

Developing Technology– Rich Teacher Education Programs: Key Issues

Drew Polly
University of North Carolina at Charlotte, USA

Clif Mims
University of Memphis, USA

Kay A. Persichitte
University of Wyoming, USA

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Chapter 32

Training Teachers for a Virtual School System: A Call to Action

Michael K. Barbour
Wayne State University, USA

ABSTRACT

Online learning at the K-12 level is growing exponentially. Students learning in supplemental virtual schools and full-time cyber schools, using a variety of delivery models that include and sometimes combine independent, asynchronous, and synchronous instruction, in almost every state in the US. In some instances the knowledge, skills, and abilities required by teachers in this technology-mediated environment is consistent with what they learned about face-to-face teaching in their teacher education programs, while in many instances, the two are quite different. Presently the lack of empirical research into effective K-12 online teaching limits teacher education programs. However, teacher education programs still need to better prepare pre-service and in-service teachers to design, deliver, and support students engaged virtual schooling.

INTRODUCTION

In the opening to her chapter on education and how the next generation of students should learn, Greenfield (2003) asks “What should we be teaching the next generation to equip them for citizen-

ship in the mid 21st century and beyond?” (p. 148). The North American Council for Online Learning (NACOL – later the International Association for K-12 Online Learning) and the Partnership for 21st Century Skills (2006) believed that “virtual schools provide access to online, collaborative and self-paced learning environments – settings that can facilitate 21st century skills” (p. 2). They

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later described twenty-first century learning as including skills such as creativity, problem solving, communication and analytical thinking. If these are some of the skills valued in the new economy and the environment provided by virtual schools is consistent with the kind of work setting our students will have to compete and excel in, one approach to re-organizing K-12 schools is through the use of virtual schooling.

However, according to Friedman (2006), students are “shaped in large measure by school systems that have had, from the dawn of the industrial age, a main purpose to produce employees for boxed positions in corporate [organizational] charts” (p. 304). Moreover, we have been preparing our teachers for the same kind of school system. In this chapter, I describe the current state of K-12 online learning in the United States. Then I discuss the nature of teaching in a K-12 online learning environment. Next, I describe how teaching in an online environment differs from traditional face-to-face teaching. Then, I examine the existing literature on teacher education and professional development related to virtual schooling, with an emphasis on the limited research into K-12 online teaching, and how the paucity of published, empirical research hinders the ability of teacher education programs to develop effective training. Finally, I describe the small number of teacher education initiatives that have begun to address the issue of preparing pre-service and in-service teachers to design, deliver and support virtual schooling.

THE STATE OF K-12 ONLINE LEARNING

The use of distance education in the K-12 environment stemming from a need to provide equal educational opportunities to rural areas is common throughout North America (Haughey & Muirhead, 1999). The use of distance education at the K-12 level has been in place since the beginning of the twentieth century, beginning with a correspon-

dence model at the Calvert School of Baltimore in 1906 (Moore & Kearsley, 1996). Over the past 100 years, the model of distance education has evolved from these initial correspondence models to educational radio to instructional television to audiographics (Clark, 2007). In the past two decades, web-based or online delivery has become the dominant form of K-12 distance education delivery—with these online learning programs being organized into formal virtual or cyber schools, at least in North America (Barbour, 2009).

Clark (2000) defined a virtual school as “a state approved and/or regionally accredited school that offers secondary credit courses through distance learning methods that include Internet-based delivery” (p. i). While others distinguished between a virtual school (i.e., an entity where students took all of their courses from) and virtual schooling (where students take one or more courses through an online learning program) (Barker, Wendel and Richmond, 1999); Clark (2001) has become the more accepted definition in the literature. In the United States, the first school to begin using K-12 online learning was the private Laurel Springs School in California around 1991. This was followed by the Utah eSchool in 1994-95, along with the Florida Virtual School and Virtual High School Global Consortium in 1996-97. In 2000-01 the for profit company K12, Inc. introduced the first full-time cyber school (Watson et al., 2009).

At the turn of the millennia, Clark (2001) estimated that there were between 40,000 and 50,000 virtual school enrolments. A decade later, Watson, Murin, Vashaw, Gemin and Rapp (2010) indicated that there were over 1,500,000 K-12 students enrolled in online courses in 48 states, and the District of Columbia. In 2006 Michigan became the first state in the US to require that all students complete an online learning experience in order to graduate from high school (a move that has been followed by other states). For example, the State of Florida requires that all school districts provide virtual schooling opportunities for any student who requests it, while New Mexico requires that

students complete an Advanced Placement, an advanced or honors course, a dual-credit course offered in cooperation with an institution of higher education or a distance learning course in order to graduate. Some have even gone so far to predict that the majority of K-12 education will be delivered using online learning by the year 2020 (Christensen, Horn & Johnson, 2008).

