and a *focus on interacting with external groups*. The administrators use professional development to enhance the teacher's effectiveness in the classroom, while interacting with external groups allows the administrators to manage the external expectations of the learning environment. Both of these mitigation strategies consume resources, which the administrators are not always able to obtain. This need for additional resources and difficulty in obtaining those resources can create a contentious environment. The tension between availability of resources and how the administrators mitigate their concerns was a major theme identified during analysis of the data.

Responses in this study support conclusions that administrators have concerns about their TEPL implementation, which include providing professional development, limited resources for the TEPL implementation, student adaption to the TEPL implementation, and external entities

influencing the learning environment. The two most commonly referenced themes, *professional development* and *limited resources*, are both intertwined in that having limited resources might not allow for sufficient professional development. This study did not provide an indication if appropriate resources were allocated in the initial TEPL planning phase or if the TEPL implementation planning did not allow for sufficient resources. In either case, future TEPL implementation planning should allow for sufficient resources to include ongoing professional development that is specific to the TEPL tool.

RQ3: What factors impact the implementation of a Technology Enhanced Personalized Learning tool as reported by the site administrators. In order to answer the third research question, factors that might impact the TEPL implementation were identified through a review of the relevant literature. All six of these factors were confirmed by a majority of the subjects as existing in their environment (*dual role of the teacher, a student culture of collegiality, an interactive learning environment, striving for authentic assessment, formal diagnosis of student characteristics, flexible scheduling/pacing*). When asked what additional factors might be present in their environment, subjects identified two additional factors.

The first of these factors was *student choice*, referring to the student's choice in learning topic and method of achieving that learning. This factor is different than flexible scheduling/pacing as it refers to the student's choice in what and how they will study, not when and for how long the student is engaged. Identification of student choice as an important characteristic is not surprising, as students taking ownership of their learning will often lead to students wanting a choice in what and how they will study in addition to the timing of the learning. The second factor identified by administrators of TEPL implementations was *teacher acceptance of technology and change*. Subjects indicated that having teachers who were

comfortable with the rapid pace of change with technology was an important factor in their TEPL implementation. The two additional factors identified in this study (*student choice, teacher acceptance of technology*) were mentioned by multiple respondents in the survey and described during the interviews, so it can be concluded that these factors are important to the TEPL implementation and warrant further study. Allowing student choice is a key component of personalized learning and helping teachers become comfortable with technology is a central tenant of a technology-centric learning environment, future research can explore the nuances of these characteristics in a TEPL environment.

RQ 4: How is Technology Enhanced Personalized Learning implemented in K12 learning environments. Based on the participants' responses, the majority of TEPL tools are implemented in a public school setting across multiple grade levels and with multiple locations. The size of environments varied, with under 500 students using the tool being the most common. Multiple charter schools were surveyed along with public schools, which created an issue for when drawing conclusions for this study. Charter schools often have characteristics of smaller private schools, yet are part of a larger public school organization. The smaller school and classroom size present in charter schools makes them similar to private schools, yet their access to resources and political structure makes them similar to public schools. This study did not consider charter schools as their own category, although future research may consider this additional classification so respondents are able to further define their learning environment.

Subjects in the study described two learning environment models: one model where the students and teachers work in a traditional face-to-face environment and a second model where the students and teachers rarely work together in the same physical location. In this 2nd model, student and teachers interact online and can include students based in different geographic

locations. Several of the schools in this study provide both of these models in order to give students a choice regarding where they want to learn. When both models are offered, the students are not permitted to cross between the models without a formal transfer. These two environments are kept separate from each other and function as separate programs within each school.

Finally, this study found that the focus of each TEPL tool was to provide the teachers with information in order to empower teacher-based decision making rather than the technology making learning decisions based on computer algorithms. With a teacher-focused tool, TEPL tools capture information and provide it to teachers for the purposes of decision making and diagnosis. Additionally, the TEPL tool was used more for humanities-related topics rather than STEM-related topics, which was unexpected. When asked about the effectiveness of the TEPL tools being utilized, the subjects indicated that their TEPL tool had high effectiveness.

Based on the analysis of data, the conclusion was drawn that TEPL implementations are used across a variety of learning environments. The study results revealed an array of learning environment sizes, applications of the tool, and manners in which the tool was administered. The lack of similarity was not entirely unexpected given technology used in personalized learning environments. As there have been few examples of TEPL implementations to follow, those implementing TEPL tools are incorporating technology with unique methods in their learning environments. A maturing of TEPL technologies may provide common use-cases and allow future TEPL implementations to develop similar characteristics.

