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The characteristics, knowledge, and preparation levels of K--12 online distance educators in the United States

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THE CHARACTERISTICS, KNOWLEDGE, AND PREPARATION LEVELS OF K-12 ONLINE DISTANCE EDUCATORS IN THE UNITED STATES

by

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ABSTRACT

The Characteristics, Knowledge, and Preparation Levels of K-12 Online Distance Educators in the United States

by

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With the increasing popularity and accessibility of the Internet and Internet-based technologies, along with the need for a diverse group of students to have alternative means to complete their education, there is a major push for K-12 schools to offer online courses. This is primarily occurring through offering virtual high school programs via online distance education. Virtual schools have been in existence since the proliferation of the Internet in the mid-1990s, and they continue to grow in popularity as a realistic alternative to traditional education. As the number of online distance education courses continue to proliferate throughout the nation, a growing number of teachers are facing the challenge of creating online versions of their traditional, face-to-face courses while still preserving the quality of the instruction. Little is known about this population of teachers or the extent of their preparation. This study examines the demographic nature of the K-12 online teachers and the level of preparation with respect to three major areas

identified from the literature: a) technological knowledge; b) pedagogical knowledge; c) content knowledge. By studying this particular population, teacher educators can better understand the specific needs that teaching in an online environment pose. This, in turn, can inform changes, adaptations, and improvements to teacher preparation programs across the United States.

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"Every day you may make progress. Every step may be fruitful. Yet there will stretch out before you an ever-lengthening, ever-ascending, ever-improving path. You know you will never get to the end of the journey. But this, so far from discouraging, only adds to the joy and glory of the climb." Winston Churchill

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right where we left off. I appreciate your warm kindness. Brian couldn't ask for better godparents, and I can't imagine a better friend.

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Finally, this work is dedicated to my mom and the memory of my dad. I'm thankful that I am the oldest and have the most memories of when we were a happy family. Those formative years shaped the person that I am today. Even though my dad is no longer here, his influence and discipline live on in me. He always believed that I was destined for great things, and my hope is that he would be proud. I cherish his letters and remember his encouragement: "You are surely destined to high places with the blessing of wisdom and maturity which God has given you. May you shine forth touching lives and hearts as you go onward and upward. Now push on."

So now, with the necessary knowledge and tools provided to me by those whom I have mentioned and countless others, I thank you all, as I continue to push on…

CHAPTER 1

INTRODUCTION

While modes and methods of teaching remained much the same during the 20th century, the development of recent technology has vastly changed the way we communicate, learn, and engage with one another. As a result, the 21st century educational landscape has also been altered. One of these changes has been the addition of online distance education, specifically the proliferation of virtual schools in K-12 settings. These programs allow students to complete entire levels of schooling via the World Wide Web (Web). In the case of virtual high schools, students are able to earn their diplomas via online distance education programs. Clark (2001) defined a virtual school as "an educational organization that offers K-12 courses through Internet or Web-based methods" (p.1). To incorporate this mode of education, various formats have emerged from a variety of sources including state, local, private, and non-profit agencies. The extent of online content offered within these types of schools varies. While certain virtual schools have been created to include curriculum that is entirely online, others have incorporated specific distance education courses that are offered in addition to their traditional classes held in "brick and mortar" buildings (Roblyer & Marshall, 2002-2003).

In all of their various inceptions, virtual schools can be viewed as part of the online distance education movement in which the Internet is used to provide education to students. Many terms have emerged to describe different types of online distance

education within virtual schooling, including "e-learning," "hybrid courses," "asynchronous learning," and "Web-based learning," adding to the confusion of researching this particular field. Finally, however, in a recent report regarding online distance education, Allen and Seaman (2006) developed specific definitions, as follows:

1. Online—Course where most or all of the content is delivered online. At least 80% of seat time being replaced by online activity.
2. Blended/Hybrid—Course that blends online and face-to-face delivery. Thirty percent to 79% of the content is delivered online.
3. Web-Facilitated—Course that uses Web-based technology (1-29% of the content is delivered online) to facilitate a face-to-face course.

Virtual schools offer an organized set of courses leading to the completion of various grades, using the Internet as the primary means of communication. According to Russell (2004), "They emerged in the closing years of the 20th century, and can be understood as a form of schooling that uses online computers to provide some or all of a student's education" (p. 2).

With the emergence of K-12 online education as a growing and legitimate form of schooling in the 21st century, an increasing number of teachers find themselves instructing students via online distance education. To date, research in this area has focused on student characteristics, student achievement, and predictive measures for student success in online environments (Cavanaugh, Gillan, Kromrey, Hess & Blomeyer, 2004; Rice, 2006; Roblyer & Marshall, 2002-2003). Little is known about the population of educators who teach online, their characteristics, preparation, and whether or not they differ from the general population of those who teach in traditional settings. The current

study surveyed K-12 online teachers from across the nation in order to describe the population of those teaching in online environments. These teachers were surveyed with regard to general demographic information including age, race, gender, ethnicity, educational background, and years of teaching experience. They were asked to rate their knowledge and preparation with regard to their content area, pedagogical strategies, and technical expertise to answer the following research questions:

1. What are the demographic characteristics of those teaching in online K-12 distance education programs in the United States?
2. What is the perceived knowledge level of those who teach in an online environment specific to technical expertise, online pedagogy, and content area, including the combinations of these domains?
3. What is the perceived preparation level of those who teach in online environments specific to technical expertise, online pedagogy, and content area, including the combinations of these domains?
4. Is there a relationship between the perceived knowledge level and preparation level of K-12 online teachers with respect to technical expertise, online pedagogy, and content area?

Using a survey methodology, this study gathered data to begin examining the population of K-12 online distance educators.

Current Status of Distance Education

In understanding the scope of virtual schools, it is helpful to gain an overall picture of the current status of online K-12 education in the United States. In a national survey of 2,305 public school districts in the 50 states and District of Columbia, Setzer

and Lewis (2005) found that during the 2002-2003 school year, approximately one-third of public school districts (36%) had students enrolled in online distance education courses. Of the total enrollments in online distance education courses, 68% of students attended high schools, 29% attended combined or ungraded schools, 2% attended middle or junior high schools, and 1% attended elementary schools (Setzer & Lewis, 2005). In fact, the most recent national data show that of a survey of 366 school districts, 57.9 % had at least one student who took an online course during the 2005-2006 school year, with an additional 24.5 % planning to add online courses to their offerings in the next three years (Picciano & Seaman, 2007). According to the researchers, "These data clearly reflect that the majority of American school districts are providing some form of online learning for their students and many more plan to do so within the next three years" (Picciano & Seaman, 2007, p. 7). Examining existing data (Setzer & Lewis, 2005; Smith, Clark & Blomeyer, 2005) and extrapolating these figures, an estimated 600,000 to 700,000 K-12 public school students were engaged in online learning in 2005-2006, even without counting private school enrollment or the large home-school population. These figures are expected to increase as more school districts explore the potential advantages of offering online classes, including addressing growing student populations, dealing with the challenges of limited space, scheduling conflicts, failed courses, and meeting the needs of specific groups of students (Setzer & Lewis, 2005). The researchers also found that the most frequently cited reason for the importance of having distance education courses was the ability to offer classes that would not otherwise be available at the school (80% of respondents reported this as being very important). Other reasons ranking high on the "very important" category included meeting the needs of specific groups of

students (59%) and being able to offer advanced placement or college-level courses (50%). In addition, 72% of districts with distance education programs planned to expand them in the future (Setzer & Lewis, 2005).

Distance Education in K-12: Virtual Schooling

The proliferation of distance education programs in K-12 settings has been through the emergence of virtual schools. These programs, such as Arizona Virtual Academy, which offers Kindergarten through grade 11 online, allow students to complete entire levels of schooling via the Web. In the case of virtual high schools, students are able to earn their diplomas via online distance education programs. Clark (2001) defined virtual school as "an educational organization that offers a K-12 courses through Internet or Web-based methods" (p.1). This differs from school districts that offer isolated classes online for the purposes of dealing with issues such as limited space, scheduling conflicts, and failed courses.

Virtual schools can be viewed as part of the distance education movement in which the Internet is used to provide education to students. While distance education refers to offering courses that rely heavily on the Internet and compressed video to provide online education (Valentine, 2002), virtual schools take this concept and offer an organized set of courses leading to the completion of different levels of schooling, using the Internet as the primarily means of communication. To incorporate this mode of education, however, various formats have emerged from a variety of sources including state, local, private, and non-profit.

Virtual schools have the option of joining a larger non-profit organization, such as Virtual High School (VHS), founded in 2001, while others develop their own courses

either on their own as part of an independent school district, a state-sponsored school, or a virtual charter school. Because virtual schools are mostly sponsored by states or local educational agencies, implementation varies widely. According to a recent report, 21 statewide virtual school programs existed as of summer 2005 (Watson, 2005). Certain common characteristics identify this group. First, they are primarily funded by a limited number of entities: the state department of education or some other state-related agency, state legislation, a local education agency such as a school district, or other formerly distance education programs (such as correspondence). These schools function mostly at the high school level, tend to be supplemental in nature, and rely on local districts to supply their students as well as financial support (Watson, 2005).

Virtual schools have been in existence since the proliferation of the Internet in the mid-1990s, and they continue to grow at a significant pace, with 72% of school districts planning to expand distance education courses in the future (Setzer & Lewis, 2005). Certain schools are provided as an alternative form of education to students, as in the case of charter, district, or state virtual schools. Others are offered by for-profit companies as private institutions. Many of these virtual schools are providing K-12 content in which students can work at their own level, as opposed to being labeled by a particular grade (Clark, 2001). With the capability for technology to easily deliver content at different grade levels, the distinction among specific grade levels is becoming increasing small.

With the growing population of K-12 online students and teachers, it remains to be determined if this group of teachers differs from the notion of what it means to be a teacher in a traditional classroom. The current understanding of what teachers should know and be able to do is based on a traditional classroom setting. However, as the

number of virtual schools increase, so too are the number of teachers entering the field of online distance education. Research that focuses on teachers' knowledge of content, pedagogy, and technology as it pertains to teaching in an online environment is going to become increasingly central to the quality of K-12 online distance education and how teacher education programs should address the needs of this group of educators.

Purpose and Advantages of Virtual Schooling

Virtual schools present potential advantages when compared with traditional schools because of the inherent flexibility that comes with those who attend school at a distance. One of the major positive aspects to online education is "anytime, any place" learning, in addition to the ability of the technology to tailor the curriculum to meet the needs of individual students. Fulfilling each child's specific educational requirements has long been a goal of the modern educational system, but unfortunately, it has often acquiesced to offering the same general curriculum due to convenience. Traditionally, schools have been organized by an industrial model that specifies structure in terms of time, space, modes, and places of learning. Virtual schools challenge this notion, and technology makes it possible for different students at various levels to engage with the content at their own pace and speed. Dewey (1938) strongly advocated for individualizing learning: "Responsibility for selecting objective conditions carries with it, then, the responsibility for understanding the needs and capacities of the individuals who are learning at a given time" (p. 45).

In addition to individualized learning, technology makes it possible for students to learn in ways that, until recently, were unimaginable. Web-based simulations and interactive sites enable students to learn through experience and to examine all of the

content-related aspects of a particular topic. Through the use of Web-based units, it would be possible to take a specific topic, and then explore all aspects of the selected subject, including related biological, environmental, scientific, social, economical, and cultural issues. Specific simulation sites could even take learning further, offering students the chance to observe cause and effect relationships. This type of simulated experience is but one of numerous examples that enables students to have real-world experiences via the Web that would otherwise be impossible.

Limitations of Virtual Schooling

One of the limitations posed by virtual schooling is the relative lack of research regarding the effectiveness of online education in the K-12 setting. As Cavanaugh (2001) wrote, "Although distance learning is well documented with adults, fewer studies of effectiveness exist that center on the primary and secondary school levels. At a point when all states offered distance education in schools, very few had conducted formal evaluations" (p. 75). As the trend toward virtual schooling continues, additional studies focusing on the evaluation component of K-12 online distance education programs are warranted.

Another limitation is that online learning may be best suited for a particular type of student, one who is highly self-regulated. Certain cognitive measures are predictors of academic success in distance education, including self-motivation and the ability to structure one's own learning, previous experience with technology, a good attitude toward the content, and self-confidence in academic endeavors (Roblyer & Marshall, 2002-2003). Because not all students meet these criteria, virtual school may not be a viable choice for all students, despite its apparent advantages.

Assuming that students have the appropriate cognitive skills to be successful in a virtual school environment, another limitation involves the inevitable discussion of access. Technology has become pervasive throughout the 21st century, but certainly, not for everyone. The digital divide, while less significant than before, is a key factor when determining if distance education is a realistic option. According to the latest Pew study, 67% of adults use the Internet on a regular basis, with 84% of those between the ages of 18 and 29. Those who do not use the Internet are becoming a minority; however, the percentage of low income users (49%) versus those making more than $75,000 annually (93%) still reveals a broad gap, in addition to white users (70%) as opposed to those of African American decent (57%) (Rainie & Horrigan, 2005). It seems clear that even if virtual school is presented as an alternative for students, in reality, it may not be for all segments of the population. With the help of grant funding and business partnerships, however, virtual schools have often provided computers and Internet access for those who could not otherwise afford them.

Virtual Schooling and Teacher Education

Although there is a variety of types of virtual schools, this study focused on those schools that are sanctioned by states, either through a charter, local education agency, university, or state program. These schools fall under jurisdictions similar to their traditional counterparts, and therefore are required to hold teachers to the same state licensing and highly qualified standards. While states have a great deal of discretion in setting these requirements, they must include a college degree; demonstration of subject-matter knowledge; and meeting any state licensure/certification requirements. Subject-matter knowledge can be demonstrated through majoring in the subject in college or

going back to college and completing courses that would be equivalent to a major; earning an advanced degree or credential in the subject; or passing a rigorous state test in the subject (NCLB, 2001). Teachers from state sanctioned virtual schools provide an excellent source for examining how teachers have been prepared in their teacher education programs to be able to address the unique challenges of teaching in a distance education environment.

Purpose of the Study

While the virtual school movement continues to increase in popularity, little is known about the preparation of K-12 online distance education teachers. As institutions seek to move their teacher preparation programs into the 21st century, researchers need to begin examining what is currently being done and what should be done with regard to preparing educators to teach in online settings. Currently, there is a lack of data to describe the population of educators who teach online, their characteristics, preparation, and whether or not they differ from the general population of those who teach in traditional settings.

This study describes the population of those teaching in K-12 online environments through data collected via a national survey. Teachers who work in state-sanctioned virtual schools were surveyed with regard to general demographic information including age, race, gender, ethnicity, educational background, and years of teaching experience. They also rated their knowledge and preparation with regard to their content area, pedagogical strategies, and technical expertise. Through the gathering of these data, the current study sought to answer the following research questions:

1. What are the demographic characteristics of those teaching in online K-12 distance education programs in the United States?
2. What is the perceived knowledge level of those who teach in an online environment specific to technical expertise, online pedagogy, and content area, including the combinations of these domains?
3. What is the perceived preparation level of those who teach in online environments specific to technical expertise, online pedagogy, and content area, including the combinations of these domains?
4. Is there a relationship between the perceived knowledge level and preparation level of K-12 online teachers with respect to technical expertise, online pedagogy, and content area?

Significance of the Study

The topic of teacher preparation for online distance education environments is of particular relevance, as little is known about the current population of those who teach K-12 online. The literature to date has focused primarily on the quality of K-12 online programs as well as student perceptions (Cavanaugh et al., 2004; Rice, 2006; Roblyer & Marshall, 2002-2003), rather than the group of people who teach online K-12 classes. Currently, Iowa State University is the lead institution focusing on creating a model program for preparing teachers for the virtual environment. Through their Teacher Education Goes into Virtual Schooling (TEGIVS) program, Iowa State University is leading a national project which focuses on preparing future teachers for K-12 distance education environments. This project is supported by a federal Fund for Improvement of

Post Secondary Education (FIPSE) grant, and is working to develop materials such as case studies, observation, and evaluation tools for use with preservice teachers.

According to Davis & Roblyer (2005), "The U.S. Department of Education agreed that a model for incorporating VS [Virtual School] in preservice teacher education programs, accompanied by appropriate assessment of the range of acquired competencies, would be a significant and much-needed innovation" (pp. 401-402). With the increasing number of virtual schools at the elementary and secondary levels, the field of teacher preparation would benefit from examining issues related to preparing teachers for virtual environments. Laferrière, Lamon and Chanc (2006) agreed, "Despite much enthusiasm given to the use of technology in education, the potential of e-learning in transforming teacher learning is neither sufficiently explored nor well understood" (p. 77). Education programs at colleges and universities may want to consider how they are preparing future educators, who may or may not end up teaching in a traditional face-to-face classroom. This could include more fully integrating technology within the coursework and field experiences of teacher candidates; creating courses or including specific modules within existing courses to address topics of importance to virtual teaching, such as self-regulated learning; the role of the online teacher, differences in online pedagogy; and principles of instructional design. The current study gathered data regarding the preparation of K-12 online distance education teachers to help inform possible program changes within the field of teacher education.

Definition of Terms

Online distance education – Course where most or all of the content is delivered via the World Wide Web. Keegan (1995) identifies two elements that constitute online distance education: 1) students and teachers being separated by location and/or times and 2) the use of some means of communication, most commonly the Internet, that alleviates the need for students to travel "to a fixed place, at a fixed time, to meet a fixed person, in order to be trained" (p.7). Allen and Seaman (2006) define online distance education as having at least 80% of seat time being replaced by online activity.

Blended/Hybrid distance education – Course that blends online and face-to-face delivery in which 30% to 79% of the content is delivered online (Allen & Seaman, 2006).

Web-Facilitated education – Course that uses Web-based technology (1-29% of the content is delivered online) to facilitate what is otherwise a face-to-face class.

Virtual schools – A form of K-12 schooling that uses online instruction to provide all or some of a student's education (Russell, 2004).

Pedagogical Content Knowledge (PCK) – Understanding the relationship between content knowledge (the amount and organization of knowledge of a particular subject matter) and pedagogical knowledge (knowledge related to how to teacher various content), which goes beyond content or subject matter knowledge to include knowledge on how to teach that particular content, including ways of representing knowledge that make it easier for others to understand (Shulman, 1986).

Technical Pedagogical Content Knowledge (TPCK) – Understanding the connections and interactions between and among content knowledge (subject matter that is to be taught), technical knowledge (computers, the Internet, digital video, etc.), and pedagogical

knowledge (practices, processes, strategies, procedures and methods of teaching and learning) to improve student learning (Koehler and Mishra, 2005).

CHAPTER 2

REVIEW OF RELATED LITERATURE

In order to inform the creation of an instrument to survey the population of K-12 online distance educators, a careful review of existing literature is necessary. This literature review was conducted in two parts. First, research studies, literature reviews, articles and reports directly related to K-12 online distance education programs were examined and reviewed. These studies were located within ERIC and Academic Search Premiere databases using the search term "K-12 distance education." However, because only 10 articles were located, and relevant data-driven articles focused on elements of student achievement and evaluation, a second focus on distance education and higher education faculty was necessary. The second part of the literature review was conducted through a search of the Academic Search Premier, Professional Development Collection, and ERIC Ebsco databases with the terms "distance education and faculty preparation," as well as "online education and faculty preparation." This yielded a total of 346 articles. After selecting relevant empirical articles from this list, along with those gathered from an email subscription to an online journal, as well as bibliographic information from the respective reference lists were used to gather additional research, twenty studies were identified. Through careful examination of these articles, three major themes, technical assistance, course design, and pedagogy/methodology of teaching online, appeared as essential elements for faculty to be able to offer quality online courses. These themes fit

within the theoretical framework of technological pedagogical content knowledge (TPCK), built on Shulman's (1986) concept of pedagogical content knowledge, and further developed by Koehler and Mishra (2005). Prior to reviewing the existing literature, an examination of the TPCK framework is useful. This framework was used to attempt to measure the knowledge and preparation levels of K-12 online distance educators to see if it is a useful way of framing what they do.

Theoretical Framework

In his landmark article, *Those Who Understand: Knowledge Growth in Teaching,* Lee Shulman (1986) introduced the concept of pedagogical content knowledge (PCK). He raised the issue of the need for a more coherent theoretical framework with regard to what teachers should know and be able to do, asking important questions such as, "What are the domains and categories of content knowledge in the minds of teachers?" and "How are content knowledge and general pedagogical knowledge related?" (p. 9). To describe the relationship between content knowledge, or the amount and organization of knowledge of a particular subject matter; and pedagogical knowledge, knowledge related to how to teach various content, Shulman developed the idea of *pedagogical content knowledge* (PCK). He defines PCK as going beyond content or subject matter knowledge to include knowledge on how to teach that particular content. Within PCK, he included, "the most useful forms of representation of those ideas, the most powerful analogies, illustrations, examples, explanations, and demonstrations—in a word, the ways of representing and formulating the subject that make it comprehensible to others" (p. 9). Shulman also believes that knowledge of what makes a subject difficult or easy to learn is a part of PCK. This means that in order to be able to effectively teach a particular topic,

teachers should know the potential pitfalls to which students frequently fall victim, depending on the preconceptions they have developed based on their ages and backgrounds. According to Shulman, "If those preconceptions are misconceptions, which they so often are, teachers need knowledge of strategies most likely to be fruitful in reorganizing the understanding of learners, because those learners are unlikely to appear before them as blank slates" (pp. 9-10).

The concept of PCK is particularly relevant to online teaching because it sheds light on what teachers should know and be able to do within the context of the virtual learning environment. Because there is a shift to a "knowledge building" approach to learning, the focus in online teaching necessarily becomes more centered around how the course is structured, with special emphasis on the teaching materials that are used. The teacher in the virtual classroom needs to be overtly aware of the common misconceptions centered around the particular topic within the content they are teaching so that these can be addressed as part of the class materials. Online educators also need to be aware of the importance of encouraging and teaching specific self-regulated behaviors to their students to ensure every possible chance for success. Many strategies for teaching self-regulated behaviors relate specifically to Shulman's notion of PCK in that they involve the use of cognitive strategies such as modeling, analogies, and metaphors to aid in understanding the content-related material. This involves the teacher's ability to translate and contextualize information to improve students' understanding and motivation for learning. In order to be able to create such materials and implement these types of strategies, online teachers need to have not only an excellent grasp of their given content area but also an appreciation of how technology and the online environment affect the

content and the pedagogy of what they are attempting to teach. To address such issues, Koehler and Mishra (2005) built on Shulman's notion of PCK to articulate the concept of technological pedagogical content knowledge (TPCK).

Technological Pedagogical Content Knowledge

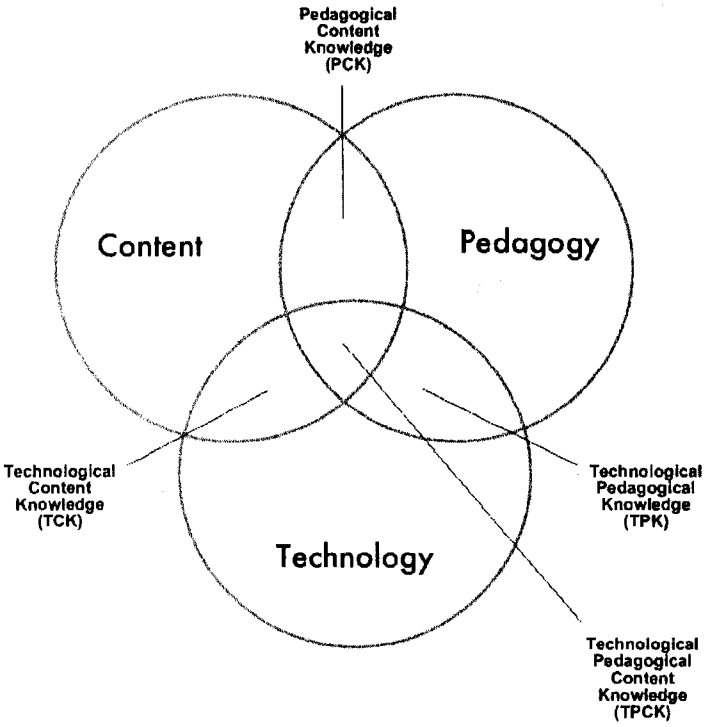
TPCK involves an understanding of the complexity of relationships among students, teachers, content, technologies, practices, and tools. According to Koehler and Mishra (2005), "We view technology as a knowledge system that comes with its own biases, and affordances that make some technologies more applicable in some situations than others" (p. 132). Using Shulman's (1986) pedagogical content knowledge framework, and combining the relationships between content knowledge (subject matter that is to be taught), technological knowledge (computers, the Internet, digital video, etc.), and pedagogical knowledge (practices, processes, strategies, procedures and methods of teaching and learning), Koehler and Mishra define TPCK as the connections and interactions between these three types of knowledge. As they put it:

> Good teaching is not simply adding technology to the existing teaching and content domain. Rather, the introduction of technology causes the representation of new concepts and requires developing a sensitivity to the dynamic, transactional relationship between all three components suggested by the TPCK framework (p. 134).

The TPCK framework considers three distinct and interrelated areas of teaching, as represented by Figure 1.

Figure 1

Graphic Representation of Technical Pedagogical Content Knowledge (TPCK)



In examining how teachers should be prepared to teach in online environments, TPCK addresses each of the three major components needed to ensure quality instruction. This lens offers a way for teacher education programs to begin looking at how these elements are currently covered and how they would need to be altered to specifically meet the needs of teachers entering online classrooms. As Niess (2005) wrote, "TPCK, however, is the integration of the development of knowledge of subject matter with the development of technology and of knowledge of teaching and learning. And it is this integration of the different domains that supports teachers in teaching their subject matter with technology" (p. 510). Niess also outlined four components that offer a framework for the development

particular subject using technology to facilitate student learning, (2) knowledge of instructional strategies and representations for teaching a particular topic through the use of technology, (3) knowledge of students' misconceptions, understandings, thinking, and learning in a particular subject matter and how these might be represented using technology, and (4) knowledge of curriculum materials that implement technology to enhance learning in a given content area. Teacher education programs would benefit from creating and redesigning course work and practica to address these elements in order to prepare teachers entering 21st century classrooms, a growing number of which will not have walls.

There are important implications for using the TPCK framework to examine issues related to online teaching. Specifically, it allows the researcher to focus on important aspects, defined by the extensive literature on quality online teaching in higher education, that are necessary for quality teaching in an online distance education environment. As Mishra and Koehler (2006) wrote:

> For instance, consider faculty members developing online courses for the first time. The relative newness of the online technologies forces these faculty members to deal with all three factors, and the relationships between them, often leading them to ask questions of their pedagogy, something that they may not have done in a long time (p. 1030).

Using the TPCK framework, three important elements need to be considered when creating effective online courses and discussing the role of the instructor. These include technical considerations (technological aspects that impact the extent to which technology facilitates student learning), differences in online pedagogy (the differences in

teaching strategies that have to be implemented when adapting curriculum to a distance environment, involving issues such as student interaction, evolving teacher roles, student access, and evaluations of student outcomes), and principles of instructional design (sufficiently knowing a particular content to be able to use adopted technology to develop and offer quality online instruction).

While the concept of TPCK makes sense on the surface, adding the element of technology to Shulman's notion of pedagogical content knowledge, it remains to be determined if knowledge in each of these domains truly exists, and if so, how it can be accurately measured. However, the framework does offer a level of face validity and a way to organize key areas of quality instruction incorporating the use of technology. In addition, there are important implications for using the TPCK framework to examine issues related to online teaching. Specifically, it allows the researcher to focus on important aspects, defined by the extensive literature on quality online teaching in higher education, that are necessary for effective teaching in an online distance education environment.

Technological Content Knowledge

An essential part of the role of the online instructor is to not only have a strong command of his/her subject matter (content knowledge), but also be able to design and deliver materials and activities in an electronic format for students (technological content knowledge). According to Mishra and Koehler (2006), "Although technology constrains the kinds of representations possible, newer technologies often afford newer and more varied representations and greater flexibility in navigating across these representations. Teachers need to know not just the subject matter they teach but also the

manner in which the subject matter can be changed by the application of technology" (p. 1028).

In a survey conducted of 83 faculty from across the University of North Carolina system, a clear distinction in training was made between technological content knowledge, online pedagogy, and technological knowledge. While the majority reported having access to technological knowledge, this was less true of training related to content or pedagogy. Kosak et al. (2004) concluded, "The technical information is essential for the physical construction and placement of the courses to occur, yet the quality of that content could be enhanced if more faculty members had access to pedagogical information related to DE [distance education]."

Technological knowledge has been the area of focus by universities to help faculty start developing distance education courses. The more pressing need is in designing courses for online delivery and how this alters course material and how the content is taught. While the majority of universities realize the need for technical assistance for their faculty and staff, TCK can be an area that is often overlooked (Littlejohn, 2002). According to a review of related research conducted by McKnight (2004), survey results of Educause members in 2000, 2001, and 2002 revealed that, "faculty development, support, and training was ranked as one of the top three issues by all three surveys" (p. 5). In another survey of 38 faculty who taught online or had online components to their face-to-face courses, their advice to other faculty emphasized the importance of preparation (30%), technical support (16%), technology knowledge (16%), and clearly defined course design (8%) (Moskal & Dziuban, 2001).

In a case study of faculty at six major institutions recognized for their leadership in distance education, Phipps, Merisotis, Harvey, and O'Brien (2000) found that quality faculty support includes technical assistance in course development, assistance in the transition from teaching face-to-face to online instruction, and ongoing training throughout the duration and progression of online courses. This finding was echoed by a survey of 207 faculty and 30 administrators in two mid-western universities, in which Rockwell, Schauer, Fritz, and Marx (2000) reported that it was "very important" for faculty to gain further education and assistance with developing instructional materials as well as "somewhat important" to develop an instructional design for the courses they teach online. Technical staff also agreed that better training in instructional design is needed, noting that problems with faculty-developed instructional materials could be avoided if there were better training for faculty in instructional design (Cheurprakobkit et al., 2002).

Along with expertise in their content field, faculty also need to become proficient, not only in the general use of technology, but also in how to transform hard copy materials to electronic format, as well as how to structure the online environment through the use of course management software. However, it should be pointed out that creating and teaching an online course is more than changing traditional materials to electronic ones that are then placed on the Web. As Kosak et al. (2004) put it:

> Converting a traditional course to an online course is not simply a matter of typing lectures and posting them to the Internet. Instructors must discover new ways to engage the learners and encourage them to be active in the class

instruction. For many, this is a major change from the way they were taught and trained to teach.

This gets to the crux of the struggle with quality distance education. In order for faculty to be able to provide effective online instruction, there must be opportunities for them to become educated about the nature of online pedagogy and the fact that it differs from the methodology used in traditional classroom settings.

Technological Pedagogical Knowledge

According to Mishra and Koehler (2006), technological pedagogical knowledge is, "knowledge of the existence, components, and capabilities of various technologies as they are used in teaching and learning settings, and conversely, knowing how teaching might change as the result of using particular technologies" (p. 1028). The literature concerning online pedagogy primarily deals with instructional design issues, the implementation process, and student outcomes (Brennan, 2003). In a recent literature review in which she gathered findings from previous interviews, workshops, focus groups, and questionnaires from across Australia, Brennan (2003) found that in order to help ensure effective student learning outcomes, online pedagogy needs to address a variety of factors. These include a) reducing students' reliance on text, b) exploring and valuing students' backgrounds, c) developing knowledge beyond the level of transmission, d) promoting reflective practices, e) establishing an inclusive learning environment, f) fostering communication among classmates as well as instructors, g) helping students become more self-regulated and engaged, and h) developing a group identity that connects students with their learning as well as with their social environment.

Brennan also found that certain factors are indicators of pedagogical effectiveness. Among these include the level to which a learner-centered environment is created, whether or not approaches are used that enable learners to build new knowledge and skills upon the ones they have already acquired, the quality of the design of online materials and the engagement with such, the use of teaching and learning methodologies that develop cognitive skills, the level of interactivity among all participants, and whether or not there is a consistent level of appropriate feedback as well as opportunity for self-testing, review, and reflection. While there is no way to ensure the right combination of these factors to produce quality online instruction, the interaction among them is what currently constitutes effective online pedagogy (Brennan, 2003).