MODELS OF K-12 ONLINE LEARNING

There are many different delivery models used by K-12 online learning programs. Kaseman and Kaseman (2000) described them as ranging from traditional correspondence courses with student interaction being limited to readings and written responses, while others allowed students to interact with their teacher and classmates through a variety of asynchronous and synchronous communication tools. However, three primary models of delivery have emerged for virtual schools: independent, asynchronous, and synchronous (or a combination of two or more of these methods). The term virtual school began to be used to describe supplemental programs where the student is enrolled in a traditional brick-and-mortar or physical school and enrolls in one or more online courses to supplement their in-school courses, while the term cyber schooling began to refer to full-time programs when a student is not enrolled in a brick-and-mortar school at all but completes all of their courses online. For the purposes of this chapter, I will use the term virtual school to include all forms of K-12 online learning.

Independent Model of Delivery

As Kaseman and Kaseman indicated one model of delivery, the independent one, is similar to a student in a traditional correspondence course. Greenway and Vanourek (2006) described the delivery model as:

In a “typical” day, a student might take mostly core courses with some electives and log on to the computer for an hour or two, clicking through interactive lessons with text, audio or video clips, Flash animation, and links to related sites; completing an online math quiz; e-mailing the teacher; and “chatting” with classmates online. Students complete the majority of their work offline in many of these online schools, for example, reading assignments, drafting an essay, conducting an experiment with school-supplied materials, and studying for an exam.... A parent or other responsible adult is asked to supervise—and sometimes to assist with instruction and motivation, all under the direction of a licensed teacher.

In this delivery model, the student is essentially teaching themselves or being taught by a parent, with only minimum involvement from a teacher and the virtual school simply providing the materials used by the student.

Asynchronous Model of Delivery

The asynchronous model of delivery is the most common. For example, Friend and Johnston (2005) described how students interact with an online curriculum that engages them in real-world applications, challenging them with content, and providing them with choice in the resources that they use and how they demonstrate their understanding of the content. When a student feels they have mastered the content, they turn “in assignments, and the teacher gives written feedback in the electronic course room or phones to discuss ways the student [sic] can improve performance” (p. 109). Zucker and Kozma (2003) described the asynchronous model as one where a student would use the online content and their textbook to work through the material and complete the written work – which would be submitted to the teacher for written feedback delivered to the student through the course management system. Along with the tools provided by the course manage-

ment system, many K-12 online teachers utilize a variety of Web 2.0 tools (e.g., blogging, wikis, social networking, etc.) in their asynchronous instruction. In this model the role of the teacher is more active, guiding the students through their course content.

Many online teachers experience difficulty teaching in this asynchronous environment. For example, Barbour (2007) found that in one virtual school teachers assigned time to work on assignments and other “seat work” to students during their scheduled asynchronous class time. Barbour compared the nature of this work to the kind of “busy work” classroom teachers often assign students to complete at the end of a lesson to practice the skills or knowledge presented in the lesson, or simply to occupy the time remaining in the class. Surrey and Ely (2007) described how people are likely to adopt innovations that are consistent with their current beliefs and practices. For many teachers, the asynchronous instructional tools are foreign to their traditional teaching habits, and they are unable to utilize them in effective ways beyond the kind of asynchronous work they would assign students in a traditional classroom environment.

Synchronous Model of Delivery

Some virtual schools also offer synchronous classes during the school day, although this model of delivery is utilized by only a small number of virtual schools. Murphy and Coffin (2003) described a synchronous learning environment as a “virtual classroom, [where students] have access to DM [direct messaging] and hand raising. Access to other tools, such as the microphone or the WB [whiteboard], must be assigned by the teacher” (p. 236). Using these tools, the teacher can lead a traditional lecture, using slides on the whiteboard to guide their thoughts or as notes for the student. Nippard and Murphy (2007) described many of the forms of interaction that might occur. Teachers can facilitate both audio and text-based discussions. The audio discussion can allow one

person to speak at a time or multiple people, and the text messaging provides the opportunity for multiple individuals to participate in private or public discussions. These virtual classrooms also allow the teacher to have students to in groups in a variety of breakout rooms created by the teacher. Finally, the teacher can also allow the students to control various instructor functions to present material within the classroom.

