Preparing future teachers for virtual schooling: Assessing their preconceptions and competence

by

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Dedicated to my husband Sachin
Your love and support has helped this dream come true

TABLE OF CONTENTS

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Abstract

This dissertation presents three research articles in the area of preparing preservice teachers for Virtual Schooling (VS). The context of the dissertation is embedded in a Teacher Education Goes Into Virtual Schooling (TEGIVS) project under the Fund for the Improvement of Postsecondary Education (FIPSE), U.S. Department of Education. The first article presented TEGIVS curricula and its preliminary evaluation, the second article discussed the study on preservice teachers' perspectives and preconceptions about VS, and the third article described the development, validation, and implementation of a rubric to assess the preservice teachers' competence as VS facilitators. Both quantitative and qualitative data were collected from preservice teachers and three practitioners in the area of VS. The main findings of the articles indicate that preservice teachers are ready to learn about VS, but hold preconceptions about VS. The most commonly stated preconception was technology is becomes teacher's surrogate in VS. The TEGIVS curriculum was found helpful in preparing preservice teachers see the complexity of teaching and learning online. Lastly, the competence assessment instrument developed and implemented to assess preservice teachers' competence to facilitate in VS was found to be reliable and valid. Thus, this dissertation provides evidence for the need to integrate VS into teacher education, and further suggests that teacher education should identify and correct preservice teachers' preconceptions about VS. The competence assessment instrument that included a scenario and rubric was developed as part of this dissertation and has not been implemented outside the TEGIVS project. Teacher education programs can also use this very first competence assessment instrument to assess VS facilitator competence of preservice teachers in the three aspects of technology, mentoring, and collaboration.

Chapter 1

General Introduction

Overview

In this era where Virtual Schooling has rapidly grown, the purpose of this dissertation is to study the preparation of preservice teachers as future Virtual Schooling facilitators. In the framework of a federally-sponsored project: "Teacher Education Goes Into Virtual Schooling," (TEGIVS) the aim of this dissertation is to study preservice teachers' preconceptions, perspectives, and competence related to Virtual Schooling.

Virtual Schooling and its growth

Virtual Schooling (VS) is a system where K-12 students learn via technology from a teacher, who is at a distance (TEGIVS curricula, 2007), and a 'virtual school' is an educational organization that offers K-12 courses through Internet or Web-based method (Clark, 2001, p. 1). VS began in 1996 when the Internet went graphic with browser software (Clark, 2001; Roblyer, 2003; Zucker & Kozma, 2003.) Roblyer (2003) captures this event of the Internet boom and rise of VS very appropriately, "as the popularity of the Internet spiraled upward in the 1990s, online course delivery migrated steadily downward from colleges and universities to pre-secondary schools" (p. 159).

Compared to only five states in 1997, 44 states in 2007 had adopted VS (Watson, Gemini, & Ryan, 2008). Florida and Utah are the oldest states using VS and their enrollment increased 50% over the five years, from 2001 to 2006 (Ethan & Tucker, 2006.) The National Center for Education Statistics (NCES) reported that during the 2002–2003 school year, about one-third of the U.S. public school districts had students enrolled in distance education courses (Setzer, Lewis, & Greene, 2005.) Three years after this NCES report, Tucker (2007) reported that virtual schools served 700,000 students

during the 2005–06 school year, mostly at the high school level. Tucker further states this rapid increase in VS will only move in an upward direction in the future. “Although this is only a fraction of the nation's 48 million elementary and secondary students, it is almost double the estimate of students taking online learning courses just three years earlier, and it's a number that is likely to continue to rise rapidly” (Tucker, 2007, para. 2).

Although access to distance technology has grown vigorously (Zucker & Kozma, 2003), the role of the teacher still remains at the heart of the VS system (Harms, Niederhauser, Davis, Roblyer, & Gilbert, 2006.) As suggested by the systemic approach of Distance Education proposed by Moore and Kearsley (1996), VS also operates as a system. In the VS system the heart of the education system continues to be the teacher-student relationship. Following are the eight key personnel and their roles in a VS system as described by Harms et al.

The VS teacher is responsible for designing the context, initiating activities, establishing and facilitating communication, and assessment. Other roles include:

- Instructional designers responsible for creating instructional activities and materials;
- Site facilitators who enable and support students locally—this role is usually taken by a classroom teacher, guidance counselor, or an aide hired specifically for the purpose;
- The instructional technology support person role ensures the teacher receives adequate access to technological resources and the network systems function properly;
- The administrator at the host school supports the teacher in allocating necessary resources, looks after the logistical coordination within and across VS sites, and takes leadership in initiating and maintaining the overall VS system.

> These roles are complementary and overlap. Smaller and not well established virtual schools' staff and teachers play multiple roles while, in larger and well established virtual schools multiple roles evolve in individual positions, such as teachers, facilitators, instructional designers, and technology aids (Ferdig et al., 2009).

Need for VS teachers and facilitators

Given the boom in VS enrollment, and that Florida and Utah Virtual Schools will reach half a million VS students in a few years (Tucker, 2006), the need for professional development of future tea**c**hers as VS instructors and site facilitators is critical. With a growing demand in VS courses, there will be a parallel need for teachers, facilitators, and designers for a successful functioning of the VS system (Davis & Roblyer, 2005.) "Virtual Schools and 21st Century Skills," found in The North American Council for Online Learning and the Partnership for 21st Century Skills (2006) asserted the 21st century needs teacher education programs to prepare teachers for the skills required to teach and facilitate online courses. However, few teacher education programs include VS to prepare preservice teachers for the competency required of VS teachers and facilitators (Davis et al., 2007.) As Cavanaugh (2004) puts it, leadership to promote VS should start at the national level. In 2004, The United States Department of Education took the leadership and granted a project called "Teacher Education Goes Into Virtual Schooling," under the Fund for the Improvement of Postsecondary Education (FIPSE).

Teacher Education Goes Into Virtual Schooling (TEGIVS)

The goal of TEGIVS was to prepare preservice teachers for three VS roles—VS site facilitator, VS teacher, and VS designer. Led by a land grant university (Iowa State University [ISU]), the project focused its activities in a large public southern university (University of Florida [UF]), a selective eastern university (University of Virginia

[UVA]), and a liberal arts college (Graceland University [GU]) with several Midwest campuses, including a virtual campus.

This unique and innovative project started in September 2004 and with successful implementation closed in 2008. It was unique, since it was the very first project in the U.S. devoted to preparing preservice teachers for VS. It was innovative, since it operated within the complex infrastructure of teacher education programs at participating universities, and these two ideas do not seem connected---separate the sentences there is very little existing research and literature in the area of VS. Due to this innovative nature of the project, the curricula, evaluation tools, and assessment prepared and administered under the project were modified every semester, based on usability ratings and other experimental and non-experimental findings from the implementation of the curricula.

This researcher‘s role in TEGIVS

Since August 2005, this researcher was under the direction of internal and external evaluators (one internal and one external evaluator) for this project, and worked as a graduate assistant responsible for internal evaluation of the project. Her main role was to collaborate with the external evaluator and design evaluation instruments to administer evaluation tools, collect data, and to assist the external evaluator in analyzing and reporting results for the project each year. Apart from these given responsibilities, this researcher was also instrumental in creating an intervention tool with scenarios for preservice teachers, designed to sensitize them about some of the many issues in VS. This intervention helped the TEGIVS designers to visualize the creation of the first version of the TEGIVS intervention tool. This researcher also had firsthand experience implementing the TEGIVS intervention in the course CI 202: Introduction to Instructional Technology in Teaching and Learning, for three semesters.

This researcher, as participant researcher in the project, has also contributed to publications and conference papers related to TEGIVS. Also, at various occasions during the project she participated in the biannual project retreats and other meetings of TEGIVS management and tools committee. This participation and contribution from the researcher helped the evaluation team gain an overall insight in to the functioning of the TEGIVS project. This researcher anticipates that her first hand experience of the key activities of the project will favorably help the documentation and analysis of this dissertation.

One of the most important objectives of the TEGIVS project was to develop rubrics to assess students' performances on the VS developed curricula (lab tool.) This objective of developing rubrics and assessing the students' performance/competence was delayed, due to the complex nature of the infrastructure at the participating teacher education programs and the fact that no published work existed at the time of the project on standards specifying performance/competency in VS for preservice teachers. At this point the project's principal investigator developed scenarios/vignettes to assess preservice teacher's performance/competency as VS teacher and site facilitator. This researcher, undertook the task of developing and validating a rubric to assess the preservice teachers' performance on these scenarios and conduct a detailed analysis assessing their competence as VS facilitators.

Research in professional development in VS

Very little research has been conducted in the area of preparing preservice teachers for VS. The three papers included in this dissertation address VS preparation in preservice teacher education. Neither preservice, nor inservice professional development for VS educators has been studied adequately. Various organizations like Southern Regional Educational Board (SREB) and North American Council for Online Learning (NACOL) have published guidelines on competence required to teach and facilitate

online courses in K-12. However, these guidelines are not based on research in K-12, and ignore the multiplicity of roles VS teachers may play, depending upon the type of virtual school they belong. It is only recently that the need to formulate research based standards on best practices in teaching and facilitating in VS, has been documented. The synthesis by Ferdig et al. (2009) has compiled research in K-12, higher education, and, in general, teaching and educational technology, that suggests competence required of online educators. This synthesis highlights different roles of VS educators and their corresponding tasks as VS teacher, coordinator, instructional designer, and site facilitator. This synthesis has set the stage for state and national bodies to lay standards for teaching and facilitating in VS.

Another unexplored area in VS is the development and implementation of assessment and evaluation tools. Very few assessment tools related to teacher efficacy in VS are available. These often address the technological ability of teachers and often are not tested for reliability and validity (DiPietro, Ferdig, Black & Preston, 2008). This dissertation presents an assessment tool to measure preservice teachers' competence as VS facilitators with a report of its reliability and validity. This assessment tool was developed and evaluated in the context of the TEGIVS curricula.

Research objectives

VS, as a field of research, has been studied only recently and thus has a frail body of literature (Cavanaugh, 2004.) This research aims to inform the VS developing body of literature by specifically contributing to the area of professional development of future teachers in VS.

Objectives of this research are:

- Present TEGIVS curricula and its preliminary evaluation.
- Study preservice teachers' perspectives and preconceptions about VS.

- Develop, validate, and implement a rubric to assess the preservice teachers' competence as VS facilitators.

Organization of the dissertation

Five chapters are included in this dissertation. These five chapters fall under the umbrella of VS in teacher education and the context of TEGIVS. Chapter 1 introduces VS in teacher education and TEGIVS (current chapter), Chapter 2 presents a published article explaining TEGIVS VS curriculum and the preliminary findings assessing its effectiveness, Chapter 3 proposes a study analyzing preservice teachers' perspectives on VS, Chapter 4 proposes a study assessing preservice teachers' competency as VS facilitators, and Chapter 5 synthesizes the findings of all three articles and draws out recommendations for future research and intervention. The following section further explains the highlights of each chapter and the researchers' contributions to the study.

Chapter 2 presents a published article "Illustrating the virtual in Virtual Schooling: Challenges and strategies for creating real tools to prepare virtual teachers" in the *Journal of Internet and Higher Education* (2007). This article explains the project goals, development of formative evaluation tools, and preliminary findings on the effectiveness of intervention tools used in its initial stages. This article was produced in the second year of the TEGIVS project. Hence, it explains the preliminary findings and suggests areas of improvement in the intervention tools.

This researcher's role in this article was to collaborate with the external and internal evaluators to design the survey, to administer the survey and collect the data, to determine the relevant statistical procedures and run statistical analyses, and to collaborate with other authors in writing this article. As mentioned above (section on role of researcher in the TEGIVS project), this researcher also participated in the development and implementation of the VS curricula/intervention, also a part of this article.

Chapter 3 presents an article "Preservice teachers' preconceptions and perspectives on virtual schooling." This article will be sent for publication in the *Journal of Internet in Higher Education*. This paper contains preservice teachers' preconceptions about Virtual Schooling (VS), and their readiness to teach, facilitate, and design in Virtual Schooling. These data were collected in Spring 2007 from the participating teacher education core courses at Iowa State University and the University of Florida. Data from only teacher education majors were used for this paper. The total sample size used in this paper was 207 preservice teachers (teacher education majors).

This researcher collaborated with the internal and external evaluators to design the survey, administer the survey, and collect data. This researcher conceptualized the research purpose and objectives for this article, analyzed results, and wrote the paper.

Chapter 4 presents an article "Development, validation, and implementation of a virtual schooling competence assessment instrument" which will be sent for publication in the *Journal of Technology in Teacher Education*. In this chapter, a rubric to assess preservice teachers' competency as VS facilitators was developed and validated. Further, the rubric was used to assess preservice teachers' level of competence as VS facilitators. Data from 153 preservice teachers participating in TEGIVS intervention at Iowa State University and the University of Florida in Fall 2007 were used for this paper.

This researcher collaborated with the principal investigator of the project to design the survey and competence scenario; participated in creating the VS curricula and implementation of the intervention at Iowa State University courses; administered the survey, collected data, developed and validated the rubric with the help from three national scholars in the area of VS and the principal investigator of the project, analyzed and discussed the results of the study; and wrote the article.

Chapter 5 highlights the relationship among the three articles and draws on findings from all three articles to present recommendations for teacher education programs for integrating VS into their curriculum.

Alternative method for the dissertation

This dissertation will be presented in the form of a collection of three articles (one published and two to be submitted for publication). This is an alternative format for the dissertation, as it differs from the traditional format that presents elements of a single study like Methodology, Results, and Discussion in different chapters of the dissertation. The traditional formats of the dissertation have very limited access and dissemination, as it caters to a restricted audience (Duke & Beck, 1999.) According to Duke and Beck, alternative formats that present a collection of articles prepare doctoral candidates for academic and professional worlds, where they will be expected to tease out different aspects of the same topic into a number of different papers or reports. Given the innovative nature of this project and the need for research on preparing teachers for Virtual Schooling, this researcher decided to follow an alternative dissertation format with an emphasis on immediate publication of results.

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Chapter 2
Illustrating the "virtual" in Virtual Schooling: Challenges and strategies for creating real tools to prepare virtual teachers

The Internet and Higher Education

Davis Niki, Roblyer Margarett, Charania Amina, Ferdig Rick, Harms Chad, Compton Lily &Cho Miok

Abstract

Virtual schooling, or the practice of offering K-12 courses via distance technologies, has rapidly increased in popularity since its beginning in 1994. Although effective interaction with and support for students in these environments requires a unique set of skills and experiences, teacher education programs currently place very little emphasis on teaching and facilitation competencies for virtual school education. This article reports on a federally-funded project to develop a model preparation program for virtual educators. After a brief review of project goals (identifying and building competencies, developing tools to support virtual teacher education, and scaffolding a national community of virtual school practice), the description focuses on the development and formative evaluation procedures and findings with a tool designed to give preservice students in introductory teacher education classes foundation concepts in effective virtual schooling practices. Also included are implications of evaluation findings and recommendations for further research and development.

Virtual Schooling: Preparing for a new era for education

Virtual schooling (VS) for K-12 students, an innovation that began just after the Internet went graphic with Web browsers in 1994, has steadily increased in popularity (Clark, 2001; Roblyer, 2003; Setzer, Lewis, & Green, 2005; Zucker & Kozma, 2003; NFES, 2006). Recent federal reports on virtual schooling from the National Center for Education Statistics (Setzer, Lewis, & Greene, 2005) indicated that about one-third of

public school districts in the U.S. had students enrolled in distance education courses during the 2002-2003 school year. Wood (2005) reported that about 300,000 students participated in online education during this time period. Based on reported virtual school annual enrollment growth of 50-100% (Watson, 2005, p.11) and the number of new state-supported virtual schools each year, subsequent estimates put that figure much higher and predict that the number of virtual school students will continue to expand over the next few years (Wood, 2005). Michigan, home to one of the 23 statewide virtual schools, recently passed a law requiring all high school students to have at least one VS experience before graduating, a requirement that may be a model for education systems in other states.

The VS movement seems to be redefining what it means to be "in school" (Roblyer, 2008), and has also placed new requirements on teachers entering these 21st century environments. Unfortunately, the explosive growth of VS has not been mirrored in teacher education programs, leaving most new educators unprepared for the new competencies required to teach in electronic classrooms. This article describes recent work and products of a federally funded project designed to address the special challenges that the VS movement has presented for teacher education.

Preparing virtual teachers: Challenges and opportunities

Virtual school experiences over the past decade have shown that effective virtual teachers have qualities and skills that often set them apart from traditional teachers. Wood (2005) quotes Blomeyer's observation that, "(there is a) persistent opinion that people who have never taught in this medium can jump in and teach a class … A good classroom teacher is not necessarily a good online teacher" (p. 36). Easton's (2003) study of skills required by distance learning instructors found that many communication skills required of the online instructor are similar to those needed for effective classroom teaching.

However, she also pointed out that the online instructor's role requires a paradigm shift in perceptions of instructional time and space, virtual management techniques, and ways of engaging students through virtual communications.

With a growing demand for virtual courses throughout the K-12 curriculum, there will be a parallel need for teachers, designers, and facilitators who understand the unique communication and pedagogical demands of VS and can work successfully in distance environments to meet the needs of students of diverse backgrounds and abilities. Yet there is almost no emphasis in current teacher education programs on these new competencies, which may contribute to an assimilation gap (Fichman & Kemerer, 1999) as new teachers' skills may not meet the needs of an implemented new educational system. Recognizing this need, a consortium of teacher education programs, led by the Iowa State University, requested and received federal funding to create a teacher education program to prepare effective VS teachers and to establish a nationwide community of practice on VS teacher preparation.

Overview of the Teacher Education Goes into Virtual Schooling (TEGIVS) project

Teacher Education Goes into Virtual Schooling (TEGIVS) is a three-year project administered by Iowa State University's (ISU) *Center for Technology in Learning and Teaching* and supported by the U. S. Department of Education's Fund for Improvement of Postsecondary Education (FIPSE). In addition to ISU, project partners include the University of Florida, the University of Virginia, and Graceland University. The goal of the project is to prepare preservice teachers to implement effective VS curricula in three VS roles: Facilitator, Teacher, and Designer. The project is based on three complementary strategies to address the overarching goal of building a preservice model for preparing virtual teachers:

- Objective 1: VS competence – This is addressed through curriculum development in teacher education to map VS into the four representative preparation programs and adapt or create selected courses that will include assessment of VS competence against standards. This is underpinned by strategic professional and organizational development.
- Objective 2: VS tools – These are instructional materials that are designed to illustrate and provide experiences with VS concepts and issues. For example, the shell software described in this paper provides a means for preservice students, faculty, and staff to select and explore specific instances of VS.
- Objective 3: A VS national community of practice – The TEGIVS project has begun bringing together teacher educators from around the U. S. to facilitate adoption of VS into teacher education nationwide. The need to develop partnerships with virtual schools and service organizations has also been recognized.

The sections that follow describe the creation and formative evaluation of tool and curriculum materials through which the project will introduce preservice teachers to virtual schooling. The description illustrates how the project team created and tested strategies and tools that prepare teachers for the real environments they will face in VS. This first major project of the consortium provided a way to address objectives 1 & 2; however, as the tool will eventually be openly accessible, it also provided a way to initiate change within the community (objective 3). Modification of the tool is underway based on findings from pilot studies. Additional tools and activities that have not yet been piloted also will be described briefly at the end of this article. First we describe the dilemmas experienced in specifying and creating our first tool and scenarios.

Virtual school lab tool development: Opportunities, challenges, and strategies

The task of preparing teachers for learning environments that are often fundamentally different from those they have experienced in their own school education carries both challenges and opportunities. In researching the current training available for virtual teachers, the project team recognized that no tools were available that could immerse learners in situations that are typical of those that virtual teachers face everyday in their "virtual classrooms." The team also recognized that this dearth of materials presents a unique opportunity to shape curriculum, an area of teacher preparation that will continue to grow in importance in coming years.