Conducting qualitative interviews of thirty exemplary instructors at the University of Maryland, Lewis and Abdul-Hamid (2006) found four major instructional strategies for effective online instruction. First, it is important for instructors to foster interaction among students and between students and instructor through the use of social interaction such as discussion boards, online chat, and email, as well as collaborative work. Another key aspect is providing prompt, in-depth, and individualized feedback with regard to student performance. This includes clearly identifying grading expectations prior to having students submit their work, as well as emailing students who are not keeping up with the course workload. Facilitating learning is another characteristic of effective online pedagogy, in which instructors communicate the learning goals of the course to students and attempt to bridge the gap between students, the course content, and the learning process. Finally, maintaining enthusiasm and having a visible "persona" in the class is also viewed as an essential role of the instructor. As Lewis and Abdul-Hamid

pointed out, "Despite differences in online course platforms, one of the expectations for effective online instruction is for structured pedagogical approaches, which evolve around interactivity and the deliberate actions of faculty willing to provide careful attention to student needs" (pp. 95-96).

In an extensive review of the literature, including over 300 articles, books, presentations, and papers, Kemshal-Bell (2001) found that teachers in an online environment need to have a variety of facilitation skills including how to do the following: engage the learner, question students, provide listening and feedback as well as direction and support, manage discussions, promote relationship building, motivate students, monitor the course, and time manage the course. According to Kemshal-Bell, "Most importantly, it is a combination of these skills that is essential. Online teachers need to know not only how to use the technology effectively, but also how to harness the power of technology through facilitation to achieve learning."

Technological Knowledge

In addition to the critical area of pedagogical content knowledge, adequate technological knowledge is often a precursor for instructor involvement in online distance education. It includes familiarity with specific courseware and being able to troubleshoot technical problems that arise. Developing technical assistance that is timely and appropriate is an essential element to creating a successful distance education program. In a recent survey of 562 online instructors, Kim and Bonk (2006) found that faculty considered monetary support, pedagogical competency, and technical competency as the most significant factors affecting the success of online programs. Twenty-seven percent of instructors projected that the use of course management software would

increase significantly in the next five years. Other technologies that were mentioned as gaining significant use included video streaming, online testing and exam tools, and learning object libraries. To be able to incorporate these tools for effective online instruction, it will become increasingly important for faculty to have a sufficient level of technological knowledge. However, despite the necessary role of technological knowledge in online education, the areas of content and pedagogy are paramount in ensuring effective learning outcomes in online distance education environments.

Online Distance Education: K-12 Environment

While online distance education has a rich history within higher education, it is a relatively new area within the K-12 field. Recent survey data show that about one-third of K-12 public school districts (36%) had students enrolled in online distance education courses in the 2002-2003 school year. Of the total enrollments in distance education courses, 68% of students attended high schools, 29% attended combined or ungraded schools, 2% attended middle or junior high schools, and approximately 1% attended elementary schools (Setzer & Lewis, 2005). Estimates of student enrollment in K–12 online learning programs have increased from 40,000–50,000 students during the 2001-2002 school year, to more than 520,000 in the 2004-2005 school year (McLeod, Hughes, Brown, Choi, & Maeda, 2005). These figures are expected to increase as more school districts realize the potential benefits of offering online classes, including being able to address growing student populations as well as dealing with the challenges of limited space, scheduling conflicts, failed courses, and meeting the needs of specific groups of students.

With the increasing number of virtual schools at the elementary and secondary level, the need arises to begin examining the role and preparation of teachers in K-12 online environments. In bringing teacher preparation into the 21st century, the role of the K-12 online instructor is becoming increasingly important. However, rather than centering on the teacher, research regarding K-12 online distance education is focused primarily on student characteristics, student achievement, and predictive measures for student success in online environments (Cavanaugh et al., 2004; Rice, 2006; Roblyer & Marshall, 2002-2003). As Cavanaugh et al. noted, "Research in K-12 distance education is maturing alongside the technology and those who use it, but current Web-based distance education systems have only been studied for about the last five years at the K-12 level, a very short time in which to build a body of literature" (p. 21). Because of this relatively small literature base, applying the TPCK framework to the limited number of studies is currently somewhat challenging. The following section will review the existing literature base related to K-12 online distance education, focusing on describing the current state of the field.

In a landmark meta-analysis of online distance education programs, Cavanaugh et al. (2004) synthesized findings from 14 studies, representing 116 scientific findings concerning K-12 online distance education programs from 1999-2004. To be considered "scientific," included studies had to be controlled, systematic, and empirically based. Other criteria specified that the studies compare the performance of a group of online students to those in a non-distance environment, and that to be considered an online distance education program, students' participation had to be 50% Web-based. Major foci of the studies were adult telecourses, academic achievement of K-12 students, student

satisfaction, student achievement, attitude, retention, and networked and online learning. Cavanaugh et al. found that after examining for 11 variables that may affect student performance, including duration of the program, frequency of use of distance learning, instructional role of the program, number of distance learning sessions, pacing of the instruction, role of the instructor, timing of the interactions, type of interactions, amount of teacher preparation for distance instruction, and level of teacher experience in distance instruction, the mean effect size was -0.028, with a 95% confidence interval. Because this effect size is close to zero, the researchers conclude that there is no significant difference between the performance of students in distance education programs compared with performance in traditional, face-to-face programs. Interestingly, within the studies examined, none described the extent of teacher preparation or experience. Cavanaugh et al. noted, "One factor warranting special consideration in assessing the effectiveness of virtual school is teacher quality. In classrooms, teacher effectiveness is a strong determiner in student learning, far outweighing differences in class size and heterogeneity" (p. 20-21).

In a similar meta-analysis, consisting of 232 studies of online distance education comparing the effectiveness of distance education to traditional face-to-face instruction, Bernard et al. (2004) found no significant difference among student achievement, attitude, and retention. Ungerleider and Burns (2003) also found a weighted mean effect size of +0.0128 in a meta-analysis of 12 comparative studies, indicating no significant difference in terms of student achievement and satisfaction between those in online environments and those in face-to-face ones.

Because the effectiveness of K-12 online distance education is a growing field of study, much of the literature to this point has focused on aspects of student achievement (Bernard et al., 2004; Cavanaugh et al., 2004; Ungerleider & Burns, 2003). Without a significant difference found in a number of studies, researchers have begun concluding that online distance education in a K-12 environment results in similar outcomes as traditional instruction (Cavanaugh et al., 2004; Smith et al., 2005). With significant meta-analyses in place that confirm the viability of K-12 online distance education, recent literature has begun to delve into other areas of consideration, including characteristics that constitute effective classes and students, challenges faced by online distance education, educational reform and policy issues, and professional development for online teachers.

According to the recent report by Smith et al. (2005) on K-12 online learning, less than 1% of teachers throughout the nation have had training to provide online instruction. As they put it, "Many of the teachers currently teaching in online environments lack both the theoretical and practical understanding and are 'learning on the job'"(p. 59). It is this role of the K-12 online instructor that is of particular concern. There are a limited number of burgeoning reports, part and parcel of virtual school evaluations, that are beginning to examine the role of the instructor in online distance education environments, with particular attention to issues related to online pedagogy.

In a comparative analysis of four online Algebra classes with three face-to-face ones similar in content and student demographics, Hughes, McLeod, Brown, Maeda and Choi (2005) examined student perceptions of the courses as well as the connection between professional development for online teachers and student perception of the

learning environment. This was done by surveying the seven teachers regarding their teacher preparation, career history, professional development experiences, content-related knowledge including mathematics and pedagogical-related knowledge, and online pedagogy. Researchers also surveyed students from both of the school environments (85 face-to face students and 31 online students) using the "What is Happening in this Class?" (WIHIC) instrument. Hughes et al. (2005) found that students in traditional classes scored significantly higher ratings on three subscales: higher cooperation (students cooperate rather than compete with one another on learning tasks), student cohesiveness (students know, help, and are supportive of each other), and involvement (students have attentive interest, participate in discussions, do additional work, enjoy the class). However, students in online classes scored significantly higher on the scale of teacher support ($r = 0.852$), which describes the extent to which teachers help, befriend, trust, and are interested in students. Results also indicated a positive correlation between the number of hours of content-related professional development and students' teacher support scores ($r = 0.872$). Because these findings involved only seven teachers, they were dropped from the preliminary report in favor of concentrating on academic math achievement and student perceptions (Hughes et al., 2006).

In another comparative analysis of online versus traditional Algebra courses, O'Dwyer, Carey and Kleiman (2007) examined 257 students participating in the Louisiana Algebra I Online project during the 2004-2005 school year. Using a quasi-experimental design, researchers conducted classroom observations and focus group interviews, administered teacher characteristic surveys, and used pre- and post-mathematics achievement tests. Their sample population included participants from 31

schools throughout six school districts. The online group consisted of 13 public schools, two private schools, and one charter school, while the traditional control group was comprised of 12 public schools, one private school, and one charter school. A total of 37 teachers participated in the study. The Louisiana Algebra I Online Project was created to address a shortage of qualified math teachers, especially in low-income areas of the state. Each Algebra course was taught by two teachers: an online teacher who was secondary mathematics certified and highly qualified under No Child Left Behind (2001) requirements and a face-to-face classroom teacher who was working toward certification. The online teacher was responsible for being the instructor of record, mentoring the in-class teacher, and providing feedback and grades on all student assignments, tests, and discussion board postings, in addition to staying in communication with the students, both as a class and on an individual basis. Students attended face-to-face class in a technology-enhanced classroom in order to logon to the online learning management system (LMS) and access online material. The in-class teacher was responsible for using a curriculum guide to teach face-to-face lessons, assisting students with the use of technology, and guiding students through units provided online. This was an innovative model that combined the expertise of an online instructor with that of a face-to-face facilitator. Both teachers were required to take a two-day professional development session in which they worked with their team teacher to plan the year. The workshop focused on an overview of the course, classroom management, and the technology used in the online setting. In addition to this summer session, classroom teachers were also required to take an online course to provide them with an orientation to online Algebra I, which covered online course management issues such as how to use the LMS as well as

graphing calculators. This course then awarded credit toward the classroom teachers becoming highly qualified.

Results of the Louisiana Algebra I Online Project were similar to other project evaluations in that the researcher found that students in the online Algebra course did at least as well or slightly better than the those students in traditional math classes ($p=0.051$). However, the important aspect of this study is that it provides a new model for online and face-to-face instruction, especially when there is a shortage of qualified, content expert teachers. According to O'Dwyer et al. (2007), "The Louisiana Algebra I online model was designed and implemented to bring highly qualified mathematics teachers to students in places where they would not be otherwise available, to provide students with the structure of a regular class period, and to provide a unique professional development model for local teachers" (p. 302). The authors go on to explain that the project was successful at achieving its goals and that other districts might be interested in following a similar professional development model.

In a mixed methods study of online K-12 teachers for Virtual High School (VHS), the oldest provider of online distance education courses at the secondary level, Lowes (2005) interviewed six educators and surveyed 215 who taught for the organization. Of this population, 50% had adapted an existing VHS course as compared with 33% who developed a new course. Seventeen percent adapted an online course they were either currently teaching or had previously taught face-to-face. In order to teach for Virtual High School, educators must complete two online professional development courses: Teachers Learning Conference (TLC) and NetCourse Instructional Methodologies (NIM). Both courses cover concepts of online pedagogy and methodology, with NIM

providing mentoring through the process of creating and managing their own "NetCourse." Lowes (2005) asked respondents how familiar they were with various pedagogical approaches prior to taking TLC and NIM, including authentic assessment, problem-based learning, use of rubrics, cooperative learning, and backward design. With the exception of backward design, the majority of teachers indicated that they were a lot or very familiar with each of the concepts, from 63% (authentic assessment) to 84% (cooperative learning). After completing the TLC and NIM courses, these percentages increased an average of 19%, with the highest gain in backward design (38%). Through the process of teaching online, instructors at the K-12 level continually made changes to improve their courses, especially the courses that they had previously taught face-to-face. According to one participant, "By developing my course, I have had the opportunity to introspectively analyze what I am teaching, why I teach the way I do, and how I can change and improve my communication with students" (Lowes, 2005, p. 7). Twenty-three percent of teachers indicated that they extensively modified their online course after having taught it once and 33% said that they moderately changed it. Among this group of teachers, there were online pedagogical approaches that were widely used, including having students complete multi-week projects (98%), having students work collaboratively in groups (95%), having students conduct peer reviews (84%), and having students create multi-media assignments (69%). In addition to these figures, 65% indicated that they used email with their students, and 43% said that they used separate instant messaging clients—both not required elements of the VHS model.

Qualitative aspects of Lowes' (2005) study showed that a number of similar themes emerged when teachers were asked about the challenges faced when teaching an

online course. The most pressing issue was how to make their courses an effective learning experience for students. This included how to evaluate and redirect students they could not interact with face-to-face. Many expressed that not being able to check for understanding via visual cues was a significant challenge in online teaching. In addition, providing clear, explicit instructions was also a concern. As one teacher put it, "I had to make sure my directions were extremely clear because I couldn't repeat myself or rephrase my question if a student 'looked' confused" (Lowes, 2005, p. 13). Another teacher expressed the same concern, and because she could not provide an immediate response to student questions as in a face-to-face classroom, she was faced with the challenge of anticipating questions and providing answers in her directions. Other teachers mentioned the difficulty in having students participate in discussions in a meaningful and engaged way. This included developing higher-order questions to ensure that discussions were worthwhile, contributed to student learning, and probed for deeper understanding. Finally, online teachers struggled with the sequencing of the course and having to lay out the entire course all at once, which is a VHS requirement. Their major concerns included pacing, scaffolding, and chunking information for their online students.

The challenges of online teachers in K-12 environments described by Lowes (2005) encompass aspects of TPCK. While these teachers have taught their specific courses face-to-face, translating the course to an online environment involves serious reconsideration of how content is organized and delivered. In addition, Lowes goes on to note that, "While creating an online course is challenging, it is actually *teaching* (emphasis in original) that leads teachers to re-examine some of the fundamental

differences between the two classroom cultures" (p. 12). Interestingly, the VHS teachers did not mention difficulties with technological knowledge. Rather, the focus centered more around pedagogical and content-related issues.

Projects, such as Teacher Education Goes Into Virtual Schooling (TEGIVS), are beginning to examine issues related to pedagogical content knowledge and teacher education (Davis & Roblyer, 2005) through the Fund for the Improvement of Post Secondary Education (FIPSE) grants. According to the National Education Association (2006), "Both traditional and alternative programs for preparing new teachers are missing an important component of preparing new teachers for millennial teaching. Without modeling of effective online teaching, most of the 86,000 new teachers who enter the profession each year begin without online teaching skills in their professional repertoire. This must change" (p. 3). Increasingly, teacher preparation for online distance education environments is becoming an area of concern. TEGIVS is a collaborative initiative started at Iowa State University, with plans to expand to the University of Florida, the University of Virginia, and a liberal arts college, Graceland University. Its goals include helping perspective teachers evaluate and assess online, standards-based curriculum; assisting preservice teachers to "observe" interactions and teaching within virtual schools through new tools; and creating a national community of online K-12 practices and teachers.

Based on the current literature in K-12 online distance education, Smith et al. (2005) recommended that state education agencies work to create and enforce requirements for online teachers, including that teachers are subject area certified in the content they are teaching. They also suggested that online teachers complete an

appropriate professional development program prior to beginning their teaching duties and that all new online educators be mentored by an experienced teacher in the field throughout the course of their first online teaching assignment. Finally, the researchers urged that online teachers be evaluated by administrators who are themselves experienced and prepared in teaching via online distance education. Smith et al. (2005) called for future research areas exploring the area of K-12 online learning as it pertains to professional development. These include the characteristics of successful K-12 online teachers; the most effective training, mentoring, and support mechanisms for online teachers; and whether or not online professional development is an effective way of certifying K-12 teachers. What is clear is that additional studies exploring aspects of TPCK and role of the instructor, such as the current study, will become vital as the field of K-12 online distance education continues to grow and become more pervasive throughout the 21st century.

The area of online distance education is growing at a rapid pace and there is much yet to be discovered, especially with regard to the preparation of educators to teach in this type of environment. According to Cavanaugh (2004), "Based on the similarities in student outcomes between distance and classroom learning, there is every reason to expect that teacher preparation is critical in distance education. However, there has been very little formal preparation available addressing the unique nature of online instruction and very little time for teachers to develop their expertise as online instructors" (pp. 20-21). Because little research exists in the area of teacher preparation with regard to K-12 online teachers, Archambault and Crippen (2006) took the opportunity to begin to delve into this area of inquiry. This first effort resulted in a study of 59 online teachers from

both K-12 virtual schools in northern and southern Nevada, as described in the following section.

Survey of K-12 Online Teachers in Nevada

Based on the lack of research on K-12 online teacher preparation, Archambault and Crippen (2006) constructed and administered a survey instrument to teachers from two Nevada virtual charter schools. These teachers all provided instruction via the Internet, and their email addresses were obtained by visiting each school's public homepage which listed contact information for each teacher. One school, located in the southern part of the state, taught grades K-12. The other taught only grades 9-12 and was housed in northern Nevada. Forty-four percent of teachers at the larger, K-12 virtual charter school responded, while 50% of the northern Nevada virtual high school responded. This resulted in an overall response rate of 46%.

This survey intended to identify teachers' perceived preparation in three distinct areas: online pedagogy, course design, and technical assistance. These areas have been identified in the higher education literature as being essential to providing a quality online experience for students (Bower, 2001; Brennan, 2003; Goodyear, Salmon, Spector, Steeples, & Tickner, 2001; Kosak et al., 2004). To measure these constructs, participants were asked questions related to their perceptions of their teacher education program and professional development preparation to teach in an online environment. The scale used for measurement was (1) Not at all prepared, (2) Somewhat prepared, (3) Moderately well prepared, and (4) Very well prepared.

The majority of respondents (91%) reported being regular, full time teachers and teaching all of their classes online. Fifty-nine percent of respondents indicated that they

interacted with students both via the Internet as well as met with them on a weekly basis, while 25% reported that they interacted with students, and saw them at least once during the term. Nine percent of respondents stated they interacted with students both online as well as meeting with them multiple times throughout the term, and one teacher indicated his/her interaction with students took place only online.

To obtain an overall depiction of the number of years of teaching experience, as well as the number of courses and students taught, general statistical measures, such as mean, median, and mode were used (Table 1).

Table 1

Virtual Charter School Teacher Preparation Survey: Summary of teaching experience

Statistic	Number of years employed as teacher	Number of years at current (online) school	Number of Students taught online
Mean	14	3	114
Median	13	3	128
Mode	5	2	22
Minimum response	2	1	2
Maximum response	36	7	300

By deciding to sample teachers from virtual charter schools, the educational backgrounds of those teaching in online environments were similar to those in traditional environments

(Zumwalt & Craig, 2005). This could be because teachers at charter schools are required to have the same certification requirements as regular classroom teachers. As a result, all respondents had at least a bachelor's degree. While 75% reported holding a master's degree, 25% of those had obtained them along with their graduate license to teach. Only 8% of those were in the area of educational technology, and one individual had a master's in computer science. Six percent held an education specialist (Ed.S.) degree, while one individual was in the process of working on his/her doctorate. Overall, surveyed teachers appeared to have the expected qualifications as mandated by the No Child Left Behind (NCLB) Act, in that they held degrees directly related to the subject(s) they taught.

Archambault and Crippen (2006) also examined the level of perceived preparedness in the areas of online pedagogy, course design, and technical assistance, asking K-12 online teachers, "Based on your teacher education program, how prepared do you feel you were to do the following activities in a distance education setting?" Items "a" through "l" required respondents to rate their preparation level on a scale of (1) Not at all prepared, (2) Somewhat prepared, (3) Moderately well prepared, and (4) Very well prepared. Results are displayed in Table 2.

Table 2

Virtual Charter School Teacher Preparation Survey: Subscale Analysis (1-Not at all prepared to 4-Very well prepared)

Statistic	Online Pedagogy	Course Design	Technical Assistance
Mean	1.80	1.55	1.42
Standard Deviation	.853	.867	.686
Cronbach's alpha	.738	.911	.928

Although this survey had a small number of respondents, the data confirmed that the teachers in the virtual environments reported having little preparation for teaching online during their teacher education program. Overall, the sample population reported that they fell in-between "not at all prepared" to "somewhat prepared" for measures associated with the areas of online pedagogy, course design, and technical assistance. Even though the sample population was highly educated, with a majority (75%) holding master's degrees, only two teachers had master's degrees specific to educational technology, and one teacher held a master's in computer science. The highest average response (3.58), which equated to a rating in-between "moderately well prepared" and "very well prepared," was reported by the individual having a computer science master's degree. Another respondent with a background in educational technology also had a higher than average response, at 2.5. This implied that those with specific training related to technology perceive themselves as being better prepared to teach in online environments. However, this may not hold true for everyone, as one individual reported

having a master's degree in "computers in education" and only reported an average response of 1.33, which was lower than the overall average response. Overall, survey data confirmed that teachers felt only slightly more than "not at all prepared" in each of these three areas identified by the literature as necessary for quality online instruction within higher education.

While there is a growing body of literature concerning faculty preparation to teach in a distance education environment in higher education, there is an absence of research regarding the same topic with K-12 teachers. With the increasing number of virtual schools at the elementary and secondary level, the field of teacher preparation may need to begin to examine similar issues. Education programs at colleges and university could benefit from examining how they are preparing tomorrow's 21st century educators. In their article, "Preparing Teachers for the 'Schools that Technology Built': Evaluation of a Program to Train Teachers for Virtual Schooling," Davis and Roblyer (2005) wrote, "Just as today's virtual student differs in fundamental ways from those of the past, virtual teachers must also reflect different qualities" (p. 400). Studies on how teachers in online K-12 environments are being identified, trained, and supported, along with relevant recommendations, will be essential as this trend continues to grow in popularity. The current study begins to examine these issues by identifying and surveying a cross-section of K-12 online educators to determine their characteristics as well as their perceived level of knowledge and preparation.

CHAPTER 3

METHODOLOGY

Much of the research within K-12 online distance education to date has focused on elements of evaluation and quality, including student characteristics, student achievement, and predictive measures for student success in online environments (Cavanaugh et al., 2004; Rice, 2006; Roblyer & Marshall, 2002-2003). However, key researchers in this area have begun calling for additional research focusing on K-12 online teachers. Cavanaugh et al. (2004) discussed the fact that there has been a lack of formal preparation when it comes to K-12 online instruction, let alone time for online teachers to develop their expertise in the field. Because teacher effectiveness has been correlated with student achievement in traditional classrooms (Darling-Hammond, 2000), teacher preparation is likely a major factor in offering quality distance education opportunities for K-12 students.

Due to the lack of data on the general demographics of K-12 online distance educators as well as their level of preparation, the current study focused on these areas, seeking to describe the population of those teaching in online environments in addition to describing their knowledge and preparation with regard to their content area, pedagogical strategies, and technical expertise. These areas were measured with a survey designed to answer the following research questions:

1. What are the demographic characteristics of those teaching in online K-12 distance education programs in the United States?
2. What is the perceived knowledge level of those who teach in an online environment specific to technical expertise, online pedagogy, and content area, including the combinations of these domains?
3. What is the perceived preparation level that of those who teach in online environments specific to online pedagogy, technical expertise, and content area, including the combinations of these domains?
4. Is there a relationship between the perceived knowledge level and preparation level of K-12 online teachers with respect to online pedagogy, technical expertise, and content area, including the combinations of these domains?

Through these research questions, this study gathered data to gain a better understanding of who makes up the overall population of K-12 online distance educators, including (a) general demographic characteristics such as gender, age, race; (b) school characteristics including classes taught, class size, format, and authorship; and (c) teachers' perceptions of their own knowledge and preparation as they relate to the domains of technology, pedagogy, content, and the intersections of these areas.

The goal of this research was to gather an overall picture of those who teach in K-12 online distance education settings, as this does not currently exist in the literature. Because this study dealt with a large set of data for the purposes of quantifying attributes from a specific population, a survey methodology was appropriate (Czaja & Blair, 2005). A survey instrument encompassing questions of a demographic nature, questions regarding school settings and teaching, and questions asking teachers to rate their level of

knowledge and preparation with regard to technological pedagogical content knowledge was developed and administered to K-12 online teachers throughout the United States. This chapter describes the process by which data concerning this population was gathered and analyzed to answer the research questions.

Survey Population

The population surveyed consisted of teachers throughout the United States who taught at least one online class with K-12 students in a state-sanctioned virtual school. This study focused on teachers from publicly funded virtual schools which include schools that are sponsored by states, universities, lead educational agencies (LEAs, such as individual school districts), and virtual school consortia. Although there are a variety of types of virtual schools, this study concentrates on those that are sanctioned by states because teachers at these schools are required to hold the same state licensing and highly qualified status as teachers in traditional schools. While states have a great deal of discretion in setting these requirements, they must include (a) a college degree, (b) demonstration of subject-matter knowledge, and (c) meeting any state licensure/certification requirements. Subject-matter knowledge can be demonstrated through majoring in the subject in college, taking courses that would be equivalent to a major, earning an advanced degree or credential in the subject, or passing a rigorous state test in the subject (NCLB, 2001). Teachers from these types of virtual schools provide an excellent source for examining the characteristics of this specific population, including basic demographic information as well as how online teachers view their own knowledge and preparation levels in completing specific tasks related to teaching in an K-12 online distance education setting.

A non-random purposeful sample was used to gather as many online teacher responses as possible. This technique is described by Patton (1990) as the process of selecting specific information-rich cases from which the investigator can learn significant information central to the research. In this case, criterion sampling was used to select participants based on predetermined characteristics, specifically, educators who currently teach at least one class in a state-sanctioned K-12 virtual school.

A required and adequate sample size is difficult to determine when using a purposeful criterion sampling. However, according to Patton (1990), "Sample size depends on what you want to know, the purpose of the inquiry, what's at stake, what will be useful, what will have credibility, and what can be done with available time and resources" (p. 184). Currently, there are no definitive estimates of the number of K-12 online distance education teachers. The closest data are reported in a survey of school administrators, in which Picciano and Seaman (2007) estimated the number of students in online courses to be 700,0000 as of the 2005-2006 school year. While specific numbers of K-12 online teachers are not reported, approximations in the range of 10,000 to 20,000 seem reasonable based on an average of 30 students per class per teacher. However, this number could vary widely, depending on class size and the number of multiple sections of the same class taught by one individual. To yield the most representative sample possible, as well as to protect against high nonresponse rates, the survey was sent to as many K-12 online teacher educators in the United States as possible from as many states as possible. This included a total of 2,262 possible respondents. Email addresses for K-12 online distance educators in the United States were available to the public through various virtual school Websites were gathered and compiled into a *FileMaker Pro*,

Version 6, database for the purposes of distributing the survey. To find these email addresses, searches for specific state-sponsored schools identified by *Keeping Pace with K-12 Online Learning* (Watson, 2005), the latest report on K-12 online learning in the United States were conducted. Typically, these schools have a faculty/staff link on their Web site that lists the names and email addresses of the teachers, administrators, and staff at that particular location. This is the case for Oregon's COOLSchool Website, http://coolschool.k12.or.us/csset_contact.php. Available information on this site includes the course number, title, teacher name, and teacher's email address. Other schools, such as Arizona Virtual Academy, give short biographies of their teachers. However, by searching for the teacher's name together with the name of the school using the search engine Google, a separate page is available which includes the email addresses of teachers at this school. Google was ideal for searching in the email address collection phase of this study, as it scans the actual text of various Web pages. When conducting a Boolean search for a teacher's name and their school, it often produced additional pages, whether it be school forums or newsletters, that contained the email address of the particular individual.

Many state board of education Web sites, such as the Arizona State Board of Education Web site, included links to contact lists of virtual schools that have been approved by the state, along with specific school Web pages that could be searched for teacher email addresses. Another strategy that was used was to find virtual school consortia Web sites, such as Virtual High School (VHS). Through VHS's Web site, http://www.govhs.org/Pages/AboutUs-ParticipatingSchools, links to schools that use

VHS content are given. These schools' Web sites are searchable to locate additional teachers and their email addresses.

Finally, once these search strategies were exhausted, the search engine Google was used to locate additional virtual schools by using the following search terms: "K-12 virtual schools," "K-12 online schools," "virtual academy," and "K-12 distance education schools." School Web sites that were produced from these searches were examined to determine if they met the criteria for the current study (state, LEA or university-sponsored virtual school), and to see if teachers' names and email addresses could be ascertained. Using this technique helped ensure that a cross-section of K-12 online teachers in the United States were represented, as specific state names were also included within the search terms.

A total of 2,262 email addresses from K-12 online teachers from state and university sponsored virtual schools were collected. The survey was conducted using a single stage sampling procedure, as the email addresses to individuals in the targeted population were readily accessible via the Web. To increase the response rate, the survey was sent to as many valid email addresses to K-12 online teachers as possible. No stratification procedures were used, as this survey sought to establish overall baseline data concerning the population of K-12 online educators.

Survey Design

The survey instrument was developed to capture demographic information about K-12 online teachers in the United States in order to describe this population. In addition to gathering descriptive data to see if the population of online teachers differed in any significant way from those in traditional classrooms, the survey instrument also employed

the use of technological, pedagogical, and content knowledge (TPCK) as a guiding framework for skills that online teachers should know and be able to do. When attempting to describe essential elements of effective online instruction, TPCK presents interesting combinations of areas that seem, on the surface, to be important in successful online teaching.

This study explored the usefulness of the TPCK framework when describing the perceived knowledge and preparation levels of K-12 online teachers. Using the domains of content, pedagogy, and technology, as well as each of the overlapping areas created by the blending of these areas (i.e., technological content, technological pedagogy, content pedagogy and technological pedagogical content knowledge as represented in Figure 1), three to four items were written in each area to attempt to measure online teachers' perceptions of their knowledge and preparation. These items were written based on definitions provided by Kohler and Mishra (2005) and Shulman (1986). By measuring K-12 online distance education teachers' perceptions of their preparation and knowledge levels using the TPCK framework, the goal was twofold: a) describe the population of K-12 teachers who teach online and b) determine if the TPCK framework is a useful tool for thinking about what online teachers do and being able to describe their knowledge, skills, and abilities.

Instrument Development

Because an appropriate instrument measuring the intended variables did not exist in the literature, and many of the questions were of a general demographic nature, a questionnaire was developed by the researcher. It consisted of demographic questions in addition to questions that sought to describe online teachers' level of knowledge and

preparation to perform various tasks associated with teaching in an online environment, as described by the TPCK framework. The variables measured in the survey consisted of general background information such as educational level, number of years of teaching experience (both in traditional as well as online environments), as well as basic demographic information (e.g., age, gender, and ethnicity). The survey instrument employed the use of TPCK as a guiding framework for skills that successful online teachers should possess.

Using the domains of content, pedagogy, and technology, as well as each of the overlapping areas created by the blending of these areas (technological content, technological pedagogy, content pedagogy and technological pedagogical content), three to four items were written in each area to attempt to measure online teachers' perceptions of their knowledge and preparation. For example, participants were asked to rate their knowledge and preparation concerning their ability to troubleshoot technical problems associated with hardware, which falls under the domain of technological knowledge (item 20a). An item within the content domain covered such topics as the ability to create materials that map to specific district/state standards (item 20b), while pedagogy asked about the ability to use a variety of teaching strategies to relate various concepts to students (20c). Subsequent items combined the domains of technology, pedagogy, and content, such as item 20w: *My ability to use technology to create effective representations of content that depart from textbook knowledge.*

These items were written based on definitions provided by Kohler and Mishra (2005) and Shulman (1986). This survey sought to identify teachers' perceptions of their knowledge and preparation level in three distinct areas covered by TPCK: (a) content

background, (b) technical expertise, and (c) online pedagogy, as well as the overlapping areas among these constructs. These areas have been identified in the higher education literature as being essential to providing a quality online experience for students (Bower, 2001; Brennan, 2003; Goodyear et al., 2001; Kosak et al., 2004).

In order to measure these constructs, the survey asked participants to rate their knowledge level in these areas and their perceptions of their teacher education program to teach in an online environment. Operators for Question 20, *How would you rate your own knowledge in doing the following tasks associated with teaching in a distance education setting?* consisted of a five point Likert-type scale (1=Poor, 5=Excellent). Operators for Question 21, *Based on your teacher education program, how prepared do you feel you were to do the following activities in a distance education setting?* were also based on a five point Likert-type scale (1=Not at all prepared, 5= Extremely well prepared).