Again, Barbour (2007) found that most of the actual instruction provided to students in that one virtual school occurred during the synchronous classes. The teachers’ reliance on synchronous methods of instruction was consistent with the premise stated earlier by Surrey and Ely (2007). These teachers were drawn to the synchronous environment because the virtual classroom allowed them to teach in a way that they were familiar with (e.g., lecturing to students with the use of a whiteboard or other visual aids, students raising their hands to ask questions, speaking one at a time, etc.). The majority of synchronous instruction in virtual schooling occurs in Canadian programs, where education is controlled at the provincial level and provincial governments can expect accommodation as a condition of participation. As education is locally controlled in the United States, this kind of demand is not an effective tool. For example, if the Michigan Virtual School wished to have full-class synchronous sessions they would need as many of the 549 public schools districts that were participating in the Michigan Virtual School to agree upon a common schedule, start time, class period, lengths, etc.. This is why synchronous instruction in virtual schools in the United States are often limited to individual sessions or are outside of the school day.

A NEW MODEL OF TEACHING AND LEARNING

As evidenced by all three of these different models of virtual schooling, many of the teaching and

learning interactions that are taking place in the virtual school environment are consistent with what one would find in a traditional brick-and-mortar classroom – only these interactions are being mediated by technology (e.g., having students read material in a textbook and then respond to written questions, a teacher giving a lecture that is accompanied by overheads or a PowerPoint to students who can take notes and ask questions, etc.). These current models notwithstanding, some continue to argue that virtual schools have the ability to provide K-12 students with “the knowledge and skills they need in typical 21st century communities and workplaces” (Partnership for 21st Century Skills, 2002, p. 3). These proponents believe there is potential for K-12 online learning to equip students to work in a “fully networked computing environment as more important than a desk.... [where] they cannot be supervised in the traditional sense. Rather they must be given the environment and tools to create and succeed” (Tapscott, 1998, p. 10). With the ability to learn in that environment preparing them with the information and communication skills, along with the interpersonal and self-direction skills that will be needed for the twenty-first century.

Like many aspects of K-12 education, there are examples of K-12 online learning that are breaking the mold and providing students with these twenty-first century skills. For example, since 2005 the Michigan Virtual School has offered courses that introduce students to the Chinese language and culture. This course is taught by a native-speaking Chinese teacher, with a background in second language acquisition (NACOL & the Partnership for 21st Century Skills, 2006). With the growing importance of Asia in the global economy, this kind of opportunity for secondary school students has the potential to provide them with the global awareness and second-language skills that will be critical to their futures.

Another example is the any time, any place, any pace delivery model used by the Florida Virtual School. Under this system, students have

the option to complete their online courses in more or less time than would be provided by a traditional brick-and-mortar school. The ability to customize how they take the course to fit their individual needs – in terms of when, where and how long they take to complete the necessary work to master the course content (Friend & Johnston, 2005). This provides students the opportunity to develop self-directed learning skills that they will be required to have as lifelong learners in the workplace. However, the ability to provide these skills does not necessarily mean that virtual schools are providing these skills at present. There is ample evidence examining online learning in higher education that has found online learning to not only not have lived up to the potential of online learning proponents, but also to have limited most faculty members’ ability within the teaching and learning process (Herrington, Reeves & Oliver, 2005; Reeves, 2003, 2005). While virtual schools may allow for the development of the skills and knowledge needed for the twenty-first century, it certainly does not guarantee it. The question then becomes whether teacher education programs ready to prepare teachers to support these technology-mediated twenty-first century experiences to their students.

TEACHING ONLINE IN A K-12 ENVIRONMENT

Smith, Clark, & Blomeyer (2005) believed that only 1 percent of the K-12 teachers in the United States have been trained to teach online. Wood (2005) indicated that there was a “persistent opinion that people who have never taught in this medium [i.e., online] can jump in and teach a class,” quoting Robert Blomeyer of the North Central Regional Education Laboratory, who continued “a good classroom teacher is not necessarily a good online teacher” (p. 36). In this section I describe some of the characteristics related to teaching in an online environment, and

how those characteristics are unique to the virtual school environment.

Characteristics of Teaching Online

Some of the skills necessary for teaching in an online environment are consistent with those provided by traditional teacher education programs, but there are other necessary skills that are largely absent (Davis & Roblyer, 2005). Roblyer and McKenzie (2000) stated that many of the factors that make a successful online teacher, such as good communication and classroom organization skills, were similar to those for any successful teacher. However, Davis, Roblyer, Charania, Ferdig Harms, Compton and Cho (2007) discovered “effective virtual teachers have qualities and skills that often set them apart from traditional teachers” (p. 28). Teaching in an online environment also requires a paradigm shift in how teachers perceive time and space, manage instructional activities and assessments, and engage students (Easton, 2003).