The first major challenge the team faced was trying to conceptualize a suitable lab tool before specifying the VS curriculum. Proposals such as avatars and games proved unfruitful because the tool developers needed much more information about needed curriculum in order to proceed with the conceptualization process. Organizing VS curriculum and selecting contents for target users was also challenging. After considering several approaches, the TEGIVS team made a decision to specify the VS curriculum and then repetitively prototype the curriculum and the tool interfaces for the best VS Lab experience. That tool was then honed to accommodate restraints including time, assessment and compatibility among consortium programs.

VS Curriculum Design Process

The six person multidisciplinary design team, which included content, instructional technology and human computer interaction experts, began the process of design with a brainstorming process of various VS technologies, interfaces, tools, communication and management issues plus related aspects. These elements were then grouped into four categories, namely: pedagogy, technology, assessment, and VS classroom management issues.

Based on the assumption that the target preservice student teacher users could not be assumed to have experience with VS, the team decided to focus on three topics: (a) potential issues in using VS, (b) VS implementation methods, and (c) ways to organize learning within the VS environment. To address these topics, storyboards for three scenarios were drafted to specify variety within VS. The tool's resemblance to a website aimed to provide a familiar format for the users and, thus, signaled the need for tool-specific training. The fictional scenarios were set in a high school foreign language course and two high school science courses because these were among the best understood examples at hand. They aimed to illustrate different aspects (pedagogy, learning environment, assessment, and challenges) so as to complement one another as shown in Table 1.

Table 1. *Matrix of First Three Scenarios Used in Pilot Studies*

Phase Content	**HS Spanish**	**HS Chemistry**	**HS Anatomy & Physiology**
Technology Shown	*Elluminate* – Internet audio/whiteboard conference	ICN video conference connecting 2 classrooms	WebCT managed learning environment
Tools Shown	Audio, whiteboard, web walk	ICN, Online chat room	Content and Quiz online
Synchronous?	Yes, plus blended	Yes, except some peer group work	No, but has blended face-to-face labs and ICN office hours
Stage in Course	Before course starts	Mid to Late	Midway
Interaction Illustrated	Student-HS Teacher and Principal	VS Teacher-classes; Students-students (+uninvited guest)	Student-content (alone); Peer support
Organizational Issue(s)	Advising, testing technology	Group work; Safety on web	Pace; Cheating on Test
Assessment focus (implied)	Spanish oral performance-based	Project report	Test (not proctored)
Pedagogy	Adapted to technology	Normal for HS science: didactic plus project inquiry	Problem-based through content modules

In terms of pedagogy, the fictional scenarios illustrate how VS courses may be structured using different learning approaches including didactic inquiry and problem-based learning. The communication and interaction among the VS teacher, students, and content were major concerns in designing VS curriculum. Different teaching strategies such as individual and group work and variations in the flow of communication in VS courses in terms of synchrony and symmetry were also illustrated. The issue of evaluating learning in a VS context was illustrated with several methods of assessment including reflections, proctored and performance-based test, and quizzes. Because VS uses many different learning environments, technologies and learning tools, three common and contrasting technologies used in VS courses were selected: managed learning environment (WebCT), classrooms connected via live videoconference, and a multimedia audio conferencing interface (Elluminate). Additionally, the scenarios presented a range of tools used to support the learning process with both synchronous and asynchronous modes including discussion boards, chat rooms, audio/video, email, and whiteboard. Since every teaching, learning, and assessment strategy as well as instructional tool illustrated in the three scenarios had disadvantages, it created the opportunity to highlight some challenges of VS. For example, cheating and plagiarism issues were linked to assessment while privacy and safety issues, lack of interaction time, and scheduling conflicts were linked to pedagogy.

Once the VS curriculum was created, the team produced two tasks (one individual task and one group task) to engage and evaluate the preservice teachers' awareness of VS. The individual task was structured using a step-by-step task sheet to review all four categories of VS based on each scenario, while the group task required the preservice teachers to explore further one of the four categories using additional web resources that were provided and then make a presentation to the class on that category.

Lab Tool Creation Process

Once the storyboards were completed, the project designer produced curriculum materials as flash files containing audio narrations, closed-captioning, and images. The website interfaces for the Lab Tool presented the flash files and web links that were included as resources in a familiar format. The users' familiarity and comfort with the tool - and particularly its interface - was an important concern given the need for its typical use within a two hour lab. Access to the lab tool was feasible since the preservice teachers met in a computer lab with full internet access during their lab sessions. This also provided a solution for compatibility among consortium programs. Figure 1 shows the outer shell of the lab tool that provided the introduction and learning objectives as well as information task sheets and a link to the scenario interface.

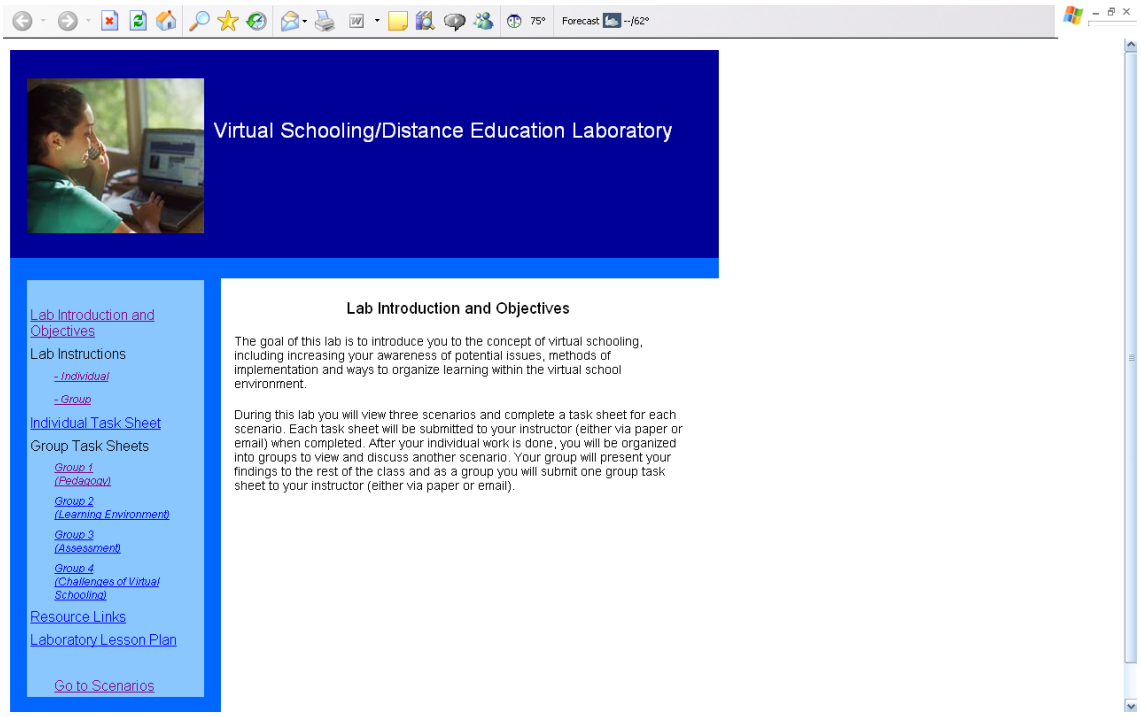

Figure 1. Lab Tool's outer shell/introduction page

Figure 2 shows the screen capture of the lab tool scenario interface. This interface has five major sections. The top section presents the menu bar for all three scenarios and

link to the outer shell. Each scenario is divided into a number of scenes which are located on the right column while the left column contains the links to selected web resources. The middle section displays the visuals (flash files), which were still pictures accompanied by audio and closed captioning located on the bottom section.

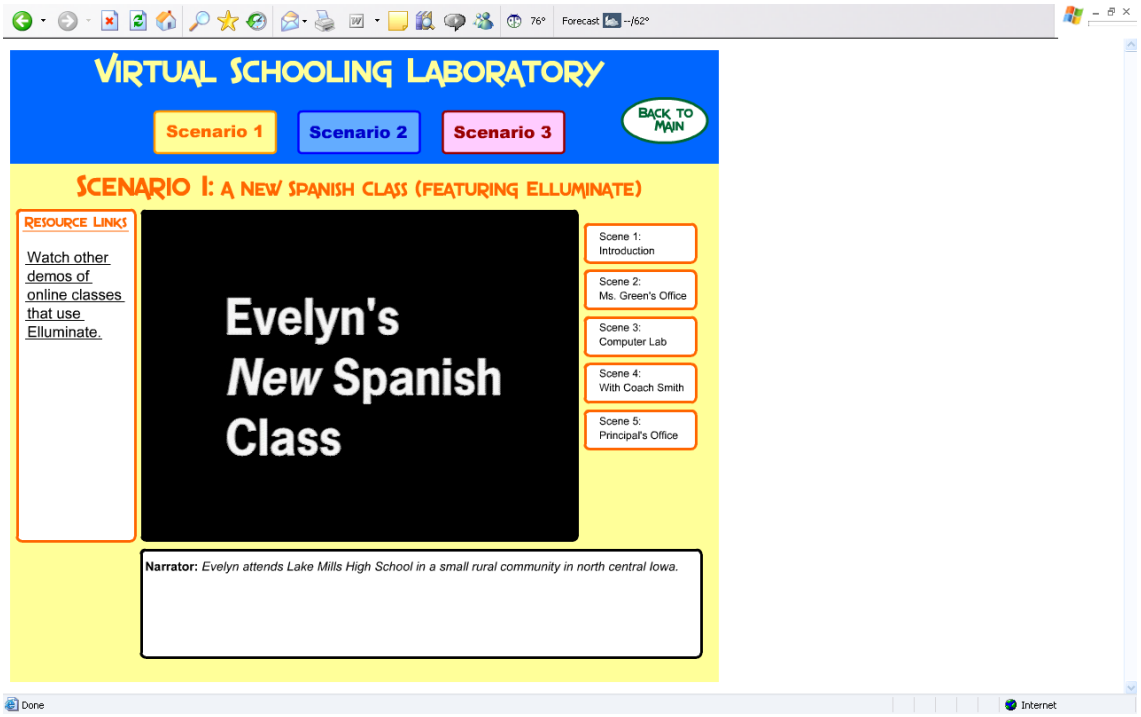

Figure 2. Screen capture of the Lab Tool's scenario interface

Lab Tool Implementation Strategies

This introductory VS curriculum pilot was conducted at Iowa State University (ISU) during the Spring, 2006 semester and at the University of Florida (UF) during the Summer, 2006 semester. Prior to the pilot, the project designer and one of the project evaluators worked closely on the pilot procedures. At ISU, project directors selected one lab section of an introductory technology course. The target students were preservice teachers who took ISU's Curriculum and Instruction Introduction to Technology (CI 201) course. Because the designer and evaluator had both taught a similar lab section before, they were able to work closely with the lab instructor to ensure that that the pilot test was

integrated into the course syllabus. Additionally, the designer took over the role of the lab instructor for the pilot lab session; her instructions were limited to a general description of the pilot test and an overview of what the students' tasks were. Students were encouraged to make full use of the Lab Tool. The designer was on standby to handle any technical issues, and the evaluator recorded the session using a camcorder, took observation notes, and handled the usability testing evaluation at the end of the lab.

The target students at UF were enrolled in the Introduction to Educational Technology course (EME 2040). EME 2040 is currently required by all teacher education students in the State of Florida. In addition, the course is also available to non-education students in place of a computer science elective. It is common to have students enrolled in EME 2040 with majors ranging from Journalism to Agriculture Food Sciences. EME 2040 generally enrolls 180-200 students each semester and 30-60 students each summer. The class is taught in a lab/lecture format; the students generally meet in a large lecture hall for one period a week, then have a small-group, hands-on class period in a computer lab each week. Beginning in summer 2005, however, the lecture component was moved completely online using *Moodle* (an open-source learning management system). The large-class lecture format made it difficult to address the needs of each student. By using an online setting, instructors aimed to model a more constructivist teaching and learning approach. Smaller labs were kept face-to-face so that students would get to see teaching with technology in multiple formats.

In both universities, the pilot test was completed in approximately 2 hours. Table 2 illustrates the implementation process including the stages, allotted time, tasks and outcomes. The pre-test survey had been implemented a week prior to the pilot test. On the day of the pilot lab session, students navigated through the online VS curriculum and then

completed the posttest. Finally, at ISU only, the pilot test ended with a usability evaluation.

Table 2. *TEGIVS Lab Tool Pilot in ISU and UF*

* Online only in UFL for most students

Stage in Process (first to last)	Time Planned for Activity	Computer Interface	Individual or Group	Task Sheet or other document	Outcome
Pre-test Online	(no limit)	Survey Monkey	Individual	Online Survey	Submit
Instructor's Introduction*	5 minutes	Lab tool Outer shell	Group (class)	No	N/A
Familiarity with Scenarios*	45 minutes	Lab tool Scenario Interface	Individual	Yes, 1 per scenario	Submit first analysis
Group Work to Analyze One issue	45 minutes	Lab tool Scenario Interface plus Web URLs	Group	Yes, same sheet again	N/A
Present to Class	20 minutes	None	Group	No	Presentation
Post-Test Online	(no limit)	Survey Monkey	Individual	Online Survey	Submit
Usability (ISU only)	(no limit)	None	Individual	Yes	Hand in

Evaluating Virtual Lab Tools: Strategies and Preliminary Findings

The plan for evaluating the VS tools called for three activities. First, evaluators reviewed documentation of the software development using evaluation procedures common to projects that use a rapid prototyping instructional design model (Tripp & Bichelmeyer, 1990), which require frequent evaluative checks throughout the design and development phases. The design team used ISU CI 201 students and teaching assistants as

participants during the testing of several prototypes and, in the early phase, an expert in instructional design was consulted for content accuracy and design appropriateness. Suggestions for improvement were also gathered in the second phase along with opinions on the instructional quality, usefulness and overall impact of the instruction to raise awareness of VS issues and development of competence to facilitate VS.

Second, project evaluators collected formative evaluation data using a survey plus observation of both student and instructor users to determine the usability of the software. Project evaluation strategies during field trials called for tools to be used with randomly selected preservice students in experimental and contrast groups to determine their impact on students' learning of VS concepts. The instruments used during the pilots and findings from these initial uses are described here.

Formative Findings: Tool Usability

Students at ISU and UF who piloted the VS Lab Tools with three scenarios completed pre-post self-report instruments to indicate their awareness, confidence, and competence with VS concepts. In addition, ISU students in the intervention group completed usability test rating scale and quantitative data from these ratings are shown in Table 3.

Overall, ISU participants found the web tool visually attractive, clear, and easy to navigate. They also gave positive ratings to the usefulness of resources in terms of understanding of VS and completing individual and groups tasks sheets. In terms of the quality of scenarios, the students rated the audio clarity less effective than the other characteristics such as visual clarity and website appeal. The meaningful use of scenarios in terms of understanding VS also received positive ratings. The UF students were less positive on all but two items (scenario visual clarity and resources helpful to complete group task).

Table 3. *ISU & UF Student Ratings of Tool Usefulness/Usability*

Responses	Mean ISU Responses (n= 18)	Mean UFL Responses (n= 34)
Scenario audio clarity	2.78	2.20
Scenario visual appeal	3.00	2.38
Scenario meaningful	3.18	2.44
-(Easy to get lost) [reversed for negative statement]	3.27	3.07
Scenario visual clarity	3.42	2.73
Resources helpful to complete individual task sheet	3.52	2.91
Resources helpful to complete group task sheet	3.63	3.29
Resources aided understanding of VS	3.68	3.35
Web-site clarity	3.78	3.5
Web visuals attractive	4.15	3.12
Navigation swift	4.21	3.23

*Scale = 1 (strongly disagree) to 3 (neither agree or disagree) to 5 (strongly agree)

Data provided by the ISU students from the open-ended questions on the usability rating sheet provided more detail to explain these ratings. The ISU students reported technical difficulties in terms of audio clarity of scenarios and some trouble navigating the links within the web tool. In terms of presentation of instructions, the participants suggested including video instead of still pictures and captions along with the movie. Many participants found that there was not enough content to aid their understanding about VS and/or help them complete the task sheets. The UF participants faced problems related to downloading the flash movie and reported difficulties with audio clarity of the scenarios. They also commented that the VS content lacked details and did not help a great deal in completing the task sheets. Their suggested strategy to increase the visual appeal of the scenarios was to use video instead of still images in the scenarios, and to make task sheets more challenging.

As highlighted in the course descriptions, the ISU class had a moderately blended environment where online tools were an important part of the Lab activity. In addition, the tool development team (including the designer and the evaluator) had taught the ISU course before and so worked closely with the instructor to implement the tool into the course. They were also available to provide in-person support during the implementation. In contrast, UF students had one portion of their class (the lecture component) taught completely online and another section (the lab) taught completely face-to-face. The UF team provided support, but the content simply replaced a week-long section of the course entitled "Online Learning." Finally, and most obviously, the UF program was at a distance; therefore, some of the materials (e.g. video) were not easily accessible by the UF students. These three issues may account for the UF ratings being generally lower than ISU.

In addition, the differences between these two groups may point to specific needs for the development team, particularly as we envision tools being used by a wider audience nationally. First, we need to allow for the varied teaching environments in which the tools will be applied, e.g. the UF students had already spent 75 percent of the semester in one online environment being exposed to many VS concepts simply by the medium of the instruction. Second, we need to account for instructor support in terms of curricular integration and problem-solving. Finally, there are a variety of tools that can be used to promote teaching and learning about virtual schools. Movies, although appealing and potentially useful, provided some obstacles to learning in this pilot. Synchronous vs. asynchronous, text vs. audio vs. video, and collaboration vs. individual work will all be important points to consider in both the development and evaluation of online tools for teacher education.

Preliminary Summative Findings: Experimental Comparison of Courses

To determine the impact of the online scenarios in practice, two of the ten labs for the ISU introductory technology-based teaching methods course were selected for an experimental comparison of VS skills with the lab tool. Selection was based on convenience sampling for the intervention. Contrast and treatment groups were assigned (13 students in the first lab served as contrast group and 20 students in a second lab served as treatment group). The contrast group (13 students) was administered a paper based pretest in the lab. All 13 students responded to the pretest and completed a paper-based posttest after their lab. Due to time constraints, the treatment group was administered the pretest online, and 19 of 20 students responded to the pretest and the paper-based posttest was administered in the lab after the intervention. The treatment group was also asked to complete a usability rating sheet to evaluate the content, design, and general ease of usage of the VS tools and their lab intervention was video recorded. Comparative results of the ISU students' reactions to the Lab Tool are shown in Table 4.

Table 4.*Objective 1 Pre-Post Self-report Results for ISU CI 201 Treatment and Contrast Groups*

(Scale: 1 =strongly disagree to 3=neither agree or disagree to 5=strongly agree)

Variables	Treatment Group Means		Contrast Group Means	
	Pre (N=19)	Post (N=18)	Pre (N=12)	Post (N=9)
Awareness				
Learning environment in VS	2.05	3.39	2.17	2.33
Pedagogy	1.79	3.28	2.33	2.22
Issues	2.00	3.61	2.00	2.55
Assessment	2.79	3.39	1.92	2.44
Confidence teaching VS	1.63	2.78	2.00	1.78
Competence teaching VS	1.79	3.00	2.09	1.78
Competence developing VS courses	1.58	2.72	1.91	1.78

To obtain preliminary, formative information about the impact of the materials, a statistical test for significance was performed on the pilot data. However, given the pragmatic (i.e., non-random) nature of the group selection, the term contrast group is used here rather than the more scientific term of control group. Since the contrast and treatment groups at ISU were not matched and had a very small sample size, non-parametric statistical procedures were used (Mann Whitney U test) to determine significant differences between contrast and treatment groups on pretest and posttest. Only participants who took both pretest and posttest were included in the analysis. As expected the results in Table 5 showed no significant differences between treatment and contrast groups at pretest, whereas at posttest the treatment group showed significantly higher average ranks on all self-reported measures of awareness and competence.