Development and Revision of the Instrument

The survey instrument was first created by the author in a prior research project used to survey online teachers in Nevada (Archambault & Crippen, 2006). Since that project, the current survey instrument underwent numerous revisions during a two year time span, including a formative evaluation to better capture data related to the characteristics of K-12 online distance educators. The following section details the specific questions that were added or altered as a result of this formative evaluation.

Item Additions to Original Instrument

First, several questions were added to the initial instrument. These include race, age, and gender, whether or not the participant taught online and if so, in which state.

Question 1, *Do you currently teach at least one class in grades K-12 online?* and Question 2, *In which state do you currently teach?* were added to determine eligibility in the survey, as it was possible that gathered email addresses could have sent the survey to teachers who are no longer teaching via online distance education. Questions concerning race, gender, age and ethnicity were added as the first five questions to create an environment of trust, avoiding a sense of surprise by placing these demographic questions at the end of the instrument. According to Andrews, Nonnecke, and Preece (2003), "Placing the data request at the end of the survey presents a surprise to the respondent to which he/she reacts negatively by dropping the survey before completing it. Placing the data request at the beginning may be perceived as honesty on the part of the researcher" (p. 192).

Question 6 was added to ask about the type of virtual school in which the participant teaches. This was based on classifications from the literature, specifically Clark (2001) and Cavanaugh (2001). Question 9, *Which of the following best describes the format of your online classes?* was reworded to match definitions developed by Picciano & Seaman (2007). Question 13 was added to ask, *Considering the content of your class(es), who is the* ***primary*** *author?* This was added to find out if teachers in K-12 online distance education environment are actively creating material for their classes or if the content being delivered is "pre-packaged."

Question 20 was added to ask online teachers *How would you rate your own knowledge in doing the following tasks associated with teaching in a distance education setting?* Items for this question included those developed for the original survey, covering pedagogy, technical assistance, and course design. These items were reexamined to better

fit within the TPCK framework, and additional items were written to fit the areas of content, technological content, technological pedagogy, pedagogical content, and technological pedagogical content knowledge. Items that covered each of these areas were developed using the definitions of the constructs created by Mishra and Koehler (2005). The following section describes the items added to Question 20 by domain.

Items Added to Question 20 by Domain

Content

1) Decide on the scope of concepts taught within my class.
2) Plan the sequence of concepts taught within my class.
3) Create materials that map to specific district/state standards.

Technological Content

1) Use technological representations (i.e. multimedia, visual demonstrations, etc) to demonstrate specific concepts in my content area.

Technological Pedagogy

1) Create an online environment which allows students to build new knowledge and skills.
2) Implement different methods of teaching online.

Pedagogical Content

1) Distinguish between correct and incorrect problem solving attempts by students.
2) Anticipate likely student misconceptions within a particular topic.
3) Comfortably produce lesson plans with an appreciation for the topic.
4) Assist students in noticing connections between various concepts in a curriculum.

Technological Pedagogical Content Knowledge

1) Use online student assessment to modify instruction.
2) Use technology to predict students' skill/understanding of a particular topic.
3) Use technology to create effective representations.
4) Meet the overall demands of this teaching assignment.

Changes to Original Measurement Scale

These items, in addition to the ones used on the original survey (Archambault & Crippen, 2006), were also used to ask Question 21, *Based on your teacher education program, how prepared do you feel you were to do the following activities in a distance education setting?* The original scale, which used a four point Likert-type scale, included the operators, 1 (*Not at all prepared*), 2 (*Somewhat prepared*), 3 (*Moderately well prepared*), and 4 (*Very well prepared*). This scale was expanded to a five point Likert-type scale to provide for a wider range of answers as well as a more continuous scale: 1 (*Not at all prepared*), 2 (*Not very prepared*), 3 (*Somewhat prepared*), 4 (*Very well prepared*), and 5 (*Extremely well prepared*).

Changes to Specific Items

Also, certain items within the survey were modified to better measure constructs described by the technological pedagogical content knowledge framework. This included Question 9, which asked, *Which of the following describes the format of your online teaching? Check all that apply:*

☐	There is no specific time at which my students are required to be online to receive instruction.
☐	There are certain specific times when my students *must* be online to receive brief instruction, but there are also assignments that are completed offline.
☐	My students *must* login at predetermined times to receive complete instruction.
☐	Students are required to spend a certain number of hours online to receive instruction to complete the course.

Sixteen percent of those surveyed in the original survey (Archambault & Crippen, 2006) indicated both the first response and the fourth response were applicable. This presented a confounding variable, as the linking of these responses was unexpected,

especially at such a high level. When writing this item, it was intended that either students would not be required to be online at a specific time (response 1) or that they would be required to be online for a set amount of time (response 4). Although directions for the question indicated "check all that apply," these responses were not expected to be linked. Initially, the intent of Question 9 was to elicit a response as to whether or not teachers in virtual schools were instructing their classes synchronously, asynchronously, or in a hybrid manner. However, in attempting to manage the readability of this question, it did not capture what it was designed to measure. Because of this, and the fact that neither the second or third responses of Question 9 were selected, this question was reworded. In addition, the direction to *Check all that apply* was removed to avoid confusion.

Other questions were simplified, as in the case of Question 19, which asked respondents to report major field of study for various degrees and certificates. This question was streamlined to have online teachers report their education level and major field of study for their bachelor's, master's degree(s), and any other degrees. This was done to make the question less time intensive in order to help minimize incomplete survey responses.

Addition of Open-Ended Questions to Original Instrument

Adding two open-ended questions at the end of the survey was prompted by teachers who were surveyed by Archambault & Crippen (2006) as part of a formative evaluation of the survey instrument. In the initial survey of Nevadan online teachers, several respondents contacted the lead researcher by email to express their interest in the topic and to share their experiences in narrative fashion. This suggested that the survey

would benefit from more open-ended responses that allow online teachers to share their unique experiences.

Because these responses were unsolicited, it would appear that there is a strong interest in the topic of online distance education teacher preparation, especially on the part of teachers in this type of environment. There appears to be a desire for online teachers to share their stories and to describe how they ended up in their current position, as well as how they have managed to gain the necessary skills in order to be successful. To this end, asking open-ended questions to gather qualitative data at the end of the quantitative survey instrument was appropriate. Questions 22 and 23 were added to the survey to gather qualitative data specifically addressing issues raised in the emails sent to the research after the initial survey in 2005: *Describe the career path that led you to teaching online. Was this type of teaching always a goal? What led you to your current position?* and *Describe your overall experience with teaching online K-12 students.* Collecting both quantitative and qualitative data together on the same instrument was accomplished through the use of a mixed methodological approach called concurrent nested design.

Concurrent Nested Design

Creswell (2003) described various mixed methodological approaches, including the concurrent nested design in which both quantitative and qualitative data are gathered at the same time. This strategy is used when one methodology takes precedence over the other, and the goal is to gain a broader understanding of the data through using different methods than would be otherwise possible through the use of one method alone. This approach has several strengths, including collecting different types of data in a single

collection phase and being able to use multiple research methods to gather a better overall perspective. While this method does open the researcher up to possible problems, such as having to find a way to resolve discrepancies between the types of data and having unequal evidence within a study, its overall potential outweighs these challenges.

Taking this into consideration, qualitative data was gathered by asking two open-ended questions regarding how online teachers came to their positions. These questions include Question 22: *Describe the career path that led you to teaching online. Was this type of teaching always a goal? What led you to your current position?* and Question 23: *Describe your overall experience with teaching online K-12 students.* Data gathered from these open-ended questions allowed the researcher to more fully describe this particular teaching population and the unique challenges they face. These questions were placed at the end of the survey, as participants are most likely to contribute open-ended responses after a set of coded, closed responses (Andrews, Nonnecke, & Preece, 2003).

Survey Validity and Reliability

Currently there is a shortage of validated instruments to measure attitudes concerning online courses (Zhang, 2007). This is especially the case when exploring the field of K-12 online distance education. Because of this, surveys to study this particular population, such as the current one, must be developed and validated. When dealing with conceptual frameworks, such as technological pedagogical content knowledge (TPCK), this means working to ensure that the instrument demonstrates a sufficient level of construct validity. According to Gall, Gall, and Borg (2003), construct validity is "the extent to which inferences from a test's scores accurately reflect the construct that the test is claimed to measure" (p. 620). Items were created by the researcher and then reviewed

by Dr. Kent Crippen and Dr. P.G. Schrader, technology education experts who have extensive experience with online teaching. Because validity requires that the items adequately measure the proposed constructs and that respondents correctly interpret what each item is asking, piloting of the survey is essential. Piloting of the survey was conducted in cooperation with K-12 online teachers from Odyssey Charter School in Las Vegas, Nevada. Specific procedures are discussed in the *Pilot Study* section.

According to Czaja and Blair (2005), "The reliability of data obtained through survey research rests, in large part, on the uniform administration of questions and their uniform interpretation by respondents" (p. 73). Using a Web-based self administration of the survey instrument ensured a consistent delivery of the survey, and pilot testing assisted in establishing content and construct validity. In addition, subscales that were used in the original survey developed by Archambault and Crippen (2006) to measure online pedagogy, course design, and technical assistance were used in this study. These subscales were found to demonstrate a sufficient level of reliability (α = .738, .911, and .928).

In order to easily examine specific survey items in conjunction with the constructs and research questions they aim to address, the following section summarizes each research question, related variables, and specific corresponding items.

Summary of Research Questions, Variables, and Corresponding Items

Research Question 1

What are the demographic characteristics of those teaching in online K-12 distance education programs in the United States?

Variables: Age, Gender, Education Level, Location of School, Number of Students, Number of Classes, Subject Taught, Years of Experience, Type of Online Class, Type of Virtual School, Content creation

Corresponding Items

Do you currently teach at least one class in grades K-12 online? [1]
In which state do you currently teach? [2]
What is your gender? [3]
What race/ethnicity do you consider yourself? [4]
What is your age group? [5]
How would you classify the school in which you currently teach? [6]
How do you classify your main assignment at THIS school (i.e., the activity at which you spend most of your time) during this school year? [7]
Which best describes the way YOUR classes at this school are organized? [8]
Which of the following best describes the format of your *online* classes? [9]
Which of the following describes the format of your online teaching? [10]
What is your main teaching field? [11]
Which specific courses do you teach online? [12]
Considering the content of your class(es), who is the **primary** author?[13]
What is the total number of classes you teach online? [14]
What is the number of students you teach online? [15]
Including this school year, how many years have you been employed as a teacher? [16]
Including this school year, how many years have you been employed as a teacher at THIS school? [17]
Which grades do you currently teach at this school? [18
Do you hold the following degrees or certificates? [19]

The next section describes the research question, variable, and specific survey items that correlate to the second and third research questions. These questions are broken into subparts to separate each of the domains described by the TPCK framework.

Research Question 2

What is the perceived knowledge level of those who teach in an online environment specific to online pedagogy, technical expertise, and content area, including the combinations of these domains?

Research Question 2.1. What is the perceived knowledge level of those who teach in an online environment specific to online pedagogy?

Variable: Pedagogical Knowledge

Corresponding Items

How would you rate your own knowledge in doing the following tasks associated with teaching in a distance education setting? [20]

Use a variety of teaching strategies to relate various concepts to students. [c]
Determine a particular strategy best suited to teach a specific concept. [j]
Adjust teaching methodology based on student performance/feedback. [r]

Research Question 2.2. What is the perceived knowledge level of those who teach in an online environment specific to technological expertise?

Variable: Technological Knowledge

Corresponding Items

How would you rate your own knowledge in doing the following tasks associated with teaching in a distance education setting? [20]

Troubleshoot technical problems associated with hardware (e.g., network connections) [a]
Address various computer issues related to software (e.g., downloading appropriate plug-ins, installing programs) [g]
Assist students with troubleshooting technical problems with their personal computers [q]

Research Question 2.3. What is the perceived knowledge level of those who teach in an online environment specific to their content area?

Variable: Content Knowledge

Corresponding Items

How would you rate your own knowledge in doing the following tasks associated with teaching in a distance education setting? [20]

Create materials that map to specific district/state standards. [b]
Decide on the scope of concepts taught within in my class. [d]
Plan the sequence of concepts taught within my class. [m]

Research Question 2.4. What is the perceived knowledge level of those who teach in an online environment specific to technical expertise and content area?

Variable: Technological Content Knowledge

Corresponding Items

How would you rate your own knowledge in doing the following tasks associated with teaching in a distance education setting? [20]

Use technological representations (i.e. multimedia, visual demonstrations, etc) to demonstrate specific concepts in my content area). [o]
Implement district curriculum in an online environment. [t]
Use various courseware programs to deliver instruction (e.g., Blackboard, Centra). [v]

Research Question 2.5. What is the perceived knowledge level of those who teach in an online environment specific to pedagogy and content area?

Variable: Pedagogical Content Knowledge

Corresponding Items

How would you rate your own knowledge in doing the following tasks associated with teaching in a distance education setting? [20]

Distinguish between correct and incorrect problem solving attempts by students. [f]
Anticipate likely student misconceptions within a particular topic. [i]
Comfortably produce lesson plans with an appreciation for the topic. [s]
Assist students in noticing connections between various concepts in a curriculum. [u]

Research Question 2.6. What is the perceived knowledge level of those who teach in an online environment specific to technology, pedagogy, and content area?

Variable: Technological Pedagogical Knowledge

Corresponding Items.

How would you rate your own knowledge in doing the following tasks associated with teaching in a distance education setting? [20]

Create an online environment which allows students to build new knowledge and skills. [h]
Implement different methods of teaching online [l]
Moderate online interactivity among students [n]
Encourage online interactivity among students [p]

Research Question 2.7. What is the perceived knowledge level of those who teach in an online environment specific to technology, pedagogy, and content area?

Variable: Technological Pedagogical Content Knowledge

Corresponding Items

How would you rate your own knowledge in doing the following tasks associated with teaching in a distance education setting? [20]

Use online student assessment to modify instruction. [e]
Use technology to predict students' skill/understanding of a particular topic. [k]
Use technology to create effective representations of content that depart from textbook knowledge. [w]
Meet the overall demands of this teaching assignment. [x]

Research Question 3

What is the perceived preparation level of those who teach in online environments specific to technical expertise, online pedagogy, and content area, including the combinations of these domains?

Research Question 3.1. What is the perceived level of preparation provided to those who teach in online environments specific to online pedagogy?

Variable: Pedagogical Knowledge

Corresponding Items

Based on your teacher education program, how prepared do you feel you were to do the following activities in a distance education setting? [21]

Use a variety of teaching strategies to relate various concepts to students. [c]
Determine a particular strategy best suited to teach a specific concept. [j]
Adjust teaching methodology based on student performance/feedback. [r]

Research Question 3.2. What is the perceived level of preparation provided to those who teach in online environments specific to technological expertise?

Variable: Technological Knowledge

Corresponding Items

Based on your teacher education program, how prepared do you feel you were to do the following activities in a distance education setting? [21]

Troubleshoot technical problems associated with hardware (e.g., network connections) [a]
Address various computer issues related to software (e.g., downloading appropriate plug-ins, installing programs) [g]
Assist students with troubleshooting technical problems with their personal computers [q]

Research Question 3.3. What is the perceived level of preparation provided to those who teach in online environments specific to their content area?

Variable: Content Knowledge

Corresponding Items

Based on your teacher education program, how prepared do you feel you were to do the following activities in a distance education setting? [21]

> Create materials that map to specific district/state standards. [b]
> Decide on the scope of concepts taught within in my class. [d]
> Plan the sequence of concepts taught within my class. [m]

Research Question 3.4. What is the perceived level of preparation provided to those who teach in online environments specific to technical expertise and content area?

> *Variable*: Technological Content Knowledge

Corresponding Items

Based on your teacher education program, how prepared do you feel you were to do the following activities in a distance education setting? [21]

> Use technological representations (i.e. multimedia, visual demonstrations, etc.) to demonstrate specific concepts in my content area. [o]
> Implement district curriculum in an online environment [t]
> Use various courseware programs to deliver instruction (e.g., Blackboard, Centra [v]

Research Question 3.5. What is the perceived level of preparation provided to those who teach in online environments specific to pedagogy and content area?

> *Variable*: Pedagogical Content Knowledge

Corresponding Items

Based on your teacher education program, how prepared do you feel you were to do the following activities in a distance education setting? [21]

> Distinguish between correct and incorrect problem solving attempts by students [f]
> Anticipate likely student misconceptions within a particular topic [i]
> Comfortably produce lesson plans with an appreciation for the topic [s]
> Assist students in noticing connections between various concepts in a curriculum [u]

Research Question 3.6. What is the perceived level of preparation provided to those who teach in online environments specific to technology and pedagogy?

Variable: Technological Pedagogical Knowledge

Corresponding Items

Based on your teacher education program, how prepared do you feel you were to do the following activities in a distance education setting? [21]

Create an online environment which allows students to build new knowledge and skills. [h]
Implement different methods of teaching online [l]
Moderate online interactivity among students [n]
Encourage online interactivity among students [p]

Research Question 3.7. What is the perceived level of preparation provided to those who teach in online environments specific to technology, pedagogy, and content area?

Variable: Technological Pedagogical Content Knowledge

Corresponding Items

Based on your teacher education program, how prepared do you feel you were to do the following activities in a distance education setting? [21]

Use online student assessment to modify instruction. [e]
Use technology to predict students' skill/understanding of a particular topic [k]
Use technology to create effective representations of content that depart from textbook knowledge [w]
Meet the overall demands of this teaching assignment [x]

Research Timeline

The following section describes the research procedures, tasks, and timeline of the current study. First, each task associated with conducting the study is described in Table 3. Then, a description of the task associated with administering the survey is discussed, along with a plan for the analysis of the resulting data.

Table 3

Research Timeline

Begin Date	End Date	Task
8/1/07	9/7/07	Gather email addresses of potential respondents from the Internet and add them to a created database.
9/10/07	10/10/07	Revise survey items with advisor feedback and input.
8/1/07	10/1/07	Prepare and submit materials for Institutional Review Board Approval.
9/7/07	10/12/05	Build and refine survey response system.
11/14/07	11/21/07	Conduct Pilot Survey (in person with Odyssey Charter School K-12 online teachers)
12/1/07	12/7/07	Send out pilot emails to test survey response system.
1/10/08	1/10/08	Send out prenotification email to respondents notifying them of the upcoming survey.
1/14/08	1/21/08	Send out emails with survey URL. Send reminder and follow up emails to complete survey one week apart.
1/21/08	2/25/08	Gather survey data and begin to conduct analysis. Seek assistance as necessary.
2/25/08	5/15/08	Continue data analysis.
3/25/08	6/1/08	Write survey analysis based on results.

Survey Pilot

According to Oppenheim (1992), "Survey piloting is the process of conceptualizing and re-conceptualizing the key aims of the study and making preparations for the fieldwork and analysis so that not too much will go wrong and nothing will have been left out" (p. 64). This is an important step to ensure that questions, question sequence, layout, survey instructions, and scales are optimized for gathering and analyzing the intended data (Oppenheim, 1992). Dillman (2007) outlined a four-stage process for piloting a Web-based survey:

1. Review of the survey by experts in the field to make sure that the questions are complete, relevant, and arranged in an appropriate format.
2. While respondents take the proposed instrument, they are observed and asked to "think aloud". Following the completion of the survey, participants are interviewed. This helps to ensure that items on the survey are easy to understand, interpreted in a consistent manner, and logically arranged within the instrument. In addition, overall impressions of the look and feel of the survey are gathered.
3. A small pilot of the survey is run, using all of the procedures proposed by the main study. Dillman (2007) also suggests that for large scale surveys, 100-200 individuals take the instrument and the data gathered from this stage are analyzed to see if scales need to be adjusted, the number of questions reduced, remove or reword questions with high non-response rates. This stage also helps to determine if the open-ended questions on the

survey were producing constructive data, as well as to estimate possible response rates.

4. Finally, one last check of the survey by non-researchers is conducted to check for typos and errors as a result of revisions from the previous three stages.

Expert Review

Following Dillman's (2007) methodology, the current survey instrument was carefully reviewed by the researcher's advisor throughout the development process. A number of ongoing discussions took place regarding survey items, both at the inception of the original instrument and throughout the revision of the current instrument. Based on Dr. Crippen's feedback, several changes were made to the instrument. In particular, formatting of the instrument underwent several revisions, including breaking the survey up into five separate Web Pages, adding a percentage bar at the top of the survey that showed respondents how much they had completed as well as how much they had left to finish, and creating a mouse over feature that showed the stem of Questions 20 and 21. Dr. P.G. Schrader also reviewed the instrument and found the questions to be reasonable and well constructed. Specifically, he found the question stems for Questions 20 and 21 to be excellent because they were focused, specific, and all of the same grain size. Having experts review the instrument to ensure that items were complete, relevant, and arranged in an appropriate format was important to establish an adequate level of content validity.

Think Aloud Pilot

While content validity can be established by having the instrument reviewed by experts, construct validity can begin to be verified by using a "think aloud" strategy to

interview participants while they read and answer survey items. This is done by asking participants to explain what they are thinking as they go through each question of the instrument. Responses can then be compared from one person to the next to ensure that the questions are being interpreted in the same way, easy to understand, and arranged in a logical sequence. However, this is only a first step, and additional construct validation of the items used to measure the TCPK framework is needed through a confirmatory factor analysis. This was beyond the scope of the current study and is an area for future research.

To begin the piloting process, a think aloud was conducted in two phases with six teachers from Odyssey Charter School, an online virtual school run in conjunction with the Clark County School District. Each of the teachers interviewed taught within the secondary department, and one of the teachers also served in an administrative capacity. The first phase of the think aloud pilot was conducted on November 16, 2007. The researcher met with three of the six teachers at the school's central office. Interviews with the teachers were audio recorded. The purpose of this first phase was to make sure that survey questions were being understood in the same manner and to gather suggested changes that would make specific items clearer and easier to understand.

Survey Item Changes from Think Aloud Pilot

The major theme that emerged among the teachers with whom the survey was piloted was changing the wording of certain questions and/or responses to make them easier to understand. For example, Question 1 was changed from *Do you currently teach online?* to *Which of the following best describes your K-12 online teaching?* This was done to be able to include additional responses that would cover a wider range of

teaching experiences, such as *I currently teach at least one class online, I do not currently teach online, but I have previously taught an online course,* and *I have never taught an online course.*

According to the teachers piloting the survey, Question 6, *How would you classify the school in which you currently teach*? also posed some confusion because the teachers were unclear as to exactly how to classify their particular school. Because Odyssey is a virtual charter school, all three teachers wanted to answer the first response: *Virtual school operated by a local education-based agency (i.e. a school district).* However, they mentioned that their school was not run by the Clark County School District, but rather, in conjunction with the school district. Upon reflection, this was a better conceptualization of charter schools. As a result, the first response to Question 6 was changed to *Virtual school operated in conjunction with a local education-based agency (i.e. a school district).* This question is particularly complex, as there are a multitude of ways under which virtual schools are organized, and it would be virtually impossible to cover all of the possibilities in a set number of responses. Due to this, the open-ended response of "other" was particularly important in this question, and this was noted by the think-aloud participants.

Initially some debate took place as to whether or not Question 21 should refer specifically to "teacher preparation" or simply "preparation" in general. It was determined from the think-aloud that this question was much easier to understand, and it was interpreted consistently from person to person when it referred to teacher preparation. When it was left open, the teachers had difficulty deciding if Question 21 was asking about their experience with professional development, preparation on their

own, or teacher preparation. All of the teachers agreed that anchoring Question 21 so that it asked, *Based on your teacher education program, how prepared do you feel you were to do the following activities in a distance education setting?* was easier to understand and would be consistently interpreted from one participant to another.

Another significant change was made to each of the items for Questions 20 and 21, items a-x. Teachers participating in the think-aloud understood the formatting of Questions 20 and 21, but had a difficult time understanding what they were being asked to rate when each of the items began with a verb, such as *Use a variety of teaching strategies to relate various concepts to students.* To make the items easier to understand, the phrase "My ability to" was added to each stem for clarity. As one teacher stated, "I really think if you could direct these questions back to the user, it would make more sense . . . if it said, 'your ability to' that would help me out here" (personal communication, November 16, 2007).

In addition, instead of beginning with an item that covered multiple domains, such as pedagogical content knowledge, it was suggested by one think-aloud participant to start with a simpler item that had initially appeared later in the survey. For this reason, the order of the first three items was changed so that Questions 20 and 21 began with the following:

(a) My ability to troubleshoot technical problems associated with hardware (e.g., network connections).
(b) My ability to create materials that map to specific district/state standards.
(c) My ability to use a variety of teaching strategies to relate various concepts to students.

This resulted in each of the first three statements of Questions 20 and 21 covering a single domain of technology, content, and pedagogy, making it easier for participants to get acquainted with the layout of the survey. One of the participants commented on the layout of Questions 20 and 21 after going through a few of the items: "Now, as we are going through this, and I don't know if it's because you and I are talking this thing out, but it's becoming more organic from this point forward (personal communication, November 17, 2007). The consensus among the think-aloud participants was that starting with less complex items to help respondents become familiar with the layout would be beneficial.

In addition to changing the order of the items (a), (b), and (c), the wording for items (w) and (x) was changed to make them clearer, easier to understand, and to use more active language. For example, item (w) initially was *Use technology to create effective representations of content that depart from textbook knowledge*. This was changed to *My ability to create effective technological representations of content that depart from textbook knowledge*. Item (x) was also changed from *Meet the overall demands of my online teaching assignment* to *My ability to meet the overall demands of online teaching*. This was to clarify the term "teaching assignment" which presented some confusion.

Online teachers participating in the think-aloud agreed that the layout of Questions 20 and 21 was not difficult to follow, as they were used to completing various types of online forms. They liked that each of the responses was anchored, so that they did not have to use a drop down menu to make a selection or refer to the top to figure out the scale. Think-aloud participants also found useful the fact that the question appeared

when they rolled over their possible selection. The percentage of completion bar was another positive feature of the survey, according to the think-aloud pilot results.

Overall, teachers completing the think-aloud pilot provided excellent feedback for improvements to the instrument. By making their suggested changes, the survey was improved to ensure that questions were easily understood and were being understood in the same manner. The goal of gathering and implementing suggested changes that would make specific items clearer and easier to understand was met in this first phase of the pilot.

Phase Two of Think Aloud Pilot

Once changes to the survey from the initial think-aloud pilot were made, the second phase of the think-aloud focused specifically on stems for Questions 20, *How would you rate your own knowledge in doing the following tasks associated with teaching in a distance education setting?* and Question 21, *Based on your teacher education program, how prepared do you feel you were to do the following activities in a distance education setting?* The purpose in doing so was to establish a certain level of construct validity to ensure that participants were interpreting items for Questions 20 and 21 consistently. In addition, the researcher needed to check to see that interpretations of each subscale were in line with the intent of the items.

On November 27, 2007, the researcher met with three different teachers from Odyssey Virtual Charter School who all taught numerous classes online. They represented subject content areas of math, social studies, and computer applications, with an average of seven years of experience in teaching online. Think aloud participants went through the survey as normal, and then were given additional information and directions

when they came to Questions 20 and 21. At this point, they were given a printed description of each of the seven subscales: Pedagogy, Content, Technology, Technological Content, Technological Pedagogy, Content Pedagogy, and Technological Pedagogical Content (Appendix K). After discussing the definitions, think-aloud participants were then asked to read each item aloud and consider under which category they thought the item fit.

Participants consistently identified single domain items of technology correctly as well as items that covered all three domains (technology pedagogical content knowledge). The difficulty they encountered was trying to decide between issues of pedagogy and content. A common theme emerged among the think-aloud participants. They were challenged with separating out specific issues of content and pedagogy. For example, item (d) *My ability to decide on the scope of concepts taught within my class* was interpreted by two of the participants as being part of the pedagogical content domain, rather than the single content domain, as intended by the researcher. The same misinterpretation happened with item (b) *My ability to create materials that map to specific district/state standards*. The same two teachers thought that this was a pedagogical issue rather than a content one. Along with the confusion between content and pedagogy, the other issue was the occasional identification of technology within an item that did not specifically deal with any technological-related issues. For example, one teacher identified item (f) *My ability to distinguish between correct and incorrect problem solving attempts by students* as dealing with elements of all three domains, instead of simply pedagogical content knowledge. This participant had the same error for

item (j), and this may be related to the fact that he teaches computer applications and programming classes, so his content is inextricably linked to technology.

Despite the confusion between content and pedagogy, one of the teachers participating in the think-aloud correctly identified all of the items, with the exception of four items that were intended as either technological pedagogy or technological content (which he interpreted as having elements of all three, technological content pedagogical knowledge). Overall, think-aloud participants correctly identified at least one of the domains for all of the items. Specifically, items (a), (i), (k), (l), (n), (q), (u), (w), and (x) had 100% agreement among all three online teachers and their ratings matched the intentions of the researcher.

The important consideration from this phase of the pilot was that items were being interpreted consistently from one participant to the next. Even though the researcher had clear notions of the specific domains and the distinctions among them, the online teachers had notions of pedagogy and content as being linked as one domain. Despite this finding, the three participants demonstrated a common understanding and interpretation from item to item.

Pilot Study

According to Dillman (2000), "Presumably, the knowledgeable person review and the cognitive/motivational interview have revealed ways of improving the questionnaire. The next pretest step is to do a pilot study that emulates procedures proposed for the main study (p. 146). The pilot study for this research was conducted from December 9, 2007 to January 15, 2008, using Dillman's survey methodology of a prenotification email, a main email containing the link to the survey, and then three subsequent reminders. The primary

purpose in doing so was to ensure that the technology being used worked correctly to capture the desired data, to see that open-ended questions were producing data, and to estimate the possible response rate. On December 9, 2007, a prenotification email was sent to 76 K-12 online teachers from Nevada, followed by the main email with the survey link on December 12, 2007. Over the next five weeks, three email reminders were sent. Among the emails sent, two addresses bounced back with an email delivery failure. Database software, *FileMaker Pro 6*, was used to send out emails and capture responses. This worked extremely well, without any technical difficulties. Of the 74 valid emails, 36 responses were obtained, representing a response rate of 48.6%. The open-ended produced adequate responses, as only four of the 36 did not complete these questions.

Following the Nevada survey pilot, the instrument was reviewed by four non-researchers to check for any minor errors, typos, or overlooked changes that needed to be made. While reviews of early instrument drafts as well as cognitive interviews (think-alouds) yielded multiple revisions, the actual pilot and subsequent reviews gave no indication that further revisions were needed. Specific details concerning Dillman's methodology as it applies to the current study are discussed in the following section. Results of the pilot survey are discussed in Chapter 4.

Research Procedure

Because those who teach in an online environment are expected to have a basic level of technical knowledge, including the daily use of email, this cross-sectional survey was self-administered via the Internet using a Web-based survey. According to Andrews, Blair and Preece (2003), "Electronic surveys provide the ability to conduct large-scale data collection by others than organizations at the centers of power in society. The

technology provides an inexpensive mechanism for conducting surveys online instead of through postal mail and one in which costs per response decrease instead of increase significantly as sample size increases" (p. 186). In addition to being low cost, Web-based surveys have the advantage of format and response control, being able to offer multiple response cycles, and the convenience of having responses automatically collected via a database application to reduce data entry error. With these features in mind, a Web-based survey was developed and implemented for the current study. Approval to conduct this study was granted by the University of Nevada Las Vegas' Institutional Review Board on November 8, 2007 (Appendix B). Dillman's (2007) tailored design method was used to administer the survey. The tailored method design involves five points of contact that are recommended to increase response rates. These are outlined in detail below.

Stage One: Prenotification Email

On January 21, 2008, online teachers whose email addresses had been obtained via the Web were emailed a prenotification email informing them of the upcoming survey, along with its purpose and benefits (Appendix C).