Connection to Literature

As outlined in the literature review, Keefe and Jenkins (Jenkins & Keefe, 2001a, 2002a, 2002b; Keefe & Jenkins, 2000, 2008; Keefe et al., 1991) outlined six characteristics that they contend should be present in a personalized learning environment, including technology

enhanced learning environments. This study confirmed the six characteristics outlined by Keefe and Jenkins, while identifying two additional characteristics that the respondents indicated are important TEPL learning environments. The first of these additional characteristics, *student choice*, is likely to be present in any personalized learning environment without regard to the presence of technology. One of the core premises of personalized learning is giving the student choice in how and what they learn. This study indicates that a TEPL learning environment has the same characteristic as a non-TEPL learning environment.

Although this study found that the administrators view *student choice* as an important characteristic, Kelly (2008) found that presenting learning in a manner which may not initially have been preferred by the students often leads to greater learning. Kelly's findings contradict the administrator's perspective in that allowing the student to choose the manner in which they learn may not be the best choice. The administrators may think that allowing students choice will help with their learning, but research may contradict their perceptions. It is entirely possible that the administrators are focused on a characteristic which may or may not be the most appropriate for student learning. Future research will need to be done in order to confirm Kelly's findings and how they might interact with the findings from this study.

The second of these identified characteristics, *teacher comfort with technology*, is specific to a personalized learning environment where technology is a central focus. Dornisch (2013) found that although teachers tend to desire technology based solutions in their teaching, they often do not have the comfort with technology required to be effective. In non-technology enhanced classrooms, being effective without utilizing technology is overcome by using traditional teaching methods. In a TEPL learning environment, the teacher must be comfortable with technology in order to be effective.

Along with the desire to utilize technology in the classroom, there also is a need for teachers to teach effectively with technology. Simply providing technology to the students will not change teaching if the teacher has no understanding of how to integrate the technology in instruction. Mishra and Koehler (2006) outline a framework which includes the traditional areas of teaching (pedagogical and content knowledge) with technological knowledge. They term this framework TPACK in reference to the requirements that an effective teacher requires knowledge in all three areas. A teacher missing one of the three knowledge areas will not be an effective teacher in a technology-enhanced environment. The *teacher comfort with technology* characteristic finding agrees with the literature, although little has been written specifically about TEPL learning environments. Bringing the work of Dornisch together with the work of Mishra and Koehler adds credence to the findings of this study. Both of these characteristics add to the TEPL literature in a specific way and should be considered along with the previously identified six characteristics.

This study also explored how the subjects defined success, how this definition might have changed, what concerns might be present, and how these concerns might be mitigated in a TEPL environment. Although literature has explored these topics in traditional learning environments, these topics have not been explored in a TEPL learning environment. Further review of the relevant literature has not been able to identify additional research specific to the findings of this study. Therefore, the findings of this study will add to the general understanding of TEPL implementations. The key findings from this study can be used to further understand the topic and provide a basis for future research.

Recommendations for Future Research

Most of the recommendations for future research are related to further clarification of the findings from this study. Although this study has identified findings and conclusions related to the research questions, there is still much to be explored. This study identified multiple definitions of success, with the most common being external measurement of the learning environment. Future research should consider the additional sub-components of external measurement such as Common Core, state standards, district standards, and industry standards. This study could be modified to include specific questions related to the types of external measurement that administrators utilize in their learning environments.

Additionally, a deeper understanding of the concerns and mitigation strategies should also be considered for future research. The findings from this study show that professional development and external communication are chief among the concerns and mitigation strategies, this study only identified the broad topics without obtaining a deep understanding of these issues. Further research should examine the various forms and subject matter of professional development and external communication to better understand the nuances that are inherent. Specifically, a future study should explore how administrators balance a lack of resources with the requirements to provide professional development and external communications.

Conceptually, there was widespread agreement among the respondents about the literature-identified learning environment factors impacting their TEPL implementation. Additional future research should expand upon the characteristic definitions identified in this literature review and how these six environmental factors are implemented to understand what differences might exist. Additionally, two factors were identified that had not been described in

the literature review. The factors of *student choice* and *teacher acceptance of change* should be the focus of future research in order to understand how they impact the learning environment when a TEPL tool is present. This study could be modified to obtain a greater level of detail about the previously identified factors and include the two identified factors. These changes would allow for a more granular exploration of the topic.