Table 5a. *Posttest Mean Average Ranks of Contrast and Treatment Groups at ISU*

	Contrast group N = 7	Treatment group N = 17	z
Awareness			
Learning environment in VS	8.06	16.38	2.79**
Pedagogy	9.39	15.68	2.08*
Issues	9.50	15.62	1.98*
Assessment	8.89	15.94	2.38*
Confidence teaching VS	8.50	16.15	2.53*
Competence teaching VS	7.44	16.71	3.08**
Competence developing VS courses	9.28	15.74	2.13*

*p<.05, ** p<.01

For the larger data set form the University of Florida a paired-samples t test was conducted to evaluate whether the participants ratings on awareness, confidence, and competence related to VS significantly differed from pretest to posttest. The results indicated that compared to pretest ratings, the participants gave significantly higher

ratings to their awareness for learning environment in VS, pedagogy in VS, issues related to VS, and assessment related to VS at the posttest. The ratings for confidence and competence for teaching VS school courses, and competence designing VS school courses were also significantly higher at the posttest. (See Table 5b).

Table 5b. *Posttest Mean Average Ranks of Contrast and Treatment Groups at UFl Using* Paired Sample t test

Variables	Pretest		Posttest		
	M	*SD*	*M*	*SD*	*t*
Awareness (N = 32)					
Learning environment	2.16	1.11	3.97	.78	-7.70***
Pedagogy	1.56	.98	3.66	.83	-9.86***
Issues	1.97	1.06	4.06	.72	-10.88***
Assessment	1.94	1.10	3.94	.91	-8.57***
Confidence teaching VS (N = 33)	2.03	.95	3.15	.90	-4.98***
Competence teaching VS (N = 33)	2.09	1.13	3.21	.89	-4.25***
Competence developing VS courses (N = 33)	1.88	.99	2.97	1.13	-5.19***

*** p<.001

Next Steps: Research and Further Development

The project's three-year evaluation plan called for collecting formative and summative data to shape and confirm the accomplishment of all these objectives (Davis & Roblyer, 2005). The project is currently reaching the end of its second year during which both ISU and UF have collected formative data described and that has informed revision of project strategies, tools and materials. By the end of this year, the project will have collected scientifically based evidence on the effectiveness of interventions in the preparation of teachers.

Additionally, project activities involving the VS Lab Tool and other aspects of the project will be expanded in a range of courses and will be used in all four teacher

education programs during the following semester. Our aim is to prepare preservice teachers for the three main roles in VS: facilitator, teacher and designer (Harms et al, 2006). Our next steps include development of the Lab Tool and a second tool for VS field experience and this is now described.

Lab Tool and Scenarios Revision

The feedback described from the piloting of the VS Lab Tool stimulated several developments to improve materials before further trials and pilots are done in other universities. In addition to the student and instructor feedback from the two universities discussed above, experts in distance education and instructional design undertook further critique and development of both the Lab Tool interface and the scenarios in order to illustrate VS more clearly and to engage students more in the process.

Based on the feedback from initial field tests, the three scenarios were edited and expanded. In some cases, the goal to increase the drama of story had resulted in the fictional case study apparently showing less-than-optimal practice, while the instructional points that needed to be made had not been sufficiently emphasized. Therefore, it was important to provide some debriefing at the end of each digital story. This was designed to stimulate students to explore web links, find illustrations of good practice, and gain a richer picture of the variety of VS technologies, pedagogies and organizational approaches. In addition, further scenarios were created to extend the range of content and grade levels covered by scenarios. For example, scenario illustrating a Teddy Bear exchange project between PK-3 classrooms will be added modeled on the iEARN international association's project of the same name.

The major revisions of the Lab Tool Interface reduced distracting elements and improved navigation, which had been recognized as particularly important when viewing a scenario. The frame set of the Scenario Interface was redesigned in pastel shades with

one menu on the left hand side, plus a Next button on the bottom right following the convention for book-like interfaces. The expected flow of activity thus became more obvious and the student is guided through the introduction and scenes of the 'digital story' of this scenario of VS, and then drawn into further investigation of this case using live web links with an individual task specific to each case. The student's analysis of that scenario is guided with a generic task sheet for student's notes structured in the three themes of the rubric that will be used to evaluate their understanding. A short self-test is planned to encourage students to review the evidence they have gathered before continuing to the concluding individual task to provide a solution to the challenges that should have been identified in the fictional scenario. Group work is still under revision. When an extensive bank of scenarios is available, preservice students will be able to choose scenarios to match their interests, content expertise, and grade levels.

The work on the scenarios also included improvements to the media elements deployed and related file management, since the project aims to share these materials using an open source approach. It is recognized that teacher education faculty and their assistants may wish to edit our materials to suit local contexts and we wish to encourage and support good practice in the construction of new scenarios and curriculum materials. We have found screen capture software (in our case Adobe Captivate; http://www.adobe.com/products/captivate/) versatile in improving, and combining elements that includes images, screen shots, and audio in ways that may be output flash files for use in our VS Lab Tool. The feedback discussed earlier indicated that further work was required to improve the quality of the elements and this was done using Captivate and other audio tools such as Gold Wave (http://www.goldwave.com/). The materials were also gathered into carefully labeled files and folders, so that it becomes

possible to adjust part of a scenario with relative ease. A process of documenting open source intellectual property is also being implemented.

Deployment of the VS Lab Tool in Fall, 2006

Table 6 lists the planned deployment of the VS Lab Tool in eight classes and one conference during fall 2006. The two universities that have already piloted the tool will participate in a field trial during which it is planned to collect scientifically based data set with randomized sampling. After piloting the other two universities, they will also move to field trials in the following semester.

As expected, each teacher education program integrates instructional technology preparation in different ways. Three of the four programs have a specific introductory course, but the delivery mode of the course and streaming of students into age specific and content specific groups varies. Further variation in Graceland University requires that VS be introduced in a methods class because there is no course in introduction to instructional technology due to the integrated nature of that program. With regard to the delivery mode, the courses also vary but most have become blended with both face to face and web-based modes. These pilots and trials should bring us interesting evidence. A pilot within a conference is also noted that will provide interesting evaluation from virtual schools.

The project also incorporates the creation of an Open Source "foundry" that will continue to expand production of VS materials and refinement of VS tools. Three courses will create further materials, particularly draft scenarios that may be selected for further development. This strategy to have courses continue to create materials was designed to increase the sustainability of this innovation as an approach that has been successful in technology mentoring (Davis, 2004; Thompson, Sahin & Schmidt, 2008). The transferable aspect of this strategy is that an internship experience for students (led by a

member of faculty teaching a course for them) also results in continual updating of technology within our program at ISU. In fall 2007 a course in instructional design was further developed to improve its applicability to the design of materials, especially content and learning environments for VS (Correia & Davis, 2008).

Table 6. *Planned Implementation of the VS Tools for Fall 2006*

	University & course/Conference	Pilot/Trial/Design	VS Tool	Mode
Introductory course	ISU CI 201 sect 1	Trial elementary	Lab	Blended
Introductory course	ISU CI 201 sect 2	Trial secondary	Lab	Blended
Introductory course	UF	Trial	Lab	Blended
Introductory course	UVA	Pilot	Lab	Blended
Methods course	GU	Pilot	Lab	Blended
Course in distance learning	ISU CI 407/507	Pilot of revised materials; Design: specification of new scenarios	Lab	Online only for most
Instructional design course	ISU CI 503	Design: creation of new scenario and critique of Lab Tool	Lab	F2F
Conference review by VS	NACOL	Critique by Virtual Schools	Lab	F2F with online follow-up
Field experience	ISU CI 280 B	First pilot of Tool 2	Mentoring	Blended

Finally, the project will pilot a VS field experience within an ISU course. During spring 2006, the instructor carried out a pre-pilot activity during which students were introduced to some organizational aspect of VS in their preparatory seminar before field experience and a task to identify instances or opportunities for VS was added. This curriculum activity has been improved and will be piloted along with a virtual experience during which students will explore a VS course (using relevant technologies) sandwiched between briefing and debriefing by both the VS teacher and their university instructor.

Anticipated Future Implementation

The goal of the project is to prepare as many teachers as possible to facilitate students in VS environments. In addition, some preservice students who take additional courses will be prepared for future roles as a VS teacher or designer. Once the curriculum and organizational innovations of the project are complete, preservice students who undertake part of their final teaching practicum in a VS context will become eligible for an additional VS certificate. By the end of its third year, the project should have developed and piloted the integration of VS within four courses in one preservice program, and will have at least piloted VS within all four teacher education programs.

At the same time, the design of real tools to provide teachers access to VS experiences remains challenging. Though avatar-based virtual reality and similar tools has not proven a good match for our objectives, other innovative approaches that could be of use to us are emerging continually, including the picture games discussed in the Human Computer Interaction seminar at ISU as we write (von Ahn & Dabbish, 2006). The project's scenarios have similarities with recently emerging curriculum approaches using digital stories (Bull & Bell, 2005), and our mentoring tool may resemble "vodcasts" (multimedia-enhanced audio-casts transmitted via the Internet often to hand held devices such as an iPod). At the same time, managed learning environments (e.g. WebCT) that are being upgraded to include more multimedia tools seem likely to help our project sustain the open source format we have started.

Conclusion: Current challenges and future opportunities

VS is rising in both popularity and importance, becoming part of legislated school reform and improvement in many states. It is also being promoted for its innovative ability to provide increased educational opportunities for both traditional and non-traditional students. However, a key component in the success of VS teaching and

learning is the extent to which teacher education programs can foster the development of future educators who can become effective VS facilitators, teachers, and designers. Part of the responsibility of teacher educators is to ensure that we prepare students for the technology-enhanced environments they are likely to encounter in their professional lives. Additionally, students arriving in higher education are increasingly sophisticated technology users, bringing with them enhanced Information Age skills and new approaches to learning (Oblinger & Oblinger, 2005). Since students expect teachers to be as sophisticated as they are in their use of technology, the need for increased emphasis on technology skills in higher education is likely to increase rapidly over the next few years, along with a concomitant need for improved leadership in using technology to leverage change in education (Davis, 2008). The recent call for an improved higher education system is likely to fuel that expectation.

The TEGIVS project has attempted to build VS competencies by developing a tool that can be shared within the teacher education community. Our initial findings suggest that such a tool can influence future educators' thinking about teaching and learning in the 21st century. Results suggest improvements needed in both content and delivery. In terms of content, it is important that we continue to build multiple scenarios in order to begin to reflect the complexity within virtual school teaching. We must provide multiple and crisscrossed tours through the complex and ill-structured domain of teaching, and of teaching online (Spiro et al., 1988). In order to do that, we are keen to hear from readers who are engaged in or planning similar innovations in higher education. We would welcome interdisciplinary collaboration to inform our practice. Such research could also include more basic multidisciplinary research into theory and models of effective learning, teaching, professional development, and training.

In terms of delivery, we focus on our ambitious attempt to influence a broader community of practice, in keeping with our project goals. This project invites a re-examination of the complexity of both the subject of teaching and the context of teaching to teach. In our initial research, the medium of delivery, the curricular support, and the pedagogical strategies of implementation all provided both affordances and constraints to successful teaching and learning. Though we do not suggest that the "perfect tools" would address all these concerns, we suggest that TEGIVS materials permit students to see the complexity of teaching and learning online and with other technologies. If we are successful, the VS tools described here and those to be developed will reveal a new world of teaching and learning through the lens of VS practice.

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Chapter 3
Preservice teachers' perspectives and preconceptions on Virtual Schooling

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Abstract

This study is an attempt to study preservice teachers' preconceptions about Virtual Schooling (VS), and their readiness to teach, facilitate, and design in Virtual Schooling. The data were collected from two of the four participating universities in the Teacher Education Goes Into Virtual Schooling (TEGIVS) project funded by the Fund for the Improvement of Secondary Education, US Department of Education. The data revealed that preservice teachers attach high importance for teachers to learn about VS, and rate themselves low on VS competencies. The open-ended responses indicated the preservice teachers hold preconceptions about VS. These include the preconceptions that in VS technology is a teacher's surrogate, VS is a curriculum or a tool, VS integrates technology into the classroom/school, VS is a replica of face-to-face school online, VS involves learning at leisure, and VS is for advanced students. Given that no prior intervention on VS was conducted and TEGIVS was a pioneering project in the US, about one-fourth of the preservice teachers' reported high competence in VS, thereby reiterating the common preconception that teaching is easy. Other commonalities between preconceptions in the data, and preconceptions about teaching and online learning in non-VS contexts documented in the literature are discussed. This study provides evidence for the need to integrate VS into teacher education, and further suggests teacher education should identify and correct preservice teachers' preconceptions about VS.

Introduction

The demand for VS has increased but remains unmatched with the supply of educators to teach and facilitate in VS. Every year about 86,000 new teachers flow into the K-12 system in the U.S. without any preparation in VS. This gap in the supply of VS educators cannot be filled without the integration of VS education into teacher education programs. Acknowledging the need to integrate VS into teacher education programs, this paper informs teacher education faculty and researchers about the perspectives and preconceptions of preservice teachers about VS.

This paper begins with a literature review regarding VS and teacher education, and then presents preconceptions about teaching in face-to-face classrooms in K-12 and online learning in higher education. This review aids in understanding and drawing connections with the preservice teachers' preconceptions about VS found in this study. The data source and tools used in this study are discussed, followed by three sets of analyses. The first set of analysis presents preservice teachers' perspectives of VS in terms of the importance they attach to learning about VS, and their reported competence to teach, facilitate, and design in VS. The second set of analysis presents preconceptions about VS as found in preservice teachers' stated definition of VS, and as indicated in their ratings on competence in VS. The last set of analysis interprets the preconceptions found in the definitions, and draws a connection with preconceptions about teaching in face-to-face classrooms and online learning discussed in the literature review.

Literature Review

VS is a system through which K-12 students learn via technology from a teacher who is at a distance (TEGIVS curricula, 2007). VS is one of the fastest growing trends in education today (National Forum, 2006; Setzer, Lewis, & Green, 2005; Zandberg & Lewis, 2008), especially in North America (Barbour & Reeves, 2009; Patrick & Powell,

2006). In the United States, compared to only five states in 1997, 44 states offered supplemental, part-time, or full-time online learning courses for K-12 students in Fall 2008 (Watson, Gemin, & Ryan, 2008). This growth in VS is speculated to increase further, as new legislation in several states in the U.S. has mandated online experiences for every K-12 student.

One of the factors that remained in sync with this growth is the evolving distance technology. The growth of VS boomed as the Internet went graphic with the Web browser in 1994. Since then, the evolution of advanced synchronous and asynchronous distance technologies has grown exponentially with the rapid growth in VS. Although access to distance technology has grown vigorously (Zucker & Kozma, 2003), the role of the teacher remains at the heart of the VS system (Harms et al., 2004). Several studies in distance education have found that teacher quality was the most influential factor in predicting the success of students in an online course (Rice, 2006). However, unlike the supply of distance technologies that matches the growing demand for VS, the VS system suffers from a shortage of teachers and educators. Many "virtual schools and other organizations that offer online courses and other forms of distance education to K-12 students are eagerly seeking to recruit new staff to match the demand for high quality VS in many U.S. states" (Davis & Rose, 2007, p. 7). However, most teacher preparation programs "rarely include courses either about online teaching, or conducted through distance teaching" (NEA, 2006). As a result, 86,000 new teachers each year enter the profession without any online teaching skills. It is a common preconception among educators that first-year teachers and regular certified teachers can teach in VS with ongoing professional development in online learning (Davis & Rose, 2007). Also, a good teacher in a traditional school may not be an effective teacher in VS (Wood, 2005; Darling, 2000). Teaching in VS requires specialized skills, and many organizations and

government bodies have reported guidelines for skills required in online teaching (National Education Association (NEA); Guide to Teaching Online Courses (2006), North American Council for Online Learning (NACOL); NACOL National Standards for Quality Online Teaching (2008); Southern Regional Education Board (SREB); Standards for Quality Online Teaching (2006a), Online Teaching Evaluation Tool (2006b); International Society for Technology in Education (ISTE): National Educational Technology Standards for Teachers 2nd Ed. (2008)). However, none of these reports offer suggestions based on empirical evidence (Rice, Dawley, Gasell, & Florez, 2008).

Few studies conducted in the area of VS and teacher skills have reported on the precise skills required of a successful teacher in VS related to student learning and retention. These required skills are necessary for technological literacy skills (Kapitzke & Pendergast, 2005), classroom management skills addressing behavior issues a student may exhibit in a virtual school course, skills to identify and monitor 'warning signs' in a student with personal crisis, and pedagogical strategies related to content and content-based activities in a virtual school course (DiPietro, Ferdig, Black, & Preston, 2008). Besides these skills that lead to student success in VS, the VS teachers rated the most important skills required professional development in VS. These teachers rated communication technologies, time management strategies, risks of academic dishonesty to learners, and student Internet safety as the most important professional development needs for VS teachers (Rice et al., 2008). Even at face value, these skills required of VS teachers seem different than those required in traditional schools. This reiterates the need to prepare future teachers to teach in VS.

However, very few teacher education programs include VS to prepare preservice teachers for the skills/competence required of VS teachers and educators (Davis et al., 2007). Also, there is not much research and formulated guidelines in the area of integrating VS

in teacher education. Most of the available research in the area of VS and teacher education was undertaken by the national project, "Teacher Education Goes Into Virtual Schooling" (TEGIVS). As Cavanaugh, Gillan, Kromrey, Hess, and Blomeyer (2004) put it, leadership to promote VS should start at the national level. In 2004, The United States Department of Education took leadership and granted funding for the TEGIVS project under the Fund for the Improvement of Postsecondary Education (FIPSE). TEGIVS was a four-year project administered by Iowa State University's (ISU's) Center for Technology in Learning and Teaching and supported by FIPSE. In addition to ISU, project partners included the University of Florida, the University of Virginia, Graceland University, and Iowa Learning Online (Iowa's Virtual Schooling organization). The goal of this project was to prepare preservice teachers to implement effective VS curricula in three VS roles—facilitator, teacher, and designer.

These three roles of teacher, facilitator, and designer are core to the VS system (Davis & Niederhasuer, 2007). The VS teacher designs and executes course objectives, curriculum, pedagogy, and assessment. Also, the teacher is actively involved in monitoring and engaging students in online learning activities from distance. The facilitator, also called a site coordinator, is often the local school teacher, media helper, or school counselor. Facilitators provide face-to-face support and advocate students in the VS system. They engage in local problem-solving and mentoring students, and are liaisons between the students' local school and the virtual teacher. Mostly, the VS course web sites/learning management systems are designed by instructional designers and other IT professionals. However, many VS teachers work in collaboration with these professional course designers, or they adapt an existing course shell.

In the context of the TEGIVS project, this study undertook the task of informing teacher education about the future/preservice teachers' perspectives on VS, and their

preconceptions about VS. The policy papers that advocate integration of VS in teacher education are based on the growth and demand of VS in the K-12 education. Except for a qualitative study by Compton, Davis and Mackey (2009), there is no other research or policy paper that has studied the perspectives of preservice teachers about VS. This study was designed to guide the integration efforts of teacher education programs by reporting preservice teachers' perspectives and preconceptions about VS is based on both quantitative and qualitative data analyses. The findings from this study will help teacher education programs know the baseline of their learners-preservice teachers, and thereby make informed decisions and planning about integrating VS in their teacher education curriculum. The section below presents a literature review on preconceptions and myths about teaching in K-12 face-to-face classrooms. It also presents other preconceptions and myths about online learning in higher education. This literature review will help understand and interpret the preconceptions about VS found in this study.

Teachers' faulty beliefs: Preconception is to form an opinion prior to actual knowledge or experience (Merriam-Webster.com). It has been well documented that teacher faulty beliefs and attitudes can hamper effective teaching and learning in the classroom (Ertmer, Addison, Lane, Ross, & Woods 1999; Stipek, Givvin, Salmon, & MacGyvers, 2000; Cronin-Jones, 1991). Similarly, it is likely that preconceptions as they are not based on actual knowledge and experience about VS can be detrimental to teaching and learning in the VS classroom. Since teacher beliefs are difficult to change (Kagan, 1992), it is sensible to identify and specifically address the preconceptions preservice teachers have about teaching in virtual and non-virtual classrooms.