Morris (2002) described teachers who teach in technology-mediated environments, such as those provided by virtual schools, should have a high level of technology skills, be familiar with the curriculum, possess strong communication and organizational skills, and are excited about this new method of delivery. Lowes (2005) indicated that online teachers are required to use different strategies when determining “how to reach and evaluate, students when you cannot interact with them face-to-face on a daily basis” (p. 12). Since the skills to teach in an online environment cannot be assumed to transfer automatically from skills in teaching a face-to-face classroom, most online instructors are left unprepared to deal with the demands placed upon them because they do not understand the unique communication and pedagogical demands of teaching in an online environment (Davis et al., 2007).

Unfortunately, Harms, Niederhauser, Davis, Roblyer and Gilbert (2006) described the literature on effective teaching in virtual school environ-

ments as “often supported only by anecdotal evidence” (p. 4). Like other aspects of virtual schooling, there is little actual research into what specific factors or characteristics are different between teaching online and teaching in a face-to-face environment – only some acknowledgement that teaching in the two environments are different. One of the exceptions to this lack of research is Elizabeth Murphy and her colleagues, who have also examined a variety of aspects related to teaching in a virtual school environment. For example, these individuals have studied teachers’ perceptions of learner centeredness in the online classroom (e.g., sage on the stage vs. guide on the side) (Murphy & Rodríguez-Manzanares, 2009a, 2009b), motivating students in the online environment (Murphy & Rodríguez-Manzanares, 2009c), and effective strategies for both asynchronous and synchronous instruction (Murphy, Rodríguez-Manzanares & Barbour, *in press*). However, Murphy and her colleagues focused their research on either a single virtual school or on the beliefs of teachers without verification of those beliefs. Murphy and another group of her colleagues also investigated the use of synchronous virtual classroom tools in the second-language courses (Murphy, 2010; Murphy & Coffin, 2003) or how online teachers project social presence – or a sense of community and belonging in the online classroom – in the synchronous virtual classroom environment (Nippard & Murphy, 2007). Unfortunately these studies were focused upon a single virtual school that used a high percentage of synchronous instruction – making it quite unique among virtual schools in North America, the majority of whom use a primarily asynchronous instructional model.

Similarly, DiPietro, Ferdig, Black and Preston (2008) outlined 37 best practices in asynchronous online teaching. However, these best practices were based upon interviews with teachers at a single virtual school selected by the virtual school itself. Additionally, these teachers’ beliefs about their best practices were not validated through ob-

servation of the teaching or student performance. Further, DiPietro (2010) described five beliefs virtual school teachers had about effective instructional practices. Once again, these beliefs were based upon interviews with a purposeful sample of virtual school teachers and an examination of a sample of their online course content. There were no observations to determine if the virtual school teachers enacted their stated beliefs. There were also data collected from students to verify if the beliefs about effective instructional practices translated into better student performance or to examine whether students were aware of or found these beliefs to be effective. I highlight the methodological limitations of the work published by DiPietro and her colleagues, along with Murphy and her colleagues, not to imply that these individuals are poor researchers or that their results should be called into question. I do highlight these methodological weaknesses to illustrate that these findings are not generalizable beyond the settings where the research was conducted or are simply based upon the opinions of virtual school teachers. Simply put, the limited amount of research literature into teaching K-12 students in an online environment is still very much in its infancy.

Finally, in addition to the limited amount of research into teaching in an online environment, the main practitioner organization representing K-12 online learning organizations have further muddled the waters. In 2008, the International Association for K-12 Online Learning (iNACOL) conducted a review of published standards of K-12 teaching online that resulted in the release of the National Standards for Quality Online Teaching (see NACOL, 2008). Once again, it was unfortunate that these standards were essentially those that had been originally published by the Southern Regional Educational Board (SREB), with some additions related to twenty-first century learning skills (largely due to iNACOL's involvement in the Partnership for 21st Century Skills). Beyond the SREB standards, iNACOL also reviewed standards from the National Education Asso-

ciation's Guide to Teaching Online Courses, the Ohio Department of Education's Ohio Standards for the Teaching Profession, and the Electronic Classroom of Tomorrow's (ECOTs) Teacher Evaluation Rubric. With the exception of ECOT's rubric, none of the standards were based upon published research – and neither the SREB's nor iNACOL's standards have been verified as valid and/or reliable (although Ferdig, Cavanaugh DiPietro, Black & Dawson [2000] did attempt to map existing literature, not research, to the iNACOL teaching standards). Regardless, while standards exist, they provide little systematic guidance for teaching online.