Stage Two: Email with Survey Access Link

Four days after the prenotification email was sent, on January 25, 2008, an email inviting the participants to complete the survey instrument was sent out. This email contained a hyperlink to the online instrument (Appendix D). Once teachers clicked on the URL provided within the email, an informed consent page appeared to discuss the nature and purpose of the study, as well as possible benefits and risks, including the transmittal of information by surreptitious means due the nature of the Internet (Appendix H). If participants agreed to the informed consent by clicking on an "I

accept" button, they were directed to the survey instrument. Those who clicked on "I do not accept" were redirected to the homepage of the University of Nevada Las Vegas. Responses to the survey were submitted electronically, gathered, and complied within a *FileMaker Pro* database, exported to *Excel*, and then imported to *Statistical Package for Social Sciences* (SPSS) software, Version 16.0, for analysis.

Stage Three: Thank You/Reminder Email

One week after sending the email invitation, a thank you/reminder note was emailed to potential participants who had not yet responded (Appendix E). Its purpose was to provide a reminder to those who had not completed and returned the survey to do so as soon as possible. This notice also contained the email link to the survey in case participants had accidentally deleted the original message (Dillman, 2007).

Stage Four: Follow-up Email

Two weeks after emailing the thank you/reminder note, on February 17, 2008, another email was sent to non-respondents to urge them to complete the survey (Appendix F). As indicated by Dillman (2007), the tone in this reminder was more urgent in order to try to convince possible participants to respond to the instrument. Once again, the link to the survey was provided.

Stage Five: Final Email

A week after emailing non-respondents a replacement link, a final email was sent containing both a link to the survey and an attached *Microsoft Word* version of the instrument (Appendix G). This use of a *Microsoft Word* version of the survey offered non-respondents a paper and pencil response option as well as a final opportunity to complete the survey. However, no online teachers took the option to complete the survey

via *Word*, so despite Dillman (2007) strongly recommending an alternate delivery method to help with increasing the response rate, this was not applicable for the current study.

Considerations for Web-based Surveys

Dillman (2007) outlined special considerations when implementing a Web-based survey, including email addresses that bounce, or are no longer valid, and email inquires to the survey. Each of these issues requires special attention in order to successfully deploy a national Web-based survey.

Email Bounces

Email addresses that are not valid bounce back to the sender. This can happen for a variety of reasons, including a typographical error in the email address, an address that this no longer in existence, or a firewall blocking a mass mailing. In the current study, 413 of the 2,262 email addresses bounced back as undeliverable. Forty-eight of these emails addresses had typographical errors that were corrected and then resent successfully. One virtual school, CCS Web Academy, closed during the course of this study, and as a result, 126 emails bounced back as no longer valid. This resulted in an overall bounce rate of 16%. For surveys of large scope in which email addresses are gathered via the Web, such as the current study, bounce rates from 7% to 17% are typical (Manfreda, Bosnjak, Berzelak, Haas & Vehovar, 2008).

Email Inquires

A number of K-12 online teachers invited to participate contacted the researcher to express a variety of sentiments throughout the course of the study. Initially, 64 participants shared their excitement about the topic and their willingness to complete the

survey. Many also appreciated the pre-notification and noted this as well. Thirteen requested a copy of the results at the conclusion of the study. Other online teachers emailed the researcher to comment on a particular aspect of the survey, often explaining the response they had selected for "Other" when answering Question 6, *How would you classify the school in which you currently teach?* Still others emailed or called the telephone number provided in the informed consent to verify the legitimacy of the research project. Additionally, some teachers emailed the researcher to resolve technical problems associated with completing the survey online. For example, teachers from Oregon's Cool School had trouble accessing the survey because of their specific email client and firewall. This was resolved by creating a general link for the school to distribute for their teachers. Finally, 39 K-12 online teachers emailed to ask to be removed from the study. Each round of survey and reminder emails sent out by the researcher produced a flurry of responses from K-12 online teachers. Their requests and feedback were answered clearly and honestly, emphasizing the value of the survey and the importance of each participant's response, as recommended by Dillman (2007).

Plan for the Analysis of Data

Analysis of the data gathered by the K-12 Online Teacher Survey took place in a series of steps as follows:

1. Information regarding the sample population, including respondents and non-respondents was reported, along with response rates. Within the body of the email that is sent out, a randomly generated unique identification number was issued as part of the link to access the survey. When participants accessed the link and agree to the informed consent, the *FileMaker Pro* database captured

the IP address from the computer that the participant was using. Using the Network Utility feature within Mac OS 10.4.10, the IP address was entered to verify location.

2. Basic descriptive statistical measures were used to present general findings of the data, including percentages of male/female respondents, types of teachers (regular vs. part-time), level of teacher education, type of online courses (both online, hybrid, or Web-facilitated and asynchronous vs. synchronous), content area, and number of students. Descriptive statistics including mean, minimum, and maximum of the following variables were calculated: number of students, years of teaching experience, grade level taught. These data were used to create a narrative profile of the average online K-12 teacher in order to answer the first research question: What are the demographic characteristics of those teaching in online K-12 distance education programs in the United States?
3. Once the basic demographic information were reported, the mean and standard deviation for items (a) through (x) were calculated for Question 20, *How would you rate your own knowledge in doing the following tasks associated with teaching in a distance education setting?* These descriptive statistical measures were also tabulated and reported for each subscale which include the following categories: Pedagogy, Content, Technology, Technological Content, Technological Pedagogy, Content Pedagogy, and Technological Pedagogical Content. Scores on each of the items and subscales were calculated, and the results were be used to create the overall profile of an online K-12 educator. These scores were analyzed to answer the second

research question: What is the perceived knowledge level of those who teach in an online environment specific to technical expertise, online pedagogy, and content area, including the combinations of these domains?

4. The mean and standard deviation for Question 21, items (a) through (x) were calculated, *Based on your teacher education program, how prepared do you feel you were to do the following activities in a distance education setting*? These descriptive statistical measures were reported for each subscale: Pedagogy, Content, Technology, Technological Content, Technological Pedagogy, Content Pedagogy, and Technological Pedagogical Content. Scores on each of the items and subscales were tabulated, and the results were added to the existing measures to continue to build an overall depiction of someone who teaches in a K-12 online distance education environment. These scores were analyzed to answer the third research question: What is the perceived preparation level of those who teach in an online environment specific to technical expertise, online pedagogy, and content area, including the combinations of these domains?
5. Once descriptive statistics for both Questions 20 and 21 were calculated, comparisons between respondent's perceived knowledge level and preparation level were made by examining the differences and similarities of mean and standard deviation results for each item and conducting independent groups t-tests to compare each of the subscale means between knowledge and preparation. In addition to these measures, correlations between each of the domains described by the TPCK framework were also calculated.

This analysis answered the fourth and final research question:

What is the relationship between the perceived knowledge and preparation level of K-12 online teachers with respect to technical expertise, online pedagogy, and content area?

6. In addition to conducting basic descriptive statistical measures, reliability testing in the form of Cronbach's alpha coefficient was conducted for each of the subscales to determine the level of internal consistency.
7. Once descriptive statistical measures were calculated, qualitative methods were used to analyze the data gathered from the open ended questions on the survey, including *Describe your overall experience with teaching online K-12 students. Was this type of teaching always a goal? What led you to your current position?* and *Describe your overall experience with teaching online K-12 students*. One of the strategies for conducting qualitative analysis is homogenous sampling, in which a group of similar cases are examined in order to describe a particular subgroup in depth (Patton, 1990). To do this, a coding strategy was developed to organize the data. According to Glesne (1999), "Coding is a progressive process of sorting and defining and defining and sorting those scraps of collected data....By putting like-minded pieces together into data clumps, you create an organizational framework" (p. 135). Using the codes, as certain patterns began to emerge, a framework was developed as a result of this analysis (Spradley, 1980). Once relationships were determined, connections between and among themes were described to

help create a more complete and holistic profile of the participating online K-12 teachers.

Table 4 describes specific survey questions with their specific domains. Table 5 summarizes each of the research questions, corresponding item number on the survey, and what type of analysis was conducted to answer the research question.

Table 4

Summary of Research Questions and Domains

Survey Items	Domain
1. Do you currently teach at least one class in grades K-12 online?	Demographic Information
2. In which state do you currently teach?	
3. What is your gender?	
4. What race/ethnicity do you consider yourself?	
5. What is your age group?	
6. How would you classify the school in which you currently teach?	
7. How do you classify your main assignment at THIS school (i.e., the activity at which you spend most of your time) during this school year?	
8. Which best describes the way YOUR classes at this school are organized?	
9. Which of the following describes the format of your online teaching?	
10. Which of the following describes the format of your online teaching?	
11. Considering your most recent FULL WEEK of teaching at THIS school: What is your main teaching field?	

(Table Continued)

12. Which specific courses do you teach online?	Demographic Information
13. Considering the content of your class(es), who is the **primary** author?	
14. What is the total number of classes you teach online?	
15. What is the number of students you teach online?	
16. Including this school year, how many years have you been employed as a teacher?	
17. Including this school year, how many years have you been employed as a teacher at THIS school?	
18. Which grades do you currently teach at this school?	
19. Do you hold the following degrees or certificates?	
20. How would you rate your own knowledge in doing the following tasks associated with teaching in a distance education setting?	Knowledge
21. Based on your teacher education program, how prepared do you feel you were to do the following activities in a distance education setting?	Preparation

(Table Continued)

(j) Determine a particular strategy best suited to teach a specific concept. (c) Use a variety of teaching strategies to relate various concepts to students. (r) Adjust teaching methodology based on student performance/feedback.	Pedagogical Knowledge
(a) Troubleshoot technical problems associated with hardware (e.g., network connections). (g) Address various computer issues related to software (e.g., downloading appropriate plug-ins, installing programs). (q) Assist students with troubleshooting technical problems with their personal computers.	Technological Knowledge
(b) Create materials that map to specific district/state standards. (d) Decide on the scope of concepts taught within in my class. (m) Plan the sequence of concepts taught within my class.	Content Knowledge
(o) Use technological representations (i.e. multimedia, visual demonstrations, etc.) to demonstrate specific concepts in my content area). (t) Implement district curriculum in an online environment. (v) Use various courseware programs to deliver instruction (e.g., Blackboard, Centra).	Technological Content Knowledge

(Table Continued)

(f) Distinguish between correct and incorrect problem solving attempts by students. (i) Anticipate likely student misconceptions within a particular topic. (s) Comfortably produce lesson plans with an appreciation for the topic. (u) Assist students in noticing connections between various concepts in a curriculum.	Pedagogical Content Knowledge
(h) Create an online environment which allows students to build new knowledge and skills. (l) Implement different methods of teaching online (n) Moderate online interactivity among students (p) Encourage online interactivity among students	Technological Pedagogical Knowledge
(e) Use online student assessment to modify instruction (k) Use technology to predict students' skill/understanding of a particular topic (w) Use technology to create effective representations of content that depart from textbook knowledge (x) Meet the overall demands of this teaching assignment	Technological Pedagogical Content Knowledge

Table 5

Summary of Research Questions, Survey Items, and Analysis

Research Question	Survey Items	Analysis
What are the demographic characteristics of those teaching in online K-12 distance education programs in the United States?	Questions 1-19	Basic descriptive statistics
	Questions 22-23	Content Analysis
What is the perceived knowledge level of those who teach in an online environment specific to technical expertise, online pedagogy, and content area, including the combinations of these domains?	Question 20	Basic descriptive statistics; Cronbach's alpha for subscales to test internal consistency

(Table Continued)

What is the perceived preparation level that of those who teach in online environments specific to technical expertise, online pedagogy, and content area, including the combinations of these domains?	Question 21	Basic descriptive statistics; Cronbach's alpha for subscales to test internal consistency
Is there a relationship between the perceived knowledge level and preparation level of K-12 online teachers with respect to technical expertise, online pedagogy, and content area?	Questions 20-21	Comparison of basic descriptive statistics; Independent groups t-test; Correlations of TPCK domains

Limitations and Advantages

Although the design of this study has several advantages, it is also limited in certain respects. Because it relies heavily on self-report data gathered via an emailed survey, there are inherent accuracy issues, in which the researcher is unable to verify the precision of the responses. In addition, as with all methods of data collection, Internet surveys have their own specific associated advantages and disadvantages (Fowler, 2002). Advantages include the benefits of using technology to gather data, including the speed with which the surveys can be completed. Results can be gathered much more quickly than with mail surveys. The cost is also minimal, and simply involves the amount of time needed to set up a database and enter email addresses. As a result of the instrument being self-administered, asking a group of similar questions intended to measure a specific variable is feasible. Also, completing a survey via the Internet allows the participant time to verify their responses before actually submitting them. Finally, this survey was administered through computer-assisted means, including the use of a database to administer the survey as well as collect the data. This saved a significant amount of time and energy on the part of the researcher.

However, using the Internet to conduct a survey was not without its drawbacks. The survey could only be completed if the participant has posted a valid email address. Due to the fact that the email addresses for the participants of this study were gathered via public Web pages, potential respondents were only able to complete the survey if their email address was accurately listed, and if they checked their inboxes on a regular basis. In addition, an Internet survey also faces the challenge of not having a personal contact associated with the administration of the survey. Without an incentive, other than

the intrinsic value of assisting the research process, this potentially resulted in a lower response rate. However, while it may be difficult in an Internet survey to gather responses when those surveyed have little interest in the topic, in this case, many online teachers emailed the researcher to indicate their enthusiasm about providing information regarding this new and challenging field.

Methodology Conclusion

Using the described concurrent nested strategy in which both quantitative and qualitative data are collected at the same time, this study gave precedence to the quantitative survey data, but utilized the qualitative data to gain a broader understanding than would be otherwise possible through the a single method alone. Combining the results from both closed and open-ended questions on the survey, this study looked to understand the nature of K-12 online teachers, their perceived level of knowledge and preparation within the domains of technology, pedagogy, and content, and the overlapping of these key areas.

This is an important area of study, as little is known about the population of K-12 online distance educators. While 26 states with K-12 online distance education policy simply require that these teachers be state certified to teach in their content area, without specific training regarding teaching via distance education, future research is needed to determine if this is adequate in preparing the next generation of educators. As teacher education programs evolve throughout the coming decades, they may want to begin to consider ways in which to prepare future educators for online teaching. This may include better integration of technology-related concepts throughout course work and field experiences and the integration of content within existing technology courses to address

topics of importance to virtual teaching, including the role of the online teacher, differences in online pedagogy, and principles of instructional design. This study gathered data regarding the preparation of K-12 online distance education teachers to create a profile of who is entering this field and their characteristics. These data can in turn help to inform possible program changes within the field of teacher education to accommodate this emerging teaching population and prepare both future teachers and students for the challenges and educational opportunities of the 21st century.

CHAPTER 4

DATA ANALYSIS

The purpose of this study was to determine the demographic characteristics of K-12 online teachers and their views regarding their own knowledge and preparation through the deployment of a national survey of K-12 online teachers. The developed survey was designed to capture demographic data related to K-12 online teachers in the United States, in addition to their perceptions of knowledge and preparation levels associated with each of the domains of the technological pedagogical content knowledge (TPCK) framework. This chapter presents findings gathered from the current study.

Analysis of the resulting data was performed with SPSS for Macintosh, Version 16, using both descriptive and inferential statistics to examine the data. Descriptive measures such as mean and standard deviation were calculated to present an overall picture of K-12 online teachers in the United States. Inferential statistics were used to determine the relationship between teacher ratings of their knowledge and preparation levels along the TCPK framework. These measures were used to answer the following research questions:

1. What are the demographic characteristics of those teaching in online K-12 distance education programs in the United States?

2. What is the perceived knowledge level of those who teach in an online environment specific to technical expertise, online pedagogy, and content area, including the combinations of these domains?
3. What is the perceived preparation level of those who teach in online environments specific to technical expertise, online pedagogy, and content area, including the combinations of these domains?
4. Is there a relationship between the perceived knowledge level and preparation level of K-12 online teachers with respect to technical expertise, online pedagogy, and content area?

Response Rate

Using Dillman's survey methodology, 2,262 potential respondents were emailed a prenotification of the survey. Of these, 413 bounced back as undeliverable. However, 48 of these bounced emails were corrected and resent for a total of 1,897 distributed emails. Of this total, 102 were determined not to fit the criteria of the survey in that the potential respondents did not teach online. This resulted in an overall potential pool of 1,795 respondents. After the prenotification of the survey, the main email containing the link to the instrument, and three subsequent reminders, a total of 596 responses were gathered. This represented an overall response rate of 33%, which is considered average and acceptable for web-based surveys (Cho & LaRose, 1999; Manfreda & Vehovar, 2007).

Demographic Data

The first section of the survey focused on demographic information including gender, race, age, level of education, current teaching role, types of online courses taught, number of students, and location of school. These questions helped to form an overall

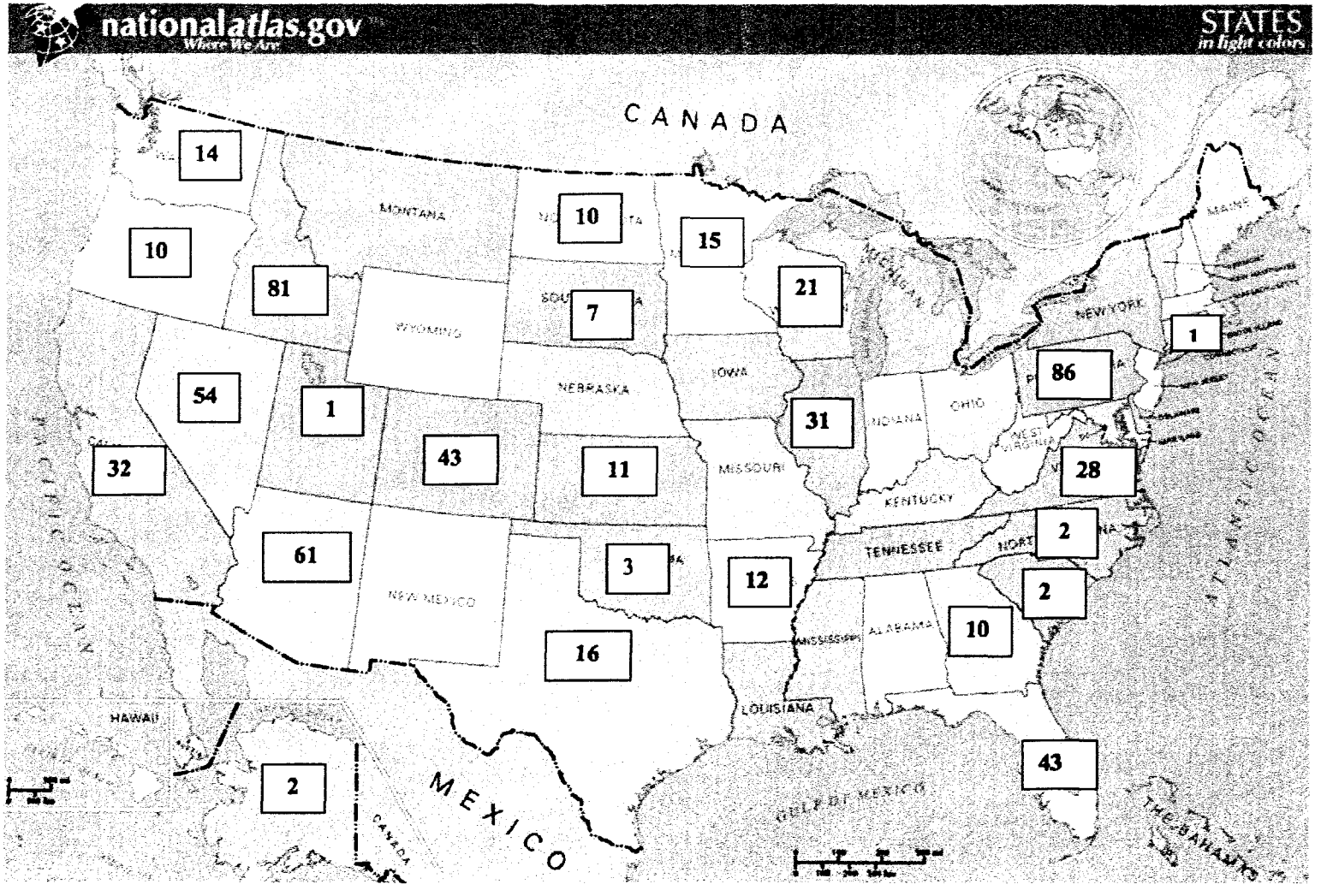
depiction of those teaching online distance education in the K-12 setting, and to answer the first research question:

What are the demographic characteristics of those teaching in online K-12 distance education programs in the United States?

Those responding to the survey represented 25 different states, including Alaska, Arkansas, Arizona, California, Colorado, Connecticut, Florida, Georgia, Idaho, Illinois, Kansas, Minnesota, North Carolina, North Dakota, Oklahoma, Oregon, Pennsylvania, South Carolina, South Dakota, Texas, Utah, Virginia, Washington, and Wisconsin. Of these states, the majority of responses came from Pennsylvania (14.4%), Idaho (13.6%), Arizona (10.2%), and Nevada (9.1%). Figure 2 displays the number of responses from each state.

Figure 2

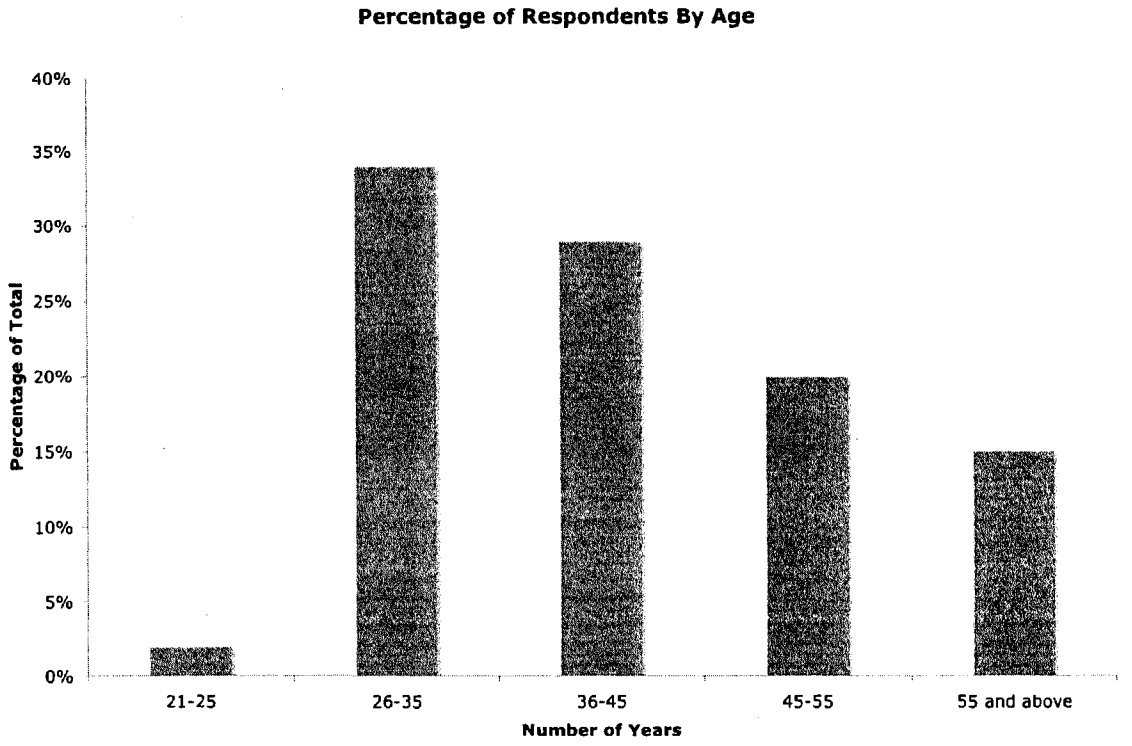
Number of Responses Per State



Participants were predominantly female, with 456 responses (77%) versus 139 (23%) male and were between the ages of 26-35 (201, 34%) and 36-45 (172, 29%). The mean age range was 36-45 (Figure 3).

Figure 3

Percentage of Respondents by Age



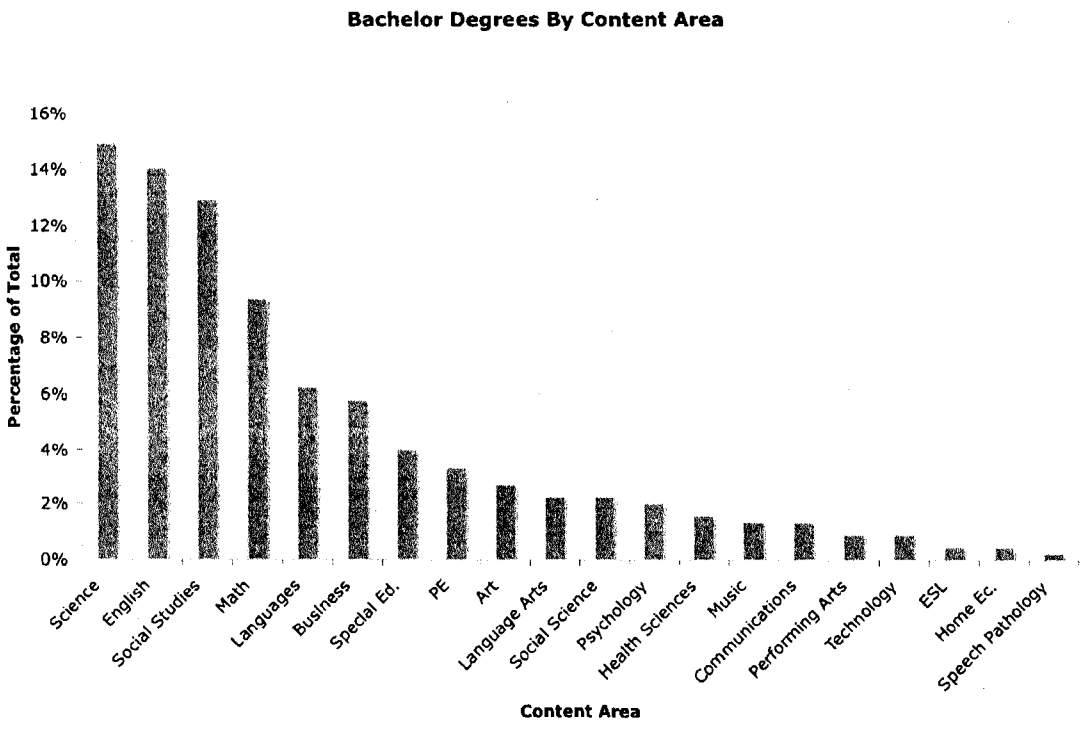
In addition to the majority being female, 534 (91%) of respondents were White/Caucasian, along with 16 (3%) Hispanic, 11 (2%) Black/African American, 7 (1%) Asian/Pacific Islander, 13 (2%) mixed racial background, 3 (<1%) Native American and 16 (3%) other background, including those who indicated that they preferred not to answer the question regarding race.

Education Level

While 37 (6%) respondents did not indicate a response for the area of their bachelor's degree, 559 (92%) reported having a bachelor's degree. Examining the majors of their bachelor's degrees revealed that of the K-12 online teachers who responded to the survey, 5 (1%) had bachelor's degrees in early childhood, 77 (14%) were in K-12 education, 89 (16%) were in elementary education, 127 (23%) were in secondary education, and 261 (47%) indicated a particular content area (Figure 4). Of the contents that were reported, major areas included English (including literature), science (including biology, botany, chemistry, and zoology), social studies (including American Studies, history, and political science), and mathematics.

Figure 4

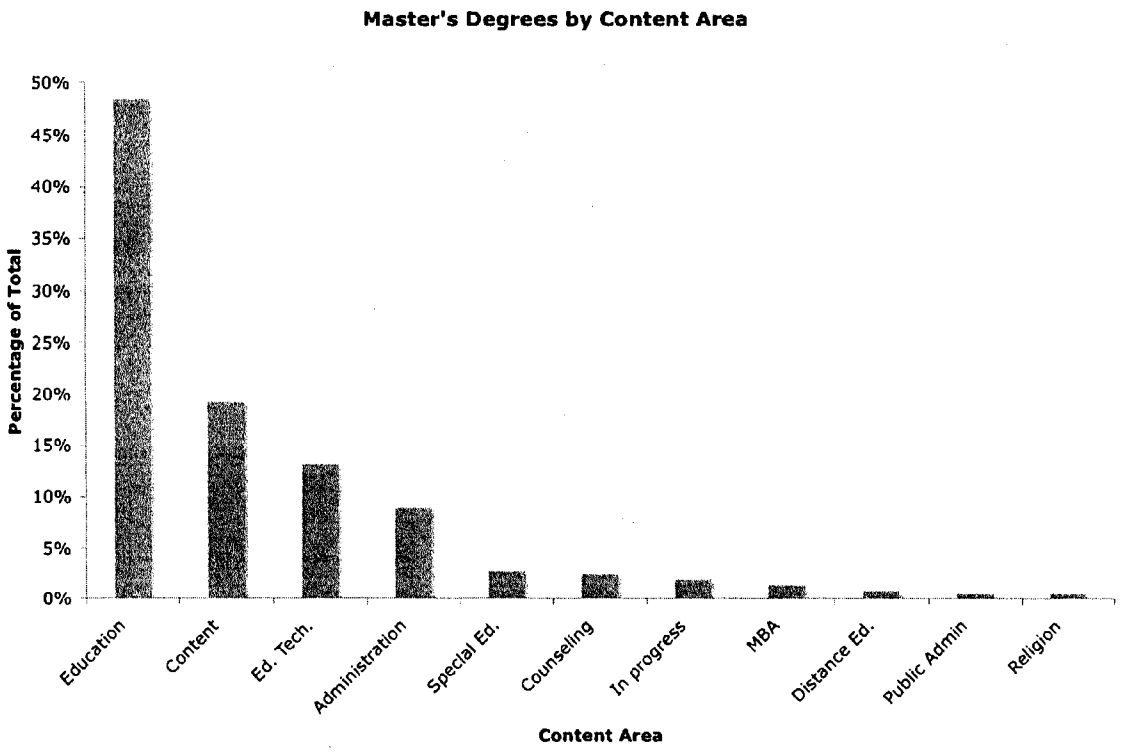
Bachelor Degrees by Content Areas



Of the K-12 online teachers who responded to the survey, 380 (62%) indicated that they had earned a master's degree, with 7 (2%) currently working toward their master's degrees. Of the 62% with master's degrees, 148 (48%) were education (M.Ed.) degrees, including those in curriculum and instruction, while 73 (19%) reported having a degree in a particular content area, such as mathematics, science, social studies, or English. Interestingly, 50 (13%) have master's degrees in educational technology and three participants (<1%) indicated having a master's degree in distance education. Another major area for graduate degrees held was educational leadership/administration, with 34 (9%) teachers (Figure 5).

Figure 5

Master's Degree by Content Area



Only 18 respondents (3%), indicated that they had earned a doctoral degree in either education, administration, and the content areas of science and public affairs. One individual indicated earning a doctoral degree in online education, along with another person stating that they had a doctorate in life studies. Eight K-12 online teachers (1%) indicated that they were currently working on their doctoral degrees.