Many studies in K-12 face-to-face learning have examined different content areas and technology, and have provided evidence that teacher beliefs affect classroom practices. For example, science teachers' existing belief structure did not match the

underlying philosophy of the curriculum and this hampered the successful implementation of the science curriculum in the classroom (Cronin-Jones,1991). Teacher beliefs about mathematics teaching matched their classroom practices; the teachers' higher ratings for traditional beliefs matched their emphasis on performance (e.g., achieving correct answers, receiving good grades) and speed in their classrooms, and less on learning and understanding (Stipek et al., 2000). The relationship between teacher beliefs and use of technology in the classroom has been studied extensively. For example, teachers who believed that technology use enhances student learning tried ways to deal with external barriers like lack of technology access and technical support, while teachers who had doubts about technology use in the classroom made very little effort to seek help for the external barriers (Ertmer, Addison, Lane, Ross, &Woods, 1999).

Beliefs develop over a period of time and if faulty beliefs or negative preconceptions are not addressed, they may become ingrained over the years. Thus, a relevant question to ask here is—when do teachers develop these beliefs, that is do they develop these beliefs in the classroom or in teacher education programs? Future teachers or preservice teachers bring in beliefs about what is good teaching before they even enter the teacher education program (Kagan, 1992). The faulty preconceptions about teaching must be clearly defined and disputed through cognitive dissonance; for example, pairing a student teacher with a supporting teacher whose self image and teaching beliefs differ from the supporting teacher. The preconceptions about teaching are due to personal and contextual factors. Besides these personal factors, it is also inadequate procedural knowledge offered to novices in university courses that carries faulty preconceptions beyond teacher education and into classrooms (Kagan, 1992)

One of the common preconceptions discussed in this paper that preservice teachers hold about teaching is that teaching is easy (Whitbeck, 2000; Feiman-Nemer,

McDiarmid, Melnick & Parker, 1989). Most of the preservice teachers believe that being a teacher is a call or an innate ability, and teacher education programs have little to do with preparing them as teachers. Therefore, these educators believe they can easily handle the problems of day-to-day classroom simply because they have been called to teach (Whitbeck, 2000). If preservice teachers consider teaching an easy profession because they have a call to teach, then they will not take teacher preparation seriously. In a qualitative study that analyzed preservice teachers' course assignments and reflection, it was found that preservice teachers thought that teaching involved giving information and answering questions about assignments, it is easy, and that merely love of children can make good teachers. However, during the course, preservice teachers began disputing these beliefs and began to understand the complexity involved in teaching (Feiman-Nemer et al., 1989). The preconception that teaching is easy may contribute to preservice teachers' high confidence about future teaching. Many preservice teachers enter the program with high confidence in their ability to perform well in the profession (Richards & Killen, 1994; Weinsten, 1988). Preservice teachers perceive themselves as very confident in their competencies as first year teachers (Richards & Killen, 1994). In a study by Weinstein (1988), both elementary and secondary preservice teachers, who had not started their student teaching, were asked for their expectations about their ability to teach. He found that 81% of the elementary preservice teachers indicated their future teaching performance would be above average. Eighty-seven percent of the secondary preservice teachers indicated their confidence in their ability to perform as teachers was above average. He suggested that over confident preservice teachers may run into the risk of a lack of motivation to seek learning opportunities that teacher education programs have to offer them.

Similar to the preservice teachers' preconception that face-to-face K-12 teaching is easy, some of the researchers in the area of online learning in higher education/post secondary have stated that, in general, teaching in an online environment is also preconceived as being easy (Li & Akins, 2005; Hillstock, 2005; Watson, 2007). Further, preconceptions about online learning at the higher secondary level include beliefs that online education is quick (Felix, 2003), dominated by technology use and high tech (Hillstock, 2005; Watson, 2007), and teacher-less (Watson, 2007; Felix, 2003). Unlike preconceptions about teaching in face-to-face K-12 based on research, reported preconceptions about online learning in higher education are often based on guidelines or policy papers by practitioners in the field.

The preconception that online learning will replace teachers or make them redundant is an illusion (Li & Akins, 2005). With the advent of television, radio, and computers, and now with the Internet, anxieties that these technologies will phase out teachers' roles are common. But teaching has always remained an important and complex task which responds to real students and their diverse needs. Similar to the preconception about face-to-face teaching, preservice teachers perceive online teaching as easy and quick. However, online learning, although flexible, may take twice as much time and effort as face-to-face teaching and learning (Li & Akins). Providing quality teaching and feedback involves monitoring students' responses on discussion groups and answering student email queries, which could become overwhelming for many teachers (Felix, 2003), and designing an online curriculum is a labor intensive task (Goodyear, Salmon, Spector, Steeples, & Tickner, 2001).

Another preconception that preservice teachers have about online learning is that traditional learning can be copied to online learning (Li & Akins, 2005). An example from Li and Akins study illustrates this preconception. In their course, due to the

asynchronous nature and lack of social interaction in online learning, students took a lot of time to form groups in the collaborative discussion. Thus, they suggested that assignment of collaborative groups by the instructor could have saved time for students and instructor. On the other hand, in the face-to-face course, instructor pre assigning groups was perceived by students as a non constructive approach. This example from their study showed that instead of replicating, a selective adaptation of face to face strategies in online learning will be more meaningful (Li & Akins, 2005). However, what usually happens is that learners and practitioners put a lot of effort in replicating the face-to-face environment in online learning (Kanuka & Kelland, 2008). Sometimes, even the preconceptions in face-to-face learning becomes replicated in online learning, like old wine in new bottles (Kanuka & Kelland, 2008).

To conclude, teacher preconceptions about teaching in face-to-face K-12 classrooms affect their classroom practices. This preconception can be identified as early as preservice teachers' entrance into teacher education programs. One of the preconceptions preservice teachers hold about teaching is that teaching is easy. This can make them overconfident about their ability to teach in the future. This overconfidence leads them to not taking the teacher education program seriously. To avoid the potential danger of quality of teaching and students' over-confidence about teaching, it is important for teacher educators to identify and address preservice teachers' preconceptions about teaching. Both face-to-face teaching at K-12 and online teaching at higher education share a common preconception that teaching is easy. Other preconceptions highlighted in online learning at higher secondary are teachers play an insignificant and less complex role in the online learning, and face-to-face strategies should be replicated in online learning.

Although there is much known about preservice teachers' preconceptions about teaching in K-12-face-to-face classrooms and online learning at higher education, educators in VS have just begun to note that preconceptions about VS exists within educators (Davis & Rose, 2007). There is only one qualitative study conducted within the context of TEGIVS that explored preconceptions of preservice teachers about VS. This study exposed preservice teachers to the field experience in VS and educated them about VS. This exposure was tied into the field experience course. The curriculum included exploring their preconceptions about VS. One example from a participating preservice teacher's reflective journal showed the teacher first thought VS could be used only for few classes and had doubts about teacher-student communication. After completing the course and learning about VS, she realized these thoughts were simply preconceptions (Compton, Davis & Mackey, 2009). However, this study findings were based on a very small sample (qualitative data collected from only two preservice teachers) from a TEGIVS participating university.

Rationale of the study

Since there is evidence that teachers' faulty beliefs negatively affect their classroom practices, it is very likely that preservice teachers' perspectives and preconceptions about VS will influence their quality of teaching and facilitating VS in the future. Knowledge about preservice teachers' perspectives will guide teacher education programs to effectively develop and integrate VS competence in their programs. Identifying preservice teachers' preconceptions about VS can also offer room for challenging preconceptions about VS at the preservice education level, as these may also likely be inflexible and resistant to change over time. Since VS has just evolved, its integration into teacher education largely remains on the shelf, as very few universities integrate it in their teacher education curriculum. Considering the need to prepare

teachers for VS and contributing to building research in teacher education in VS, this study undertook the task of informing teacher education programs about the preservice teachers' preconceptions, and, in general, their perspectives about teaching/facilitating/designing in VS. This study used a mixed methodology; preconceptions were explored and analyzed using both quantitative and qualitative data from 207 preservice teachers in teacher education across two universities in the U.S.

Research Questions

1. Do preservice teachers think it is important that teachers and teacher education programs integrate knowledge about VS?
2. Do preservice teachers perceive themselves as competent VS facilitators, teachers, and designers?
3. What are preservice teachers' preconceptions about VS?

Data source

This researcher was part of the TEGIVS evaluation team and was involved in developing the survey with other members of the evaluation team and the principal investigator. Data for this paper were collected and analyzed by this researcher. They were collected from four courses at two different universities (one mid western, and one south western) during Spring 2007. To ensure participants' profiles as preservice teachers, data from only those participants enrolled as education majors were analyzed. Table 1 briefly explains the nature of these courses and the number of participants, and Table 2 shows the participants' majors, gender, and year of college. For the purpose of confidentiality the universities will be named as A and B. The courses at university A had face-to-face delivery. The course at university B had a hybrid delivery, where the course was delivered partially online and partially face-to-face. All data were pretest data collected before providing any exposure to the VS curricula. However, in one of the

courses a lecture on distance education coincided with the duration allocated to take the pretest online. Thus, it should be noted that some of the participants took the pretest after attending the lecture on distance education. This lecture was recorded and analyzed by the TEGIVS team before designing the TEGIVS curriculum. It mainly covers the theory of distance education and various technology tools used in distance education. There was no content directly addressing VS.

Table 1: *Description of four courses from two universities*

Uni	Course Code	Name of course	Nature of course
A	A1	Introduction to Instructional Technology (Elementary)	Overview of ways to use instructional technologies to support instruction in PK-6 settings.
A	A2	Introduction to Instructional Technology (Secondary)	Overview of ways to use instructional technologies to support instruction in 7-12 settings.
A	A3	Field Experience in Teaching	Field experience in area educational settings.
B	B1	Introduction to Educational Technology	An introduction to computer productivity (word processing, etc); multi-media, communications (Internet, ERIC); educational software, interactive media, reference (e.g. atlases, clip art, libraries, etc.); instructional applications; and ethical, legal and social issues.

Tool/Instrument

A self-reported survey was developed and administered electronically via SurveyMonkey.com. This survey had the following dimensions—demographics, importance ratings, competence rating, and scenario rating and write-up. For the purpose of this study, data for the following items in the survey were used: 1) preservice teachers' definition of VS; 2) the importance for teachers to know how to teach in VS, students access to VS, and use of distance technologies; 3) the importance that teacher education programs prepare future teacher for VS; and 4) their competence to be VS teachers, VS

designers, and VS facilitators. Apart from definition of VS, all other items had a five-point Likert-type rating scale, where a rating of 1 corresponded to not competent and rating of 5 corresponded to very competent.

Table 2: *Participants' Majors, Gender, and Year of College*

Spring 2007	A1	A2	A3	B1	Total
Education Majors					
Elementary	80	0	4	69	153
Secondary	0	21	14	19	54
Year in College					
Freshman	36	9	1	14	60
Sophomore	21	4	1	68	94
Junior	21	6	7	5	39
Senior or Other	2	2	9	1	14
Gender					
Male	7	9	5	7	28
Female	73	12	13	81	179
Total of participants	240	63	54	264	207

Development process: The preliminary survey instrument was first developed in October 2005 by this researcher, two student teacher field service specialists, and an expert in survey development. This survey was then piloted in Fall 2005, Spring 2006, and Fall 2006 in four courses related to Educational Technology at two TGEIVS participating universities. Apart from demographics, participants were asked to rate their awareness regarding VS and its issues, confidence level to teach an online course, and willingness to teach an online course in the future. This survey instrument was modified in Spring 2006 by the evaluation team of TEGIVS (this researcher; internal, and external evaluator for TEGIVS). At this time, three key skills of VS facilitator, teacher, and designer were introduced in the survey. Thus, in this version of the survey, preservice teachers were asked to rate also their competence as facilitator, teacher, and designer for

VS. A face validity of the survey was established in October 2006 at the TEGIVS retreat, by collecting feedback on the survey from eminent national scholars in the VS, and other TEGIVS collaborators. Prior to administering this survey instrument to the target sample, two preservice teachers at the Center for Technology in Teacher and Learning at one of the participating universities were asked to take the survey. Based on their feedback, the instructions of the survey were modified. A copy of the survey can be found in Appendix A.

This survey did not directly address preconceptions of VS and specific VS competence. This is because at the time of survey development the competence required for VS educators was unknown in the field. First, this could occur because the research in the area of professional development in VS had just begun, and second, there is a wide variety of VS institutions and the competence required from the educators is likely to depend upon the type of VS institution where they belong. For example, in smaller and not well-established virtual schools, staff and teachers play multiple roles and accordingly require manifold competencies; while in larger and well-established virtual schools, multiple roles evolve in individual positions, such as teachers, facilitators, instructional designers, and technology aid, and may demand only specific competencies (Ferdig et al., 2009). Also, at the time of survey development, there was no speculation about preservice teachers' preconceptions about VS; it was only after data collection and at the time of documentation of the TEGIVS report that preconceptions about VS were discussed by the TEGIVS research team. This supposition of preconceptions was documented by the principal investigator and a TEGIVS collaborator in the NACOL white paper (Davis & Rose, 2007).

Data Analysis

Both open-ended and quantitative data analyses were conducted.

***Analyses of open-ended responses*:** All the open-ended data from Surveymonkey.com were imported into spreadsheets. Then, each response was analyzed for any emerging themes. The responses were accordingly coded into different themes, such as VS is online learning, and VS is learning at distance. After coding all responses, the themes were revised and merged, if they appeared to be similar in meaning. These themes were then grouped into different meaningful categories, such as nature of VS, and benefits of VS. The definitions that seemed to hold preconceptions were separated from the rest of the definitions. For example, definitions like 'VS is where technology becomes a teacher's surrogate' and 'VS means using technology in schools' were considered as preconceptions.

Quantitative data analysis: SPSS 17.0 was used to analyze the quantitative data. Means and standard deviations were calculated to obtain an average rating on the Importance, Competence, and Willingness variables. Data from the preservice teachers, whose definition of VS indicated preconceptions, were excluded in the quantitative analyses. The paired *t*-test analyses were conducted to determine interrelationships between importance and competence to teach in VS. Pearson correlation analysis was used to determine the relationship between year of college and competence ratings.

Findings and Discussion

The results section is divided into three parts: Part I analyzes the perspectives of preservice teachers about VS, and addresses research questions 1 and 2. It further explores the interrelationship of preservice teachers' ratings on VS competence, importance, and willingness to teach in VS in the future. Part II analyzes the preconceptions about VS and thus addresses research question 3. Part III interprets the preconceptions determined from this study and draws out the connection with preconceptions about teaching face-to-face in a K-12 classroom and in online learning in

higher education. The Part III analysis was not part of the research questions, but evolved at the analysis stage of this study.

Part I: Perspectives of preservice teachers about VS in terms of the importance preservice teachers attach to learning about VS and their reported competence in teaching, facilitating, and designing in VS.

Research question 1: Do preservice teachers think it is important that teachers and teacher education programs integrate knowledge about VS?

Research question 2: Do preservice teachers perceive themselves as competent VS facilitators, teachers, and designers?

Table 3a shows descriptive statistics for the importance variables, and Table 3b shows descriptive statistics for the competence variables. A majority of the preservice teachers perceived it important for teachers to know how students access VS, how to teach in VS, how to use distance technologies, and the importance for teacher education to integrate VS in their programs. On the other hand, Table 3b shows a majority of preservice teachers reported less than competent ratings (not at all, somewhat, and uncertain) to teach, facilitate, and design in VS. These findings highlight the gap between perceived importance and perceived competence, which was analyzed further.

The gap between perceived competence and perceived importance: Although only about one-fourth of the preservice teachers rated themselves as competent in VS (32% facilitating, 22% teaching, and 18% designing VS), about three-fourths rated it as important (fairly to extremely important) for teachers to learn about VS (71% important to learn how students access VS, 75% important to learn how to teach in VS, and 84% important to learn how to access distance technologies). These descriptive statistics indicate a gap between preservice teachers' perceived competence in VS and the importance they attach to teachers' learning about VS. This gap between competence and

importance was further tested statistically, using a paired *t*-test. The parallel variables available were importance attached to teachers learning how to teach in VS, and how competent they believed they are to teach in VS. Table 4 shows the mean importance ratings are significantly higher than the mean competence ratings on how to teach in VS. Thus, these results indicated the perceived importance to learn is rated higher than the perceived competence to teach, facilitate, and design in VS.

Table 3a: *Percentages, Means, and Standard Deviations for Importance Variables*

Variables (*N*=185)	%	M	SD
Importance/teachers should learn how student access VS		3.80	.87
Not important	1.1		
A little important	7.6		
May or may not be important	20.5		
Fairly important	51.4		
Extremely important	19.5		
Missing = 1	0.5		
Importance/teachers should learn how to teach VS courses		3.92	.86
Not important	0.5		
A little important	6.5		
May or may not be important	18.4		
Fairly important	49.2		
Extremely important	25.4		
Missing = 1	0.5		
Importance/teachers should learn how to use distance technologies used in VS		4.13	.81
Not important	0.5		
A little important	3.8		
May or may not be important	12.0		
Fairly important	49.2		
Extremely important	34.4		
Missing = 3	1.6		
How important do you think it is that teacher education programs prepare students to teach in Virtual Schools?		3.72	.88
Not important	0.5		
A little important	8.6		
May or may not be important	26.5		
Fairly important	45.4		
Extremely important	17.8		
Missing = 2	1.1		

Table 3b: *Percentages, Means, and Standard Deviations for Competence Variables*

Variable N=185	%	M	SD
How competent do you think you are to counsel or guide students who are considering taking Virtual School courses?		2.75	1.12
Not competent at all	19.7		
Somewhat Incompetent	18.0		
Uncertain	30.1		
Somewhat competent	31.7		
Very competent	0.5		
Missing = 3	1.6		
How competent do you think you are to teach VS courses		2.53	1.09
Not competent at all	21.6		
Somewhat Incompetent	25.4		
Uncertain	30.3		
Somewhat competent	19.5		
Very competent	1.6		
Missing = 3	1.6		
How competent do you think you are to design VS courses?		2.35	1.14
Not competent at all	30.8		
Somewhat Incompetent	22.2		
Uncertain	28.1		
Somewhat competent	15.1		
Very competent	2.2		
Missing = 3	1.6		
Given an opportunity, how likely would you be to choose to teach Virtual School courses in the future?		2.88	1.04
Not likely	11.4		
Somewhat unlikely	21.1		
Uncertain	37.3		
Somewhat likely	23.2		
Very likely	4.3		
Missing = 5	2.7		

Table 4: *Paired Sample t-Tests for Paired Differences Between Importance and Competence*

		M	SD	Std. Error Mean	Lower	Upper	t	df	p
Paired Differences	How important it is that teachers learn to teach VS courses	3.89	.87	.096	1.13	.51	13.81	190	000***
	How competent do you think you are to teach Virtual School courses?	2.57	.12						

These findings that preservice teachers rated high importance for teachers to learn about VS (teachers should know how to teach and use distance technologies, and how students access VS) indicates they believe teachers should be prepared for VS. If preservice teachers believe that learning about VS is important, it is likely they will be supportive of VS in their future teaching career. On the other hand, the preservice teachers rated themselves higher on importance variables than competence variables. This finding reinforces the literature that shows teacher education programs do not prepare teachers for VS. The findings also show, although about 70 % of the preservice teachers rated highly the importance that teachers should know how to teach using VS, only 33% reported they were somewhat willing or willing to teach a VS course in the future. Their unwillingness to teach a VS course in the future could be related to their lack of VS exposure and competence. If teacher education programs integrate VS awareness and competence into the curriculum, it is likely that preservice teachers will be better prepared and thus willing to teach in VS in the future.

In general, the preservice teachers attach high importance to learning about VS in teacher education programs, lack competence, are unwilling to teach in VS in the future, and see the need for preparing teachers as VS facilitators and teachers (Davis & Roblyer, 2005; NACOL, 2006; Davis et al., 2007; Davis & Niederhauser, 2007). Thus, it becomes imperative for teacher education programs to begin integrating VS teacher and facilitator competence into their curriculum.

Part II: Preconceptions about VS

Research question 3: What are preservice teachers' preconceptions about VS? Preconceptions emerged in two types of data analyses. a) open-ended: definition of VS, b) quantitative: self-reported competence ratings. Definition of VS (open-ended): Definitions of VS were coded as discussed in the data analyses section above. The open-

ended responses for the definition of VS are listed in Appendix B. Table 6 shows identified categories of preconceptions.