Based on the lack of integration between onsite and remote TEPL learning models, future research should explore why these groups are not integrated and if compelling reasons exist why they should remain separate. As learning entities spend resources on TEPL implementations, natural questions will arise as to why they may have two distinct groups. Without valid reasons for them to be separate, learning entities should optimize resources by combining the learning models. Future research will provide additional guidance on the benefits and issues surrounding this topic.

As this study did not specifically limit the subject pool to public/private and school sizes, future research will provide deeper analysis of the differences between the demographic profiles identified. This study attempted to explore how the TEPL tool was implemented across multiple learning environments and identify areas where variations exist. Based on the findings from this study, there appear to be few distinctions between the demographic profiles. Further research into the topic might identify differences that were not readily apparent in this study's findings. Additional insight will be valuable when considering diverse organization sizes and the type of learning institution. Public and private institutions may be similar, but primarily in-person learning environments may have significant differences from primarily virtual learning environments.

Implications for Practice

As learning entities consider implementation of a TEPL tool, they will likely approach the project by reviewing the existing literature. In the existing literature, they will find information about how the technology should be configured for student personalization, the theoretical basis for why personalized learning will impact student learning, and characteristics that might be present within a personalized learning environment. Minimal information will be found about the definition of success, the concerns they might encounter, and how they might plan for changes in their definition of success to mitigate their concerns. This study enhances the current literature by providing an exploration of these topics while adding two learning environmental characteristics that should be considered. This study also identified a potential difference in TEPL learning models by describing a lack of coordination between in-person and virtual TEPL learning environments. The potential TEPL administrator can use the results from this study to enhance their planning process and gain a greater understanding of their learning environment.

For practice, this study identified three areas where the administrator will focus. The first of these recommendations is the addition of two factors which might enhance the implementation of a TEPL tool. These factors, *student choice* and *teacher comfort with technology*, will impact the planning and operation of a TEPL implementation. With *student choice*, the administrator should welcome input to the students' preferred mode, topic, and timing of learning. The overall focus of the program would be impacted by this simple change. For *teacher comfort with technology*, the administrator might change the hiring criteria to include technology skills and the candidate's ability to adapt to rapid change in their environment. The use of the TPACK concept (Mishra & Koehler, 2006) will guide the hiring administrator to

consider technological knowledge along with pedagogical and content knowledge. Several of the subjects in this study indicated that this ability to function with technology and technological change is an important element of their TEPL implementation, which leads to administrator considerations in the hiring and professional development process.

The second recommendation for administrators considering a TEPL implementation are the definitions of success identified in this study. This study has shown external measurement as the most common definition of success, although this study has also shown that the definition of success can change over time. The administrator might consider this implication and allow for change in the definition of success while contemplating how external measurement will impact the learning environment and its success. An understanding of the external measurement criteria required of the school leadership will guide TEPL administrators on how to define success in their own learning environment.

The third recommendation for an administrator to consider with a TEPL implementation is what concerns they might encounter. This study showed that providing professional development for teachers and engaging with external communication are important factors, but these factors compete with limited resources in order to be effective. The administrator must work to balance the resource constraints with the need for professional development and effective external communication. Optimally, the administrator would allow for sufficient resources during the TEPL implementation planning, particularly in regards to technological training which enhances the teacher's utilization of technology in instruction. As this may be difficult, the TEPL administrator can at least understand the issue and work to allocate resources appropriately.

Closing

Many school districts across the United States are spending large amounts of financial and employee resources on the implementation of technology enhanced personalized learning (TEPL) tools. There is little empirical understanding of the success, concerns, and characteristics of TEPL implementations and the learning environments they enable. This exploratory study used a qualitative descriptive methodology to survey and interview TEPL administrators in an effort to understand their perspectives on TEPL characteristics, definitions of success, concerns, and a general description of how TEPL tools are implemented in their learning environments.