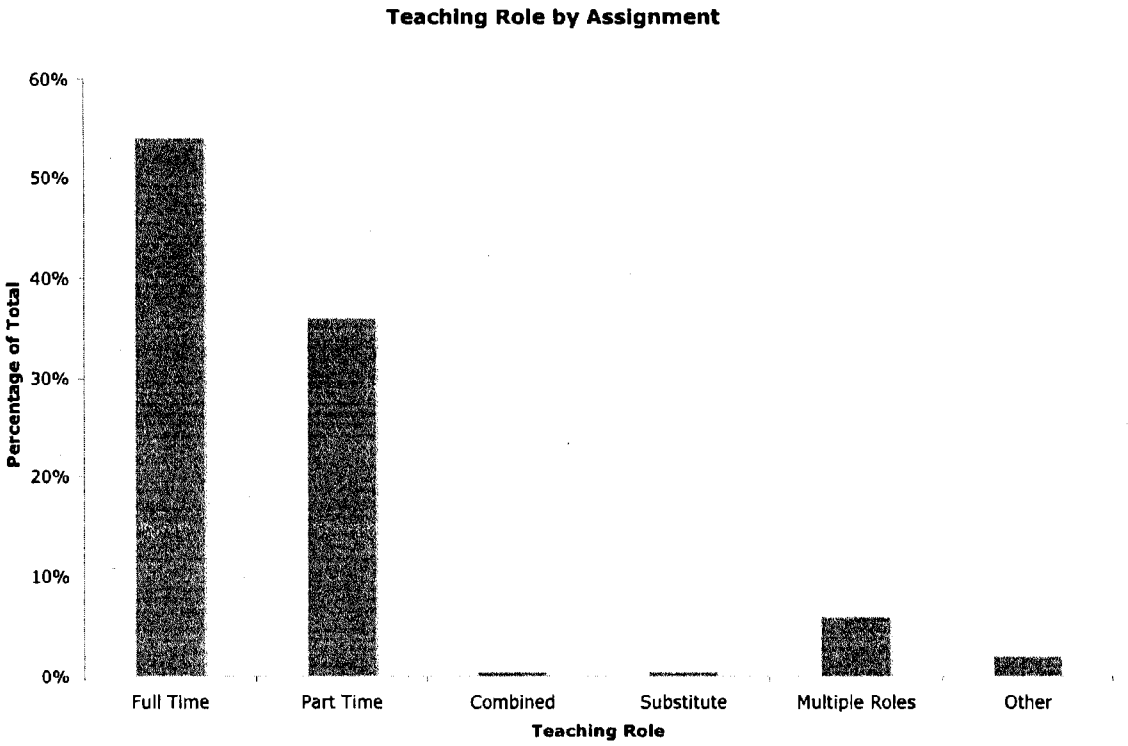
In addition to undergraduate and graduate degrees, 43 participants (7%) indicated that they had additional certifications in a variety of teaching areas, including administration, special education, and content areas such as English, science, and social studies. Two respondents (<1%) stated that they had specific certifications in online teaching. Five teachers (1%) indicated that they had two master's degrees related to education, and one (<1%) had three master's degrees including a M.Ed., a M.A. in administration, and an MBA.

K-12 Online Teachers

In analyzing the major roles of those who responded to the current study, 318 (54%) stated that they were regular full time teachers, with 212 (36%) reporting that they were part time teachers, who also taught either at another online school or in a traditional, face-to-face environment. Thirty-five (6%) reported having an additional role to teaching within their school, such as an administrator, curriculum specialist, instructional designer, or staff developer. Three (<1%) indicated that they were a "combined" teacher, or a long-term substitute. Twelve (2 %) indicated an "other" response consisting primarily of additional roles they had within the school such as customer service, mentor, learning coach, or special education facilitator (Figure 6).

Figure 6

Teaching Assignment by Role

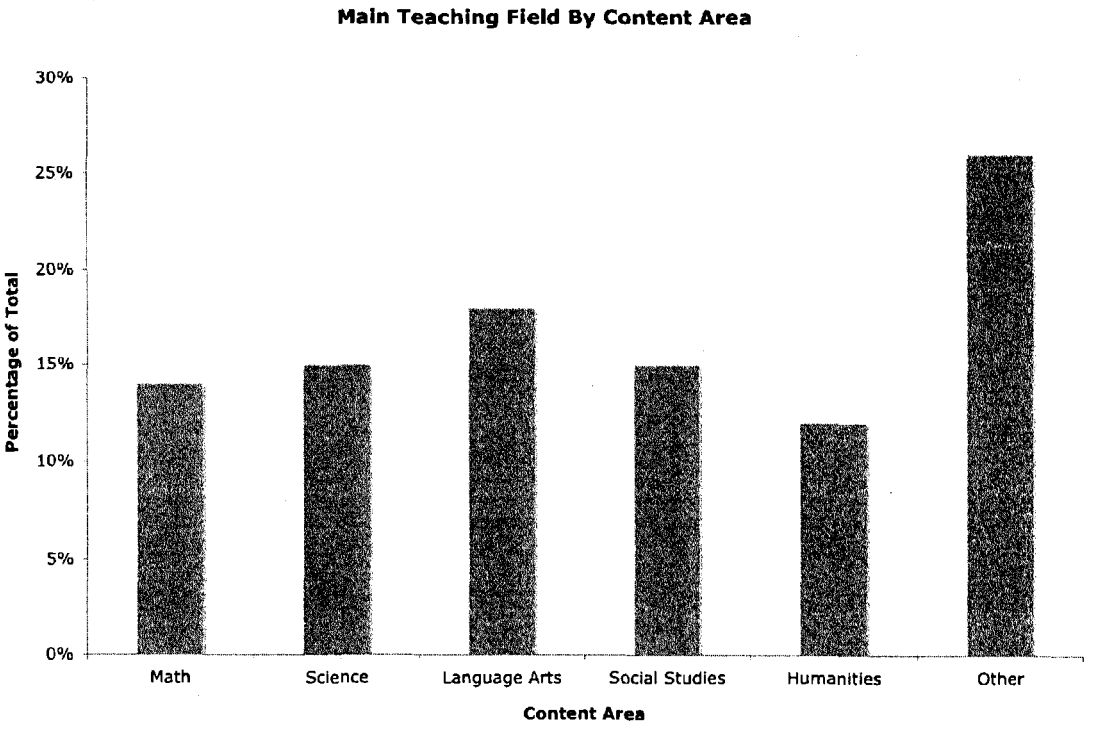


Teaching Field

Along with teaching roles, data regarding online teachers' main teaching field were gathered. Traditional subjects that were reported as being taught online were evenly distributed among mathematics (80, 13%), science (84, 14%) language arts/reading (101, 17%), social studies (86, 14%), or humanities (69, 12%). These major fields accounted for 74% of responses (Figure 7). Teaching fields classified as "other" and accounting for 26% of responses included elementary, all subjects, special education, PE/Health, business, computers, or a combination of two or more major areas, such as language arts together with mathematics.

Figure 7

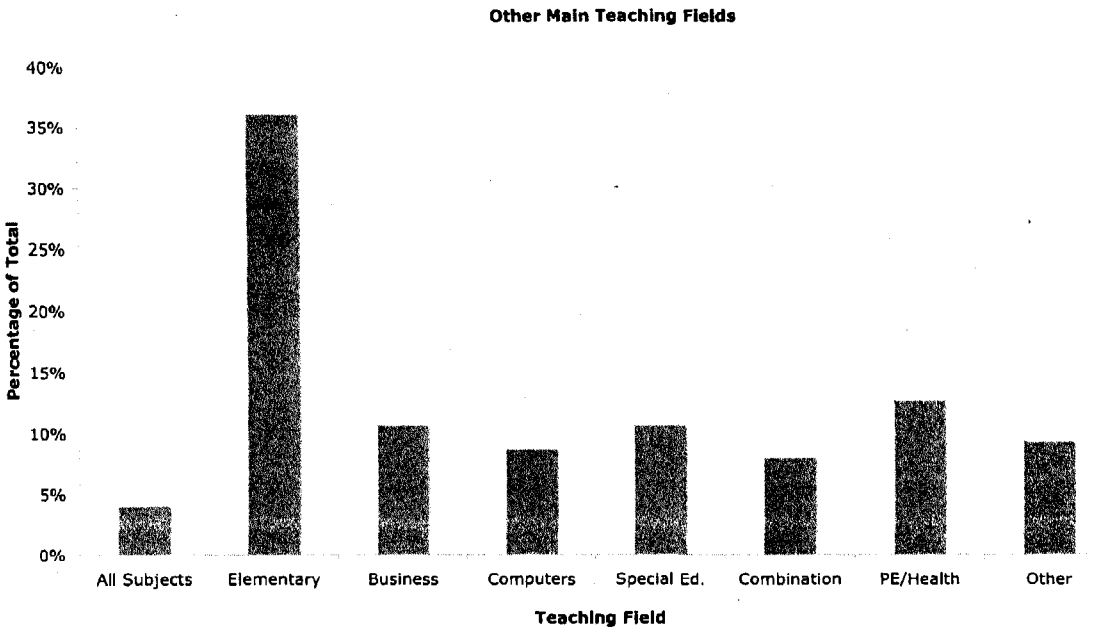
Main Teaching Field



Within the "Other" category, K-12 online teachers reported teaching all subjects (6, 4%), elementary classes (54, 36%), business (16, 11%), computers (13, 9%), special education (16, 11%), a combination of fields (12, 8%), and PE/health (19, 13%). Additional fields represented by 14 teachers (9%) included mentoring, driver's education, study skills, and agriculture (Figure 8).

Figure 8

Other Main Teaching Field



Grade Levels Taught

K-12 online teachers reported the specific grades they taught online. The majority of online teachers surveyed reported teaching at the high school level (grades 9-12), followed by middle school grades six through eighth, and finally those at the elementary level (pre-K through 5th grade) (Table 6). The average grade taught was eighth grade, and surprisingly, five individuals indicated teaching pre-kindergarten. These individuals represented schools from four states that provided special education courses, so this number may reflect the level of content rather than the age of the students being taught.

Table 6

Percentage of Teachers by Grade Level Taught

Grade Level Taught	Number of Respondents	Percentage of Total
Pre-Kindergarten	5	<1%
Kindergarten	78	3%
1st	81	3%
2nd	81	3%
3rd	93	4%
4th	141	6%
5th	100	4%
6th	122	5%
7th	154	6%
8th	185	7%
9th	352	14%
10th	382	15%
11th	403	16%
12th	376	15%

Specific Classes Taught Online

Specific classes reported to be taught online within the field of English/language arts include American Literature, British Literature, composition, writing, journalism, publications, mythology, science fiction/fantasy and creative writing. Mathematics courses were made up of pre-algebra, algebra I and II, geometry, pre calculus, calculus,

trigonometry, and consumer mathematics. Online courses taught within the field of social studies consisted of U.S. Government, politics, civics in cyberspace, world history, geography, and economics, and global studies. Science classes included general science, physical science, life science, biology, marine biology, environmental science, physics, astronomy, earth science, chemistry, and biotechnology, and anatomy. Elective courses consisted of a variety of foreign languages, such as Spanish, German, Latin, Chinese, and French. Other electives included business law, art and music history/appreciation, driver's education, computer applications, and study skills.

Years of Teaching Experience

K-12 online teachers responding to the survey had an average of 14 years of experience. This includes the number of years that they have been employed as a teacher, including both traditional as well as online environments. The minimum number of years of experience was 1 year, while the maximum number was 50 years. Experience specific to the current school, representing online teaching, was lower, with an average of 4 years. The minimum was 0 years of experience, with the 2007-2008 school year being the first year of teaching online. The maximum years of experience was 32, although it was noted that this number also included years of experience with distance education as well as online distance education.

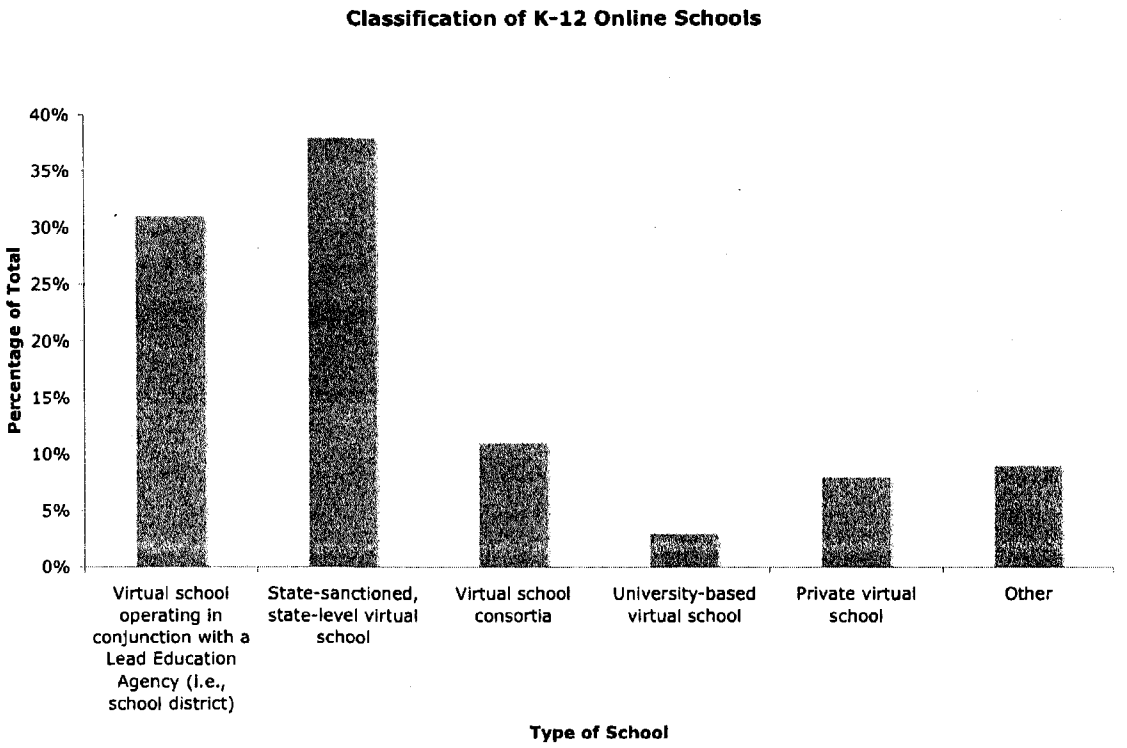
Nature of K-12 Online Schools and Classes

Data regarding the characteristics of K-12 online school and nature of specific classes were also gathered as part of the current study. The majority of participants (223, 38%) reported teaching at a state-sanctioned, state-level virtual school, with 132 (31%) teaching at a virtual school operated in conjunction with a lead educational agency.

Additional responses included virtual school consortia (64, 11%), a private virtual school (47, 8%), and other virtual school (53, 9%). Those that selected "other" responded that they worked at either a virtual charter school, a school that encompasses elements of a state-level and district level virtual school, or a nationally accredited online school (Figure 9).

Figure 9

Classification of K-12 Online Schools



The nature of the online classes was captured through a variety of elements, including the number of online classes taught, the format of those online classes (the amount of instruction taking place online), and the extent to which instruction happened

in real time (synchronous) versus offline. A total of 467 respondents (80%) indicated that all of their classes were taught online, while 38 (7%) taught half of their courses online, and 50 (9%) taught less than half of their courses online. The remaining respondents indicated that none of their courses were currently taught online, although correlating these responses with those from the first question found that while these teachers did not currently teach online, they had done so in the past.

In examining the amount of instruction taking place online, 80% reported teaching their entire class online, with the majority of face-to-face instruction being replaced by online activity. Hybrid classes, with 30% to 79% of the class being taught online, were reported by 7% of online teachers. Finally, 13% indicated that their classes were Web-facilitated, with 1-29% of instruction taking place online. In addition, 81% of online teachers reported that their instruction took place asynchronously, answering that there was no specific time that their students were required to be online to receive instruction. Twelve percent of online teachers responded that there were certain specific times when their students had to be online to receive brief instruction, while 6% stated that instruction took place synchronously and that their students were required to login at predetermined times to receive complete instruction.

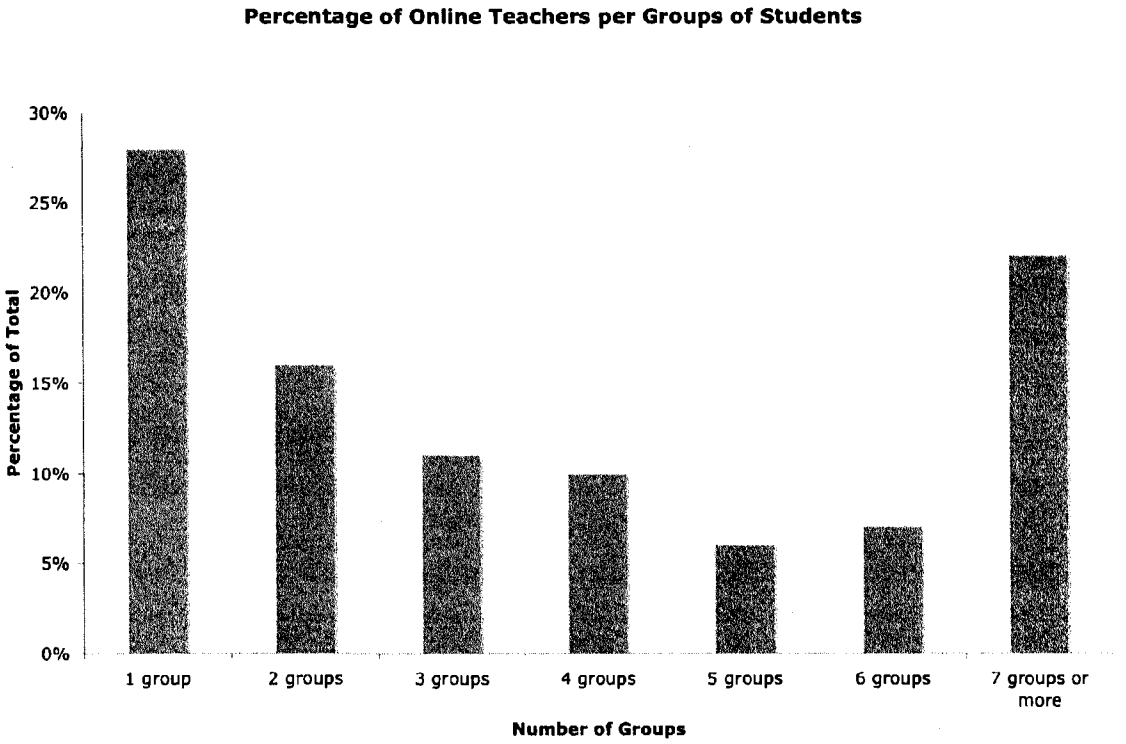
Number of Students and Classes Taught

K-12 online teachers responding to the survey reported teaching an average of 97 students. However, there was a wide variance in responses, from no current students to 2,000 students. Several teachers also indicated that the number of students they taught varied or was difficult to determine. In addition to the number of students, 152 (28%) reported teaching one group of students, while 121 (22%) taught seven or more groups of

students. Eighty-nine (16%) taught two groups of students, 64 (12%) taught three groups of students, 57 (10%) taught four classes, and 32 (6%) taught five classes, and 37 (7%) taught six classes (Figure 10).

Figure 10

Percentage of Online Teacher Per Groups of Students

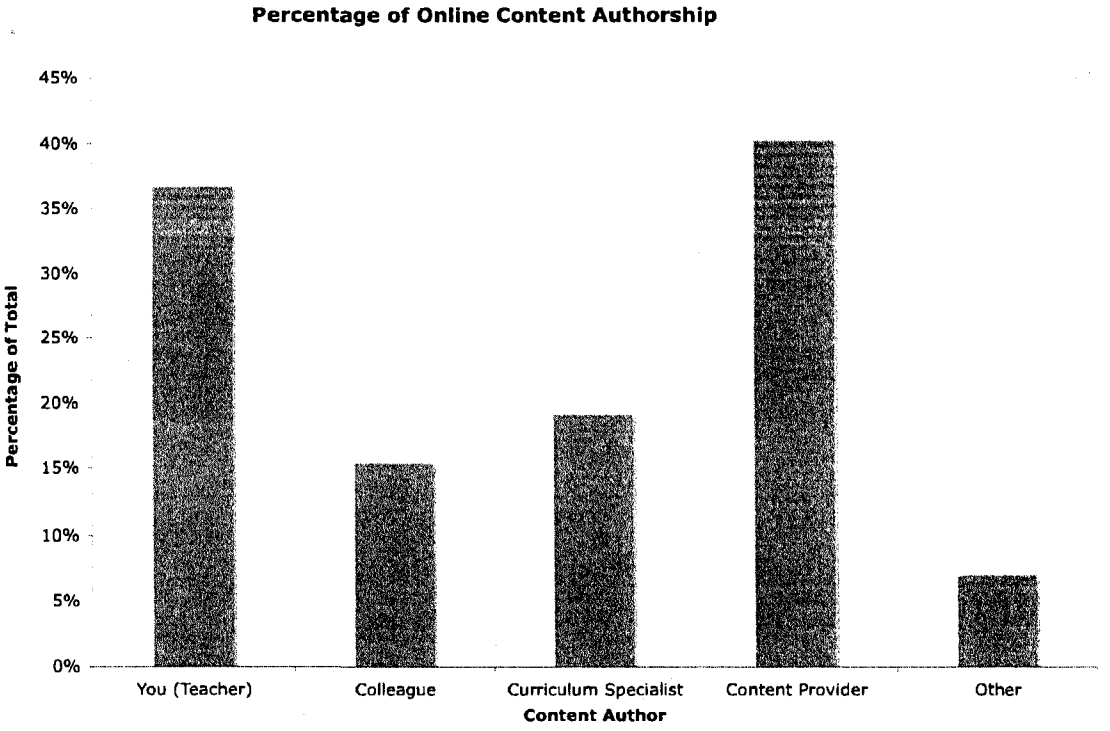


In addition to the groups of students taught online, surveyed teachers also reported the primary author of the content used to teach online, selecting as many sources as appropriate. A total of 219 (38%) responding K-12 online teachers indicated that they were the author themselves, while 240 (42%) reported using a content provider such as Apex Learning, K-12 curriculum, or Virtual High School. A curriculum specialist was cited as the primary author by 114 (20%) of online teachers, while 92 (15%) cited a

colleague. Forty-two (7%) selected "other" as the primary author, and this included collaborations among various individuals such as the teacher together with a curriculum specialist or colleague. Other sources indicated were comprised of Web resources, traditional texts, online consortiums, and textbook publishers (Figure 11).

Figure 11

Percentage of Online Content Authorship



While the first 19 questions focused on the demographic nature of K-12 online teachers, and the characteristics of their classes and schools, Questions 20 and 21 focused on their perceptions of their own knowledge and preparation levels with respect to the TPCK framework. The following section reports the results of online teachers'

knowledge and preparation levels along the areas of technology, content, pedagogy, and the combinations of each of these fields.

TPCK Knowledge Levels of K-12 Online Teachers

In addition to demographic, school, and classroom-related questions, those responding to the K-12 Online Teacher Preparation Survey were asked, *How would you rate your own knowledge in doing the following tasks associated with teaching in a distance education setting?* Twenty four items along the areas of technology, pedagogy, content, and the combination of these areas were asked, and the scale for answering was 1 (*Poor*), 2 (*Fair*), 3 (*Good*), 4 (*Very Good*), and 5 (*Excellent)*. These data were gathered to answer the second research question: What is the perceived knowledge level of those who teach in an online environment specific to technical expertise, online pedagogy, and content area, including the combinations of these domains?

The average mean for all subitems for Question 20 was 3.81. The overall median and mode for items (a) through (x) was 4, with a minimum of 1, a maximum of 5, and a standard deviation of .939. The number of respondents, mean, and standard deviation are reported for each item in the Table 7.

Table 7

Summary of Descriptive Statistics Results for Question 20, How would you rate your own knowledge in doing the following tasks associated with a distance education setting?

Subscale	Item	Responses	Mean	Standard Deviation
Pedagogy	[c]	556	4.18	.765
Pedagogy	[j]	547	4.01	.769
Pedagogy	[r]	542	3.92	.802
Technology	[a]	559	3.20	1.12
Technology	[g]	555	3.44	1.12
Technology	[q]	545	3.04	1.14
Content	[b]	558	3.98	.929
Content	[d]	554	4.05	.888
Content	[m]	542	4.03	.840
Pedagogical Content	[f]	555	3.98	.834
Pedagogical Content	[i]	553	3.91	.772
Pedagogical Content	[s]	542	4.23	.810
Pedagogical Content	[u]	541	4.04	.781
Technological Content	[o]	541	3.81	1.04
Technological Content	[t]	533	4.01	.937
Technological Content	[v]	537	3.79	1.11
Technological Pedagogy	[h]	554	3.87	.955
Technological Pedagogy	[l]	542	3.76	.934
Technological Pedagogy	[n]	538	3.57	1.12
Technological Pedagogy	[p]	541	3.40	1.10
Technological Pedagogical Content	[e]	555	3.79	.999
Technological Pedagogical Content	[k]	545	3.53	.931
Technological Pedagogical Content	[w]	541	3.76	.983
Technological Pedagogical Content	[x]	548	4.07	.874

Table 8 summarizes the results for each of the subscales within Question 20, *How would you rate your own knowledge in doing the following tasks associated with teaching in a distance education setting?*

Table 8

Summary of Descriptive Statistics for Subscales of Question 20, How would you rate your own knowledge in doing the following tasks associated with a distance education setting?

Domain	Number of Items	Number of Responses	Mean	Standard Deviation	Cronbach's Alpha
Pedagogy	3	1645	4.04	.779	.772
Technology	3	1659	3.23	1.12	.888
Content	3	1654	4.02	.886	.761
Pedagogical Content	4	2191	4.04	.805	.799
Technological Content	3	1611	3.87	1.03	.699
Technological Pedagogy	4	2175	3.65	1.03	.772
Technological Content Pedagogy	4	2189	3.79	.947	.785

TPCK Preparation Levels of K-12 Online Teachers

In addition to gathering data related to the perceived knowledge levels of K-12 online teachers, responses regarding their preparation to teach online were also tabulated using the TPCK framework. Question 21 asked participants, *How prepared do you feel you were by your teacher preparation program to do the following tasks in a distance education setting?* The same items asked in Question 20 along the areas of technology, pedagogy, content and the combinations of each area were repeated for Question 21 using a scale of (1) Not at all prepared (2) Not very prepared (3) Somewhat prepared (4) Very well prepared (5) Extremely well prepared. These data were gathered to answer the third research question: What is the perceived preparation level that of those who teach in online environments specific to technical expertise, online pedagogy, and content area, including the combinations of these domains?

The average mean for Question 21 was 2.86. The overall median and mode for items (a) through (x) was 3, with a minimum of 1, a maximum of 5, and a standard deviation of 1.19. The mean and standard deviation are reported for each item in Table 9.

Table 9

Summary of Descriptive Statistics Results for Question 21, How prepared do you feel you were by your teacher preparation program to do the following tasking in a distance education setting?

Subscale	Item	Responses	Mean	Standard Deviation
Pedagogy	[c]	547	3.49	.991
Pedagogy	[j]	539	3.29	1.04
Pedagogy	[r]	532	3.25	1.06
Technology	[a]	547	2.24	1.18
Technology	[g]	545	2.26	1.17
Technology	[q]	535	2.07	1.13
Content	[b]	547	3.12	1.20
Content	[d]	544	3.37	1.03
Content	[m]	533	3.29	1.09
Pedagogical Content	[f]	546	3.18	1.10
Pedagogical Content	[i]	544	3.10	1.08
Pedagogical Content	[s]	536	3.58	1.06
Pedagogical Content	[u]	533	3.36	1.06
Technological Content	[o]	533	2.76	1.29
Technological Content	[t]	525	2.91	1.31
Technological Content	[v]	529	2.52	1.40
Technological Pedagogy	[h]	544	2.62	1.34
Technological Pedagogy	[l]	533	2.60	1.29
Technological Pedagogy	[n]	529	2.47	1.35
Technological Pedagogy	[p]	535	2.46	1.32
Technological Pedagogical Content	[e]	544	2.76	1.28
Technological Pedagogical Content	[k]	535	2.52	1.23
Technological Pedagogical Content	[w]	533	2.71	1.26
Technological Pedagogical Content	[x]	536	2.68	1.36

Table 10 summarizes the overall results related to preparation levels along each of the subscales within the TPCK framework.

Table 10

Summary of Descriptive Statistics for Subscales of Question 21, How prepared do you feel you were by your teacher preparation program to do the following tasking in a distance education setting?

Domain	Number of Items	Number of Responses	Mean	Standard Deviation	Cronbach's Alpha
Pedagogy	3	1618	3.34	1.03	.866
Technology	3	1627	2.19	1.16	.920
Content	3	1624	3.26	1.11	.824
Pedagogical Content	4	2159	3.31	1.33	.891
Technological Content	3	1587	2.73	1.028	.844
Technological Pedagogy	4	2141	2.54	1.33	.928
Technological Content Pedagogy	4	2148	2.67	1.28	.902

Comparison of Results Between Knowledge and Preparation Levels

In order to answer the forth and final research question for the current study: Is there a relationship between the perceived knowledge level and preparation level of K-12 online teachers with respect to technical expertise, online pedagogy, and content area? a comparison of descriptive statistics from Questions 20 and 21 was conducted using an independent groups t-test. All of the comparisons between knowledge and preparation means were found to be statistically significant at the .01 level (two-tailed) (Table 11).

Table 11

Summary of Difference Between Current Knowledge and Preparation Levels

Domain	Knowledge Mean	Standard Deviation	Preparation Mean	Standard Deviation	Difference in Mean
Pedagogy	4.04	.779	3.34	1.03	.70**
Technology	3.23	1.12	2.19	1.16	1.04**
Content	4.02	.886	3.26	1.11	.76**
Pedagogical Content	4.04	.805	3.31	1.33	.73**
Technological Content	3.87	1.03	2.73	1.03	1.14**
Technological Pedagogy	3.65	1.03	2.54	1.33	1.11**
Technological Content Pedagogy	3.79	.947	2.67	1.28	1.12**

**Difference is significant at the 0.01 level (2-tailed).

Inferential Statistical Analysis

In addition to this comparison, inferential statistics were also used to correlate the results between K-12 online teachers' perceive knowledge and preparation levels. Using SPSS software for Macintosh, version 16, a two-tailed Pearson product-moment correlation coefficient (r) was calculated between each of subscales for Questions 20 and 21. This was done to determine the extent of the relationship between each of the subscales related to the TPCK framework.

The lowest correlation coefficients for Question 20, asking participants to rate their levels of knowledge, was between the technology and the pedagogical content (n=523) subscales at r(521) =.278, p=.001. The highest correlation was between the technological pedagogy and the technological pedagogical content (n=514) subscales at r(512)=.787, p=.001. Question 21, which measured respondent's levels of preparation, resulted in higher correlations. These ranged from the correlation between the technology and pedagogy (n=517) subscales at $r(515)$=.514, p=.001 to the correlation between technological content and technological pedagogy (n=494) subscales at $r(492)$=.896, p=.001. Tables 12 and 13 report the correlation coefficients among each of the subscales (pedagogy, technology, content, pedagogical content, technological content, pedagogical content, and technological content pedagogy) to determine the extent to which online teachers' knowledge and preparation levels are related on each of the domains described by the TPCK framework. Correlations that are significant at the .01 level (two-tailed) are flagged.

Table 12

Correlations Among Subscale Variables for Question 20, How would you rate your own knowledge in doing the following tasks associated with a distance education setting?

	1.	2.	3.	4.	5.	6.	7.
1. Pedagogy	—						
2. Content	.690**	—					
3. Technology	.289**	.323**	—				
4. Pedagogical Content	.782**	.713**	.278**	—			
5. Technological Pedagogy	.544**	.540**	.488**	.561**	—		
6. Technological Content	.488**	.557**	.555**	.526**	.743**	—	
7. Technological Pedagogical Content	.595**	.544**	.570**	.609**	.787**	.773**	—

**Correlation is significant at the 0.01 level (2-tailed).

Table 13

Correlations Among Subscale Variables for Question 21, How prepared do you feel you were by your teacher preparation program to do the following tasking in a distance education setting?

	1.	2.	3.	4.	5.	6.	7.
1. Pedagogy	—						
2. Content	.823**	—					
3. Technology	.514**	.541**	—				
4. Pedagogical Content	.893**	.830**	.502**	—			
5. Technological Pedagogy	.552**	.592**	.828**	.550**	—		
6. Technological Content	.595**	.610**	.808**	.602**	.896**	—	
7. Technological Pedagogical Content	.632**	.652**	.828**	.625**	.895**	.893**	—

**Correlation is significant at the 0.01 level (2-tailed).

K-12 Online Teacher Open-Ended Responses

In addition to the quantitative data gathered for the current study, two open-ended questions were also asked, including Question 22. *Describe your overall experience with teaching online K-12 students. Was this type of teaching always a goal? What led you to your current position?* and Question 23 *Describe your overall experience with teaching online K-12 students*. One strategy for conducting qualitative analysis is homogenous sampling, in which a group of similar cases are examined in depth in order to describe a

particular subgroup (Patton, 1990). Using this approach, a content analysis strategy was used to make sense of the resulting data. This included the development of a coding strategy as patterns emerged among the responses. The responses were then coded into manageable categories using an interactive coding method whereby new codes were added as necessary throughout the examination of the text. By reducing the responses to categories consisting of a word, set of words, or phrases, specific patterns became evident. Each question is examined separately in the following section.