Open-ended analysis: The analysis of open-ended responses for the definition of VS revealed 11% of the preservice teachers hold preconceptions about VS. Thirty-one out of 205 participants did not define, and 20 of the remaining 174 (11.49%) were identified as having preconceptions. Six themes of preconceptions emerged after arranging the categories: 1) technology is a teacher's surrogate, 2) VS is a curriculum or a tool, 3) VS is integrating technology into classroom/school, 4) VS is a replica of face-to-face school online, 5) VS involves learning at leisure, and 6) VS is for abled or advanced students. Table 5 shows each of these themes with the corresponding responses with preconceptions. A majority of these responses with preconceptions (9 out of 20) showed these identified preconceptions were related to underestimating the role of teacher in VS. Besides preconceptions, there were a few responses that indicated preservice teachers had a narrow or limited concept of VS. For example, "I would define the term virtual schooling as a way to teach students by communicating by programs on a computer" and "VS is school on computer." Definitions like these underestimated the scope of VS and the fact that it works as a schooling system (Harms et al., 2006; Davis & Rose, 2007).

Table 5: *Participants' Preconceptions about VS*

Technology is teacher's surrogate (9 out of 20)
1. Schooling that has been practiced over the computer rather than teacher to student contact.
2. Virtual schooling incorporated technology. Students take online courses and do not have contact with other student or teachers.
3. Learning that takes place through the use of technology but involves some element of distance: technology becomes a teacher surrogate.
4. Schooling over the computer where the actual teacher is not present. Similar to online classes in college.

Table 5. (continued)

Technology is teacher's surrogate (9 out of 20)
5. Computer based learning courses, with little to no interaction with instructor. 6. Having a class taught by a professor which is not in a personal learning environment rather watching a video tape of a lecture. 7. Class rooms taught by technology without the teacher. 8. I would define virtual schooling as a type of learning that is done strictly through technology, and technology alone. 9. I would define the term virtual schooling as a way to teach students by communicating by programs on a computer.
VS is a curriculum or tool (2 out of 20)
1. A curriculum that includes technology, which is very important for students these days. It would incorporate technology which students can relate to. 2. A tool that students can use to learn via the Internet.
VS is integrating technology in schools/classes (4 out of 20)
1. Using technology in schools 2. Being able to use technology to help the students learn different ways. 3. This to me would be using more than just the paper, pencil and books. 4. Virtual schooling is using technology in your lessons.
VS is replica of face-to-face school online (3 out of 20)
1. Teaching traditional classroom activities over the internet. 2. I would define 'virtual schooling' as taking classes over the internet (watching lectures online and submitting grades via the Internet.) 3. Virtual schooling is the incorporation of things that can be done in the classroom, but are more convenient online..
VS is learning at leisure (1 out of 20)
There is no true classroom for lessons, and students can receive instruction at their leisure along with assignment/exam guidelines and/or due-dates.
VS is for abled students (1 out of 20)
I would define "Virtual Schools" as a school that uses technology to the most able.

1. Technology becomes a teacher's surrogate: These responses indicated VS technology takes over or minimizes the role of a classroom teacher. This finding is

consistent with the findings by Compton ,Davis and Mackey (2009). In their qualitative study, one of the two preservice teachers mentioned that before learning about VS, she had doubts about teacher-student communication in VS. However, it is known a teacher plays a vital role in VS (Davis & Roblyer, 2005; Harms et al., 2006; Rice, 2006; Rice et al., 2008; Davis & Rose, 2007), and many professional institutes like NACOL, NEA, and SCERB have time and again released guidelines on how to teach an online class in a K-12 setting. Also, Kapitzke and Pendergast (2005) found that teachers' technological skills can actually affect student dropout rates in VS. Thus, in VS technology, taking the place of a teacher stands as a preconception

2. VS is a curriculum or a tool: Instead of acknowledging VS as a schooling system, some preservice teachers perceived VS as a curriculum, or a tool. This emphasis on technology ignores other components of VS: teachers, facilitators, administrators, designers, connecting schools, and students at each of the connecting schools (Davis et al., 2005; Davis and Rose, 2007).

3. *VS aims to teach technology to students:* Meta analysis by Roblyer and Davis (2008) found that many studies have documented technology access, skills, and absence of technological problems as strong predictors to students success in VS. Thus, technology serves as an important tool in VS, but learning technology is not, per se, an aim of VS.

4. VS is a replica of face-to-face school online: A majority of the preservice teachers' VS definitions described VS as school on computer or the Internet. Some responses also indicated VS involved transferring the traditional teaching and learning tools into an electronic mode. Similar findings were documented for online learning, in general, by Kanuka and Kelland (2008) that learners and practitioners try to replicate the face-to-face and old distance learning (non-technology) modes into the e-learning

environment. Similarly, Li and Akins (2005) in their study also pointed out it is a myth that traditional learning can be copied to online learning. Since online learning uses an asynchronous mode, face-to-face pedagogies cannot be replicated in an online asynchronous mode. VS, on the other hand, involves an online mode for K-12 students; thus, both face-to-face and general online learning should be carefully scrutinized if it is to be adapted in VS.

Quantitative analyses: These preconceptions were derived from the preservice teachers' perceived competence in VS. Although no VS-related intervention was conducted and considering that TEGIVS was the pioneering intervention in North America educating preservice teachers in the area of VS, 32% of the preservice teachers indicated they were competent facilitating students in VS, 22% of the preservice teachers indicated they were competent teaching VS courses, and 18% of the preservice teachers indicated they were competent designing VS courses.

Furthermore, these competence ratings were analyzed by the preservice teachers' year of college. Preservice teachers' competence to facilitate, teach, and design in VS was compared with their year of college. Descriptive statistics and correlations were administered for each competence separately.

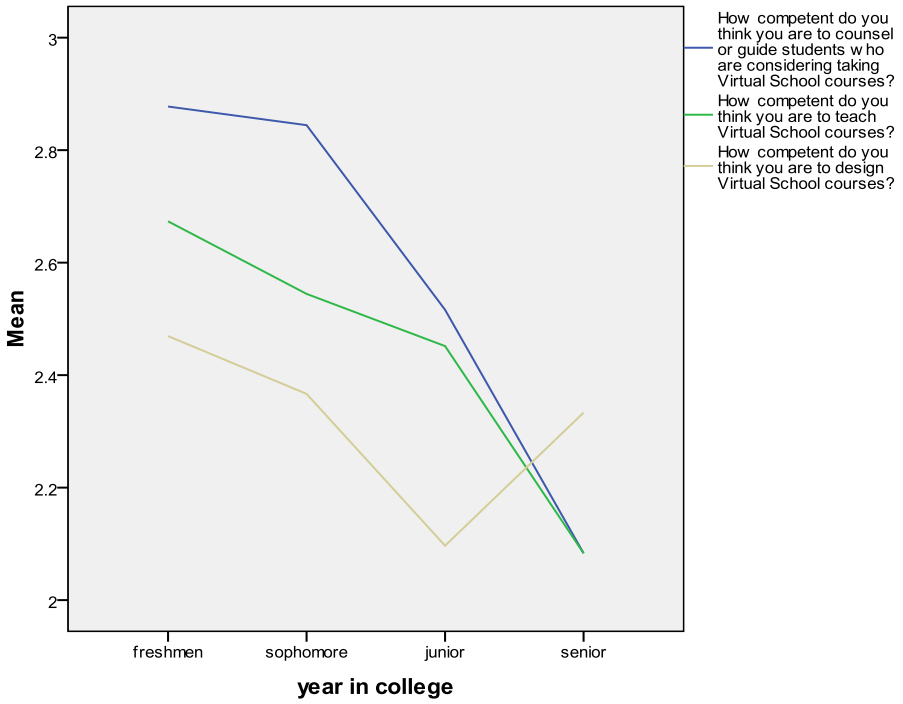
Competence to facilitate students in VS: 35% of freshmen, 35% of sophomore, 25% of juniors, and 18% of seniors indicated that they were competent (somewhat or very competent) facilitating students in VS. This descending percentage from sophomore to senior also shows a downward trend in the self-report ratings on competence. It could be that as preservice teachers gain more experience in teacher education programs, their perceived competence to facilitate students in VS becomes more realistic. This finding is consistent with the findings and claims of Weinstein (1988), Feiman-Nemer et al. (1989), Richards and Killen (1994), and Whitbeck (2000) that preservice teachers enter teacher

education with the preconception that teaching is easy and are overconfident about their future teaching performance.

Competence to teach in VS: 24% of freshmen, 20% of sophomores, 22% of juniors, and 25% of seniors indicated they were competent to teach in VS. Unlike competence to facilitate students, competence to teach in VS did not show a decrease in competence ratings from freshmen/sophomores to seniors. More seniors rated themselves competent to teach than they did for competence to facilitate in VS. Seniors exposure to student field teaching in their senior year could have made them perceive higher competence in teaching, in general. Lack of exposure to teaching in VS could have lead them to overgeneralize competencies required in face-to-face classrooms as similar to those required in VS. This is consistent with the commentaries made by VS and online learning scholars that regular (face-to-face) teachers think online teaching is similar to teaching online (Rose & Davis, 2007; Wood, 2005; Darling, 2000).

Competence to design VS courses: 14% of freshmen, 19% of sophomore, 16% of juniors, and 33% of seniors indicated that they were competent in designing VS courses. Again, the seniors were not likely to be exposed to designing a VS course. Their indication of competence could be again related to their exposure to competence in designing courses or lessons in face-to-face teaching. This again could be related to overgeneralizing the competencies in face-to-face schooling to those in VS. However, designing an online course is different than designing a face-to-face course, designing an online course is a labor intensive task (Goodyear et al., 2001), and may involve other stakeholders like instructional designers or content experts (Harms et al., 2006).

Figure 1 shows the negative or downward trend between year of college and competence



ratings.

Figure 1. Trend between year of college and competence ratings

Although all three competencies show a downward trend, the correlation analyses show a significant negative correlation only for facilitating competence (See Table 6).

Table 6*: Correlations Between Competencies and Year in College*

Competence		Year in College
How competent do you think you are to counsel or guide students who are considering taking Virtual School courses?	Pearson Correlation	-.173*
	Sig. (2-tailed)	.019
	N	182
How competent do you think you are to teach Virtual School courses?	Pearson Correlation	-.122
	Sig. (2-tailed)	.102
	N	182
How competent do you think you are to design Virtual School courses?	Pearson Correlation	-.081
	Sig. (2-tailed)	.276
	N	182

*p< 0.05 level

In summary, the preconceptions—teaching as a profession is easy and that teacher competencies in face-to-face teaching is similar to that in VS—could have led the

freshmen and seniors to rate themselves competent in VS facilitation and teaching/designing, respectively. A majority (53%) of those who rated themselves as competent on facilitation, teaching, and designing VS indicated they would like teacher education to integrate VS. This reiterates their need to learn competence in VS.

Part III: Interpreting the preconceptions

The preconceptions about VS discussed above can be explained as an overgeneralization of preconceptions from face-to-face and online classrooms. The tendency to overgeneralize preconceptions from face-to-face schooling to online learning was also noted by Kanuka and Kelland (2008). Table 7 shows the preconception that teaching is easy holds across face-to-face learning in K-12, online learning in higher education, and in VS. Table 8 highlights the common preconceptions in online learning in higher education as found in the literature, and preconceptions about VS as found in this study.

Table 7: *Common preconceptions about teaching in face to face, online, and VS classroom*

Common preconception	Preconceptions about teaching in non VS as found in the literature	Preconceptions about online learning (not K-12) explained in the literature	Preconceptions about VS as in data
Teaching is easy	If one is born to teach, teaching is easy (Whitbeck, 2000); Preservice teachers are overconfident of their competencies as future teachers (Richard & Klein, 1994, Feinman et al., 1989)	Online teaching and learning is quick and easy (Li & Akins, 2005); since there is increased responsibility on students, faculty job is easier than in face-to-face classroom (Hillstock, 2005)	Higher Competence ratings indicating over confidence and the preconception that it is easy to teach online

Furthermore, a common trend found among preconceptions about teaching in face-to-face and VS is that compared to experienced preservice teachers, novice preservice teachers are more likely to be overconfident about their competence to teach in the future. Preservice teachers, who had just entered teacher education, were determined more overconfident about their teaching competence than the experienced preservice teachers (Kagan, 1992). Similarly, data in this study showed the preservice teachers' reported teaching/facilitating/designing competence rating across year in college had a downward trend. Thus, indicating overconfidence of competence in freshmen (novice preservice teachers), and reporting more realistic competence rating with increase in year of college (juniors and seniors-experienced preservice teachers). This trend again is an example of overgeneralization of preconceptions, in this case, the overconfidence about teaching competence from face-to-face was overgeneralized as overconfidence about competencies in VS.

Table 8: *Common preconceptions across online learning and VS.*

Common preconception	Preconceptions about online learning (not K-12) explained in the literature	Preconceptions about VS as in data
Distance technologies overpowers online learning and VS.	Distance education equals the use of a particular type of technology (Hillstock, 2005).	Overemphasizing the role of technology
Online learning and VS involves replicating face-to-face environment	A lot of efforts go in replicating face-to-face learning in an online learning environment (Kanuka & Kelland, 2008); selective adaptation of face-to-face pedagogies to online pedagogy is important (Li & Akins, 2005).	VS is a replica of face-to-face online
The role of teachers is trivial	Online learning will make teachers redundant (Li & Akins, 2005; Felix, 2003)	Technology becomes teacher's surrogate

Kanuka and Kelland (2008) explained the overgeneralization of preconceptions from face-to-face to online as old wine in new bottle. The overgeneralization of preconceptions across settings can also be explained as a type of cognitive distortion (Ellis, 1962). Overgeneralization is defined and used in various contexts and subject areas. Following are a few definitions of overgeneralization. "Overgeneralization is a belief that a nested relation is disjunctive" (Daws, 1964). "Overgeneralization is a response set in which incorrect conclusions are drawn, based on a restrictive sample or from nonexistent data" (Kluft, 1990, p. 168). "Overgeneralization is an error of inference in which a person abstracts a general rule from a single event and applies it to both related and unrelated event" (Salkovskis, 1997: 232).

The concept of overgeneralization is most commonly researched in the area of language acquisition, solving mathematical problems, irrational beliefs, and counseling psychology. Rational Emotive Therapy proponents have used overgeneralization as one of the processes in irrational beliefs which affects ones thoughts and emotions, and thereby affects behavior. Bernard (1990) a proponent of Rational Emotive Therapy has used overgeneralization as one of the constructs in Teacher Irrational Beliefs Scale. This scale was then used to gauge teachers' burnout.

In the context of this study the common preconceptions found across face-to-face K-12 learning, online learning in higher education, and in VS could be a result of overgeneralization. Preservice teachers, who are familiar with face-to-face and online teaching and learning but are relatively unfamiliar with VS (Compton, Davis &Mackey, 2009), might have overgeneralized the preconceptions of face-to-face and online learning to VS. Preconceptions in familiar settings like face-to-face and online learning, if unattended, may be overgeneralized and replicated into new settings like VS. However, the scope of this study was limited to exploring preservice teachers' beliefs about VS.

Future studies can assess the overgeneralization effect of preconceptions and other beliefs across virtual and non virtual settings.

Conclusions

Drawing from the findings on perspectives of preservice teachers, this study affirmed the need to integrate VS into teacher education. It further informs teacher education about the preconceptions preservice teachers are likely to hold and develop about VS. Finally, this study has pointed to the possible overgeneralization effect of preservice teachers' preconceptions from non-VS to VS settings.

The findings from this study, that preservice teachers think it is important teachers should learn and teacher education programs should teach about VS, support the suggestions of VS scholars about a need for integration of VS into teacher education programs. The preservice teachers' relatively lower competence ratings in teaching, facilitating, and designing VS courses, and their unwillingness to teach a VS course in the future reemphasizes the need to educate them about VS.

The open-ended and quantitative findings of this study confirmed Davis and Rose (2007) indication, and Compton, Davis and Mackey (2009) qualitative findings that preservice teachers hold preconceptions about VS. It further reiterated these preconceptions about VS are likely to be overgeneralized from preconceptions about teaching in non VS settings. Accordingly, the study explained preconceptions based on two types of data analyses: the open-ended VS definitions and the quantitative self-reported preservice teachers' competence ratings. The preconceptions found in the definition of VS were 1) technology is a teacher's surrogate, 2) VS is a curriculum or a tool, 3.) VS is integrating technology into the classroom/school, 4) VS is a replica of face-to-face school online, and 5) VS involves learning at leisure, and 6) VS is for abled students. The higher competence ratings for VS facilitation and teaching without any

intervention highlighted that preservice teachers, especially new preservice teachers, are over confident about their teaching, facilitating, and designing competencies in VS.

Further analyses of these preconceptions were compared with the preservice teachers' preconceptions about teaching in face-to-face and preconceptions, in general, about online learning found in the literature. The common preconceptions across VS and non-VS settings gave insight into the overgeneralization effect. The preconceptions found in the literature on online learning similar to preconceptions about VS in this study were distance technologies overpower online learning and VS, online learning and VS involves replicating the face-to-face environment, and the role of teachers is trivial in online and VS learning. The preconception found in the teacher beliefs literature, teaching is easy and preservice teachers enter teacher education with high confidence about their competence in teaching, was also identified as a preconception in the VS definitions and competence ratings in this study.

Implications and suggestions for future research and practice

Many VS scholars and practitioners have noted the need to integrate VS in teacher education. This study, based on data collected from two universities' preservice teachers, confirms the need to integrate VS from the perspective of preservice teachers. Furthermore, it informs teacher education that preservice teachers hold preconceptions about VS, novice preservice teachers are overconfident about facilitating and teaching in VS, and these preconceptions could be a result of overgeneralization of preconceptions about non VS settings. Thus, disputing preconceptions about VS and non VS settings should be attempted by teacher education. In order to expose preservice teachers to VS and to prepare them to become competent educators of VS, curriculum, like TEGIVS, can be integrated into the course, like methods and technology integration.

This paper was limited to reporting preconceptions of preservice teachers prior to their exposure to TEGIVS-designed VS curriculum, Charania (2010, in preparation) reports post VS intervention (TEGIVS curriculum) VS competence ratings of preservice teachers. TEGIVS also had a model where VS curriculum was integrated into a student field teaching course. As a result, student teachers (senior preservice teachers) received an opportunity to directly relate VS knowledge in to their lessons in the classroom, as reported in Compton, Davis, and Mackey (2009). Ferdig et al. (2009) suggested that teacher education should partner with virtual schools to begin apprenticeship programs, educating preservice teachers in the 21st century. The VS curriculum should also include discourse to dispute preservice teachers' preconceptions about VS and, in general, about teaching. Also, integrating VS in field placements as documented by Compton et al. (2009) could be implemented. Although this paper was limited to VS preconceptions of preservice teachers in the K-12 setting, its findings can be explored and applied in tertiary settings. Since tertiary teachers do not undergo preservice preparation and are often asked to teach online without support, preconceptions found in this study may seem to apply to tertiary teaching also and should be addressed.

All data in this study were self reports; in the future it would be very useful to assess VS competence of preservice teachers by means other than their self ratings. Competence ratings, based on an external assessment, would serve as an authentic source. Also, since preservice teachers in this study were not exposed to any intervention that familiarized them about VS and its issues, it would be appropriate to check these preservice teachers' competencies after they have been exposed to such an intervention. Finally, to assess the overgeneralization effect of preconceptions, future studies can assess the overgeneralization effect of preconceptions and other beliefs across virtual and non virtual settings.

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Appendix A

Survey Instrument
Your ISU e-mail address (e.g. **jess@iastate.edu**)

_____

CI 201 Lab Section

Monday 10-12 ☐
Tuesday 8-10 ☐
Wednesday 10-12 ☐
Wednesday 3-5 ☐
Thursday 8-10 ☐
Thursday 12-2 ☐

Gender
Female ☐ Male ☐

Major _____

Year in College
Freshman ☐ Sophomore ☐ Junior ☐ Senior ☐

1. How would you define the term "Virtual School?"
2. Give your rating of how important it is for all teachers to learn the following about Virtual Schooling?