Along with confirming six characteristics previously identified (dual role of the teacher, diagnosis of characteristics, a student culture of collegiality, an interactive learning environment, flexible scheduling/pacing, striving for authentic assessment), this study found that administrators consider student choice and teacher comfort with technology as additional learning environment characteristics. Results also show that administrators define success through external measurement, are concerned with professional development, and how to leverage limited resources. The subjects indicated that the definitions of success and administrator concerns evolve over time. Finally, this study found that large variance exists in learning environments when considering online vs. face-to-face instruction, school size, number of users, grade level use, focus and perceived effectiveness of the tool. Recommendations were made for future research, including analysis of two newly identified characteristics, deeper exploration of learning environments, and further exploration of external measurement's sub-components. Recommendations for practitioners include considerations for their success definitions, allowing for the two additional learning environmental characteristics, and initial allocation of resources.

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APPENDIX A

Technology Enhanced Personalized Learning Implementation Survey (TEPLIS)

Thank you for taking the time to provide your input for this survey. The Technology Enhanced Personalized Implementation Survey (TEPLIS) is designed to allow you, the respondent, to provide information on the success, concerns, and characteristics of your technology enhanced personalized learning tool implementation and the learning environment in which it exists. Please answer as completely and honestly as you can, you will be able to type as much or as little as you like.

Background

1. What is your official job title? (open ended)
2. What percentage of your time is spent focused on the TEPL implementation versus other activities?
 - a. 1-25%
 - b. 25-50%
 - c. 50-75%
 - d. 75-100%
3. What grade level(s) use your Technology Enhanced Personalized Learning (TEPL) tool?
(Check all that apply):
 - a. Elementary
 - b. Middle School
 - c. High School
 - d. Other
4. Is the TEPL tool implemented at a Public or Private school setting? (Check one)
 - a. Public
 - b. Private

- c. Other
5. How many locations use your TEPL tool implementation?
- a. 1
 - b. 2
 - c. 3
 - d. 4
 - e. 5-9
 - f. 10-14
 - g. 15+
6. Approximately how many students use the TEPL tool on a regular basis? (Check one)
- a. 1 - 500
 - b. 500 – 1,000
 - c. 1,000 – 2,000
 - d. 2,000 – 3,000
 - e. 3,000 – 4,000
 - f. 4,000 – 5000
 - g. 5,000+
7. How many students are in your organization?
- a. 1 - 500
 - b. 500 – 1,000
 - c. 1,000 – 2,000
 - d. 2,000 – 3,000
 - e. 3,000 – 4,000

- f. 4,000 – 5000
 - g. 5,000 – 7,500
 - h. 7,500+
8. Please move the slider to indicate the focus of your TEPL tool's focus:
- a. TeacherTechnology
9. Please move the slider to describe the usage of your TEPL tool in the learning environment:
- a. Heavy Light
10. What academic content is used within the TEPL tool?
- a. STEM Humanities
11. How would you define the effectiveness of the TEPL tool in achieving your learning objectives?
- a. High Effectiveness Low Effectiveness

Section 1 – Characteristics

12. Do the teachers have a dual role? Y/N
- Description: The teacher is encouraged to be a facilitator of learning (direct instruction or assigning resources), work with students on career and personal-social goals, or function as the chief in-school contact for all persons concerned with the student*
13. Are the student characteristics formally diagnosed and used in instruction? Y/N

Description: Developmental characteristics of the students are identified and measured, teachers are encouraged to identify each student's learning style, and the students learning history is available to the teacher

14. Is there a student culture of collegiality? Y/N

Description: Teachers and students work together to accomplish learning goals and students work together with or without teacher guidance

15. Is there an interactive learning environment? Y/N

Description: Organization of classroom interactions encourages thoughtful questions, students participate actively in learning activities, and student output is tied to the real-world.

16. Are the students allowed to have flexible scheduling/pacing? Y/N

Description: The school day does not have set periods of time with set topics for all students in class, technology is used to enable learning anytime and anywhere the student has access, and students are allowed to progress at their own pace.

17. Does the learning environment strive for authentic assessment? Y/N

Description: Student assessment focuses on the student's mastery of the topic, the public is often involved with a student's final work output, and students are encouraged to learn how to rate their own work and revise as needed.

18. Are there any additional characteristics you deem important to the success of the personalized learning environment? If so, please describe them. (open ended)

Section 2 - Success

19. How will this project be deemed successful? (open ended)

20. Please describe if the definition of success for this project has changed since the beginning. (open ended)

Section 3 – Concerns

21. Are there any concerns with implementing personalized learning technology into the classroom environment? (open ended)

22. If so, how have these concerns been mitigated? (open ended)

APPENDIX B

Initial Email Requesting Study Participation

(Insert Date)

Greetings,

My name is Rod Gallagher and I am a doctoral student in education at Pepperdine University, Graduate School of Education and Psychology. As a technologist and educator, I am particularly interested in how technology interacts with the learning environment. I would like to invite you to participate in a study that will help us all have a better understanding of technology enhanced personalized learning implementations.