Content Analysis of Question 22, Describe the career path that led you to teaching online.

Question 22 asked respondents to complete an open-ended response regarding how they came to teach in the K-12 online environment. To encourage responses, participants were prompted with the sentence starter, *I began teaching online because...* to begin their answer. A total of 528 responses were gathered for Question 22 and 21 codes were used to classify the resulting data. The developed coding system was used to categorize the primarily reason teachers gave for going into online teaching. These codes are described in Table 14.

Table 14

Coding Scheme Used to Classify Responses to Question 22, Describe the career path that led you to teaching online.

Code	Definition	Number of Respondents	Percentage of Total
Ability to work from home	Expressing a desire to be able to work from home either in order to take care of young children or due to personal illness	98	19%
New model of teaching	Desire for a new and innovative way of teaching; desire for a new challenge and a better way to connect with students; intrigued by the possibilities of online teaching	76	14%
Employment	The need for employment; saw the job and applied for it; inability to find a traditional position in a particular subject area	53	10%
Flexibility of position	Desire to not have a set work schedule; the ability to decide when and where work occurs; the ability to create and change course content	39	8%
Supplement to income	Need for additional income to meet expenses; Desire to take on a second job	39	7%
Recruited	Asked by a principal or other authority to teach online and/or create content for an online course that then led to teaching	33	6%

(Table Continued)

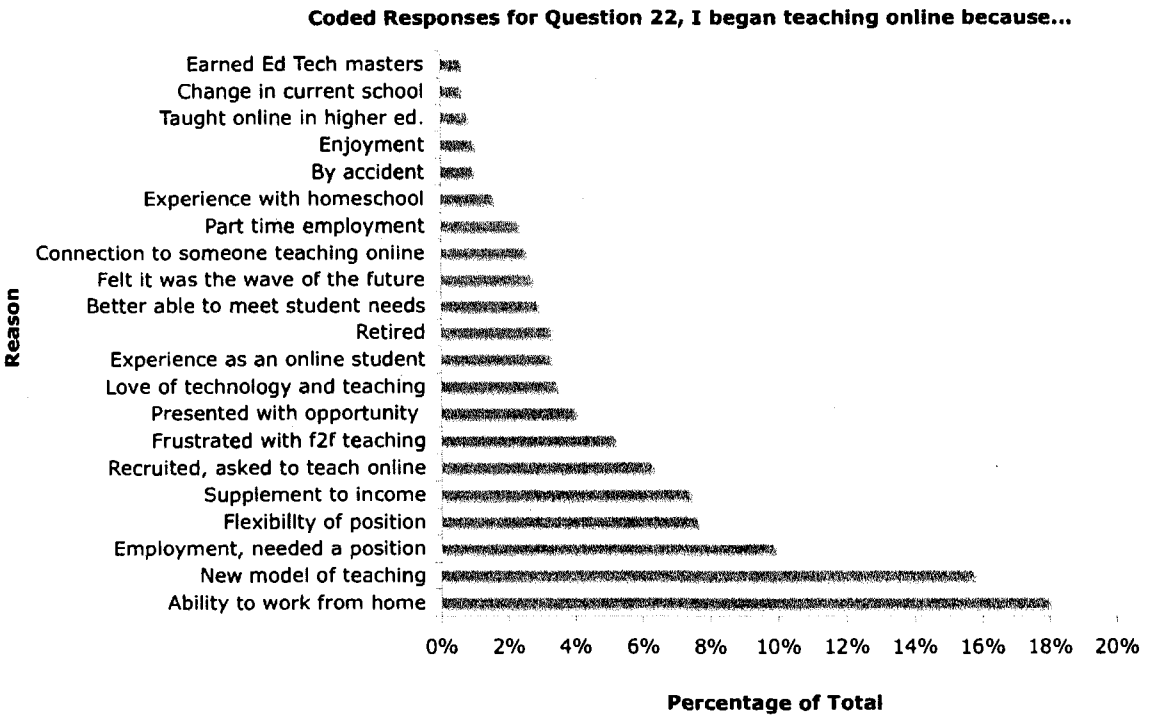
Frustrated with face-to-face teaching	Overwhelmed with the demands of traditional teaching including classroom management, administrative duties, not being able to meet student needs, lack of respect	27	5%
Opportunity	The chance to teach online presented itself	19	4%
Love of technology and teaching	Affinity toward to the use of technology and the desire to combine this passion with that of teaching	18	3%
Experience as an online student	Positive experience as an online student in either undergraduate or graduate classes	17	3%
Retired	Retired from traditional classroom with the desire to continue teaching	17	3%
Better able to meet student needs	Desire to work one-on-one with students; ability to provide students an education who might not otherwise have one (special needs, terminally ill, at-risk); ability to work with students from all over the world	16	3%
Wave of the future	Felt that online teaching was the future of education; Desire to be part of what is cutting edge in teaching	17	3%
Connection	Encouragement from a friend/colleague who was teaching online regarding the benefits of doing so	13	2%
Part time employment	Started online teaching via a part time position that expanded	12	2%

Experience with home school	Previously home schooled own children and became interested in online teaching	8	2%
By accident	Chance circumstance (i.e. personal illness, helping another colleague who then quit, applying for a position and not knowing that it was online)	5	1%
Enjoyment	Teaching online sounded like it was fun and would be rewarding	5	1%
Taught online in higher education	Gained experience teaching online in a higher education setting	4	1%
Change in current school	Either traditional or distance education school decided to add online courses	4	1%
Earned Ed Tech masters	Desire to use knowledge and experience gained by completing a master's degree in educational technology	3	1%

The distribution of responses is displayed in Figure 12.

Figure 12

Coded Responses for Question 22, Describe the career path that led you to teaching online.



The majority of respondents (98, 19%) expressed their desire to teach online because of the ability to work from home due to having small children at home and still wanting to be able to continue to have a career and earn an income. As one participant wrote:

> I began teaching online because....I wanted to continue my career in teaching, but also stay home with my children. I did not anticipate that this would be in my future, but after I had my first child, I knew that I did not want to work full time outside of my home. This seemed to be the perfect solution. I get to stay home.

One individual also indicated that working from home was a necessity due to her personal illness:

> I began teaching online because....I was searching a job posting board created by the Arizona Department of Education. I cam across a posting for a Title I Mathematics teacher position and I applied. I was a bit skeptical at first but I am very glad that I went in for the interview. I have suffered from a significant health problem over the last several years and teaching online enabled me to do what I love (teaching) while I was recovering from the illness.

These K-12 online teachers expressed the benefit of being able to teach from their homes, allowing them the freedom to be able to teach from a different location than their students.

Another major reason respondents reported for becoming involved with online teaching was the desire to participate in a *new model* of education (14%). Teachers in this category felt that this type of teaching was a new and innovative way of instruction that intrigued them. They were seeking a new challenge and a better way to connect with students. Teachers were drawn to the possibilities of online teaching and wanted to experience what online teaching was like. Specifically, as one teacher commented, "I was intrigued by the new model of education." Another agreed, "I was interested in this innovative learning and teaching model." This theme was elaborated on by a respondent who wrote:

> I began teaching online because....It is much more conducive to educational experimentation, new ideas, new theories. Public classrooms are stagnant and administrators frown on non-traditional methods of instruction. I took a virtual teaching job as a temporary escape from the classroom, then found it to be my niche.

This theme was echoed by a total of 76 (14%) online educators seeking a new, innovative form of teaching.

Employment was a reason cited by 53 (10 %) online teachers responding to the survey. Those citing this within their response included teachers who expressed the need for employment, saw the job opening, and applied for it. These teachers expressed difficulty finding a teaching position in a traditional environment, either in general: "jobs were tight," or due to a particular subject area: "Being in a tight field, social studies, I was happy to find a job," or because of their age: "I was a brand new teacher beginning a second career at age 50. Brick-and-mortar principals were not interested in hiring a new teacher who was middle-aged, but that did not matter to the online administration in our state."

Others sought a new job due to personal circumstances, such as making a move:

> I began teaching online because I needed a job!! We had just moved to the area, I had been in grad school but my husband's job moved us. They were hiring for summer school help, I went to interview and found out it was a virtual school. I was hired for the summer and it turned into a part time job for the fall. Then a year later it turned into a full time job. This type of teaching was never a goal of mine but I enjoy it now and continue to improve at it.

Several teachers commented that they were hired in an online teaching position right out of graduating from their teacher education program, but this was not their intention: "I began teaching online because it was the only school that offered me a job out of university. I never dreamed of becoming a virtual teacher but now that I am I do not want

to go back to classroom teaching." Other teachers were assigned to teach online, not necessarily by choice:

> I actually interviewed for a standard, 'conventional classroom' teaching but was assigned position teaching online. Since accepting this position, however, I have really become an advocate of online learning and I am very committed to continuing my career in this field.

Thirty-nine teachers (7%) cited flexibility as the major factor influencing them to pursue a career in online education. These teachers expressed the desire to not have a set work schedule. Specifically, they cited the ability to decide when and where work occurs. Respondents were quick to point out that teaching online did not mean that it took less time. On the contrary, they expressed how much more time they spent online, but they liked the fact that being online allowed them the flexibility to arrange their schedule as best they saw fit. According to one teacher, "I began teaching online because I wanted flexibility in my workday. I don't work less...probably work more...but my time is more flexible." Often the desire for flexibility was due to a family schedule with older school children, but it was not specifically to stay at home:

> I began teaching online because having children made it difficult to be at the school every night. I usually worked until 5 or 6 pm at the school and had to rely on others to deliver my kids to their activities. This model give me the flexibility to leave and work around their schedules.

In addition to the freedom related to scheduling, teachers also mentioned flexibility to create and develop content for their online classes as a major draw. As one participant put it, "I relish the freedom of working when I want and where I want, without a supervisor

micromanaging me. I enjoy the creativity of customizing the curriculum to individual students with their own learning styles, interests, aspirations, favored modalities, etc."

Another 39 (7%) respondents expressed their desire to earn additional income by taking on an additional job, which is what their online teaching provides. This group of respondents also teaches in a traditional classroom and use their online teaching to supplement their salary. For example, as one teacher commented, "I began teaching online because I saw a newspaper ad that was looking to hire online science teachers and was looking to supplement my income." In many cases, participants indicated that they were only able to find a part-time position in a traditional school:

> I began teaching online because I dropped to a part-time teaching contract in my building and wanted to pick up some extra income by working at home. I also wanted to move in this direction as it seems that education is moving there as well.

Experiencing the same situation, one teacher commented, "This was not something I had been geared towards but I decided to pursue it as a 1/2 time position to compliment the other 1/2 time position I already had in a school."

Teachers also came to be directly involved with online education through being recruited by administrators, curriculum developers, or others already working within the field. One respondent described this process in these terms:

> I began teaching online because I presented at a local college on a project I had been working on. After my presentation, I was approached by the director of IVHS at the time. He offered me the opportunity to see all that IVHS had to offer and that he felt I could offer IVHS something too.

Teachers who were recruited to teach online were often brought in to create specific courses, such as Advanced Placement courses. As one teacher wrote:

> I was hired to create and write the online course, by myself, for AP Human Geography in an online AP school called Virtual Virginia. I asked to teach part-time to understand how to create the course so that it would be teacher-friendly but effective for students to understand the curriculum and pass the AP exam.

Individuals also were specifically recruited to teach particular courses, as noted by another teacher, "I began teaching online because I was begged by an Assistant Principal to help them out of a jam because they needed a psychology teacher." Other teachers mentioned being recruited to take over a class for a teacher who left during the year: "The principal lost his mathematics teacher and asked me if I would fill in for the rest of the year. He asked if I would come back the next year and here I am."

Twenty-nine (5%) teachers expressed their frustration with working in traditional school settings and therefore sought out employment within the online environment. This theme included those who were overwhelmed with the demands of traditional teaching including classroom management, administrative duties, not being able to meet individual student needs, a lack of respect, a lack of support, and school politics. As one teacher wrote:

> I began teaching online because I was completely frustrated with teaching in the brick and mortar public schools. What I was doing in the brick and mortar school couldn't even be called "teaching." It was babysitting, with no administrative support. I was looking to leave education completely, and I had never heard of online/cyber teaching. I saw a job posting online, and I applied for it. I was at a

point in my career where I had nothing to lose. The school had just opened - was only 3 months old - and I really loved what they were trying to accomplish.

These teachers shared their frustration with teaching in a traditional school and wanted to find an alternative setting in which instruction was at the forefront, rather than having dealing with the non-teaching related challenges of the brick and mortar classroom. Another major source of irritation related to the traditional, face-to-face educational environment was the perception that the teaching had turned to nothing more than "teaching to the test." Several teachers cited this phrase as a reason for seeking a more positive experience at an online school:

> I began teaching online because....I was fed up with my job in a "regular" school. My former principal had me on his hit list; the demands thanks to NCLB and state requirements seemed to me to be TEACH to the TEST and no real work was getting done--children were (and are) being left behind daily. I was ready to dump it all and change careers--but had no idea how. Then I discovered this school thanks to a job recruitment fair. It is heaven!

> I began teaching online because I was unable to spend very much time teaching in the traditional classroom. Too much of the way I spent my day was dictated by those preoccupied with testing. With each passing year, I became less successful at being able include all the activities I wanted to be able to provide for my students along with satisfying the activities required by administration. Each year the administrative list increased. Evaluations became little more than check lists. I had a principal refuse to evaluate an afternoon of Marilyn Burns menu activities

in a 2nd grade class because she had never seen anything so "extravagant" before.

Where I am now - the "main thing" still seems to be the "main thing."

Nineteen participants (4%) expressed that the reason they were teaching online was that the opportunity presented itself, and they thought it would be a good experience. These responses were not specific beyond wanting to try it out. For example, one teacher explained that the challenge and opportunity were appealing. Another was more detailed in her response:

> I began teaching online because....the opportunity arose. All of the sudden, Chinese language became very popular. I had been teaching online and face-2-face history for 12 years, then this online Chinese opportunity came up. It sounded interesting and challenging. I needed a change.

In addition to working from home, seeking a new model of teaching, finding employment, having flexibility in one's schedule, earning supplemental income, being recruited, or pursuing a opportunity, a smaller number of teachers reported other reasons for wanting to work at an K-12 online distance education. Interestingly, three percent of surveyed online teachers reported that they were retired from the face-to-face classroom and now teaching online. While not the main reason, another eight teachers mentioned future retirement as a factor in their decision to teach online. Three percent also reported their positive experience as online students as the primarily factor leading them to want to teach in the K-12 online distance education field. The same number of teachers expressed their affinity toward to the use of technology and the desire to combine this passion with that of teaching, while another 3% cited their desire to work one-on-one with students, along with the ability to provide special needs, terminally ill, and/or at-risk students with

an education. Finally, three percent of participating teachers also felt that they wanted to be involved with online teaching because it was the future of education, and they had the desire to be a part of what is cutting edge in teaching.

Fewer teachers (2%) reported encouragement from a friend/colleague who was teaching online regarding the benefits of doing so as a major reason in getting them involved with online education. In addition, 2% either started online teaching via a part time position that expanded, or they previously home schooled their own children and became interested in online teaching through that process.

Finally, a small number of teachers expressed a variety of reasons for becoming online educators, including chance circumstance (i.e. personal illness, helping another colleague who then quit, applying for a position and not knowing that it was online), the fact that teaching online sounded like it was fun and would be rewarding, or having taught online in a higher education setting. A handful of teachers reported that their school decided to add online courses, so they had became involved, or they had earned a master's degree in educational technology and wanted to put what they had learned into practice.

Content Analysis of Question 23, Describe your overall experience with teaching online K-12 students.

Question 23 elicited an open-ended response from K-12 online teachers, asking about their overall experience with online distance education. Participants were presented with the sentence starter, *My experience with online teaching can be described as....*from which they could begin their answer. A total of 495 responses were gathered for Question 23; however, 13 (3%) of these responses discussed the nature of the participant's position, covering aspects of however long and in what roles the teacher had taught,

rather than a descriptive narrative of his/her experience. Because these data were captured by previous questions in the survey, responses that were not of an impressionistic, descriptive nature were discarded. The remaining 482 responses were then coded according to overall impression, including positive and negative aspects of teaching K-12 online distance education. Overall, 305 (63%) comments were positive toward their online teaching experience, and 38 (8%) were negative. Comments that were characterized as having both positive and negative elements accounting for 139 (29%) responses.

The majority of K-12 online teachers reported having a positive overall experience, sharing a number of benefits including not having to deal with the frustrating aspects of the traditional classroom such as classroom management. Within the positive category, there were 26 distinctions (59%) with overall impressions such as *positive, rewarding, good, enjoyable, wonderful, fulfilling, great, excellent, and exciting*. For example, as one teacher described her experience as "wonderful," citing the ability to work with student individual and actually "teach":

> My experience with online teaching can be described as wonderful! I love teaching online. I am able to work with students on an individual level. I can assist them at the level they need. Also, the organization I work for believes that the student is at the center of all we do. Teacher training is amazing. I now expect so much more of myself and other educators. I wish all teachers could experience a situation like this. We are able to teach! What a great feeling.

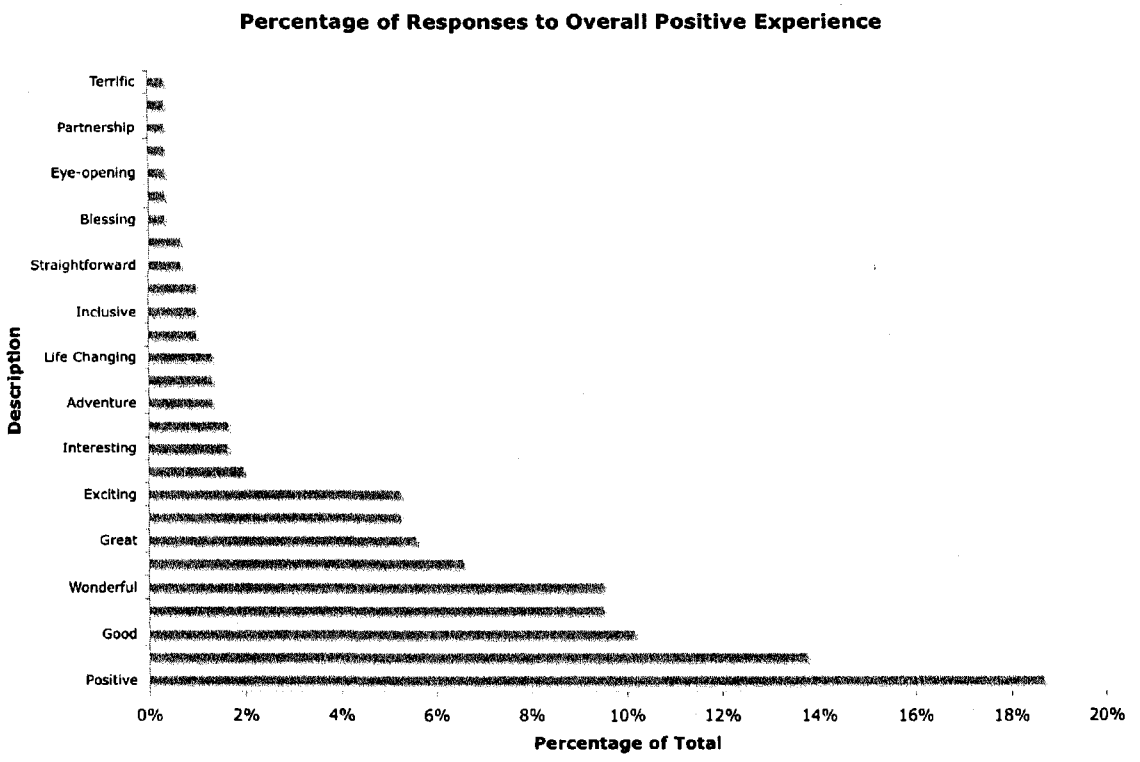
Another teacher discussed her overall experience as being positive, and explains that she loves everything about her position, including not have to worry about classroom management:

> My experience with online teaching can be described as...100% positive! I love every aspect of this job. Online school is not for every student (or teacher) but is wonderful for those of us it fits. Online school requires much more discipline on the part either of the student or the parent (who we call the learning coach). All classroom management problems and discipline problems have been taken out of my hands. I can only encourage, offer limited incentives and inform. So the student/parent must be the source of motivation.

Figure 13 displays the percentage of positive comments by category for Question 23, *Describe your overall experience with teaching online K-12 students.*

Figure 13

Percentage of Responses to Overall Positive Experience



Other teachers did not have a favorable experience with online teaching, expressing their frustration with the overwhelming nature of the position. This was described by one individual as disappointing:

> My experience with online teaching can be described as disappointing due to lack of support, the number of errors in the curriculum, lack of student discipline to complete assignments at an appropriate time, low pay, difficult programs and lack of technical support, the number of different classes (5) made it difficult to prepare effectively, poor student effort to improve, lack of support from student's schools, no little parent involvement, lack of application to AP Exams in May.

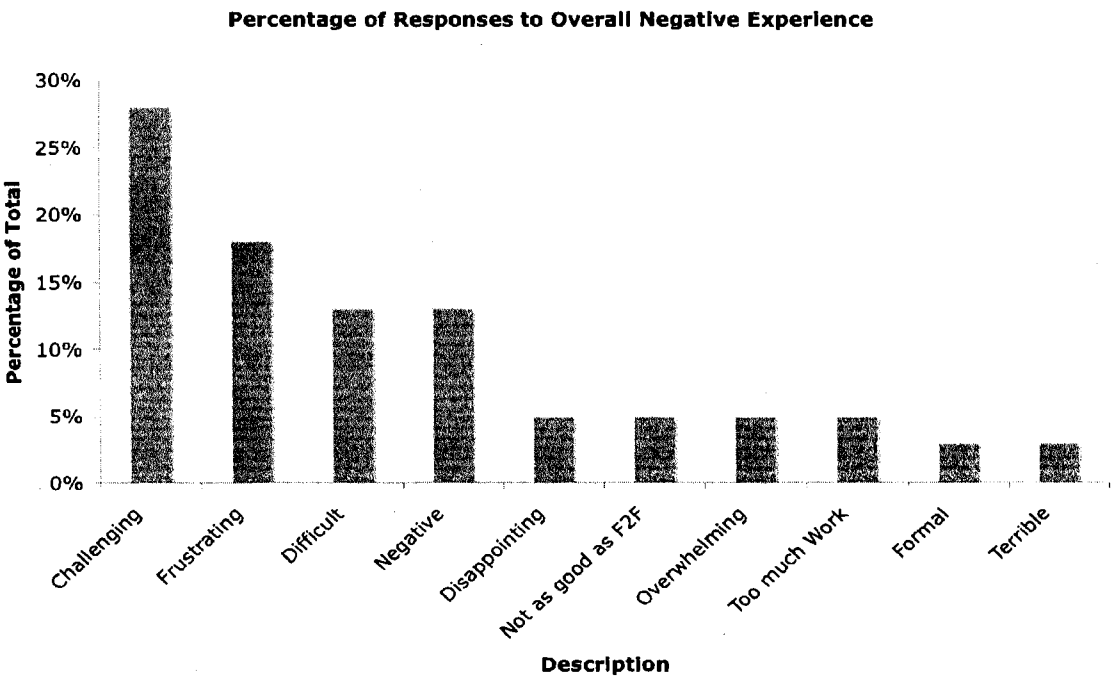
Another teacher described the experience as challenging, in a frustrated tone:

> My experience with online teaching can be described as...challenging. I don't believe that the role of an online teacher has been defined at this time. For example, high school teachers are often expected to carry student loads far and above that that would be allowed in a traditional classroom - especially at the high school level - because the technology can replace certain roles a traditional teacher fills. However, individualized communication with these students is disproportionate to the time a traditional teacher spends in communication.

Other negative categories included challenging, frustrating, difficult, negative, not as good as face-to-face instruction, overwhelming, formal (inflexible), and terrible. Figure 14 displays the percentage of negative comments by category for Question 23, *Describe your overall experience with teaching online K-12 students.*

Figure 14

Percentage of Responses to Overall Negative Experience



Four categories have elements of both positive and negative characteristics, and this "mixed" distinction accounted for 29% of responses. The four categories included *challenging but rewarding* (74, 56%,) *learning experience* or *learning curve* (42, 30%), *mixed* (17, 13%), *rollercoaster* (i.e., ups and downs) (4, 3%), and *Similar to face-to-face teaching* (2, 1%). *Challenging but rewarding* was a phrase used by many of the K-12 teachers, expressing both their concern about the position, including their position that it was time consuming, and not suited for all students, as well as the perceived benefits, such as the ability to work one-on-one with students and get to know them and their

families better than they would in a traditional classroom. This was exemplified by one teacher's response:

> My experience with online teaching can be described as...challenging and rewarding. I have the opportunity to work with families who have an interest in their child's education. I have found that to be refreshing. I also work with inner city students without worrying about teaching and living in the inner city. I find working with them to be very rewarding. There are many challenges though. I work harder now than ever before. No two years are ever the same.

Other respondents in this category expressed their overall experience with K-12 online distance education as "mixed" or a "mixed bag," again reflecting an overlap between positive and negative reactions. However, with this category, the value judgments are missing. It simply denotes a mix between advantages and disadvantages of online teaching. For example, one teacher explains:

> My experience with online teaching can be described as a mixed bag. I have taught remedial to AP courses, so I have run the gamut. The motivated students do well, the unmotivated do not and are harder to contact than in face to face school. Otherwise it is pretty much the same. Also I have far more one on one time with my online students than with my face-to-face kids.

Another category having both positive and negative elements is learning experience. This classification has beneficial aspects, such growing and gaining confidence in one's skills. It also has challenging characteristics including becoming frustrated, especially with having to learn various types of technology. On the positive side, one teacher writes:

> My experience with online teaching can be described as a learning experience! I have learned so much about computers/software/trouble-shooting. I would have never thought I could do so much on a computer. If you had asked me 8 years ago to even try to complete some of the work I now do I would have been flabbergasted! So, I learn and the students learn and we try to keep it educational, but still fun. This is a great teaching environment for teachers who are self-motivated, willing to learn, and who are good with doing a lot of work independently.

On the down side of *learning experience*, another teacher explains, "My experience with online teaching can be described as...a learning experience. I've experienced difficulties with an online textbook and had students experience technical difficulties, but I'm learning a lot. Other teachers in this category describe their learning experience as a *learning curve*:

> My experience with online teaching can be described as a steep learning curve. The teaching skills/practices are basically the same. It is the technology and software that have been a challenge to learn. I find it a terrific opportunity to try new ideas with my students because the computer opens up a whole new world to them. Many of them (3rd & 4th graders) are better at it than I am!

The term *rollercoaster* was used by a few teachers to describe the highs and lows of the online classroom. Teachers reporting this as characterizing their overall experience described it as having its ups and downs, and using the analogy of a rollercoaster to convey this sentiment:

> My experience with online teaching can be described as...a rollercoaster. Just like in face-to-face teaching the students are always ups and downs that come along. Our virtual classes have rolling enrollment which makes creating a group dynamic with classroom interactions a challenge. Many of my students are at-risk and just getting them to enter the course and continue working is a challenge, but I know the ones that do make it through that is one more student that I helped to be successful instead of dropping out.

Finally, two individuals described K-12 online teaching as being similar to that of the traditional, face-to-face classroom, highlighting the pros and cons and seeing similar issues that a teacher has to face in both environments:

> My experience with online teaching can be described as very similar to the traditional teaching experience: students still have the same issues, colleagues are still helpful and cooperative, and administrators are still harried and demanding. Differences are: online students are more prone to procrastination - I had to develop new methods for keeping them moving; plagiarizing is easier for students - I have to be more aware of the possibility of copying and pasting; technical problems are more of an issue - students are directed to technical help either at their local school or the virtual high school staff; students think a computer-based course will be easier - I have an extensive syllabus that dispels that notion at the outset.

Through the gathering of both quantitative and qualitative data using a developed instrument, the current study was designed to capture data related to K-12 online teachers in the United States. The purpose in doing so was to describe the demographic

characteristics of K-12 online teachers, in addition to their knowledge and preparation levels associated with each of the domains of the technological pedagogical content knowledge (TPCK) framework. This chapter presented findings concerning these areas. Implications based on these findings are discussed in Chapter 5.

CHAPTER 5

DISCUSSION

The purpose of this study was to explore the nature of K-12 online teachers throughout the United States, including their demographic characteristics and perceived knowledge and preparation levels along the domains of the TPCK framework. In order to describe this population of educators, survey data from 596 K-12 online distance education teachers were gathered and analyzed to answer the following research questions:

1. What are the demographic characteristics of those teaching in online K-12 distance education programs in the United States?
2. What is the perceived knowledge level of those who teach in an online environment specific to technical expertise, online pedagogy, and content area, including the combinations of these domains?
3. What is the perceived preparation level of those who teach in online environments specific to technical expertise, online pedagogy, and content area, including the combinations of these domains?
4. Is there a relationship between the perceived knowledge level and preparation level of K-12 online teachers with respect to technical expertise, online pedagogy, and content area?

This chapter evaluates the current study's findings and discusses their implications for the field of online distance education at the elementary and secondary school level. Limitations to this study and recommendations for further research are also discussed.

Summary of Activities

The goal of this research was to gather an overall depiction of those who teach in K-12 online distance education settings. Given that this study dealt with a large set of data for the purposes of examining a specific population, a survey methodology was used (Czaja & Blair, 2005). A Web-based survey composed of demographic questions, questions regarding school settings and teaching, and questions asking teachers to rate their level of knowledge and preparation with regard to technological pedagogical content knowledge was developed and administered to K-12 online teachers throughout the United States. Resulting data from this survey were then compiled and analyzed.

Summary of Data

As a result of this study, data now exist to describe a group of educational professionals who teach in a K-12 online setting. These individuals are predominately Caucasian, female, and are between the ages of 36 and 45. With 96% having a bachelor's degree, 62% holding a master's and 3% earning a doctoral degree, this population is highly educated. In addition to a high level of education, these teachers are also quite experienced, having an average of 14 years of teaching experience in both traditional and online environments, and an average of four years of experience related specifically to K-12 online distance education. Full-time K-12 online teachers comprised 54% of the surveyed population, with 36% teaching online in a part-time capacity, and the remaining teachers having multiple roles or roles specific to online teaching such as mentor or

learning coach. With respect to the online classrooms, 81% were reported being asynchronous, the majority of which were housed in either a state-sanctioned virtual school (38%) or a virtual school operating within a lead education agency such as a school district (31%). The majority of teachers (80%) taught all of their classes online, and reporting being responsible for average of 97 students.

When examining K-12 online teachers' views of their own knowledge and preparation with respect to each of the domains of the TPCK framework, scores were higher for teachers' perceived knowledge levels than their level of preparation from their teacher education program. The overall average for all domains pertaining to teachers' knowledge was 3.81, just below 4.00, or *Very Good.* Domains dealing with pedagogy, content, and pedagogical content had higher means (4.04, 4.02, and 4.04 respectively) as compared to those dealing with technology, which were lower, representing a rating of *Good* (3.23 for technology, 3.65 for technological pedagogy, 3.87 for technological content, and 3.79 for technological pedagogical content).