Teaching Online and Teacher Professional Development

As very few virtual school teachers receive training to teach online from their teacher education programs, the vast majority of teacher preparation has been accomplished through teacher professional development. Since the inception of virtual schooling, practitioners and evaluators have believed in order to fully appreciate the challenges that students face that teachers need to have the same kinds of experiences as their students when it comes to learning in an online environment (Zucker & Kozma, 2003). Many virtual schools require their teachers to complete online training and professional development prior to teaching online. For example, the Virtual High School Global Consortium requires all prospective teachers to complete an online course in online pedagogy and all potential course developers to complete an online course in online course design (Pape, Adams & Ribeiro, 2005). Recently, they have expanded their offerings to five separate courses ranging from simply technology integration for classroom-based teachers to online pedagogy to the use of Web 2.0 tools (see <http://www.govhs.org/Pages/ProfDev-Home>). They have even a partnership with Plymouth State University, Framingham State College and Northwest Nazarene University

to allow participants to receive graduate credits for completion of these courses, and a Certificate in Online Teaching and Learning if participants complete all five courses. The Illinois Virtual High School and Michigan Virtual School both offer similar six to eight-week web-based courses in online course design and online pedagogy to its teachers (see Barbour et al., 2010; Davis, 2003 respectively). Many other virtual schools in the United States offer their own teacher training in face-to-face or online formats.

These online courses usually focus on using the course management system and other tools, designing online curricular activities, and how to teach in an independent online environment (Watson, 2007). In addition to experiencing the same online environment that their students will have to use, “research into teaching has consistently shown that teachers teach the way they were taught” (Davis & Rose, 2007, p. 7). This concern was consistent with the finding of Barbour (2007), who indicated that virtual school teachers were able to use the synchronous virtual classroom efficiently because it allowed them to teach in a way that was familiar to them. He also found that these same teachers did not have effective asynchronous teaching strategies because it was foreign to them, and they often reverted to simply assigning students’ seatwork or time to work on assignments. Without the experience of being taught in an online environment, these future online teachers have only a face-to-face paradigm to bring with them into the online classroom.

In fact, Rice and Dawley (2007) found that less than 40% of all online teachers in the United States reported to receiving professional development before they began teaching online. This indicates a need for teacher education programs to begin to address pre-service and in-service teachers’ ability to teach in environments that are completely mediated by technology. Aronson and Timms (2003) also indicated that K-12 student success in online learning required support from both the online teacher and the local school-based teacher.

Recent studies have found supplemental virtual school programs placed a significant demand upon school-based teachers and administrators (Barbour & Mulcahy, 2004; Hannum, Irvin, Lei & Farmer, 2008; Mulcahy, Dibbon & Norberg, 2008; Roblyer, Freeman, Stabler & Schneidmiller, 2007). So while some virtual schools provide some training to their own teachers, in most instances no such training is provided to the school-based personnel. There is clearly a need for teacher education programs to equip all teachers with initial training in teaching and learning in online K-12 environments.

TEACHER TRAINING AND NEW MODELS OF TEACHER EDUCATION

Teacher education programs need to develop courses and complete programs that focus upon teaching and learning in a K-12 online learning environment (Davis & Rose, 2007). At present, there has only been one systematic initiative within teacher education to prepare teachers for the virtual school environment.

A Comprehensive Approach to Teacher Education and Virtual Schooling

Clark and Else (2003) indentified technology training as one of the key issues related to growing the virtual school movement. The continuing evolution of technology from the traditional static content that teachers could place online for their students to access to the read-write web (often referred to as Web 2.0) where teachers and students generate the online content together creates unique needs for teachers. Online teachers must be able to use these technologies, along with being able to instruct their own students on how to use them and have some limited knowledge of troubleshooting these technologies. Beyond a greater knowledge of and facilitation of technol-

ogy, Kearsley and Blomeyer (2004) indicated that pre-service and in-service teachers also needed to be able to complete the following tasks in a technology-mediated environment timely and meaningful feedback; create learning activities that engaged students, keep students interested and motivated, get students to interact with each other, and encourage students to be critical and reflective.