The survey will be taken online and you will be provided with a direct link to the survey through your preferred email account. Completing this survey is online and voluntary. The survey should take 10-15 minutes to complete and will include questions about how you define success, what concerns you may have had, and what characteristics are present in your learning environment.

If you agree to helping with this study, please click the link below to provide your survey information.

(Insert link)

Thank you for your time and consideration.

Sincerely,

Rod Gallagher
Pepperdine University
Graduate School of Education and Psychology
6100 Center Drive
Los Angeles, CA 90045

APPENDIX C

Consent for Research Study

TECHNOLOGY ENHANCED PERSONALIZED LEARNING IMPLEMENTATIONS: DESCRIPTIVE ANALYSIS OF SUCCESS CRITERIA, CONCERNS, AND CHARACTERISTICS

(Insert Date)

Dear Respondent,

My name is Rod Gallagher and I am a doctoral student in education at Pepperdine University, Graduate School of Education and Psychology. This research is in partial fulfillment of requirements for a dissertation at Pepperdine University. The purpose of this study is to explore how tool administrators define the success, concerns, and learning implementation factors that impact the success of a United States K-12 learning environment

As a technologist and educator, I am particularly interested in how technology interacts with the learning environment. I would like to invite you to participate in a survey that will help me examine technology enhanced learning implementations.

The survey will be taken online, completing this survey is entirely voluntary. The survey should take 10-15 minutes to complete and will include questions about how you define success, what concerns you may have had, and what characteristics are present in your learning environment. You have the right to refuse answering any question.

The only foreseeable risks associated with completing the survey is the time it will take and any possible emotions that may come up while reflecting upon your answers.

When the results of the survey are reported they will be described as a whole and not individually. To further protect your privacy, your survey answers are entirely confidential. No person other than myself will have access to the completed surveys. I am required to keep the survey results in a secure location for 3 years. After that time the information will be destroyed.

Please feel free to ask any questions about this study either before or during the process. If you have any questions, please contact Rod Gallagher, Principal Investigator at [REDACTED] or rpgallag@pepperdine.edu. If you have any additional questions you may contact my dissertation chairperson, Paul Sparks, Ph.D., Pepperdine University, Graduate School of Education and Psychology, 6100 Center Drive, Los Angeles, CA 90045, paul.sparks@pepperdine.edu.

Please indicate your acceptance to being a part of this survey by clicking the “accept” button at the bottom of this screen.

Your time is greatly appreciated!

Rod Gallagher

APPENDIX D

Consent for Research Study

TECHNOLOGY ENHANCED PERSONALIZED LEARNING IMPLEMENTATIONS: DESCRIPTIVE ANALYSIS OF SUCCESS CRITERIA, CONCERNS, AND CHARACTERISTICS

(Insert Date)

Dear Respondent,

Thank you for your time and assistance with this study. Your information will greatly assist us in understanding TEPL implementations and the characteristics which help them succeed.

Based on the study findings, we may want to ask a small number of questions to better understand your answers. Would you be willing to have a short (5-10 minute) follow-up interview?

You have the right to refuse answering any question. The only foreseeable risks associated with completing the interview is the time it will take and any possible emotions that may come up while reflecting upon your answers.

When the results of the interview are reported they will be described as a whole and not individually. To further protect your privacy, your answers are entirely confidential. No person other than myself or those working directly on my team will have access to the completed interviews. I am required to keep the interviews results in a secure location for 3 years. After that time the information will be destroyed.

Please feel free to ask any questions about this study either before or during the process. If you have any questions, please contact Rod Gallagher, Principal Investigator at [REDACTED] or rpgallag@pepperdine.edu. If you have any additional questions you may contact my dissertation chairperson, Paul Sparks, Ph.D., Pepperdine University, Graduate School of Education and Psychology, 6100 Center Drive, Los Angeles, CA 90045, paul.sparks@pepperdine.edu.

Please indicate your acceptance to being a part of this interview by clicking the “accept” button at the bottom of this screen and providing your contact information.