	Not important at all	A little important	May or may not be important	Fairly important	Extremely important
2a. How students can get access to Virtual Schools					
2b. How to teach Virtual School courses					
2c. How to use the distance technologies used in Virtual Schooling					
2d. Benefits of Virtual Schooling					
2e. Issues involved in using Virtual					

Schooling					
2f. Assessment methods in Virtual Schooling					
2g. Cost of Virtual Schooling					
2h. Impact on teachers' future career					

2i. other, please specify: _____

	Not important at all	A little important	May or may not be important	Fairly important	Extremely important
3. How important do you think it is that teacher education programs prepare students to teach in Virtual Schools?					

4. To what extent are you aware of the following about Virtual Schooling?

	Not aware at all	A little aware	Uncertain	Somewhat aware	Very aware
4a. How students can get access to Virtual Schools					
4b. How to teach Virtual School courses					
4c. How to use the distance technologies (e.g., course management systems such as WebCT) used in Virtual Schooling					
4d. Benefits of Virtual Schooling					
4e. Issues involved in using Virtual Schooling					
4f. Assessment					

methods in Virtual Schooling					
4g. Cost of Virtual Schooling					
4h. Impact on teachers' future career					

4i. Other, please specify: _____

	Not likely at all	Somewhat unlikely	Uncertain	Somewhat likely	Very likely
5. Given an opportunity, how likely would you be to choose to teach Virtual School courses in the future?					

	Not competent at all	Somewhat incompetent	Uncertain	Somewhat competent	Very competent
6. How competent do you think you are to *counsel or guide students* who are considering taking Virtual School courses?					

	Not competent at all	Somewhat incompetent	Uncertain	Somewhat competent	Very competent
7. How competent do you think you are to teach Virtual School courses?					

	Not competent at all	Somewhat incompetent	Uncertain	Somewhat competent	Very competent
8. How competent do you think you are to develop Virtual School courses?					

Appendix B

Frequency of Responses to Open-ended Survey Question: "How would you define the term VS?

Responses/Category What is VS?	Number of responses
Online school/classes	81
No brick and mortar school	15
Different than traditional school	1
Learning at distance	1
Formal education	1
Taking classes not offered at your school	1
Home schooling	1
Online community of classes	1
An educational system	1
Simulated learning	1
Learning with technology	32
Web based learning	5
Video recording of teacher lectures	7
Learning with computer	17
Chats	1
Online streaming of lectures	2
webcast/podcast	1
Use of real time	1
Classes on television	3
use of e-mail	1
Use of multimedia	2
Communication with teacher	
One teacher with many students	1
Technology becomes teacher's surrogate	1
Little or no interaction with teacher	
Absence of face to face communication/no live teacher	15
More learning than face to face	1
Where students, parents, and teachers network to access student grades and assignments	5
Teacher and students communicate through technology	6
No interpersonal communication b/w teachers and students	1
Benefits of VS	
Access from anywhere in the world	1

Responses/Category What is VS?	Number of responses
Schooling at individual space	6
Off campus learning	1
Comfort of working from home	6
Connecting other schools, states, and countries, and cultures	3
Instruction in VS	
Homework and assignments are online	17
Technology integration in instruction	3
Online activities and lectures	10
More hands on learning	1
homework submitted online	2
No formal setting	1
Nontraditional learning	1
Learning through online quiz, and tests	1
Learn by computer tutorials and simulation	1
Learning with online resources	2
No paper or handwritten work	1
Provides extra, supplemental or regular learning	1
Online submitting grades	1
Interactive learning environment	1
No idea	
I have no idea	1
Never heard	1
Total	269

Chapter 4
Development, validation, and implementation of a virtual schooling competence assessment instrument

A paper to be submitted to
Journal of *Technology in Teacher Education*
Charania Amina, Davis Niki & Thompson Ann

Abstract

Several Virtual Schooling (VS) educators and policy-makers have expressed the need to prepare preservice teachers for VS. Assessment tools in VS have not kept pace with the growth and success of VS. The first assessment tool was developed, validated, and implemented in this study to assess preservice teachers' competence as VS facilitators. The competence assessment instrument was developed, validated, and implemented within the context of a federally-funded project: "Teacher Education Goes Into Virtual Schooling." The preservice teachers, who participated in the project, were exposed to TEGIVS developed curriculum to educate them about VS and its related competence. They were then assessed on their VS facilitator competence, using the competence assessment instrument. The competence assessment instrument included a competence scenario and a scoring rubric. The competence scenario presented preservice teachers an authentic task of self-rating VS competence and then narrating evidence of their self-rated competence. Their narrated evidence in the form of open-ended response to the scenario was assessed through a rubric. This rubric was developed and validated within the context of the TEGIVS curriculum. Internal consistency of the rubric was assessed by three experts in the field of VS. The reliability of the rubric's scoring was tested through an intraclass correlation coefficient. The scenario and rubric were implemented within an experimental design. The results showed significant improvement

in the rubric assessed competence scores from pre to post for the intervention group, who interacted with TEGIVS curriculum. The analyses of the results suggested that the SFCR was valid and reliable, and was sensitive to the TEGIVS curriculum.

Introduction

K-12 students in most US states are enrolled increasingly in Virtual Schools. A key to enhance quality and reduce dropout is the role of the Virtual Schooling (VS) site facilitator. (Roblyer, 2003). Since it is mostly the classroom teacher who takes the role of VS site facilitator in the local school, it is important to prepare all teachers for this role. One of the pioneering efforts to educate preservice teachers about VS was undertaken by "Teacher Education Goes Into VS," (TEGIVS) under the Fund for the Improvement of Postsecondary Education (FIPSE). In addition to educating preservice teachers about VS and the roles of VS facilitators, it is important to assess their achieved competence in the area. Such an assessment can gauge the effectiveness of the preparation efforts and curriculum, and can be a regulator, informing VS educators about the quality of future facilitators in VS. In the context of TEGIVS, this study reports the development, validation, and, implementation of a competence assessment instrument to assess preservice teachers' competence as VS site facilitators.

This paper is divided into four sections. The first section presents a literature review on VS and teacher education, the roles and importance of VS facilitators, and the need to prepare tools to assess preservice competence as VS site facilitators. The second section explains the TEGIVS curriculum, and competence assessment instrument. The third section describes the validity and reliability procedures adopted to assess the internal consistency of the rubric, and reports the validity and reliability of the rubric. The fourth section reports implementation of the competence assessment instrument within an

experimental design. The last section summarizes the study findings and recommendations.

I. Literature Review

Virtual Schooling is a system through which K-12 students learn via technology from a teacher who is at a distance (TEGIVS curricula, 2007). VS is one of the fastest growing trends in education today (National Forum, 2006; Setzer, Lewis, & Green, 2005; Zandberg & Lewis, 2008) and especially in North America (Barbour & Reeves, 2009; Patrick & Powell, 2006). In the United States, compared to only five states in 1997, 44 states offered supplemental, part, or full-time online learning courses for K-12 students in Fall 2008 (Watson, Gemin & Ryan, 2008). The newly formed legislation in several states in the USA mandated online experiences for every K-12 student. To match this demand many "virtual schools and other organizations that offer online courses and other forms of distance education to K-12 students are eagerly seeking to recruit new staff to match the demand for high quality VS in many U.S. states" (Davis & Rose, 2007: 7).

However, VS educators and researchers have pointed out that the rapid growth of VS and state mandate for VS experience has not been matched with preparation of VS educators by teacher education. About 86,000 new teachers each year enter the profession without any online teaching skills. Teaching in VS requires specialized skills and a traditional teacher is not equipped to teach online (Woods, 2005; Rose and Davis, 2007). VS demands specific teaching skills, "Virtual Schools and 21st Century Skills," found in The North American Council for Online Learning and the Partnership for 21st Century Skills (2006), which asserted the 21st century needs teacher education programs to prepare teachers for the skills required to teach and facilitate online courses. Very few teacher education programs include VS to prepare preservice teachers for the competence required of VS teachers and facilitators (Davis, et al., 2007).

On the other hand, although VS has grown as a system and in enrollment, it faces a grave challenge to retain its students. Unlike face-to-face courses, VS courses are challenged to retain their students (Roblyer, 2003). Retention, in general, is a crucial problem in the online education; fifty to seventy percent of online students drop out of online courses or programs (Carr, 2000; Roblyer, 2006; Rovai & Wighting, 2005; Simpson, 2004). Some of the reasons for the high dropout rate in distance education are lack of support for learning (Bonk & Dennen, 1999; McCombs & Vakili, 2005), lack of personal contact, and a feeling of isolation (Abrami & Bures, 1996; Frank, Reich, & Humphreys, 2003). Few studies conducted in online education at the K-12 level found little things like interrupted connection to Internet, trouble sending and receiving electronic files, and other technical troubles can affect the retention of VS courses (cited in Roblyer, 2003). In VS, courses found to have higher retention rates were also the ones that had some face-to-face component (cited in Roblyer, 2003.)

In VS, one of the factors that can have a positive impact on student retention is the role of facilitators. Facilitators in VS, also sometimes referred to as site coordinators, coaches, tutors, mentors, etc., can play a major role in supporting VS students and thus increasing student retention (Roblyer, 2003). The classroom teacher usually fulfills the facilitator role (Harms et al., 2005). The VS site facilitators provide face-to-face support to VS students in local schools. This face-to-face support can add a personal touch, otherwise missing in distance education. In general, the facilitators align the distance course requirements and features to the local school and students (Kirby & Driscoll, 1997). Some of the specific roles of VS site facilitators identified by various researchers and policy-makers were scheduling, make-up sessions, and compensating calendar management; accommodating deadlines, and set-up of local homework and test policies to help students with problem-solving, homework, lab work (Kirby & Driscoll, 1997;

Hobbs, 2004, Hannum, 2007), and dealing with technology problems. This ensured a smooth functioning of the online courses (Aronson & Timm, 2003, Hannum, 2007), coordinating with course instructors and administrators, monitoring student attendance, assisting students with questions, or problems students believe they are unable to discuss with instructors (Hannum, 2007). Thus, facilitators' roles range from day-to-day clerical chores to those of problem-solving and providing subject matter expertise.

Willis (1992) categorized middle and high school facilitators into three categories: 1) Facilitators licensed in the subject matter offered, but may lack knowledge on specific topic. For example, a calculus course facilitator, licensed teacher in mathematics, may not have expertise in calculus. 2) Facilitators not licensed in the subject matter relevant to the course. For example, a facilitator for an English language course, licensed in physics. 3) Facilitators not licensed as teachers but may have experience as teacher aids. In a qualitative study it was found that students low on ability and prior experience in the subject matter benefitted the most from the facilitators whose subject matter expertise matched the subject matter of the course they were facilitating (Kirby & Driscoll, 1997). Besides students' characteristics, facilitators' competence can influence student retention in VS. In a quantitative study using control randomized groups, VS students, who had facilitators trained in learner-centered principles, had higher retention rates than students whose facilitators were not trained in learner-centered principles (Hannum, Irvin, Wa-Lei, & Farmer, 2008.). In addition to subject matter expertise and skills in learner-centered pedagogy, active and enthusiastic facilitators can contribute to student achievement and retention in VS. Students, whose facilitators took an active role in monitoring and organizing their activities, were found to remain active until the end of the course. They completed and submitted in-depth reports of the activities (Frid, 2001).

In summary, VS facilitators play an important role in student learning, motivation, and retention. The quality of student experiences in VS depends on the site coordinators or facilitators' level of competence (Kirby & Driscoll, 1997; Zucker & Kozma, 2003; Frid, 2001; Kapitzke & Pendargast, 2005; Hannum, Irvin, Wa-Lei, & Farmer, 2008). Some of the roles they undertake are helping with homework, organizing labs and assignments, problem-solving local problems, providing aids for technology, collaborating with the distance teacher, and managing day-to-day administrative tasks. The roles they undertake depend on their expertise, learning philosophy, and personality. Studies have documented that students benefit the most when the facilitators have subject matter expertise, use the learner-centered approach, and are active and enthusiastic. One of the limitations of these studies is they have not specified the competencies the facilitators should possess or learn. Also, none of the studies acknowledged the need to educate facilitators about issues in VS, like Internet security, plagiarism, and assessment.

Given the boom in VS, the positive impact of facilitators in student learning and retention, and that most of the facilitators' roles are taken by the classroom teacher (Harms et al., 2005; Willis, 1992), it is imperative that preservice teachers be prepared as competent VS facilitators for the future. While some of the teacher education programs across the country and internationally have just begun to integrate VS competencies in their teacher education programs (mostly TEGIVS participating and outreach universities), there is very little research available in the area to inform and guide them in this process. It is expected that more teacher education programs will adopt VS preparation curriculum. With VS curriculum becoming a part of teacher education, similar to other competencies in teaching face-to-face, like prepare and execute lesson plans, VS competencies also needs to be assessed. Thus, there is a need for tools or instruments to assess preservice teachers' competence in VS.

Quantitative tools such as multiple choice tests, and true and false quizzes can be conveniently used to investigate a low level understanding, while attitude formation, procedural knowledge, and other higher order learning require more sophisticated measurement tools (Bargainnier, 2003.) Competence can be best assessed through performance; this kind of assessment is called performance assessment. Performance assessment can directly assess the performance related to the competence. For example, competence to act on stage can be assessed by observing the actor's performance on the stage. On the far end of the performance assessment, complex competence can be assessed by openness of responses. As opposed to assessments or tests that demand multiple-choice assessments, open-ended tasks or responses can be used to assess complex competencies. Multiple choice and other written tests used in higher education are often generic and inauthentic, as they are not relevant to the context of the competence performed in the future. On the other hand, an authentic competence assessment is a replica or near replica of the context in which the competence is to prevail in the future (cited in Jonsson, 2008). "Authentic assessment includes the holistic performance of meaningful, complex tasks in challenging environments that involve contextualized problems" (Montgomery, 2002: 35). Authentic assessments are based on the constructivist ideology of cognitive theory that claims learning takes place when learners construct their own knowledge in the given learning environment. Authentic assessments require learners to demonstrate what they know and are able to do. Using authentic assessment in teacher education assumes that teaching involves complex competencies and cannot be assessed through inauthentic, out-of-context assessments, and certainly not through written tests that encourage rote learning.

Two kinds of authentic competence assessment tools used in this study are scenarios and rubrics. Scenarios or vignettes are a type of authentic assessment. Many

authors in educational and social research have studied and commented on the advantages of using scenarios over simple questions when tapping respondents' judgments and opinions. Scenarios depict a real life situation. It is assumed respondents will make judgments closer to the judgments they would have otherwise made in a real life situation (Nybom, 2005.) Compared to survey or questionnaires that tend to be bland, alien, and uninteresting, a scenario is a superior method for eliciting attitudes and thoughts to stimulate more meaningful answers, as it captures something approximating a real-life situation (West, 1982.) In other words, by presenting a scenario across a set of participants, the participants' own subjectivity gets controlled, as the scenario illicits responses more on the subjective reality of the situation and less on the participants' own personal situation. West (1982) also suggested that real life situations in scenarios can produce responses more likely to be predictive of their behavior. Rubrics are also a type of assessment. "Rubrics are descriptive scoring schemes developed by teachers or other evaluators to guide the analysis of the products or processes of students' efforts" (cited in Moskal, 2000, para. 1). Rubrics help multiple instructors derive similar conclusions when assessing attitudes, construction of higher-level conceptual knowledge, and performance skills (Bargainnier, 2003.) There are many kinds of rubrics. The two types described in Bargainnier (2003) are analytical and holistic. Analytic rubrics are often used when students self-assess a complex performance, product, process, or learning skill. Holistic rubrics measure the overall process or product without judging its individual components; thus, it provides a snapshot of performance or achievement to the measurer. Performance expectations are best measured and evaluated using a holistic rubric.

Assessment tools in VS have not kept pace with the growth and success of VS (Black, Ferdig & Depietro, 2008). To date, there are no competence assessment instruments or tools to assess preservice teachers competence in VS. In the context of

TEGIVS, this study prepared, validated, and implemented a competence assessment instrument to assess preservice teachers' competence to facilitate in VS.

II. TEGIVS curriculum, and assessment

The context for this study was a national project TEGIVS to create a model for the introduction of VS into preservice teacher education. The research objective of this study was to develop, validate, and implement a competence assessment instrument to assess preservice teachers' competence as VS facilitators. TEGIVS was a project developing a national model to prepare future teachers for VS and VS facilitators (Davis, 2008). Four teacher education programs led by Iowa State University (ISU) Center for Technology in Learning and Teaching were ISU, University of Florida (UF), University of Virginia (UVA), and Graceland University (GU). The project curriculum and assessment are briefly described in described in the following sections.

TEGIVS curriculum: This project created a curriculum in the form of two lab tools, one for elementary majors and one for secondary majors. The lab tools had short multimedia scenarios that can be downloaded from the project web site (Davis, 2008) or from the website given under the brief on TEGIVS lab .The lab tools were implemented within the four participating universities. These resources are available online for review and use (http://www.ctlt.iastate.edu/~vschool/TEGIVS/curriculum.html). Examples and scenarios from existing VS courses for K-12 students were included in this curriculum. These materials aimed to sensitize students to a range of the many issues that impact the role and responsibilities of a VS facilitator. There are many issues that they may intercept when becoming a VS site facilitator. For example, dealing with plagiarism, Internet security, and access to technology. Communicating the role of VS facilitator and its importance were the central focus in both the tools. The three aspects highlighted in each of these tools were:

Technology:

- The technologies used to support VS that connect K-12 students with teacher(s), students, and/or content beyond their school;
- Support to develop student access to relevant technologies and related skills.

Mentoring:

- Counseling and advising the students;
- Establishing and monitoring effective study habits, including health and safety;
- Monitoring assessment, including proctoring tests where relevant.

Organizational/Collaboration of Educators:

- Collaborating with the distant teacher, other VS administrators, educators, and organizations to improve student learning in VS.

Understanding these three aspects of Virtual Schooling from the perspective of VS facilitators is a complex and ill-structured task. First, it is complex and ill-structured because it requires an understanding of the three basic aspects (technology, mentoring, and organizational/collaboration) plus the role of facilitator in VS. Second, it requires the learner to interconnect the two concepts (both VS and VS site facilitator). The competence assessment instrument was developed to evaluate this complex and ill-structured task.

Competence Assessment Instrument: The competence assessment instrument had two parts—Part A presented a self rating and a scenario based on VS facilitator competence. Part B was developed as part of this study and intended to assess the open ended

responses to the scenario. The details of scenario and rubric are explained in Part A and Part B, respectively.

Part A: Scenario-based competence: The scenario was developed by the principal investigator of this project and was presented online using a survey tool called Survey Monkey. This web-base survey tool presented the following scenario on each participant's computer screen followed by one or two questions:

> In your first semester as a teacher your mentor
> tells you that one of your students has been
> advised to take a course from a Virtual School.
> She asks you how competent you are to facilitate
> or coach this student's distance learning.
>
> Q1. How competent are you?
>
> I don't understand ☐
>
> Not competent ☐
>
> Somewhat competent ☐
>
> Competent ☐

If the participating preservice teacher checked "I do not understand" or "Not competent," they were lead to the exit window of the survey. If the preservice teachers checked "Somewhat competent" or "Competent", they were prompted to provide evidence for their competence by typing a response into a box on the screen following the information as shown below:

> Q2. Please give some evidence with a brief description of how
> you can facilitate the student's virtual schooling course.
> Please frame your description in light of three aspects of
> Virtual Schooling:

- *Technology:* The technologies used to support VS that connect K-12 students with teacher(s), students, and/or content beyond their school; support to develop student access to relevant technologies and related skills.
- *Mentoring*: Counseling and advising the students, establishing and monitoring effective study habits, including health and safety, and monitoring assessment, including proctoring tests where relevant.
- *Organizational/Collaboration of Educators*: Collaborating with the distant teacher, other VS administrators, educators, and organizations to improve student learning in VS.

Following the submit button, participants exited the survey.

***Part B. The rubric*:** A rubric was developed to score the answers to the description that participants provided in response to question 2 (Please give some evidence with a brief description of how you can facilitate the student's virtual schooling course.). This section explains contents, scoring, and development process of the rubric. This rubric was called Site Facilitator Competence Rubric (SFCR) and was developed to assess each preservice teacher's 'competence as VS site facilitator. The SFCR provided a framework to assess the preservice teacher's response to the scenario and assigned a score indicative of whether each preservice teacher had acquired competence as a site facilitator.