At present, there are two resources at Iowa State University (ISU) that may provide a model, and even curricular materials, that teacher education programs can adopt to address Kearsley's and Blomeyer's five online teaching tasks: Good Practice to Inform Iowa Learning Online and Teacher Education Goes Into Virtual Schooling (TEGIVS). The Good Practice to Inform Iowa Learning Online (see <http://projects.educ.iastate.edu/~vhs/>) was a project by funded by Roy J. Carver Charitable Trust, where Iowa State University (ISU) partnered with Iowa Public Television, Iowa Department of Education, the University of Virginia, and Ottumwa Community Schools, and Wartburg College. The purpose of the project was to create "ten case studies of good practice and supported the development of three exemplary courses by pioneers in Iowa who [would] lead good practice and mentor others" (Davis, Niederhauser, Compton, Lindstrom and Schoeny, 2005, p. 342). The case studies, which have a decided focus upon courses from the science curriculum, provided users with a detailed rationale as for why the course was being offered in an online learning format, description of the course, and discussion of the online tools being used in that course. Each case study also included syllabi for each of the courses and a selection of course materials, activities and assessments as examples.

As a follow-up to these case studies, ISU secured funding from the U.S. Department of Education's Fund for the Improvement of Post Secondary Education (FIPSE) and partnered with the Universities of Florida and Virginia, Graceland University and Iowa Learning Online to cre-

ate TEGIVS (see <http://ctlt.iastate.edu/~tegivs/TEGIVS/homepage.html>). The purpose of TEGIVS was "to build on that work [i.e., the Good Practice to Inform Iowa Learning Online project] to incorporate virtual schooling into pre-service teacher education" (Davis et al., 2005, p. 342). The TEGIVS project would to introduce and orient new and current teachers to three roles in the virtual school environment:

Virtual School Site Facilitator: Mentoring & Advocating Local mentor and advocate for students(s) Proctors & records grades, etc.	Virtual School Teacher: Pedagogy & Class Management Presents activities, manages pacing, rigor, etc. Interacts with students and their facilitators Undertakes assessment, grading, etc.	Virtual School Designer: Course Development Design instructional materials Works in team with teachers and a virtual school to construct the online course, etc. (Davis, 2007)
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While the project had three objectives, this introduction and orientation was addressed by the creation of "instructional materials that [were] designed to illustrate and provide experiences with virtual schooling concepts and issues" (Davis et al., 2007, p. 29). These materials included five web-based scenarios – one for early childhood/elementary, one for elementary/middle school, and three for secondary school – that focused on different virtual schooling issues and featured a variety of different tools (see <http://ctlt.iastate.edu/~tegivs/TEGIVS/VSLab/all%20scenarios.html>).

Each of these scenarios reflected four aspects of virtual schooling: pedagogy, technology, assessment and management (Davis, Demiraslan & Wortmann, 2007). The scenarios had different approaches to online learning, such as didactic inquiry, problem-based learning, and other teaching

strategies. They also showcased on synchronous and asynchronous software used in the virtual school environment, and individual tools including discussion boards, chat room, e-mail, and the whiteboard to name a few. The scenarios provided examples of how assessment is conducted in virtual school environments, such as reflections, proctored exams, performance-based tests and quizzes, and other authentic assessments. Finally, the scenarios outlined a variety of management issues, including communications between teacher and students, motivation for challenges, teaching technology from a distance, and encouragement to complete activities in independent environments.

However, simply exposing current and future educators to these aspects of virtual schooling does not necessarily prepare them for any of the three roles that they may task with during their teaching career. As Davis and Rose (2007) cautioned, “simply viewing any online course cannot provide a rigorous experience. Quality teacher preparation requires careful selection of field experience and student teaching in the students’ content areas and grade levels” (p. 11). In this regard, the TEGIVS project was designed to incorporate the instructional materials in technology integration and/or teaching methodology course, and to provide a teaching seminar course (see <http://ctlt.iastate.edu/~tegivs/CI280A/introduction.html> for the course materials), a six hour field experience component (see <http://ctlt.iastate.edu/~tegivs/TEGIVS/curriculum.html> for the course materials), and eventually a teaching practicum (see TEGIVS Newsletter 2 for a description of this sequence).

Virtual Student Teaching

While the TEGIVS program is the most extensive initiative in teacher education to address virtual schooling – with both with specific courses and a student teaching experience, there are other teacher education programs that have created virtual school specific courses or provide student teaching opportunities. For example, the Florida

Virtual School (FLVS) has partnerships with the University of Central Florida and the University of South Florida to provide virtual school student teaching opportunities to pre-service teacher education students. The partnership with the University of Central was the first one that FLVS established in 2007-08, with a small pilot project that involved six students in three core courses.