Your time is greatly appreciated!

Rod Gallagher

(Accept button)

SKYPE (check box) (place for SKYPE name)

Phone (check box) (place for phone number)

Email (check box) (place for email address)

Best time to contact: (check boxes for morning/afternoon/evening)

APPENDIX E

Topic Codes and Operational Definitions

Category	Code	Definition	Examples of Key Phrases
Job Title	Director		Director
	Leader	Title showing a learning entity leadership role	Superintendent, Leader
	Teacher	Title with a teacher role	Teacher
	Principal	Title with a principal role	Principal
Additional Personalized Learning Environment Characteristics	Student Choice	Allowing student choice in learning selection	Student choice, Student voice
	Teacher Acceptance	Acceptance of teachers to personalized learning technologies and environment	Follow their lead
	Student Inquiry	Encouraging student questioning	Inquiry, Students generate questions
	Flexibility	Allowing the student to have a flexible learning environment	Flexibile scheduling
	Parent Involvement	Direct parent involvement in the student learning	Supervision with parents
	Student Motivation	Student's motivated to pursue their own learning	Students work at their pace
TEPL Success Definition	Standardized Tests	Use of standardized testing to define success	Standardized assessment
	Student Engagement	Use of student interaction to define success	Student engagement, They do not require ean adult
	State / District Measurement	Use of state and/or district definition of success	Requirements for high school diploma, District balanced scorecard
	School Administration Measurement	Use of school definition of success	Local school improvement plan, Curricular standards
	Stakeholder Input	Use of outside inputs to define	Parent/staff/student

		success	survey results, Students, parents, community and colleagues embrace
	Comparison To Non-TEPL Students	Comparison to other (Non-TEPL) students or classrooms to define success	Perform as well as our strictly classroom
	Student Collaboration	Measurement of collaboration among students to define success	Collaborate
	Curriculum Standards	Use of standards published with the curriculum to define success	Standards of the curriculum
	External Trade Group Standards	Use of external group standard to define success	ISTE standards
Change in TEPL Success Definition	Expectations of Students	Changing the definition of success by having different expectations of the students	Student, Student engagement
	Deeper Understanding of Success	Changing the definition of success through deeper understanding of success	Understanding of effectiveness, Refined as we learn
	Changing Content Expectations	Changing the definition of success by expecting something different from the content	Content more interactive
	Changing Assessment Types	Changing the definition of success through different assessments	Working toward
	Changing Role of Technology	Changing the definition of success by using technology differently	Technology as a learning tool
TEPL Concerns	Professional Development	Having a concern with the amount or type of professional development	Professional learning, PL
	Limited Resources	Having a concern with limited resources in the learning environment	Challenges with hardware/software, Resources limited
	External Influences	Having a concern with external entities having influence on the learning environment	Parents acting, Community education
	Student Adaption	Having a concern with student adaption to the TEPL learning environment	Focus of the student, Building necessary skills so students can learn
	Use of Technology	Having a concern with the use of	Technology must

		technology	be, Involve a lot of technology
	Maintaining Focus	Having a concern with the learning maintaining focus on the learning	Focus of the learning
	Student Measurement	Having a concern with how students are measured	Uniform standard
	Cheating	Having a concern with student cheating	Cheating
	Tool Becomes Focus	Having a concern that the tool will become the focus rather than the learning	Tool becomes the focus
TEPL Concern Mitigation	Professional Development	Use of professional development to mitigate concerns	PL, PD, Professional Learning
	External Interactions	Use of external interaction to mitigate concerns	Parent training, Community communications, Parents must be aware
	Scheduling / Additional Resources	Use of different schedules or adding resources to mitigate concerns	Scheduling, additional staff
	External Standards	Use of external standards to mitigate concerns	Set of standards
	Student Interaction	Use of student interactions to mitigate concerns	Feedback from students, Open with expectations
	No Solution Identified	No solution identified to mitigate concerns	Work in progress

APPENDIX F

Interview Script

‘Hello, My name is _____. I am calling in regard to the recent survey regarding Technology Enhanced Personalized Learning. Is this a good time to spend a few minutes?’
(Pause for answer).

If No, then: “What time would be good for me to call back?” (Record new time and skip to **ending**)

If Yes, then: “Thank you. As you may remember, you were asked about how technology is used with personalized learning. We are particularly interested with how the technology is used in the real world.”