The SFCR contained an explanation for each of the levels of competence for all three aspects (technology, monitoring, and collaboration) of VS competence as described above in the section curriculum lab tools. Examples corresponding to each of the competence level for all three aspects were also included (refer Tables 1 to 3).

Table 1. *Site Facilitator Competence Rubric (SFCR) Technology Aspect: The technologies used to support VS that connects K-12 students with teacher(s), students, and/or content beyond their school*

Levels	Description	Examples	Reasons for Scoring
0	Irrelevant, e.g., simple use of web-based resources for regular class activities, teacher's knowledge and experience with technology	I can help with my knowledge of technology. I know a little bit about computers and can assist with technology problems.	Help with technology knowledge is too vague. It does not reflect acknowledgment of technology problems related to VS.
		Having the web page clean and organized will help the student and the community understand how easy VS really is!	The response undermines the VS technology-related infrastructure and issues.
1	Some indication that s/he may/will help/teach students to access and use technology for VS. Or help the students connect with the distant teacher using technology.	I have taken 4 or 5 online WebCT courses. I know how the technology works.	There is acknowledgement and willingness to help with the Learning Management System (LMS) used in VS.
2	Notes how s/he may help K-12 students to access technology OR gain technology skills to study in a virtual classroom. May provide an example of a relevant technology such as a course management system or e-mail.	Ability to connect w/ students and teachers can be done through a manageable network like WebCT.	This response not only acknowledges the LMS, but also provides a context (connect student and teachers) in which it can be used.
		I would guide the student by explaining how the video conferencing, e-mail, bulletin boards, chat rooms and hypermedia presentations work.	Technology communication tools used in VS are mentioned as media used to guide students.
3	As for (2 above) plus indicates deeper knowledge of technology-related issues in VS such as the need for robust hardware, early testing of software and attention to Internet access or network settings (e.g. firewall).	I can show/teach the student how to use internet, set up an email account and use it if they do not already know, teach them how to text, go through the online program that the student would be using with the student one-on-one.	In addition to acknowledging the technology communication tools used in VS what also comes up is the issue of students not having enough hands on experience with using these tools.

Table 2. *SFCR Mentoring Aspect: Counseling and advising the students, establishing and monitoring effective study habits, monitoring assessment, including proctoring tests where relevant, and support for technology tools, including health and safety.*

Levels	Description	Example	Reasons for Scoring
0	Irrelevant, no mentoring mentioned OR no appreciation that supporting students is involved.	Do assessments with them to make sure they retain said knowledge. Developing online learning that is age specific and focuses on needs of younger students as well as older.	These responses are irrelevant to a facilitator's role unless there is some indication of permission or collaboration with the VS teacher or designer.
1	Some indication that s/he may will mentor students and monitor progress in VS. Or help the students develop study and organizational skills.	I would make sure that the student had access to all necessary tools that would aid in their course work. Also, making sure that I myself am willing to help the students who are using online schooling to succeed just as a kid in a classroom would. Time management would be the main thing I would focus on for any student. Making sure the student knows what is expected of them is key as well.	These responses indicate willingness to mentor the student in the online learning.
2	Notes that s/he appreciates that the coach role OR strategy to mentor and/or monitor VS student progress.	I will let the child know that I'm here to support them and help them and that they can contact me at anytime. They can email me anytime and I will help them through the course. Sending any materials and answering any questions. Help the student plan her or his activities, create schedules of activities. Select activities that suit his or her schedules. Have a seminar session where the student demonstrates that they know how to navigate around the learning environment. If more than one child is taking the course, then it is possible to form groups so that not only can I help, but they can help each other.	Strategies to monitor VS student learning are indicated in these responses. For example, answering e-mails, create schedules, orienting the student to the course, form study groups.

Table 2. (continued)

Levels	Description	Example	Reasons for Scoring
3	As for (2 above) plus indicates deeper knowledge of mentoring with a strategy(s) such as supporting organization of studying, monitoring progress, OR mentoring-related issues in VS such as the need for Internet security and safety, or the ease of plagiarism.	Sit down with the student and go over the computer part of it and how to get into the class, how to get online with the class, and all the gadgets that it involves. Have them do a couple run through so they thoroughly understand.	This response not only describes strategies to monitor student progress in VS but also points out the issue of students lacking knowledge and experience with VS technology tools that can be monitored by the facilitator by providing additional help.
		I could stress to the student the importance of keeping in contact with the instructor of the online course. When the student feels like he/she is slipping behind on their work they need to contact someone immediately. I could talk with the instructor for the online course and maybe get a copy of the syllabus and the list of assignments. This could help in assisting the student with being on task. Just keeping everything in order that is going on with the students	In addition to strategies for monitoring, this response also points out the issue of slipping behind in an online environment that needs regular communication and monitoring by the facilitator.

Table 3. *SFCR Organizational/Collaboration of Educators Aspect: Collaborate with the distant teacher, other VS administrators, educators, or organizations to improve VS student learning.*

Points	Description	Examples	Reasons for Scoring
0	Irrelevant, no VS-related collaboration mentioned; OR no appreciation that there is a distant organization involved.	I could ask another, more experienced teacher to send me information or tips for how to work with the student, and I could set up for the student to get additional assistance through the local schools.	Again the VS site facilitator should always consult the distant teacher and other administrators/teachers who are involved with VS or have students taking VS courses.
1	Some indication that s/he appreciates collaboration with a distant teacher, parents, or administrators involved in VS; OR that a virtual school, agency or another K-12 school is involved in provision of course(s).	I would work with other teachers in my school that also had students in virtual learning classes so that we could make sure our students are getting the best education possible. A starting teacher can be in contact with an experienced VS teacher and get constructive criticism from them and find out what works and what doesn't.	These responses indicate collaboration with other VS teachers to improve their own VS related skills and learning of the VS student.
2	Notes how s/he may collaborate with the distant teacher, administrator, or parents in the VS, e.g., email the distant teacher regarding a local challenge; OR notes that more than one organization involved in the education of K-12 students involved in VS (virtual school, agency, or distant K-12 school as well as the current K-12 school); OR that VS organization can improve student learning in some way.	Communicating with a distance educator through email and phone on a regular basis are essential. Also communication with administrators in the local K-12 district is important to make virtual schooling a positive experience for all parties involved. Staying in contact with a distant teacher through e-mail or an online program with live communication.	These responses suggest ways (e-mail, phone, and other online tools) to maintain collaboration with the distant teacher and other VS administrators.

Table 3. (continued)

Points	Description	Examples	Reasons for Scoring
3	As for (2 above) plus deeper knowledge of collaboration with the distant teacher, parent and/or administrators in the VS; OR indicates knowledge of challenges of collaboration or organization level (e.g. rules related to proctoring assessments, scheduling, or monitoring teacher quality).	I would set up a meeting with the student, their guardian, and the school guidance counselor to discuss what is to be expected in the current course. I would want to set up a timeline with the parents and student so that we are all aware of what is expected. I would then set up a contract with everyone at the meeting and have them all sign. I would then make a pdf of that contract and email it to the teacher of the virtual school course to make sure that everyone is on the same page,	The response suggests conducting meeting and collaborating with parents and other administrators in the VS. At the same time it also points out the importance of having a contract or accepted use of policy thus pointing towards the significance of shared responsibilities by parents and other school administrators.

Scoring of the SFCR: The three aspects of technology, mentoring, and organizational /collaboration used in the competence assessment instrument to assess competence were listed in the SFCR. Each of these three aspects was assigned four levels of competence. The level corresponded to the score; for example, level 2 would receive a score of 2. Since students were given a choice to respond for each aspect separately or compositely, the composite responses were scored for each of the aspects covered. Each preservice teacher may score between a minimum of 0 and a maximum of 9 points totaled across all three aspects (technology, mentoring, and collaboration/organization).

Levels/score of competence:

0 Indicates no competence, because the preservice teacher has not mentioned any relevant evidence within that aspect.

1 Indicates some appreciation of the role, if the preservice teacher includes at least one relevant term or phrase relevant to that aspect.

2 Indicates emerging competence, if the preservice teacher indicates at least one strategy to facilitate VS student learning within that aspect.

3 Indicates beginning or more competence, if the preservice teacher indicates deeper knowledge of the issues related to that aspect.

Development process: The researcher developed the SFCR with the help of the principal investigator of the TEGIVS project. The content was based on the topics covered in the intervention, and the three aspects of technology, mentoring, and collaboration. The first version of the SFCR was piloted, using Fall 2007 data on the VS Site Facilitator's competence scenarios from the preservice teachers' enrolled for the courses at the four participating universities. Examples of the preservice teachers' responses and approximate competence scores were given by this researcher. Based on the scoring, examples in the three different aspects demonstrating different levels of competence (0-3) were compiled and

included in the SFCR. One graduate student and the principal investigator's feedback were collected to improve the clarity of the rubric.

III. Validity and reliability of the rubric

Five examples of student responses on the scenario that represented different aspects were selected by this researcher for the assessment purpose. These examples varied in their length and quality. The objective was to select responses that represent different aspects and have low, mediocre, and high quality or levels of competence. Three experts in the area of VS were identified to assess the content validity of the rubric. Following is the background of the three experts in the area of VS:

Expert A is a curriculum designer and taught high school anatomy and physiology, and biology for Iowa Learning Online. She also serves on the National Board for Professional Teaching Standards certified teacher. She is a member of North Central Regional Educational Laboratory Teacher Advisory Council, an Access Excellence Fellow, and an advisory board member for Kaplan University. She received awards from the Milken Family Foundation, the National Science Teachers Association, the National Association of Biology Teachers, the Mid-American Educator's Hall of Fame, WebCT, Blackboard, the Iowa Department of Education, and the Iowa Academy of Science.

Expert B was a doctoral student in Curriculum and Instructional Technology, and has taught Virtual Schooling Biology course for Iowa Learning Online. As a graduate assistant, she worked with university faculty in problem-solving, instructional design, and mentors them in instructional technologies. She has helped provide non-traditional online working spaces for faculty/staff groups, as well as leads training in using instructional technologies. She was also part of the working group for the NACOL white paper on Professional Development for Virtual Schooling and Online Learning.

Expert C worked as an instructor and administrator at an institute that educates online teachers. She has over six years experience in training teachers and education administrators, and has National Board Certification. Expert C is a finalist for the National Teacher of the Year Program.

A rubric manual (Appendix A) was prepared by this researcher and shared with the experts. The manual contained details of the three aspects of competence with examples from the data, the process of rubric development, and a survey to be completed. The survey questions for experts to rate the appropriateness of the rubric for assessing VS site facilitator competence, score five examples based on the given guidelines for scoring with reasons for the score, and assign one of the three aspects (technology, mentoring, and organizational) to each of the examples. Following is a list of a few questions from the survey:

- My opinion of this SFCR is that it can be used to evaluate preservice teachers' competence as a VS site facilitator.

Agree ☐ Somewhat Agree ☐ Not sure ☐ Somewhat Disagree ☐ Disagree ☐

- Will it be appropriate to categorize level of VS site facilitator competence based on the scores: Total score ranging from 0-3 indicates no competence, 3-6 indicates some emerging competence and 7-9 indicates beginning competence?
- Suggestions for improving the SFCR

Please score the following five examples: (only example 1 given below)

Please read the following scenario responses, give each one a score of VS site facilitator competence between 0 and 3 (up to three points for each aspect). You may provide a comment e.g. your reasoning:

Example 1: I am knowledgeable with the technology

Most Relevant to the Aspect of:

☐ Technology

☐ Mentoring

☐Organizational/Collaboration of Educators

Score (0-3):

Comment:

Survey Results: All three experts responded to the survey. Following is a brief summary of the experts' opinions about the rubric. The experts' scoring and reasons for scoring is in Appendix B. Expert A agreed, and experts B and C somewhat agreed that the SFCR can be used to to evaluate preservice teachers' competence as a VS site facilitator. Expert A also indicated this rubric can be used to assess VS facilitator competence in distance education coordinator at the Area Education Administrator level, and can be used to determine what teaching veterans at a school might make a good local coach. All three experts indicated the scoring of the SFCR seemed appropriate. Expert B indicated that it limited competence as a beginning level (score of 3), and underestimated the exposure preservice teachers might gain in the teacher education curriculum. The suggestions of these experts indicated the rubric was clear and easy to use; the rationale for scoring and the three aspects technology, mentoring, and collaboration were appropriate. Expert C also indicated that the three levels could be reframed and called competencies. Thus, Competency 1: ability to use technology, Competency 2: ability to monitor and counsel students, and Competency 3: ability to connect with distant teacher for collaboration. The Table 4 shows experts' score of competence for each of the five examples (given below), and their assigned aspect to the example.

Example 1: I am knowledgeable with the technology.

Example 2: Communicating with a distance educator through email and phone on a regular basis are essential. Also communication with administrators in the local K-12 district is important to make virtual schooling a positive experience for all parties involved.

Example 3: I can provide the face-to-face assistance students may need when they don't understand an assignment or concept.

Example 4: Providing effective communication between teachers and students, and gain knowledge and usable skills in enabling a great teaching and learning environment.

Example 5: I would include many Powerpoints, hook my student up with forums and chats with other students completing the same class in a distance learning environment, and still allow that student to come in for one-on-one time and also class time, if there were any questions.

Table 4*: Three Experts' Scoring of the Given Five Examples Based on the SFCR.*

Expert	**Ex 1**	A	B	C	**Ex 2**	A	B	C	**Ex 3**	A	B	C	**Ex 4**	A	B	C	**Ex 5**	A	B	C
Score		0	0	0		2	2	1		1	2	1		1	2	1		3	0	0
Aspect		1	1	1		3	3	3		2	2	2		1	3	2		2	1	1

(Aspect1: Technology; Aspect 2: Mentoring; Aspect 3: Collaboration/organizational)

Analyses of experts' scoring: It was noteworthy that for the fifth example (see above), Experts B and C gave a score of 0 (the minimum), and the expert A gave a score of 3 (maximum). The reason for the 0 score given by Experts B and C in the survey was also similar; they explained this response indicated competence for a teacher or instructor and not for a facilitator. This contrast in the scoring and reasons given by the two experts (B and C) were discussed with Expert A via e-mail. Expert A responded to the e-mail query and explained that facilitator's background knowledge and time commitment would determine the extent of her role which sometimes may overlap with that of an instructor. Following is her response:

> It depends on the time commitment allotted for the facilitator and the facilitator's background knowledge level. I have some facilitators who would go to this extreme to help a student. Some facilitators have background knowledge in the subject and could do what is suggested. From what I read, I assumed the Powerpoints were "found" Powerpoints, not created ones, which simply require an internet search and could be done by a competent facilitator. I'll stand by my score.

This explanation was consistent with the argument presented by Ferdig et al. (2009) that educators' roles in VS depend on the VS type and model. For example, in a small VS system, the VS teacher may even take the role of a technology coordinator, instructional designer; which otherwise are taken care by specialized staff in a large VS system. The current VS research and literature lacks recognition of the decoupling of the educators' roles into multiple roles that extend beyond direct instruction (Ferdig et al., 2009). The multiple roles and responsibilities add to the competence required to teach in VS. This inconsistency in the perception of teacher and facilitators' roles in itself was a finding that supports a need for research and acknowledgment through policy and white paper about multiple roles of VS educators. Because of this inconsistency within the experts perception of teacher and facilitator roles, the example five scoring was disqualified for the inter coder reliability test. The three experts' scoring of four examples was then checked by reliability procedure, interrater reliability test.

Interrater reliability test: Judgments made by humans involve measurement error, which can plague the interpretations and claims made by the measurement. Thus, a reliability index needs to be calculated that assesses the amount of such error. Interrater reliability can be measured through the intraclass correlation coefficient (ICC) (Shrout & Fleiss, 1979). The ICC was used to score reliability across the three experts. ICC is a measure of the proportion of a variance

(variously defined) that is attributable to objects of measurement, often called targets (McGraw & Wong, 1996). There are six types of ICCs; the one used for this analysis was the two-way mixed model. In two-way mixed model, "the degree of consistency among measurements (rater A, B and C) made under the fixed levels of the column factor (score on rubric). This ICC estimates the correlation of any two measurements but when interaction is present, it underestimates reliability" (McGraw and Wong, 1996).

The ICC for interrater reliability was .783 and was significant (p<.01). See Table 5. These results indicated good interrater reliability for the SFCR.

Table 5: *ICC Analysis for Interrater Reliability of the SFCR Scores across Three Experts*

		95% Confidence Interval		F Test with True Value 0			
	Intraclass Correlation	Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.783	.208	.983	11.800	3	6	.006**
Average Measures	.915	.441	.994	11.800	3	6	.006**

**p<.01

In summary, the experts' opinions about the SFCR suggested that the rubric is appropriate for assessing the VS facilitators' competence. However, future applications of the rubric should not be considered in isolation, but within the framework of the aspects covered in the competence scenario as assessment. The interrater reliability between the three experts was good, and establishes the SFCR as a reliable rubric to assess VS site facilitator competence in the three aspects. One of the limitations of the reliability analysis was the examples scored by the experts were very few and not randomly selected. Thus, another reliability analysis was administered, based on a relatively larger pool of examples randomly selected from the TEGIVS preservice teachers' data. This procedure and its implications are explained below.

Data from all four participating universities during the Fall 2007 semester were used for reliability procedures. Furthermore, data from only teacher education majors, who indicated that they were somewhat competent or competent in facilitating VS students, were selected for reliability analyses. Accordingly, 153 teacher education majors out of 279 students, who participated in the pretest and posttest, were selected. Furthermore, about 20 percent of the 153 preservice teachers' ratings were randomly selected to establish interrater reliability of the SFCR. Proportional sampling was used to randomly select preservice teachers' ratings on the competence scenario. Excel was used to create random numbers for selection. The details of sampling are given in Table 6. The universities and their courses are labeled as A, B, C, and D for confidentiality.

This sample of 33 preservice teachers' pre and post responses on the competence assessment instrument's scenario assessment were collated, yielding 37 total open-ended responses. These 37 open-ended responses were scored using the SFCR. This researcher and a doctoral student working in the area of VS scored these responses independently (each scored the selected 37 responses). The two sets of scored ratings were then tested for intraclass reliability. The ICC of .889 was significant ($p<.001$) (see Table 7). These results confirmed the high interrater reliability for the SFCR.

Table 6: *Sample Selection Details for Reliability Procedures of the SFCR*

Uni Code	**Course Code**	**Eligible sample for random selection**	**Included in Sample**	**Exp and Control**
A	A1	46 out of 60 46 = exp 31 and 15 control 67% = exp	14 46 students out of 153 total=30% 30% of 46 = 14	10 exp and 4 cont (67% of 31=10 33% of 15 = 4)
A	A2	27 out of 35 (27 = 15 exp and 12 control 55% exp	5 27 students out of 153 = 18% 18% of 27 = 5	3 exp and 2 cont 55% of 5 = 3 students
A	A3	12 out of 18 12 = 3 exp and 9 control 25% exp	1 12 out of 153 = 8% 8% of 12 = 1	1 cont 75% cont
B	B1	21 out of 32 21= no exp and cont all exposed to treatment	3 21 out of 153 = 14% 14% of 21 = 3	No exp and cont
C	C1	39 out of 123 32=16 exp and 22 cont 41% exp	10 39 out of 153=25% 25% of 39 = 10	4 exp and 6 cont 41% of 10=4 exp 59% of 10 =6 cont
D	D1	8 out of 11 8 = no exp and control all exposed to treatment	0 8 out of 153 = less than 1	No exp and cont
Total 4 universities	Total 6 courses	153 out of 279	33 out of 153	17 exp, 13 control, and 3 neither

Table 7: *ICC Analysis for Interrater Reliability of the SFCR Scores across Two Raters*

		95% Confidence Interval		F Test with True Value 0			
	Intraclass Correlation	Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.889	.795	.941	17.035	36	36	.000
Average Measures	.941	.886	.970	17.035	36	36	.000

IV. Implementation of the SFCR

Besides interrater reliability procedures, the scoring of the SFCR was further validated by implementing the SFCR in a pre-post experimental design. This procedure was conducted to gauge the overall working of the SFCR and its scoring in a large sample. Pre-post data were used to determine if the scoring after exposure to TEGIVS curriculum (intervention) before the posttest was better than the scoring at posttest without exposure to intervention. Davis et al.'s (2005), results had showed that exposure to the TEGIVS curriculum improved the perceived VS facilitator competence of preservice teachers. Since the interrater reliability of the SFCR was already found to be adequate, this researcher scored the participants' responses using the SFCR.