Students at the University of Central Florida complete the student teaching experience over a two-semester period. During the first semester, which is often the first semester of the students’ senior year, students complete two 7-week student teaching internships. These students have the opportunity to complete both 7-week student teaching internships in a physical or brick-and-mortar environment or students have the option to complete one 7-week student teaching internship in a brick-and-mortar environment and one 7-week student teaching internship in a virtual school environment. During the second semester, students complete a full 14-week internship. Students have the option to complete this 14-week student teaching internship in either a brick-and-mortar or a virtual school environment. It should be noted that students do not have to complete either of their 7-week internships in a virtual school environment during that first semester in order to be eligible for the virtual school internship in this second semester.

While the University of Central of Florida partnership began with a half dozen students, during the 2009-10 school year that had grown to include 17 student teachers. The partnership that the FLVS have with the University of South Florida is quite similar. It began in 2008-09 and had served 45 student teachers in its first two years of operation. FLVS is currently exploring other student teaching partnerships with universities inside and outside of the State of Florida.

Online Teaching Certificates and Endorsement Programs

In addition to the virtual school student teaching experience, another area where teacher education programs have become active is in the provision of Graduate Certificates in Online Teaching. Several universities have created programs that utilize three to five Master's-level courses to form a graduate level certificate in online teaching. Most of these programs are generalized in nature, which is to say the online teaching is not specifically focused on the K-12 environment. However, some universities have created specific K-12 focused programs or K-12 focused options within a more generalized program.

The graduate certificates offered at Arizona State University, Boise State University, the University of Florida, and Wayne State University are good examples of certificates that have K-12 focused options within a more generalized program. These programs have a sequence of courses that students would complete if they were interested in teaching a virtual school environment, and a different set of courses that students would complete if they were interested in online teaching in a higher education or corporate environment. Boise State University and the University of Florida have three course certificates, while Arizona State University and Wayne State University have four course certificates plus an online teaching practicum. Almost all of the programs require students to complete a course in the foundations or theories of distance education, a course in online course design, and a course in the facilitation of online learning.

In addition to these general programs with a K-12 track or option, there are also several graduate certificate programs that are specifically focused on K-12 virtual schooling. The two programs that have this specific focus are both based in Georgia, which is also the first state in the United States that has a specific endorsement to teacher certification for online teaching. At present, Georgia

State University and Valdosta State University both offer programs that allow in-service teachers to gain the online teaching endorsement to their existing teacher certification. The Georgia State University program is a four-course certificate that includes courses in integrating technology into school-based environment, evaluation and assessment for online learning, the Internet for educators, and e-learning environments. The Valdosta State University is a three-course certificate that includes courses in course management systems for e-learning, resources and strategies for e-learning, and design and delivery of instruction for e-learning. Some states have integrated online teaching standards into other curricular areas, such as Michigan where half of the educational technology teaching endorsement standards are focused on the design, delivery and support of online learning. Finally, other states (such as Arizona and Idaho) are also in the process of considering and/or implementing online teaching endorsement programs for teacher certification.

Challenges for Teacher Education Program

Probably the biggest obstacle faced by teacher education programs when it comes to the introduction of courses and experiences to support pre-service and in-service teachers in being able to design, delivery and support virtual schooling experiences is the general lack of available models on which to design such courses and experiences. While not a complete list, the models presented above do represent a fairly comprehensive listing of the teacher education initiatives related to virtual schooling. This means that even if teacher education programs are willing and have few institutional obstacles to providing the necessary training for their students to be prepared for virtual schooling, in most instances they have to invent – or not re-invent – the wheel because K-12 online learning is often quite contextual to the jurisdiction where it occurs.

Beyond the general lack of models, another challenge that teacher education programs must overcome is the lack of systematic research into online teaching and learning at the K-12 level. Beyond the limited amount of research into the online teaching of K-12 students described earlier, there is a general paucity of research into virtual schooling and K-12 online learning in general (Rice, 2006). For example, in their review of the literature, Cavanaugh, Barbour and Clark (2009) found the literature on virtual schooling was largely limited to practitioner reports and issues surrounding the policies governing or the technology utilized. Unfortunately, the federally funded TEGIVS initiative that coupled the developed of a model and supporting curricular materials for the introduction of virtual schooling into a teacher education program, along with systematic research of its implementation has been a rare instance.