“We have 4 questions to ask in regards to this topic. As always, your answers remain confidential and no individual identifiers will be used. These questions are general questions, they may or may not be related to your previous answers, so please answer them as though they are stand-alone questions. Your answers will be recorded for later transcription and analysis.”

- 1) “Please give me an overview of your organization and how the Technology Enhanced Personalized Learning tool is used.” (Pause for answer).
- 2) “The study mentioned several factors which might be present in a technology enhanced personalized learning environment such as flexible schedules, teachers as coaches, and using authentic assessment. What other factors do you think are important?” (Pause for answer).
- 3) “Do you consider your technology enhanced personalized learning implementation successful?” (Pause for answer). (Ask “why” if they only answer yes or no).
- 4) “What issues concern you the most with your technology enhanced personalized learning implementation?” (Pause for answer.)

ending

“Thank you for your time both in answering the survey and in answering these questions. Your information is very helpful as we attempt to understand how technology interacts with personalized learning. If you have any questions or comments, please contact Rod Gallagher (the researcher) or Paul Sparks (the dissertation committee chairperson). Do you have any immediate questions?” (Pause for answer).

“OK. Thank you for your time and have a great day/evening.”

APPENDIX G

GPS IRB Exemption Notice

PEPPERDINE UNIVERSITY

Graduate & Professional Schools Institutional Review Board

November 11, 2013

Rod Gallagher
[REDACTED]

Protocol #: E1013D03

Project Title: Technology Enhanced Personalized Learning Implementations: Descriptive Analysis of Success Criteria, Concerns, and Characteristics

Dear Mr. Gallagher:

Thank you for submitting your application, *Technology Enhanced Personalized Learning Implementations: Descriptive Analysis of Success Criteria, Concerns, and Characteristics*, for exempt review to Pepperdine University's Graduate and Professional Schools Institutional Review Board (GPS IRB). The IRB appreciates the work you and your faculty advisor, Dr. Paul Sparks, have done on the proposal. The IRB has reviewed your submitted IRB application and all ancillary materials. Upon review, the IRB has determined that the above entitled project meets the requirements for exemption under the federal regulations (45 CFR 46 - <http://www.nihtraining.com/ohsr/site/guidelines/45cfr46.html>) that govern the protections of human subjects. Specifically, section 45 CFR 46.101(b)(2) states:

(b) Unless otherwise required by Department or Agency heads, research activities in which the only involvement of human subjects will be in one or more of the following categories are exempt from this policy:

Category (2) of 45 CFR 46.101, research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: a) Information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and b) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

In addition, your application to waive documentation of consent, as indicated in your **Application for Waiver or Alteration of Informed Consent Procedures** form has been approved.

Your research must be conducted according to the proposal that was submitted to the IRB. If changes to the approved protocol occur, a revised protocol must be reviewed and approved by the IRB before implementation. For any proposed changes in your research protocol, please submit a **Request for Modification Form** to the GPS IRB. Because your study falls under exemption, there is no requirement for continuing IRB review of your project. Please be aware that changes to your protocol may prevent the research from qualifying for exemption from 45 CFR 46.101 and require submission of a new IRB application or other materials to the GPS IRB.

A goal of the IRB is to prevent negative occurrences during any research study. However, despite our best intent, unforeseen circumstances or events may arise during the research. If an unexpected situation or adverse event happens during your investigation, please notify the GPS IRB as soon as possible. We will ask for a complete explanation of the event and your response. Other actions also may be required depending on the nature of the event. Details regarding the timeframe in which adverse events must be reported to the GPS IRB and the appropriate form to be used to report this information can be found in the

Pepperdine University Protection of Human Participants in Research: Policies and Procedures Manual
(see link to "policy material" at <http://www.pepperdine.edu/irbi/graduate/>).

Please refer to the protocol number denoted above in all further communication or correspondence related to this approval. Should you have additional questions, please contact Michelle Blas, Director of Student Success at gpsirb@pepperdine.edu. On behalf of the GPS IRB, I wish you success in this scholarly pursuit.

Sincerely,



Thema Bryant-Davis, Ph.D.
Chair, Graduate and Professional Schools IRB

cc: Dr. Lee Kats, Vice Provost for Research and Strategic Initiatives
Ms. Alexandra Roosa, Director Research and Sponsored Programs
Dr. Paul Sparks, Faculty Chair