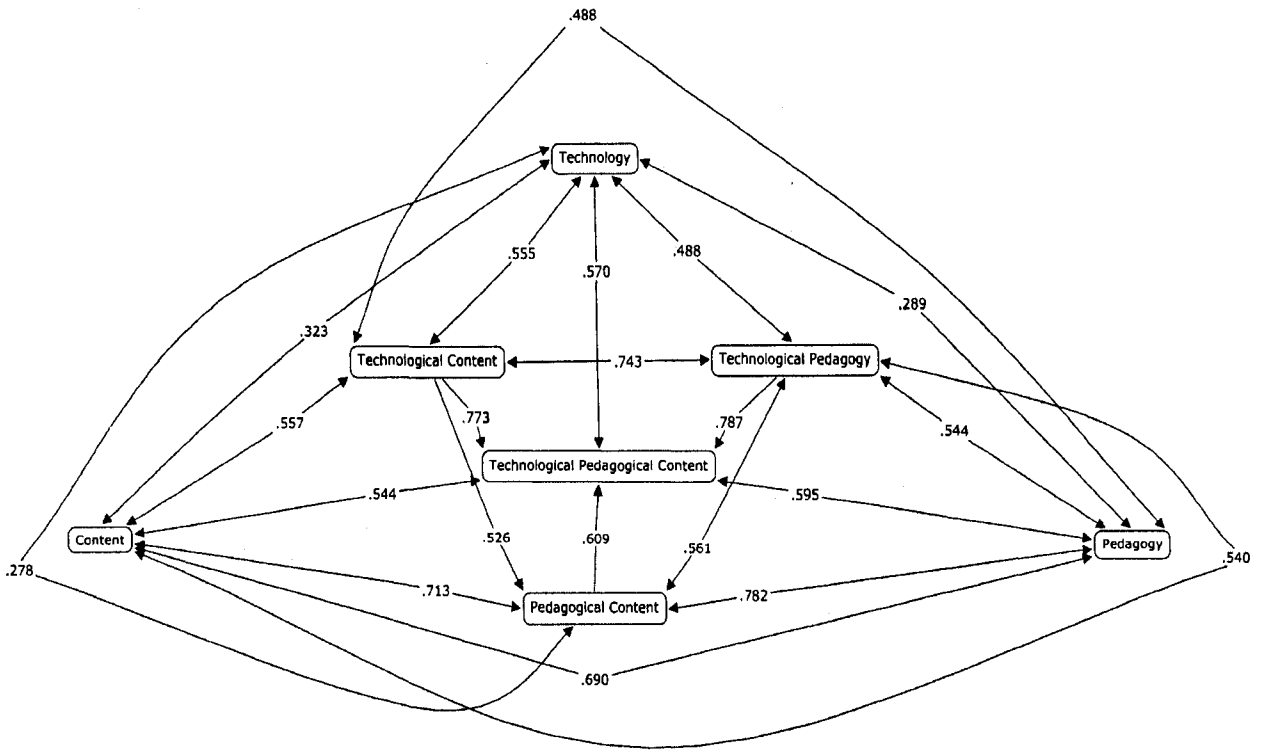
This trend of seeing lower scores along domains dealing with technology was also evident when analyzing K-12 online teachers' views regarding their teacher preparation, although the results were lower than those reported for knowledge. Specifically, mean scores for domains dealing with pedagogy and content ranged from 3.31 to 3.34, representing a rating of *Somewhat Prepared.* Within the domains related to technology, scores dropped from 2.19 (technology) to 2.67 (technological pedagogical content), representing a rating of *Not Very Prepared.*

Correlations among each of the domains within the TPCK framework related to knowledge revealed a small correlation between the domains technology and pedagogy

as well as technology and content (.289 and .323 respectively). Also low was the correlation between pedagogical content and technology (.278). However, there was a large correlation between pedagogy and content (.690). Other large correlations existed between pedagogical content and pedagogy (.782) and pedagogical content and content (.713). In addition, large correlations were also found between technological content and technological pedagogy (.743), and technological pedagogical content and both technological pedagogy (.787) and technological content (.733). Other correlations between each of the domains involving technology were moderate (ranging from .488 to .595). These correlations are visually depicted in Figure 15.

Figure 15

Correlations Among Technological Pedagogical Content Knowledge (TPCK) Domains



Correlations among each of the TCPK domains related to preparation followed a similar pattern, but overall, had higher correlations among all areas. For example, higher correlations were found among pedagogy and content (.823), while moderate correlations existed between pedagogy and technology (.514) and content and technology (.541). All other correlations ranged from moderate (between pedagogical content and technology, .502) to large (between technological pedagogy and technological content, .896).

Open-ended response data revealed that teachers began teaching online for a variety of reasons, including the ability to stay home with their small children (19%), the ability to engage in a new model of education (14%), and the need for employment (10%). Another segment of the population were retirees (3%) looking to stay involved in education while maintaining a flexible schedule. This flexibility was also mentioned as a major factor by 8% of the respondents. K-12 online teachers also reported an overall positive experience in this type of environment (63%), along with 29% sharing both positive as well as drawbacks to the experience. Only 8% reported a negative experience.

Findings

Based on the data from the current study, several key findings related to each research question came to light. In light of the first research question regarding the demographic nature of online teachers, data suggest that while K-12 online teachers are similar to their traditional counterparts in many ways, as a whole, they have more years of experience and more education than their traditional counterparts. Second, K-12 online teachers responding to this study found online distance education enabled them to work one-on-one with students in a more engaged manner, providing students with individual

support rather than having to focus on issues of classroom management and administrative tasks. In addition, respondents felt a greater sense of community with students, parents, and colleagues, and this was viewed as a major benefit.

Perceived knowledge of those who teach in an online environment specific to the TPCK framework, showed that knowledge of pedagogy, content, and pedagogical content were consistently rated higher than technology and any domain including the field of technology. The third research question looked to explore the perceived preparation level of K-12 online teachers, and this same finding was consistent with preparation levels. Teachers rated their preparation levels higher in relationship to the domains of pedagogy, content, and pedagogical content as compared with technology, technological content, and technological pedagogy. A relationship between perceived knowledge and preparation, which was addressed within the fourth and final research question, existed within the resulting data, as ratings on levels of preparation followed a similar pattern as those of knowledge. However, knowledge levels were consistently rated higher than those related to teacher education preparation, and the difference in means between preparation and knowledge were found to be statistically significant. In addition, data from this study have bearing on the notion of the TPCK framework, calling into question the validity of each of the domains described by the model. Each of these findings will be explored in the following section.

Discussion

There are many similarities between K-12 online teachers responding to the current study and a national sample of 63,135 traditional teachers from across the United States (Strizek, Pittsonberger, Riordan, Lyter & Orlofsky, 2006) responding to the

National Center for Educational Statistics' School and Staffing Survey. According to these data, the average age for a traditional teacher in the United States is 42.5, with 25% being male and 75% female. In terms of racial background, traditional teachers are made up of 83% Caucasian and 17% minorities, which is comprised of 8% African American, 6% Hispanic, 2% Asian, <1% Native American, and <1% mixed racial background. These demographic data are consistent with those reported by K-12 online teachers. The areas in which online teachers differed from their traditional counterparts included full time versus part time employment, years of experience, and levels of education.

Ninety-one percent of traditional teachers taught in regular, full time positions, while only 3% taught in part time roles, and the remainder in combined and substitute positions (Strizek et al., 2006). This is compared with 54% of surveyed online teachers in full time positions and 36% working in the field part time. In addition, 18% of traditional teachers had three or more years of teaching experience, and 82% had four or more years of experience. With online teachers, this figure was even more pronounced, with 10% teaching for three years or fewer, and 90% having four or more years of experience. Interestingly, online teachers responding to the current study who worked in a full time capacity, had an average of 12 years of both face-to-face and online teaching experience, and 3.9 years of online teaching experience. Those teaching online in a part-time role had an average of 16 years of overall teaching experience, and 4.3 years of online teaching experience.

Another area in which those surveyed from traditional teaching environments as opposed to online ones differed was level of education. While bachelor's degrees were identical by percentage (92%), online teachers reported a higher incidence of master's

degrees, at 62% versus 41% of traditional teachers. Also, 13% of online teachers reported having degrees and certifications beyond or in addition to their master's degree, as opposed to 7% of traditional teachers (Strizek et al., 2006).

The similarities and differences in demographic characteristics between traditional and online teachers only tell one part of the story. A more detailed profile is achieved by closely examining the open-ended responses provided by respondents to the current study. While many cited the ability to stay at home with their children as the predominant reason for becoming involved with online teaching, 14% expressed their desire for a new and innovative way of teaching and a better way to connect with students. This, combined with 5% who were overwhelmed with the demands of traditional teaching, and 3% who felt that online teaching was the future of education, depict a portrait of online teachers who have taught in the traditional classroom and find online teaching a better way to engage with the content and students. Many of these teachers see themselves as pioneers in a growing, ever-changing, and still developing field. As one teacher summarizes:

> My experience with online teaching can be described as fulfilling. I really feel that I can help each student individually. This is extremely challenging in a traditional classroom. I also enjoy the pioneering atmosphere in which we are helping create a new vision of education, a wonderful opportunity to explore the new and growing area of online education. My experience began as just a job, but has grown into a career which I have become passionate about. I feel that I am making a positive difference in the lives of the students that I come in contact with as I am able to help them achieve their educational goals.

Another 3% of online teachers reported that they were retired, with 2% who were planning to teach online during their future retirement from the traditional classroom. This was a surprising result, and represented the most seasoned and experienced teachers among the sample, with up to 40 years of traditional teaching. These individuals want to continue in the field that they love, while being able to have the flexibility to enjoy their retirement, including travel. They also can continue to make connections with students, which is particularly rewarding. One retiree writes:

> My experience with online teaching can be described as very good. We have lots of support and a couple of training type sessions per year. There is far less stress because we lack face to face interaction and that seems to free both sides to be more open. Students still try to pull off some plagiarism and cheating, but usually I can catch that. I love that my time is free and as a retired person, I can walk the dogs etc and still make a little money working in the field I love. I am particularly happy when I "connect" with a student and do a little encouragement and/or career counseling.

From the comparison to their traditional counterparts, as well as an examination of their open-ended responses for becoming involved with online distance education, it seems that those teaching in online environments are surprisingly experienced in the traditional classroom, as indicated by their years of experience and their levels of advanced degrees. The profile of an online teacher, then, as depicted from this study, includes those who are seeking a means to engage with students, parents, and content via the Internet in order to meet a variety of needs including a greater sense of community, a better, albeit different, connection with students and parents, and the ability to teach

without the constraints of a bell schedule or having to contend with issues of classroom management. From the descriptions of their experience with online teaching, they also appear to be innovative, adventurous, and willing to take on a challenge. Three percent of respondents expressed wanting to pursue online teaching to be able to combine their love of technology and teaching, and two specifically believed that their experiences with online teaching had made them a better face-to-face teacher:

> My experience with online teaching can be described as exciting and challenging. Science is one of the most difficult courses to teach in an online environment. It is also probably the most criticized by content face to face teachers. I have had to be more creative with my instruction as well as how I create my assessments. My online instruction has made me a more effective face to face teacher.

Building a profile of an online teacher from the current study consists of those who are willing and eager to pursue a new and innovative way of teaching that poses a unique set of benefits, especially being able to directly create and adapt content for use with students. This could explain the higher level of education, as these individuals seek out challenge and champion the learning process related to education, content-related areas, educational technology, and even distance education. In addition, in searching for a new way to engage, interact, and connect their content with students, this may imply that teachers had reached the pinnacle of their traditional teaching and sought a different challenge that also afforded them more flexibility, along with a greater focus on actual teaching. This could also account for the additional years of overall teaching experience for K-12 online teachers responding to the current study.

Knowledge Levels

K-12 online teachers responding to the current survey rating their knowledge at the highest levels for the scales of pedagogy (4.04), content (4.02), and pedagogical content (4.04). These average mean scores indicate that teachers feel very good about their knowledge related to their abilities to use a variety of teaching strategies, to create materials that map to district standards, to plan the scope and sequence of topics within their course, as well as skills that require the aspects of both pedagogy and content, such as the ability to recognize student misconceptions about a particular topic and the ability to distinguish between correct and incorrect problem solving techniques on the part of students. The highest rated individual item also fell within the category of pedagogical content, the ability to comfortably produce lesson plans with an appreciation for the topic [s] with an average response of 4.23. This suggests these online teachers are most comfortable with aspects of traditional teaching, and that they have the most experience with skills associated with face-to-face teaching.

Knowledge levels dropped by almost an entire point (.81) from the domains of pedagogy and content to technology. Online teachers responding to this survey were not as confident about their skills associated with troubleshooting computer hardware or software related problems. The lowest individually scored item fell within the area of technology, rating their ability to assist students with troubleshooting technical problems with their personal computers [q] at 3.04, which translates to a distinction of *Good.* When technology was combined with content or pedagogy, scores rose to 3.87 and 3.65 respectively. These ratings are not as high as those associated with pedagogy and content

alone, but not as low as the domain of technology by itself. In examining all three domains together, online teachers rated their skills at 3.79.

In examining the perceived knowledge levels of K-12 online teachers along the TPCK framework, it becomes evident that these teachers are quite confident in their abilities to perform as traditional teachers. They are less sure of themselves when it comes to their skills associated with technology and using technology to convey content to students, but they still feel that they are proficient and good at what they do. The theme of struggling with and learning new technology is one that is also evident throughout teachers' open-ended responses. Five individuals (1%) mentioned this as a downside of online teaching, explaining, for example, "Since I love teaching, it's OK, but I do not love teaching on line. Computers make me very nervous." Nine (2%) online teachers found incorporating technology both challenging and rewarding. As one teacher described it:

> My experience with online teaching can be described as better than I thought. I always believed I would be much better in person than through the computer, but I have found that I can still have relationships with students in this manner. I am not very competent with the computer but I am very strong in my subject matter. My students tend to be very good with the computer and not as competent in the Latin, so we make a good pair!

This sentiment seems to encapsulate how surveyed online teachers felt with regard to their knowledge within the TPCK framework. They are confident within their content area and their ability to teach. The challenge comes when trying to apply what they know to the best way to communicate content to students through the use of

technology. Despite this, they continue to find what works best and they are determined to keep trying different methods and strategies in order to do so. Six respondents specifically mentioned the ever-changing nature of online teaching, and the fact that they never taught their courses exactly the same way. They viewed their classes as works-in-progress. This is consistent with Lowes' (2005) findings that K-12 online teachers continually made changes to improve their courses, especially the courses that they had previously taught face-to-face. However, Lowes' study was focused on teachers from Florida Virtual High School, and issues related to pedagogy and content were paramount. The struggle with technology was not specifically addressed. This could be due to the timing of the study and the fact that many of the pedagogical and content related issues were still being addressed in the infancy of online distance education or simply to the differences in surveyed populations. Within the current study, teachers felt confident about their knowledge at the highest levels specific to items related to pedagogy, content, and pedagogical content. This may be as a direct result of their high levels of teaching experience within the traditional classroom, and the fact that many online teachers teach both in the face-to-face as well as the online environment.

Preparation Levels

Ratings of K-12 online teacher preparation from the current study followed a similar pattern to the way in which respondents rated their knowledge levels. The major distinction was that levels of preparation were consistently lower than those of knowledge. Teachers indicated that they were the most prepared in the areas of pedagogy (3.34), content (3.26), and pedagogical content (3.31), indicating that they felt somewhat prepared to teach along these domains. The highest rated individual item was consistent

with their knowledge ratings, as they indicated that they felt the most prepared to create lesson plans with an appreciation for the topic. This fits with the main activities of teacher education programs throughout the United States (Neely, 1986). When examining ratings of preparation along the technology domain, scores took a similar drop as when the respondents rated their knowledge levels of technology. However, the drop was more pronounced, with a difference of 1.15 between the domains of pedagogy and technology. Participants rated their technology preparation level at 2.19, translating to "not very prepared." When technology was combined with pedagogy or content, scores rose to 2.54 and 2.73 respectively. This demonstrates a similar pattern to respondents' knowledge level ratings.

In addition to the quantitative data, teachers confirmed these findings within the open-ended responses. One teacher addressed the issue specifically: "There are many technical details that a teacher must be prepared to handle to adequately teach in this environment." Another was very straightforward regarding the preparation to teach online: "This type of teaching was never a goal of mine but I enjoy it now and continue to improve at it. College did nothing to prepare me for teaching online."

Many of the teachers responding to the survey were more experienced in the traditional classroom, with years of teaching in the face-to-face environment. Online teaching was never a consideration, as the field of educational technology was not addressed when many of the respondents completed their teacher education programs. As one teacher described it, "When I took my preparation for teaching courses there were no such things as online courses! I have had in-service work, and we have good technical backup." Finally, despite the technology preparation teachers may or may not have had

while completing their teacher education programs, as new technologies continue to emerge, online teachers are faced with the challenge of keeping up to speed and learning how the incorporation of these tools could enhance their current teaching. This requires a through understanding of one's content, including the way the content is organized and what makes it understandable to students. One teacher expressed her concern with these issues:

> I strive to stay current with the latest innovations in teaching and this is a growing field but I see very few teachers at the HS level preparing for this. I had 30 years work experience prior to teaching and feel this background gives me a stronger technical background that the average classroom teacher I work with. They learn the barest information to teach textbook information, not understanding how to apply things to real work environment needs/demands.

The data from this study suggest that K-12 online teachers felt adequately prepared to deal with issues of pedagogy and content within their classrooms, but not as prepared to tackle challenges related to technology. These ratings suggest that teacher education programs have room for improvement when it comes to preparing teachers to use technology in a meaningful, content-driven way. It is possible that this finding could be related to the era in which the teacher development occurred. However, respondents with three or fewer years of experience rated their technology preparation level at 2.17, which translates to *not very prepared.* Based on these ratings, it seems evident that even current programs of teacher education are not adequately addressing the needs of those who teach online in K-12 settings, especially as they relate to the use of technology.

Technology, when it is addressed in teacher education programs, often takes place in an isolated course, devoid of the context of a content-related field (Hargrave & Hsu, 2000; Kay, 2006). This does little to prepare those who find themselves teaching in online settings. Currently, the vast majority of teacher candidates will go on to teach in traditional environments. However, they may at some point in the future, find themselves teaching an online class, as data from this study suggest that face-to-face teaching is a prerequisite for teaching online. Individuals who teach both online and face-to-face report their skills from online teaching enhance and improve their traditional classrooms. Updating teacher education programs so that they address not only pedagogical issues, but also how best to use modern technological tools to convey content and assess student understanding, should be a goal of colleges of education as we continue to advance into the 21st century.

The Relationship Between Preparation and Knowledge

In examining the relationship of data between perceived levels of preparation and knowledge, a significant difference between each of the domains exists. This difference is the lowest among the domains of pedagogy (.70), content (.76) and pedagogical content (.73). The difference between preparation and knowledge is highest among the combination of technology and pedagogy (1.14), technological content (1.11) and the overall domain of technological pedagogical content knowledge (1.12). Despite the difference between preparation and knowledge, there seems to be more of a connection between the teacher preparation programs and knowledge concerning pedagogy and content, and a greater disparity between how their teacher education program addressed the complex relationships among content, technologies, and educational practices.

This finding could indicate that participants do not directly connect their level of teacher preparation with their current knowledge, indicating that much of their skills have been acquired through other means such as self-study, professional development, and/or trial and error. From analyzing the responses to ratings of knowledge and preparation, together with open-ended responses, the overall portrait of a K-12 online teacher from the data gathered from this study show that for the most part, those involved in online distance education are self-starters, motivated, willing to try new methods and strategies, constantly adapting their practices, and in general, have an affinity for trying new things, especially when it comes to technology. According to one online teacher:

> I began teaching online because I love to learn and lead students to explore new knowledge. After teaching for 25 years and loving computer technology in the classroom, I began training to teach online. My goal was to teach online after retiring from my regular teaching assignment.

This sentiment, echoed by many K-12 online teachers from this study, expresses a genuine love of teaching and technology. It is possible that this affinity toward technology aided traditional teachers to self-select into the online teaching field, and their propensity toward using technology in their instruction is largely self-taught. This is most likely the case with older, more experienced online teachers whose teacher preparation program did not involve any use of technology.

While the relationship between preparation and current knowledge with regard to technology, pedagogy, and content shows a significant difference, interestingly, a pattern of responses is found when respondents rate how they were prepared along these domains as well as their own knowledge of these areas. This pattern displays the highest ratings

along the pedagogy, content, and pedagogical knowledge subscales; the lowest rating along the technology subscale; and scores of technological content, technology pedagogy and technological pedagogical content knowledge in the middle. This finding seems to suggest that teachers felt that they were best prepared with regard to pedagogy and content and this, together with their experience in the classroom, led to the highest ratings of knowledge along these same domains. This is likely related to the activities that traditional teachers do on a daily basis: planning lessons, using teaching strategies to convey content, mapping content to district standards, and assessing students' understanding of various topics. These are the foci of teacher education programs and make up a significant part of the instructional day. It is not surprising, then, that these areas have the highest ratings on both preparation and knowledge.

Correlations Among the TPCK Framework

In addition to examining the relationship between knowledge and preparation levels of responding K-12 online teachers, this study also looked at the correlations among each of the domains of the TPCK framework including technology, pedagogy, content, pedagogical content, technological content, technological pedagogy, and technological pedagogical content knowledge. While the TPCK framework is a relatively new conceptual model (Mishra & Koehler, 2005) based on an older, more developed construct of pedagogical content knowledge (PCK) (Shulman, 1986), there is a lack of research to measure how these domains interact with one another. With the extensive literature base on pedagogical content knowledge, this seems a logical place from which to begin examining TPCK. However, this literature is fraught with confusion regarding whether or not PCK is an actual domain. According to Gess-Newsome and Lederman

(1999), while PCK has the makings of a good model, including providing a useful organizational structure for examining teacher knowledge, it has problematic issues with its ability to discriminate between its componential parts (precision) and its ability to provide a useful explanation of data (heuristic power). As the authors explained:

> Precision can be judged by the discriminating value of the constructs included in the model, the relationship among constructs, and the match of this organization to the research data. Although PCK creates a home for the "unique" knowledge held by teachers (Shulman, 1987, p. 8), identifying instances of PCK is not an easy task. Within this volume, most authors agree that the PCK construct has fuzzy boundaries, demanding unusual and ephemeral clarity on the part of the researcher to assign knowledge to PCK or one of its related constructs (p. 10).

With the "fuzziness" created by PCK, this model becomes even more complicated with the addition of technology as a domain. This is evident from the data gathered from the current study. Correlations between pedagogy and content knowledge responses were high (.690) as were those between pedagogical content and content (.713) and pedagogical content and pedagogy (.782). These strong correlations confirm the questions raised by McEwan and Bull (1991) concerning whether or not pedagogy and content are separate fields. As they put it, "We are concerned, however, that his distinction between content knowledge and pedagogic content knowledge introduces an unnecessary and untenable complication into the conceptual framework on which the research is based..."(p. 318). Similar high correlations were found between technological content and technological pedagogy (.743), and technological pedagogical content and both technological pedagogy (.787) and technological content (.733). These correlations

call into question whether or not technology content, technological pedagogy, and technological pedagogical content knowledge are distinct domains as well. In contrast, the low correlations among technology and pedagogy as well as technology and content (.289 and .323 respectively), are more in line with what would be expected from separate domains.

While the framework of TPCK is helpful from an organizational standpoint, especially because it brings the important area of content to the discussion, the data from this study confirm that it faces the same problems as that of PCK. The TPCK framework does have practical appeal, providing an analytical structure for researching what teachers should know and be able to do, and highlighting the importance of content knowledge when incorporating the use of technology. These are important elements, as currently, there is a need for a greater emphasis on the use of technology as it pertains to a specific subject matter. As Koehler and Mishra (2008) elaborate, "Instead of applying technological tools to every content area uniformly, teachers should come to understand that the various affordances and constraints of technology differ by curricular subject-matter content or pedagogical approach" (p. 22). However, this appeal is tempered with the difficulty in measuring each of the constructs described by the framework. The inability to differentiate between and among these fields is significant, as it calls into question its precision, or whether or not the domains truly exist. It also diminishes the heuristic value of the model, specifically, the extent to which the framework helps researchers predict outcomes or reveal new knowledge (Gess-Newsome & Lederman, 1999).

From the current data, it seems that from the onset, attempting to measure each of these domains is complicated, muddled, and messy. The correlation data emerging from the current study do not support the distinction between and among each of the domains described by the TPCK framework. This did not come as a total surprise, as participants in the think-aloud pilot experienced difficulty in trying to decide between issues of pedagogy and content. They were challenged with separating out specific issues of content and pedagogy. Despite efforts on the part of the research to ensure that all pedagogy items dealt specifically with teaching strategies and methods, while content items covered materials, including their scope and sequence, and mapping to state/district standards, these domains were seen as part and parcel of the basic activities of teaching, rather than distinct fields.

Although TPCK makes practical sense, and does offer a useful organizational structure, adding the element of technology to Shulman's (1986) notion of pedagogical content knowledge befuddles an already complex model. While this study is not able to empirically validate the framework, TPCK did present a way to organize key areas of quality instruction incorporating the use of technology, along with offering important implications for examining issues related to online teaching. Specifically, it assisted the researcher to focus on important aspects, defined by the extensive literature on quality online teaching in higher education, that are salient to effective teaching in an online distance education environment. However, further study will be necessary to determine if and how the TPCK model can be validated or reconceptualized.

Implications for Teacher Education

This study has important implications for the field of online distance education and its teachers as well as for programs of teacher education who are, knowingly or unknowingly, preparing tomorrow's educators for the online classroom. The latest prediction is that in six years, 10% of all high school classes will be offered online, and by 2019, this figure will increase to 50% (Christensen & Horn, 2008). This is happening for a variety of social, economical, and political reasons including offering courses at lower cost, the opportunity to offer quality courses beyond a limited geographical area, and the ability to individualize content to meet student needs.

From the current study, data support that the vast majority of online teachers are coming from traditional classrooms, and 36% are working in the field part time, many of whom are teaching both face-to-face as well as online. It may be that there is an easier transition to the online classroom when teachers have a solid foundation of their content and pedagogical knowledge. This is a consideration that virtual schools will have to make in their hiring processes. While teachers are currently coming from the traditional classroom to teach in online settings, as the demand for online teachers increases, more educators will be recruited directly from undergraduate programs.

Whether online teachers come directly from the university or from the traditional classroom, data from this study suggest that teacher education programs prepare teachers for issues related to pedagogy and content, but have room for improvement when it comes to technology. This finding has implications for teacher education programs throughout the United States. The majority of programs address issues of using

technology in the classroom through a single course in educational technology (Hargrave & Hsu, 2000; Kay, 2006; Milken Exchange on Educational Technology, 1999; Novak & Berger, 1991). However, it is questionable that the knowledge and skills learned in this course translate to a methods or field experience, let alone classroom teaching (Pope, Hare & Howard, 2002). Because the integration of technology is unavoidable within the online classroom, it needs to be addressed within the context of content and pedagogy, throughout the teacher education program. Content is often taught in separate colleges, devoid of any educational context, let alone a focus on how subject matter can be changed by the application of technology. In order for teachers to be better prepared for the classrooms of the 21st century, teacher education may want to reconsider the role of the technology course and how technology is addressed within the entire degree program. Rather than having a single class, it would be beneficial to incorporate elements described by the TPCK framework throughout the teacher education program so that future online teachers learn to: (a) represent learning concepts using various technologies, (b) implement online pedagogical techniques that use technologies to teach content, (c) understand what makes concepts easy or difficult to learn, (d) understand how technology can help address learning problems, (e) grasp the importance of students' prior knowledge and theories of epistemology, and (f) understand how technologies can be used to build on existing knowledge and to develop new epistemologies or strengthen old ones (Mishra & Koehler, 2006).

This could be accomplished throughout a variety of courses, especially those that are contextualized, such as content methods. In addition, putting these skills to use throughout appropriate field experiences including observations and practica, both in

online and traditional settings, is essential to developing teachers who are prepared to use technology in their teaching as a way of doing business.

Due to the increase of online students, especially in secondary settings, the challenge of preparing well-qualified teachers to teach in Web-enhanced, blended, and online environments is of increasing significance. The blending of the content, pedagogy, and technology domains would result in a candidate who is adequately prepared to face the challenges of online teaching. This includes the understanding of how concepts are represented using technology and how pedagogical strategies are used in constructive ways to teach content. As such, the goal of teacher education programs should be to include course work, field experiences, and assessments that provide a unique background in each of these domains to best prepare teachers to enter online, traditional, and blended educational environments of the 21st century.

Areas for Future Research

Although this study gathered a large amount of data from a cross-section of K-12 online teachers, there is still a tremendous amount of research to be done regarding this relatively new and burgeoning field. First, there appears to be a disparity between virtual schools that allow their teachers to create their own content and those that use materials developed by a content provider, colleague, or curriculum specialist. From the expansive qualitative data, the experience on the part of the teacher with relationship to how much control they had to change their course(s) seemed to be an issue. This would be an interesting area to explore, including who provides content, how it is created, and how content is evaluated for possible use and adoption.

Another area for future research is how the experience of traditional classroom teachers impacts their online teaching. The question as to whether or not online teachers should first be required to teach in a face-to-face classroom is also of concern. This could involve how online teachers conceptualize the domains of content and pedagogy, whether or not years of face-to-face teaching experiences leads to the blending of these domains, and how this might impact successful online teaching.

In addition to the preparation provided by teacher education programs, professional development for online teachers is a major area of research. This includes what types of professional development related to content, pedagogy and technology for teaching in an online environment are the most beneficial, and how the needs of K-12 online teachers compare to those in the traditional classroom. It also has the potential for evaluative research that measures the effectiveness of various types of profession development and offers a set of principled practices for the training of K-12 online teachers.

In addition to research areas related specifically to the preparation and professional development of K-12 online teachers, a further research area stemming from this study is the further examination of the TPCK framework. This model remains to be validated, and data from the current study suggest that perhaps there is a different structure to describe the domains of technology, pedagogy, content, and their possible interactions. While a difficult pursuit, it is an important area of research to test, validate, and modify models that influence the way knowledge is conceptualized.

Limitations

Although a tremendous amount of data can be gained via a national quantitative study, a survey is inherently limited by its items and scales. Even with two pilot studies, think-aloud pilots, and expert review, there are specific questions that should have been asked differently, others that could have been added, and those that could have been omitted. For example, the question regarding age would have been more precise if respondents were asked to enter their specific age or year of birth. The responses to the role of the online teacher could have consisted of full time, part time, multiple, or other, rather than going after substitute roles that were unlikely. Also, instead of asking about years of experience "at this school, " simply years of experience in online teaching would have been more specific and to the point. While every measure was taken to minimize instrument error, it inevitably compromises the accuracy of the measured variables. This is the restrictive nature of a one time survey, and subsequent questionnaires will be informed by these results.

Also, because respondents' email addresses were gathered via the Web, there could be a bias in those schools that decide to publish their teachers' information as opposed to those who do not. To combat this, large consortium groups were contacted, and after some confusion, were allowed to participate. The goal was to cast a wide net among K-12 online teachers to gather as many responses as possible. However, because the study relied on self-report data gathered via an emailed survey, there are inherent accuracy issues, in which the researcher cannot directly verify the precision of the responses.

As with all methods of data collection, Internet surveys have their own disadvantages (Fowler, 2002). One of these is not having a personal contact associated with the administration of the survey, and no incentive to encourage participation. This potentially resulted in a lower response rate (33%) than would occur with other types of surveys. The response rate significantly limits the ability of the researcher to generalize to the overall population of K-12 online teachers. This limited ability to make generalizations is a primary limitation of the current study. Accordingly, it should be noted that the reporting of results from the current study reflected a sample of K-12 online teachers and do not necessarily reflect the population as a whole. Also, because respondents were asked about their knowledge, a current construct, together with their preparation, something that happened years ago, it is possible their responses were influenced by one another. The observed patterns then, could be a result of this pairing, rather than an actual effect.

Another limitation of this study is the fact that survey research consists of self-report rather than the measurement of observable behavior. Self-report is susceptible to a certain degree of bias. Despite of the use of methods suggested by Fowler (2002) and Gall et al. (2003) to reduce the potential for social desirability bias, such as wording survey items with neutral language, self-administration of the instrument, and ensuring the anonymity of responses, it is possible that such bias occurred.

Finally, additional construct validation of the items used to measure the TCPK framework would be beneficial. These constructions are still in need of more extensive and thorough validation measures. This could be achieved through a factor analysis of the items asked in Questions 20 and 21, followed by a hierarchical multiple regression using

the resulting factors to inform the TCPK models. As discussed, this is an area for future research.

Conclusion

The field of K-12 online distance education is continuing to expand and grow, specifically through the proliferation of virtual schools throughout the United States. Increasingly, a growing number of educators find themselves teaching in a virtual classroom without walls. Until this study, there was a lack of data concerning the population of educators who teach online, their characteristics, preparation, and whether or not they differ from the general teaching population. The purpose of this study was to describe those who teach in K-12 online environments through data collected via a national survey. A total of 596 K-12 online teachers responded to the survey, representing 25 states, and the gathered data were analyzed to answer four research questions, including their demographic nature, their perceived knowledge level of items addressing the TPCK framework, their perceived preparation level of the same framework, and the relationship between how they rated their knowledge and preparation.