Within the Canadian context, Memorial University of Newfoundland has led a consortium of K-12 and post-secondary organization to create the Killick Centre for E-Learning Research (see <http://www.mun.ca/killick/home/>). Funded through the Social Sciences and Humanities Council of Canada's College-University Research Alliance program, the Killick Centre fosters research, training and new knowledge in the area of online learning – with a focus on the K-12 environment. Specific research studies have focused on effective online teaching, the impact of online learning on students when they enter post-secondary environments, effective management and leadership models for schools and districts, and the use of online learning to provide opportunities to students in rural and remote communities, along with aboriginal students. Beyond the TEGIVS and Killick Centre initiatives, there has been little systematic examination of how to prepare teachers to be able to design, delivery and support virtual school learning opportunities.

A CONCLUDING CALL TO ACTION

I began this chapter by echoing Greenfield (2003) query, “What should we be teaching the next generation to equip them for citizenship in the mid 21st century and beyond?” (p. 148). Almost daily there are reminders that today’s economy is changing from an Industrial Age economy to a Digital Age economy. Educational reformers, many of whom are included in this book, call for increase use of technology in K-12 schools to allow students to transition from being consumers of media to creators of media. However, to date neither schools nor teacher education programs have changed to keep pace with the external pressures. Yet, research continuously points to the fact that teachers do not possess the necessary technical skills to keep up with their students in these technology-mediated environments (Duncan, 2005; Magliaro & Ezeife, 2007). Additionally, many new teachers still have limited knowledge of effective strategies for integrating technology into their classroom (Bauer, 2000; Hardy, 2003; Pellegrino & Altman, 1997), so even if they knew how to use the technology they would not know how to use it in pedagogically sound ways. Simply put, teacher education programs need to improve the depth and type of technology training provided to pre-service and in-service teachers.

Beyond providing teachers with the necessary technical skills, one of the five action items to address the training of teachers for these new realities provided by Davis and Rose (2007) was “that all regular universities and college integrate this new model of schoolings into their educational programs” (p. 14). The TEGIVS project included a Creative Commons Attribution-Non-Commercial-Share Alike 3.0 United States License, which would allow other institutions to use these curriculum materials provided that proper attribution was made, the materials were not being used for the purposes of making profit, and the materials (and any modifications thereof) continued to be shared under similar copyright

restrictions. This allows any teacher education program to adopt and/or adapt these materials for use in their own programs. While the examples provided are based upon curriculum from the State of Iowa, the teacher roles highlighted, technologies showcased, pedagogy illustrated, and management issues discussed in this curriculum are common to most virtual schools throughout the United States.

While the models for integrating virtual schooling into teacher education may be limited, there are a variety of examples that currently exist; and even curricular materials that can be used. The missing link at this stage is the will to reform teacher education programs to prepare teachers to design, delivery and support virtual schooling. In her study of the potential for and ability of pre-tenured professors to reform teacher education programs, Cole (1999) was optimistic and characterized those who would mould and shape teacher education for the next generation as “highly competent, committed, and caring” (p. 294). However, she also cautioned that often these individuals are curtailed in their efforts at challenging the status quo as institutions “serve to perpetuate rather than challenge convention” (p. 294). I mention Cole’s study because it is important to note that the majority of university faculty actively researching virtual schooling in the United States are pre-tenured faculty. The challenge will be to ensure that these teacher educators are able to overcome that status quo to enact changes to guarantee our future teachers do not whither.

Goodlad (1994) believed that innovation in K-12 schools needed to be matched with similar innovation in teacher education. Clearly innovation is occurring at the K-12 level with the increased use of virtual schooling. In order to this K-12 innovation to become widely accepted and adopted, teacher education programs must also innovate to prepare teachers who are ready for this and other changes.

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KEY TERMS AND DEFINITIONS

Asynchronous: Not in real time. For example, a discussion forum is an asynchronous technology where one student posts a message and at a later time another student can read and respond to that message. A non-technical example would be like a community bulletin board where one person posts a for sale poster and at a later time another person may walk by and see that sign.

Cyber School: A full-time K-12 online learning program where students do not attend a traditional or brick-and-mortar school.

K-12 Online Learning: A generic term to encompass all forms of distance education at the K-12 level delivered over the Internet. This includes full-time cyber schooling and supplemental virtual schooling.

Synchronous: In real time. For example, a telephone conversation occurs in real time or is said to be synchronous.

Virtual School: A supplemental K-12 online learning program where students attend a traditional or brick-and-mortar school, but may also be enrolled in one or more online courses.