Results indicated that the survey respondents were a group of motivated, innovative individuals, eager and willing to learn, and valuing the opportunities and advantages that online distance education can provide. This includes being able to connect with their content and students in a more individualized manner, without the constraints and management issues that go hand-in-hand with a face-to-face classroom. These teachers share similar characteristics to the general teaching population in terms of age, gender, and ethnicity, but they have increased experience and education levels.

Respondents' ratings of their own knowledge relative to the TPCK framework are highest among the domains of pedagogy, content, and pedagogical content, indicating that they overall, they felt very good about their knowledge related to these domains. Ratings of knowledge levels concerning technology dropped to *Good*, while the combination of technological pedagogy, technology content, and technological pedagogical content resulted in ratings of 3.87, 3.65, and 3.79 respectively. This same pattern of responses was observed in K-12 online teachers' ratings of their preparation with regard to the TPCK framework. However, preparation levels were lower along every domain. Overall, teachers felt somewhat prepared along the domains of pedagogy, content, and pedagogical content, and not very prepared for those domains involving technology. For teachers using technology as a major means of interacting and engaging with their students, this finding shows room for improvement when it comes to addressing issues of technology within the context of content and pedagogy throughout programs of teacher education in the United States.

The relationship between levels of preparation and knowledge showed a significant difference between each of the domains. This difference was lowest among the domains of pedagogy (.70), content (.76) and pedagogical content (.73), and highest among the combination of technology and pedagogy (1.14), technological content (1.11) and the overall domain of technological pedagogical content knowledge (1.12). This may indicate that participants do not draw a connection between their level of teacher preparation with their current knowledge, suggesting that many of their skills have been acquired through other means such as self-study, professional development, and/or trial and error.

This study examined those teaching in K-12 online environments, as well as the validation of the TCPK framework. Responding teachers were highly educated, motivated, and felt skilled and adequately prepared in the domains of pedagogy, content, and pedagogical content. They felt the least prepared when it came to the field of technology. These findings have important implications, especially for the field of teacher preparation, which will need to adapt to prepare future teachers for settings other than the traditional classroom. This includes the integration of technology throughout content courses as well as field experiences where the use of technology can be contextualized, rather than in a single, isolated technology course. In addition, because preservice teachers may in fact become online teachers, education programs may want to consider requiring students to experience the nuances of taking an online course in order to expose them to an ever-increasing method of learning. These suggestions offer teacher education programs direction as they strive to better prepare the educators of tomorrow. Through this study, a better understanding of K-12 online teachers, their characteristics, views on their knowledge and preparation, and reasons and experiences with teaching in a virtual environment now exist. It is through the findings of this research, and subsequent studies, that future K-12 online teachers will be better equipped to face the challenges of the classrooms of the 21st century.

APPENDIX A

VIRTUAL SCHOOL TEACHER PREPARATION SURVEY

Instructions: The following survey items are intended to gather information about your background and preparation as an online educator. Please select the response that best describes your current teaching situation.

1. Do you currently teach at least one class in grades K-12 online?
   - ☐ I currently teach at least one class online.
   - ☐ I do not currently teach online but I have previously taught an online class.
   - ☐ I have never taught an online class.

2. In which state do you currently teach?

   _____

3. What is your gender?
   - ☐ Male
   - ☐ Female

4. What race/ethnicity do you consider yourself?
   - ☐ White/Caucasian
   - ☐ Black/African American
   - ☐ Asian or Pacific Islander
   - ☐ Hispanic
   - ☐ Native American or Alaskan native
   - ☐ Mixed racial background
   - ☐ Other _____

5. What is your age group?
   - ☐ 21-25
   - ☐ 26-35
   - ☐ 36-45
   - ☐ 46-55
   - ☐ 55 and above

6. How would you classify the school in which you currently teach?

- ☐ Virtual school operated in conjunction with local education-based agency(i.e. a school district)
- ☐ State-sanctioned, state-level virtual school
- ☐ Virtual school consortia, such as *Virtual High School* (VHS)
- ☐ University-based virtual school
- ☐ Private virtual school
- ☐ Other _____

7. How do you classify your main assignment at THIS school (i.e., the activity at which you spend most of your time) during this school year? *(Check one only.)*

- ☐ Regular full-time teacher
- ☐ Regular part-time teacher
- ☐ Regular combined teacher (i.e., your assignment requires you to provide instruction at more than one school, but you work the most hours at this school)
- ☐ Long-term substitute (i.e., your assignment requires that you fill the role of a regular teacher on a long-term basis, but you are still considered a substitute)
- ☐ Other staff who teach regularly scheduled classes (e.g., administrator, library media specialist or librarian, support staff, other professional staff including counselor and social worker)
- ☐ Other *(specify)* _____

8. Which best describes the way YOUR classes at this school are organized? (*Check one only.*)

- ☐ All of my classes are taught online.
- ☐ About half of my classes are taught online.
- ☐ Less than half of my classes are taught online.
- ☐ None of my classes are taught online.

9. Which of the following best describes the format of your *online* classes? (*Check one only.*)

- ☐ My class is taught online, with at least 80 to 100% of face-to-face contact replaced by online activity.
- ☐ My class is hybrid, with both online and face-to-face instruction. Approximately 30 to 79% of the class is delivered online.
- ☐ My class is Web-facilitated, in which Web-based technology is used to facilitate a face-to-face course. Approximately 1-29% of the content is delivered online.

10. Which of the following describes the format of your online teaching?
    - ☐ There is no specific time at which my students are required to be online to receive instruction.
    - ☐ There are certain specific times when my students must be online to receive brief instruction.
    - ☐ My students must login at predetermined times to receive complete instruction.

11. Considering your most recent FULL WEEK of teaching at THIS school: What is your main teaching field?
    - ☐ Mathematics
    - ☐ Science
    - ☐ Language Arts/reading
    - ☐ Social Studies
    - ☐ Humanities (i.e. Art, Foreign Language)
    - ☐ Other (Specify) _____

12. Which specific courses do you teach online?_____

13. Considering the content of your class(es), who is the **primary** author?
    - ☐ You
    - ☐ A fellow colleague (i.e. another teacher)
    - ☐ Curriculum Specialist
    - ☐ Software company
    - ☐ Outside online content provider (i.e. Apex Learning, Virtual High School, etc)
    - ☐ Other _____(please specify)

14. What is the total number of classes you teach online? If you teach 2 or more classes of the same subject (e.g., Chemistry 1) to DIFFERENT GROUPS OF STUDENTS at this school, count them as separate classes (e.g., if you teach chemistry to 2 classes of students and physics to 2 classes of students, you would report 4 classes of different groups of students).

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7 or more

15. What is the number of students you teach online? Count each student only once.

_____

16. Including this school year, how many years have you been employed as a teacher? (*Include years spent teaching both full and part time, in both public and private schools.*)_____

17. Including this school year, how many years have you been employed as a teacher at THIS school? _____

18. Which grades do you currently teach at this school? (*Check all that apply.*)

- ☐ Pre-Kindergarten
- ☐ Kindergarten
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7
- ☐ 8
- ☐ 9
- ☐ 10
- ☐ 11
- ☐ 12

19. Do you hold the following degrees or certificates? For each degree or certificate held, please list your major and minor fields of study. If you completed more than one degree or certificate at a level or had a double major or minor, please provide information for all fields of study at that level.

Degree or certificate	If yes, record your: Major field(s) of study *(Record all that apply)*
Bachelor's degree(s)?	
Master's degree(s)?	
Doctorate degree(s)?	
Other degree(s)? (*specify*)	

20. How would you rate your own knowledge in doing the following tasks associated with teaching in a distance education setting?

For each of the statements below, please indicate your level of knowledge in the following areas. If you feel your knowledge is **poor** in a particular area, please indicate **(1)**. If you feel your knowledge in a particular area is **fair**, please indicate **(2)**. If you feel your knowledge in a particular are is **good**, please indicate **(3)**. If you feel your knowledge in a particular area is **very good**, please indicate **(4)** and if you feel it is **excellent**, please indicate **(5)**.

Item #		Poor	Fair	Good	Very Good	Excellent
a.	My ability to decide on the scope of concepts taught within in my class	1	2	3	4	5
b.	My ability to implement district curriculum in an online environment	1	2	3	4	5
c.	My ability to encourage online interactivity among students	1	2	3	4	5
d.	My ability to troubleshoot technical problems associated with hardware (e.g., network connections)	1	2	3	4	5
e.	My ability to use online student assessment to modify instruction	1	2	3	4	5
f.	My ability to distinguish between correct and incorrect problem solving attempts by students	1	2	3	4	5
g.	My ability to address various computer issues related to software (e.g., downloading appropriate plug-ins, installing programs)	1	2	3	4	5
h.	My ability to create an online environment which allows students to build new knowledge and skills	1	2	3	4	5
i.	My ability to anticipate likely student misconceptions within a particular topic	1	2	3	4	5
j.	My ability to determine a particular strategy best suited to teach a specific concept	1	2	3	4	5

k.	My ability to use technology to predict students' skill/understanding of a particular topic	1	2	3	4	5
l.	My ability to implement different methods of teaching online	1	2	3	4	5
m.	My ability to plan the sequence of concepts taught within my class.	1	2	3	4	5
n.	My ability to moderate online interactivity among students	1	2	3	4	5
o.	My ability to use technological representations (i.e. multimedia, visual demonstrations, etc) to demonstrate specific concepts in my content area.	1	2	3	4	5
p.	My ability to use a variety of teaching strategies to relate various concepts to students	1	2	3	4	5
q.	My ability to assist students with troubleshooting technical problems with their personal computers	1	2	3	4	5
r.	My ability to adjust teaching methodology based on student performance/feedback.	1	2	3	4	5
s.	My ability to comfortably produce lesson plans with an appreciation for the topic	1	2	3	4	5
t.	My ability to create materials that map to specific district/state standards.	1	2	3	4	5
u.	My ability to assist students in noticing connections between various concepts in a curriculum	1	2	3	4	5
v.	My ability to use various courseware programs to deliver instruction (e.g., Blackboard, Centra)	1	2	3	4	5
w.	My ability to use technology to create effective representations of content that depart from textbook knowledge	1	2	3	4	5
x.	My ability to meet the overall demands of this teaching assignment	1	2	3	4	5

21. Based on your teacher education program, how prepared do you feel you were to do the following activities in a distance education setting?

For each of the statements below, please indicate to what extent you feel that your teacher education program prepared you to do each activity. If you feel you were **not at all prepared** by your teacher preparation program , please indicate (**1**). If you feel you were **not very prepared**, please indicate (**2**). If you feel you were **somewhat prepared**, please indicate (**3**). If you feel you were **very well prepared** by your teacher preparation program, please indicate (**4**), and if you were **extremely well prepared**, please indicate (**5**).

Item #		Not At All Prepared	Not Very Prepared	Somewhat Prepared	Very Well Prepared	Extremely Well Prepared
a.	My ability to decide on the scope of concepts taught within in my class.	1	2	3	4	5
b.	My ability to implement district curriculum in an online environment	1	2	3	4	5
c.	My ability to encourage online interactivity among students	1	2	3	4	5
d.	My ability to troubleshoot technical problems associated with hardware (e.g., network connections)	1	2	3	4	5
e.	My ability to use online student assessment to modify instruction.	1	2	3	4	5
f.	My ability to distinguish between correct and incorrect problem solving attempts by students	1	2	3	4	5
g.	My ability to address various computer issues related to software (e.g., downloading appropriate plug-ins, installing programs)	1	2	3	4	5
h.	My ability to create an online environment which allows students to build new knowledge and skills.	1	2	3	4	5
i.	My ability to anticipate likely student misconceptions within a particular topic	1	2	3	4	5
j.	My ability to determine a particular strategy best suited to teach a specific concept	1	2	3	4	5

k.	My ability to use technology to predict students' skill/understanding of a particular topic	1	2	3	4	5
l.	My ability to implement different methods of teaching online	1	2	3	4	5
m.	My ability to plan the sequence of concepts taught within my class	1	2	3	4	5
n.	My ability to moderate online interactivity among students	1	2	3	4	5
o.	My ability to use technological representations (i.e. multimedia, visual demonstrations, etc) to demonstrate specific concepts in my content area	1	2	3	4	5
p.	My ability to use a variety of teaching strategies to relate various concepts to students	1	2	3	4	5
q.	My ability to assist students with troubleshooting technical problems with their personal computers	1	2	3	4	5
r.	My ability to adjust teaching methodology based on student performance/feedback	1	2	3	4	5
s.	My ability to comfortably produce lesson plans with an appreciation for the topic	1	2	3	4	5
t.	My ability to create materials that map to specific district/state standards	1	2	3	4	5
u.	My ability to assist students in noticing connections between various concepts in a curriculum	1	2	3	4	5
v.	My ability to use various courseware programs to deliver instruction (e.g., Blackboard, Centra)	1	2	3	4	5
w.	My ability to use technology to create effective representations of content that depart from textbook knowledge	1	2	3	4	5
x.	My ability to meet the overall demands of this teaching assignment	1	2	3	4	5

22. Describe the career path that led you to teaching online. Was this type of teaching always a goal? What led you to your current position?

23. Describe your overall experience with teaching online K-12 students.

APPENDIX B

INSTITUTIONAL REVIEW BOARD APPROVAL

UNLV
CELEBRATING FIFTY YEARS

Social/Behavioral IRB – Expedited Review
Approval Notice

NOTICE TO ALL RESEARCHERS:

Please be aware that a protocol violation (e.g., failure to submit a modification for any change) of an IRB approved protocol may result in mandatory remedial education, additional audits, re-consenting subjects, researcher probation suspension of any research protocol at issue, suspension of additional existing research protocols, invalidation of all research conducted under the research protocol at issue, and further appropriate consequences as determined by the IRB and the Institutional Officer.

DATE: November 8, 2007

TO: **Dr. Kent Crippen**, Curriculum and Instruction

FROM: Office for the Protection of Research Subjects

RE: Notification of IRB Action by Dr. J. Michael Stitt, Chair
Protocol Title: **The Characteristics, Knowledge, and Preparation Levels of K-12 Online Distance Educators in the United States**
Protocol #: 0710-2479

This memorandum is notification that the project referenced above has been reviewed by the UNLV Social/Behavioral Institutional Review Board (IRB) as indicated in Federal regulatory statutes 45 CFR 46. The protocol has been reviewed and approved.

The protocol is approved for a period of one year from the date of IRB approval. The expiration date of this protocol is November 4, 2008. Work on the project may begin as soon as you receive written notification from the Office for the Protection of Research Subjects (OPRS).

PLEASE NOTE:
Attached to this approval notice is the **official Informed Consent/Assent (IC/IA) Form** for this study. The IC/IA contains an official approval stamp. Only copies of this official IC/IA form may be used when obtaining consent. Please keep the original for your records.

Should there be *any* change to the protocol, it will be necessary to submit a **Modification Form** through OPRS. No changes may be made to the existing protocol until modifications have been approved by the IRB.

Should the use of human subjects described in this protocol continue beyond November 4, 2008, it would be necessary to submit a **Continuing Review Request Form** *60 days* before the expiration date.

If you have questions or require any assistance, please contact the Office for the Protection of Research Subjects at OPRSHumanSubjects@unlv.edu or call 895-2794.

APPENDIX C

PRENOTIFICATION EMAIL

Date
Participant's Name
Participant's School

My name is Leanna Archambault, and I am a doctoral student at the University of Nevada Las Vegas. For my dissertation study, I am conducting research about online K-12 teachers in the United States. Currently, very little is known about this population. My goal is to provide an overall picture of those who teach in an online setting.

Your name was identified by an Internet search as being affiliated with a virtual school in the U.S. In a few days, I will be sending you a link to a web-based survey. If you teach online, it would be **greatly appreciated** if you could please complete it.

I am writing to you in advance so you will recognize the request when it comes and not inadvertently delete it. This study is important, as the results will be used to describe the unique population of K-12 online teachers to better inform teacher education programs.

Your generous participation in this study will help ensure its success. Thank you in advance for your time and consideration.

Leanna Archambault, UNLV Doctoral Student
Department of Curriculum and Instruction
leanna.archambault@unlv.edu
(702) 895-2733

APPENDIX D

EMAIL TEXT INVITING ONLINE TEACHERS TO PARTICIPATE IN STUDY

Date
Participant's Name
Participant's School

I am writing to request your help with a survey study I am conducting for my dissertation. I am conducting research about online K-12 teachers in the United States.

As I indicated in the previous email, your name was identified by an Internet search as being affiliated with a virtual school in the U.S. If you teach online, it would be **greatly appreciated** if you could please complete an online survey by clicking on the following link: http://ci2.unlv.edu/online_teaching/

Data collected from this brief survey will be used to describe the overall population of K-12 online teachers in addition to helping university teacher education programs better prepare teachers for distance education.

This survey should take approximately 25 minutes. Your responses are anonymous and will be kept strictly confidential. will only be published as summaries in which no individual responses can be identified. When you submit your completed questionnaire, your name will be deleted from the mailing list. This survey is voluntary.

My goal is to provide an overall picture of those who teach in an online setting. Your reply is vital to capturing an accurate depiction of K-12 teachers. Should you have any questions, please feel free to contact me at leanna.archambault@unlv.edu

Thank you very much for your participation!

Leanna Archambault, UNLV Doctoral Student
Department of Curriculum and Instruction
leanna.archambault@unlv.edu
(702) 895-2733

APPENDIX E

THANK YOU EMAIL

Date
Participant's Name
Participant's School

Hello!

Last week an online survey was sent to you regarding your experience as a K-12 online teacher. Your name was identified by an Internet search as being affiliated with a virtual school in the U.S.

If you have already taken the few minutes needed to complete the questionnaire, thank you very much. If you have not completed the questionnaire, I hope that you will do so today by clicking on the following link: http://ci2.unlv.edu/online_teaching/

I am very appreciative for your help, because it is only by receiving information from online teachers like you that a better understanding of the unique challenges and needs of K-12 online distance educators can be gained.

Again, thank you for your time and attention.

Sincerely,

Leanna Archambault, UNLV Doctoral Student
Department of Curriculum and Instruction
leanna.archambault@unlv.edu
(702) 895-2733

APPENDIX F

FOLLOW-UP EMAIL

Date
Participant's Name
Participant's School

Approximately three weeks ago you were notified about a survey K-12 online teachers. According to my records, you have yet to reply to the survey. I anticipate the results will be useful in helping universities best meet the needs of future online teachers, such as yourself.

I am writing again because of the importance your response plays in obtaining accurate results. It is only by hearing from nearly everyone in the sample that the results can be viewed with confidence as being truly representative.

Protecting the confidentiality of your responses is a top priority. The procedures used to do this are as follows: When you click "submit," your responses are downloaded directly into a MS Excel spreadsheet. Your name is then deleted from the mailing list and is in no way connected to your responses.

I hope that you will complete and send the questionnaire you can access via the secure link below, but if for any reason you prefer not to, or if this has reached you in error, please let me know by phone or email.

Click on this link or paste it into your internet browser to access the survey:
http://ci2.unlv.edu/online_teaching/

Sincerely,

Leanna Archambault, UNLV Doctoral Student
Department of Curriculum and Instruction
leanna.archambault@unlv.edu
(702) 895-2733

APPENDIX G

FINAL EMAIL

Date
Participant's Name
Participant's School

Greetings!
During the past month you have received several emails about a survey conducted as a part of my doctoral research at the University of Nevada Las Vegas. The purpose of this study is to expand our understanding of the unique experiences and needs of K-12 online distance educators.

The study is drawing to a close and this is your final opportunity to participate. You were selected to participate in this study because your name was identified by an Internet search as being affiliated with a virtual school in the U.S. Because schools vary from district to district as well as from state to state, it is important to hear from everyone in order to truly offer a representative sample of K-12 online teachers. Your input is critical to obtaining accurate results.

If you prefer using a printed copy of the questionnaire as an alternative to the Internet link, a Word version of the questionnaire is available at http://ci2.unlv.edu/online_teaching/survey.doc. Simply download it, complete it, and email or mail it back to the address provided on the survey. Of course, the Internet link option is still available to you as well.

If you would prefer not to participate in this study, or if you believe you have received this questionnaire in error, please respond and let me know. This would be helpful as I begin evaluating the data.

Click on the following link to access the survey: http://ci2.unlv.edu/online_teaching/

Thank you again for your time and consideration. Hope to hear from you soon!

Leanna Archambault, UNLV Doctoral Student
Department of Curriculum and Instruction
leanna.archambault@unlv.edu
(702) 895-2733

APPENDIX H

INFORMED CONSENT

Purpose of the Study

You are invited to participate in a research study. The purpose of this study is determine demographic characteristics of K-12 online teachers. It also seeks to explore the perceptions of online teachers' knowledge and preparation levels to teach in such an environment.

Participants

You are being asked to participate in the study because we believe that you may teach an online course or courses in an elementary and/or secondary educational environment.

Procedures

1. Accepting participation in this study allows us to use your data in our study. Declining participation means we cannot use your data in our study. Your participation is strictly voluntary.

2. If you volunteer to participate in this study, you will be asked to complete an online survey which asks demographic questions, questions concerning the nature of the online courses you teach, your view of your own technical, pedagogical, and content knowledge, and the level of preparation you received in each of these areas.

Your identity is anonymous. A unique identifying number will solely identify you during data collection. A random anonymous coding system will be applied before data analysis.

Benefits of Participation

There may be no direct benefits to you as a participant in this study. However, we hope to establish an overall profile of those teaching in K-12 online environments. Participants who take this survey may have the opportunity to reflect on their practices and gain a deeper understanding of themselves as online educators.

Risks of Participation

There are risks involved in all research studies. This study may include only minimal risks. Access to the site is password restricted and the data is stored securely on the UNLV campus. While complete security of any computer system can never be guaranteed, every reasonable effort will be made in this regard. It is possible that data being submitted online could be obtained by surreptitious means, as responses to this survey will not use SSL encryption.

Cost /Compensation
There will not be financial cost to you to participate in this study. The study will take 30 minutes of your time. You will not be compensated for your time. The University of Nevada, Las Vegas may not provide compensation or free medical care for an unanticipated injury sustained as a result of participating in this research study.

Contact Information
If you have any questions or concerns about the study, you may contact Dr. Kent J. Crippen, kcrippen@unlv.nevada.edu, (702) 895-2517, or Leanna Archambault, leanna.archambault@unlv.edu, (702) 895-2733. For questions regarding the rights of research subjects, any complaints or comments regarding the manner in which the study is being conducted you may contact **the UNLV Office for the Protection of Research Subjects at 702-895-2794.**

Voluntary Participation
Your participation in this study is voluntary. You may refuse to participate in this study or in any part of this study. You may withdraw at any time without prejudice to your relations with the university. You are encouraged to ask questions about this study at the beginning or any time during the research study.

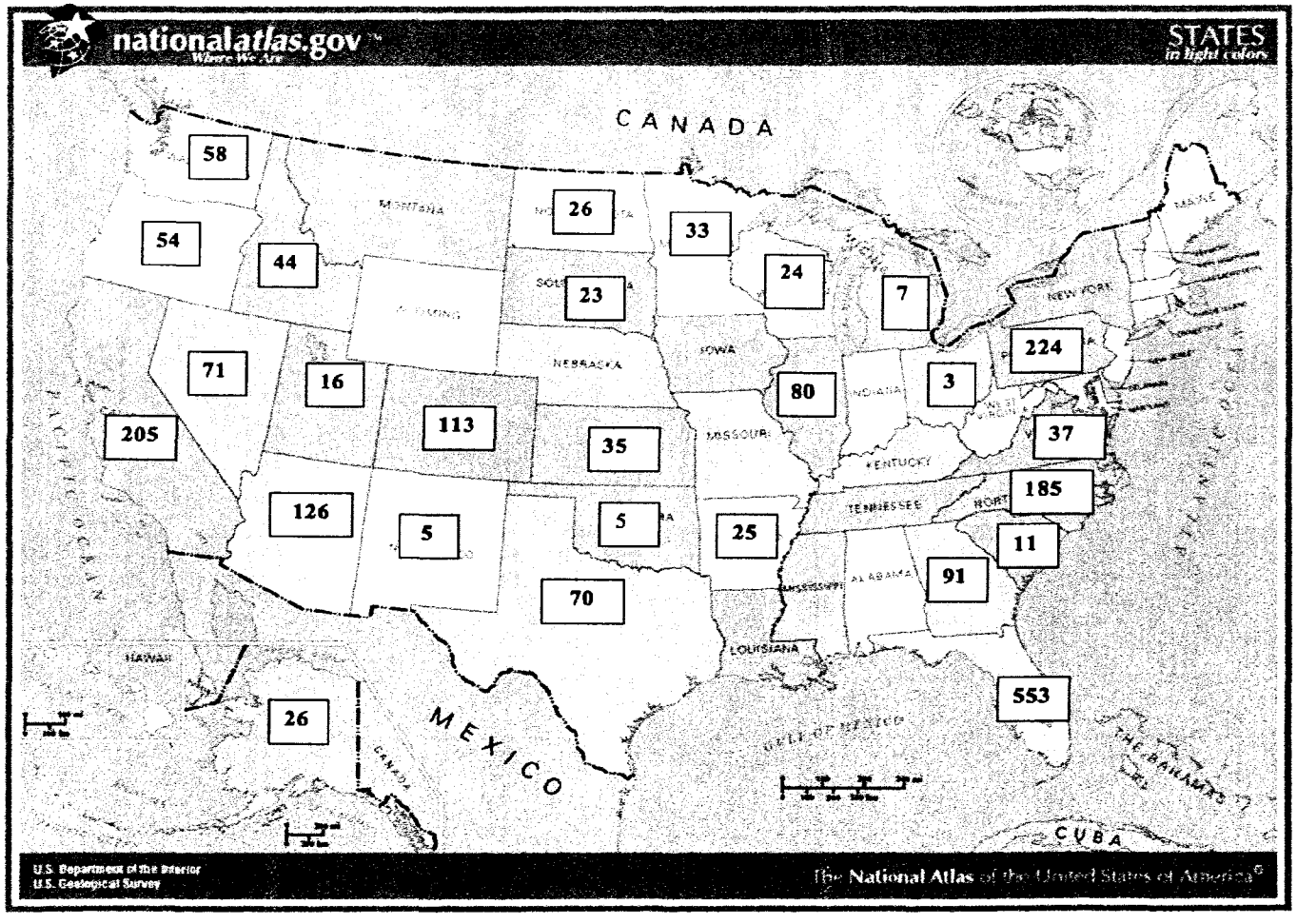
Confidentiality
All information gathered in this study will be kept completely confidential. No reference will be made in written or oral materials that could link you to this study. All records will be stored in a locked facility at UNLV for at least 3 years after completion of the study. After the storage time the information and gathered and data files will be electronically deleted and any paper-related printouts will be shredded.

Participant Consent:
I have read the above information. By clicking "Accepting participation," I certify that I am at least 21 years of age and have decided to participate.

We encourage you to print a copy of this form for your records.

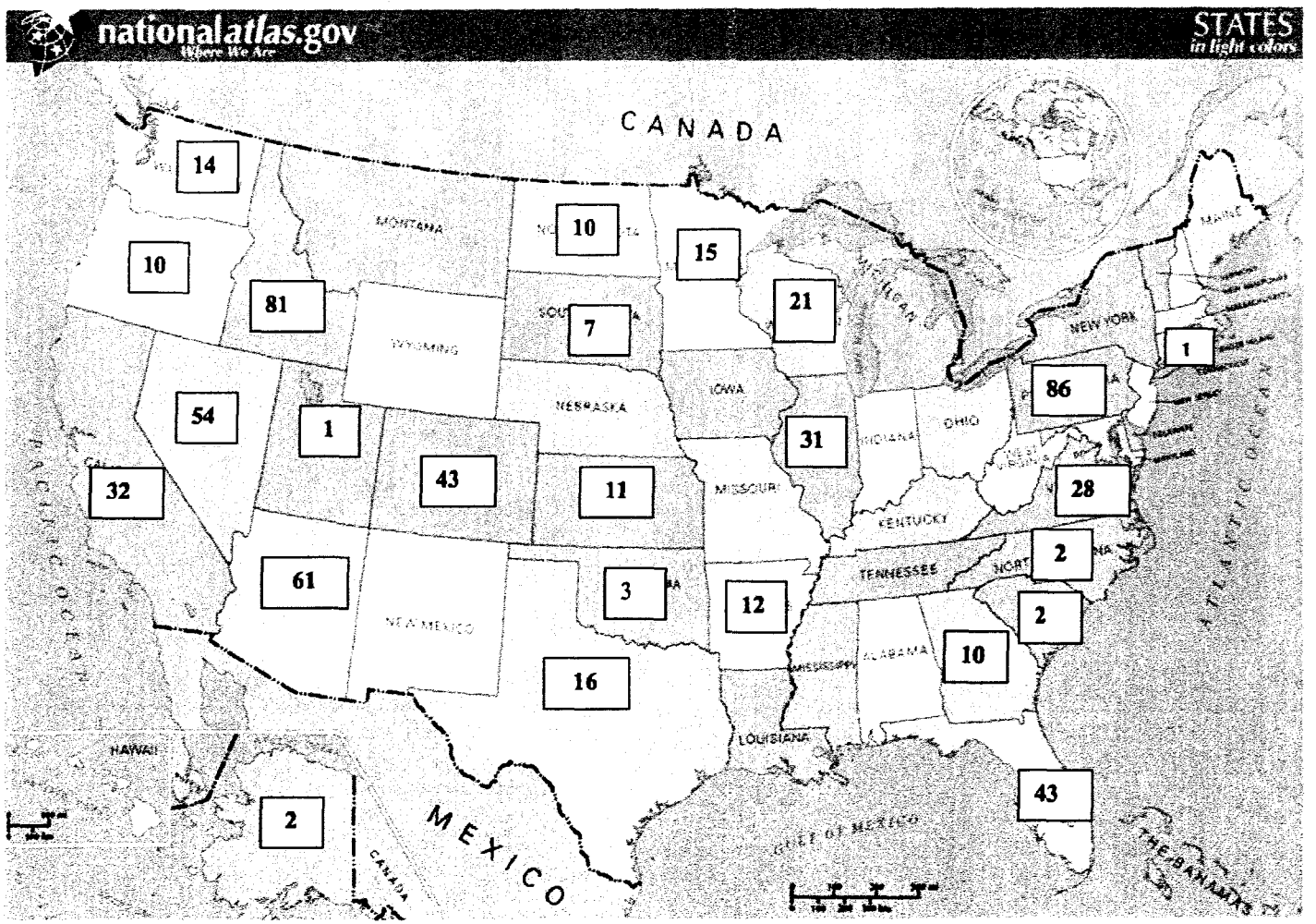
APPENDIX I

MAP DISPLAYING NUMBER AND LOCATION OF OBTAINED EMAIL ADDRESSES



APPENDIX J

MAP DISPLAYING NUMBER AND LOCATION OF RESPONSES



APPENDIX K

DEFINITIONS OF TECHNOLOGICAL PEDAGOGICAL CONTENT KNOWLEDGE (TPCK) SUBSCALES

Technological Knowledge (TK) – includes familiarity with specific courseware and being able to troubleshoot technical problems that arise.

Pedagogical Knowledge (PK) – includes knowing specific strategies and methods for teaching various concepts and topics within a discipline; practices, processes, strategies, procedures and methods of teaching and learning.

Content Knowledge (CK) – includes the central concepts, methods of inquiry, and structures of a discipline(s), including the sequencing of various topics.

Pedagogical Content Knowledge (PCK) – goes beyond content knowledge to include knowledge on how to teach that particular content; includes the most useful forms of representation of those ideas, the most powerful analogies, illustrations, examples, explanations, and demonstrations; ways of representing and formulating the subject that make it comprehensible to others.

Technological Content Knowledge (TCK) – includes the ability to design and deliver materials and activities in an electronic format for students; the manner in which the subject matter can be changed by the application of technology.

Technological Pedagogical Knowledge (TPK) – includes knowledge of the existence, components, and capabilities of various technologies as they are used in teaching and learning settings, and conversely, knowing how teaching might change as the result of using particular technologies.

Technological Pedagogical Content Knowledge (TCPK) – includes understanding of the complexity of relationships among students, teachers, content, technologies, practices, and tools. The introduction of technology causes the representation of new concepts to change.

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