This section reports the pre-post VS facilitator competence score results. For the purpose of implementation of the SFCR, data at only one university in two courses were used. The other two universities did not use an experimental design, and the remaining university had a different intervention for the control group. The research design and data collection procedure are summarized in Table 8. Course A1 had four labs randomly assigned as experimental (2 labs, *N*=31 students) and control labs (2 labs, *N*=15 students). Similarly, course A2 had four labs randomly assigned as experimental (2 labs, *N*=15 students) and control labs (2 labs, *N*=12 students). All participants took an online pretest prior to the

intervention (TEGIVS curriculum). The experimental labs were administered posttest after the intervention. The control labs were administered the posttest prior to the intervention (see Table 8).

Table 8*: Data Summary for Implementation of the Rubric at University A*

Course Code	N	**Procedure**
A1	4 labs (*N*=60) 31 exp 15 control	All participants took online pretest prior to the intervention lab. The experimental lab was administered posttest after the intervention. The control group was administered posttest prior to the intervention.
A2	4 labs (*N*=35) 15 exp 12 control	All participants took online pretest prior to the intervention lab. The experimental lab was administered posttest after the intervention. The control group was administered posttest prior to the intervention.

As explained in the competence assessment instrument section, preservice teachers who indicated they were somewhat competent or competent were directed to provide evidence of their competence in the form of an open-ended response. Preservice teachers who indicated they were somewhat competent or competent at either pretest competence assessment instrument or posttest competence assessment instrument were considered eligible for implementation of the SFCR. All participants in courses A1 and A2 were teacher education majors. Accordingly, 46 preservice teachers in the experimental labs and 27 preservice teachers in control labs were eligible for the SFCR scoring.

The pretest and posttest responses to the scenario were then scored per the SFCR by this researcher. The scored responses were analyzed using one-way analysis of variance. The mean pretest scorings of the experimental group were compared with the mean control group pretest ratings; similarly, mean posttest ratings of the experimental group were compared

with mean posttest ratings of the control group. The results showed no significant difference between the experimental (M = 1.15, SD = 1.12) and control group (M = 1.86, SD = 1.47) at the pretest, F (1, 46) = 3.63), while the experimental group scored significantly higher (M = 3.07, SD = 1.44) than the control group (M = 1.11, SD = 1.24) at posttest, F (1, 63) = 26.98 (see Table 9).

These results showed VS competence ratings, as scored using the SFCR, significantly improved for the experimental group, who interacted with TEGIVS curricula prior to the posttest. The two groups who did not show significant difference at pretest did show a significant difference on the posttest, due to interaction/no interaction of TEGIVS curriculum (p<.001). These results are consistent with Davis et al. (2005), who showed that the experimental group, who interacted with TEGIVS curriculum, perceived themselves as significantly more competent VS facilitators than the control group, who did not interact with TEIVS curriculum. These findings further indicated that scoring using the SFCR was valid and sensitive to the TEGIVS curriculum. The significant increase from a mean of 1.15 to a mean of 3.07 in the SFCR scoring after exposure to TEGIVS curriculum indicates that the SFCR is sensitive to the TEGIVS curriculum.

It should be noted that, unlike Davis et al.'s findings, which were based on perceived competence and therefore did not use rubrics, these findings assessed VS facilitator competence based on scenario-based authentic assessment and scored using the SFCR. In the future, it will be interesting to compare the perceived and scenario-based authentic assessment competence ratings. Preservice teachers were found to be over confident about their ability to teach and facilitate in VS (Charania, 2010 in preparation). A comparison of perceived competence of VS facilitator against the scenario based or any other authentic competence rating would indicate if preservice teachers are over confident about their competence to facilitate in VS. Thus, if their perceived competence ratings are significantly

higher than their competence ratings as measured by an authentic assessment than it would affirm the Charania (in preparation) findings that preservice teachers are overconfident of their competence to facilitate in VS.

Table 9: *ANOVA Comparisons of Pretest and Posttest Scores Between Experimental (E) and Control(C) Groups on VS Facilitator Competence Scores.*

	M		***SD***		**Std. Error**		***F***	***df***	**Sig.(two-tailed)**
	E	**C**	**E**	**C**	**E**	**C**			
Pre	1.15 (*n*=26)	1.86 (*n*=22)	1.12	1.47	.22	.31	3.63	46	.063
Post	3.07 (*n*=46)	1.11 (*n*=19)	1.44	1.24	.21	.81	26.98	63	<.001***

****p*<.001

V. Conclusion and recommendations

Given the VS facilitators play an important role in student learning and the quality of student experiences in VS depends on the facilitators' level of competence (Kirby & Driscoll, 1997; Zucker & Kozma, 2003; Frid, 2001; Kapitzke & Pendargast, 2005; Hannum, Irvin, Wa-Lei, & Farmer, 2008), this study was devoted to assessing future teachers VS facilitator competence. Assessment tools in VS have not kept pace with the growth and success of VS (Black, Ferdig & Depietro, 2008). The very first assessment tool was developed, validated, and implemented in this study to assess preservice teachers' competence as VS facilitator. The SFCR was found to be valid and reliable within the context of TEGIVS curriculum. The SFCR can be used by teacher education programs to assess VS facilitator competence of preservice teachers in the three aspects of technology, mentoring, and collaboration. It should be considered this rubric was developed and validated to assess VS facilitator competence based on three aspects—technology, mentoring, and collaboration. The TEGIVS curriculum

integrates these three aspects. Therefore, it will be relevant to use this competence assessment instrument to assess the preservice teachers, who are exposed to TEGIVS curriculum. This instrument can also be used by teacher education programs that have their own VS curriculum that integrates these three aspects. Also, the levels of competence in the rubric were found to be sensitive to the intervention at the implementation stage of the rubric. These levels of competence can be used for developing related assessment tools in VS.

This study reaffirms the importance of authentic assessments like rubric and scenarios that do not rely on self reports but probes for evidence relevant to the competence assessed. Given that this was the first assessment instrument in the area of VS in teacher education, the assessment tools validated in this study sets a trend of henceforth using authentic assessment tools to assess preservice teachers' competencies related to VS. The tools can also be implemented and customized to develop other authentic assessment tools (not self reports) in this area in the future.

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Appendix A

Manual for Evaluating VS Site Facilitator Competency Rubric

Teacher Education Goes Into Virtual Schooling

Overview:

The SFCR is developed to assess preservice teachers' competency as future VS Site Facilitators. The purpose of this manual is to provide you an overview on SFCR within the context of TEGIVS project, and gain your feedback on the appropriateness of SFCR in assessing preservice teachers' future competency as VS Site Facilitator. The SFCR is developed within the context of TEGIVS project.

Your expert feedback and evaluation of the SFCR will help validate and improve the rubric and its application in teacher education and related research. Please complete the feedback sheet on page at the end of this manual.

Introduction to TEGIVS

The TEGIVS project has created a national model for preparing future teachers for Virtual Schooling (VS), or K-12 distance learning, and in particular to prepare all future teachers to become VS Site Facilitators: the educator who supports K-12 students to learn from a distant teacher (also known as student mentor or student coach).

VS Site Coordinators play an important role in VS. Site facilitators enable and support students locally— this role is usually taken by a classroom teacher. Given the dramatic increase in enrollments in VS and the importance of VS Site Facilitators to the success of VS, we recognize that the teacher education programs should prepare all future teachers to take the role of VS Site Facilitators (Harms, Niederhauser, Davis, Roblyer & Gilbert, 2006; Davis & Niederhauser 2007).

One of the goals of the TEGIVS project is to develop and validate a rubric to assess the effectiveness of TEGIVS curricula by evaluating the competence of the preservice teachers as VS Site Facilitators before and after their interaction with the VS curriculum. This

manual is prepared as part of the federally-sponsored TEGIVS project led by Iowa State University [ISU]), the project leads its activities in University of Florida [UF], University of Virginia [UVA], Graceland University [GU].

Purpose

The purpose of this manual is to guide Virtual Schooling scholars, researchers and expert teachers so they may evaluate and validate the Site Facilitator Competency Rubric (SFCR). The SFCR aims to guide assessment of preservice teachers' competence as a Virtual Schooling Site Facilitator.

This manual briefly describes TEGIVS curriculum that was used to educate preservice teachers on VS and its relevance to their role as future teachers; and data gathering instrument that was used to gather preservice teachers' open ended responses related to VS Site Facilitator competency. The SFCR will be used to assess these open ended responses of the preservice teachers, and will thus reflect a range of acquired VS Site Facilitator competency. We seek your expert feedback to validate and improve the rubric and its application in teacher education and related research.

TEGIVS Curriculum

The TEGIVS project developed curricula to prepare future teachers for the role of a VS Site Facilitator. The project prepared two lab tools, one for elementary majors and one for secondary majors to be used within preservice teacher education programs across the U.S. and the labs have been implemented within the four participating universities. Both lab tools used short multimedia scenarios (http://www.public.iastate.edu/~vschool/TEGIVS/curriculum.html). Examples and scenarios of existing VS courses for K-12 students were included in this curriculum. The materials aimed to sensitize students to a range of the many issues that impact the role and responsibilities of a VS Site Facilitator. Communicating the role of VS site facilitator and its

importance were the central focus in both the tools. The three aspects highlighted in each of these tools were:

- *Technology:* The technologies used to support VS that connects K-12 students with teacher(s), students, and/or content beyond their school
- *Mentoring*: Counseling and advising the students, establishing and monitoring effective study habits, monitoring assessment, including proctoring tests where relevant, and support for technology tools, including health and safety.
- *Organizational/Collaboration of Educators*: Collaborate with the distant teacher, other VS administrators, educators, or organizations to improve VS student learning...

Understanding these three aspects of Virtual Schooling from the perspective of VS Site Facilitators is a complex and ill-structured task. First, it is complex and ill-structured because it requires understanding of the three basic aspects (technology, mentoring, and organizational/collaboration) plus the role of site facilitator in VS. Second, it requires the learner to interconnect the two concepts (of VS and site facilitator) to present a possible solution to the given problem in the scenarios. Therefore the SFCR rubric is developed to evaluate such a complex and ill-structured task. This manual has been developed to guide the assessment of competence.

Data Gathering Instrument

A survey was developed to gather data on preservice teachers' competence as a VS Site Facilitator and it was presented online using a survey tool called Survey Monkey. The survey has two parts:

1. The perceived competence includes preservice teachers' self ratings of the extent to which they are competent as site facilitators.

2. This was followed by the request to respond to a scenario about VS. If the preservice teacher indicates competency or some competency, they were prompted to provide evidence of their competence. This kind of assessment is more constructive in nature and can be called authentic assessment.

The competency scenario was as follows:

> "In your first semester as a teacher your mentor tells you that one of your students has been advised to take a course from a Virtual School. She asks you how competent you are to facilitate or coach this student's distance learning.
>
> I don't understand ☐
>
> Not competent ☐
>
> Somewhat competent ☐
>
> Competent ☐

Preservice teachers who indicated that they were somewhat competent or competent were directed to the following open ended question:

> Please give some evidence with a brief description of how you can facilitate the student's virtual schooling course.
>
> Please frame your evidence in light of 3 aspects of virtual schooling:

- *Technology:* The technologies used to support VS that connects K-12 students with teacher(s), students, and/or content beyond their school
- *Mentoring*: Counseling and advising the students, establishing and monitoring effective study habits, monitoring assessment, including proctoring tests where relevant, and support for technology tools, including health and safety.

- *Organizational/Collaboration of Educators*: Collaborate with the distant teacher, other VS administrators, educators, or organizations to improve VS student learning.

These are the open ended data that are available for assessment using the Site Facilitator Competency Rubric.

Site Facilitator Competency Rubric (SFCR):

This rubric is under developed as part of the dissertation project by one of the TEGIVS graduate assistants, Amina, with support from the TEGIVS principal investigator, Niki. The rubric was developed within the context of VS literature, TEGIVS curricula, and competency assessment scenarios.

The purpose of this SFCR Rubric is to evaluate preservice teachers' competence as VS Site Facilitators using the open ended responses that they provide after the scenario is presented. The first version of the SFCR was piloted using the Fall 07 data on the VS Site Facilitator's competency scenarios from the preservice teachers enrolled for the courses (course details listed in the Appendix**)** at the four participating universities. Examples of the preservice student responses and the approximate competency scores given by the researchers using the preliminary version of the rubric are illustrated in the SFCR. Modifications to the SFCR were made based on this coding.

Your Task as a Reviewer

Two concepts appear to be necessary for competence as a VS Site Facilitator: the concept of Virtual Schooling and, within that, the concept of the role that the VS site facilitator plays. You are requested to provide feedback on:

1. The Site Facilitator Competency Rubric (SFCR) itself (p.)
2. The scoring of typical student responses using the SFCR on a set of responses from preservice teachers gathered in Fall 2007.

SFCR Scoring: The SFCR follows 0-3 rating system on three aspects where:

0. Indicates no competence, because the preservice teacher has not mentioned anything relevant within that aspect
1. Indicates some appreciation of the role, because the preservice teacher includes at least one relevant term or phrase
2. Indicates emerging competence, because the preservice teacher indicates at least one strategy to facilitate VS student learning within that aspect
3. Indicates beginning or more competence, because it indicates deeper knowledge of the issues related to that aspect

Each preservice teacher may score between a minimum of 0 and a maximum of 9 points totaled across all three aspects (technology, mentoring, and collaboration/organization) of VS.

Your Feedback

After reviewing this manual, the rubric and other attached documents in the Appendix, please complete the following questions and e-mail your responses to nedavis@iastate.edu and aminik@iastate.edu

Your Name:

Your Institution:

My opinion of this SFCR is that it can be used to evaluate preservice teachers' competence as a VS Site Facilitator.

Agree ☐; Somewhat Agree ☐; Not sure ☐; Somewhat Disagree ☐; Disagree ☐

If you Agree, Would it also be useful to evaluate any other person's competence?

Yes ☐; No ☐

If Yes, then who?

Will it be appropriate to categorize level of VS Site Facilitator competency based on the scores: Total score ranging from 0-3 indicates no competency, 3-6 indicates some emerging competence and 7-9 indicates beginning competence?

Suggestions for improving SFCR (please provide edits on the Rubric of handbook if you wish):

Comments on any aspect of this handbook are welcome

Thank you very much for reviewing the SFCR.

Appendix B

Experts' scoring and reasoning

Expert	Expert Scoring	Expert Reason for Scoring	Expert assigned Aspect
A	0	Too vague. There is no specific evidence this person has knowledge about VS technology issues relating to a site facilitator's role. The answer indicates the person may be familiar with VS tools, but not how to help a student use them or remove technological barriers for the student at a school site.	Technology
B	0	Personally I would have written the rubric to have given this a 1 since they seem technology capable (though they are missing the helping other students point). Those without technology understanding would be a zero in my mind. This gives me no frame of reference in which to score their response; in other words, I did not know the question.	Technology
C	0	No evidence that this individual knows how to or will help students	Technology

		access technology or aid students with technology skills needed for virtual school.	

Example 2: Communicating with a distance educator through email and phone on a regular basis are essential. Also communication with administrators in the local K-12 district is important to make virtual schooling a positive experience for all parties involved.

Expert	Expert Scoring	Expert Reason for Scoring	Expert assigned Aspect
A	2	This person specifically suggests ways to connect with the Virtual instructor, as well as others in the area using the virtual schooling program. However, the person does not accept responsibility for creating a program to help all involved complete the course successfully (student, parents, technology support person at local school, school administrator).	Organizational/Collaboration of Educators
	2	This gives great insight to the roles and responsibilities of the site facilitator and I feel as though I can reference what the question was asking in order to receive this open-ended answer.	Organizational/Collaboration of Educators

C	1	Evidence that this individual understands the importance of communication with other/relevant educators without telling how that communication could occur or showing understanding of issues relevant to this aspect.	Organizational/Collaboration of Educators

Participant response 3: I can provide the face-to-face assistance that the student may need when they don't understand an assignment or concept.

Expert	Expert Scoring	Expert Reason for Scoring	Expert assigned Aspect
A	1	A willingness to help students is voiced, but no strategies for doing so are indicated.	Mentoring
B	2	Again, I feel as though the student understands the roles and responsibilities, but the question may not have led to the quality of answer being sought.	Mentoring
C	1	General evidence that F2F assistance will be provided with no evidence of strategies and related issues.	Mentoring

Participant response 4: Providing effective communication between teachers and students and gain knowledge and usable skills in enabling a great teaching and learning environment.

Expert	Expert Scoring	Expert Reason for Scoring	Expert assigned Aspect
	1	An indication is given that the site facilitator will promote good communication between the teacher and students, but gives no indication of how it will be done or what specifics will be covered.	Technology
B	2	It is missing why it enables a great environment, but it does give insight to the necessity of communication.	Organizational/Collaboration of Educators
C	1	1 point might be a gift on this item) Evidence that this individual sees role as liaison between teachers and students for the purpose of building a successful teaching and learning environment	Mentoring

Participant response 5: I would include many Powerpoints, hook my student up with forums and chats with other students completing the same class in a distance learning environment, and still allow that student to come in for one on one time and also class time if there were any questions.

Expert	Expert Scoring	Expert Reason for Scoring	Expert assigned Aspect
A	3	Specific strategies are suggested to help the online student. In addition, this	Mentoring

		person recognizes the need to scaffold the online learning experience for the student.	
B	0	This is the role of the teacher, not that of the site facilitator.	Technology
C	0	This individual's view is that of a teacher using technology for students rather than functioning in a site facilitator role.	Technology

Chapter 5
General Conclusions

This dissertation was designed to study the preparedness of preservice teachers as future Virtual Schooling (VS) facilitators. The dissertation presented the Teacher Education Goes into Virtual Schooling (TEGIVS) curriculum that intended to educate preservice teachers about VS, and studied the preservice teachers' preconceptions, perspectives, and competence related to VS. Given there is very little research in the area of preparing teachers for VS, this dissertation informed the developing body of VS literature by specifically contributing to the area of professional development of future teachers in VS. This chapter presents a summary of the findings, limitations, applications, and recommendations for future research across all articles in the dissertation.

Research findings

The three main findings of this dissertation are:

1. Preservice teachers are ready to learn about VS, but hold conceptions about VS.
2. TEGIVS curriculum can be used in helping students see the complexity of teaching and learning online.
3. Preservice teachers' competence to facilitate in VS can be assessed through reliable and valid competence assessment instrument.

1. Preservice teachers are ready to learn about VS, but hold preconceptions about VS: Many VS scholars and practitioners have advocated the need to integrate VS into teacher education, but none of their recommendations are supported by data from preservice teachers. This study, based on the data from the preservice teachers at two TEGIVS participating universities, confirmed the need to integrate VS from the perspective of preservice teachers. The preservice teachers' self ratings in the survey indicated they perceived learning about VS

as very important; but perceived a lack of awareness and competence in teaching, facilitating, and designing in VS.

The open-ended and quantitative findings of this study, based on a large sample, confirmed Davis and Rose's (2007) speculation, and Compton, Davis, and Mackey's (in press) qualitative preliminary findings, based on two case studies that preservice teachers hold misconceptions about VS. The two main preconceptions determined in the preservice teachers' definition of VS in this study were 1) technology taking over the role of the classroom teacher and 2) the notion that VS replicates face-to-face classroom online. It is a myth that technology can replace classroom teachers. VS scholars have time and again emphasized that teacher plays a vital role in VS (Davis & Roblyer, 2005; Kapitzke and Pendergast 2005; Harms, et al., 2006; Rice, 2006; Rice, Dawley, Gasell & Florez, 2008; Davis & Rose, 2007), and many professional institutes like NACOL, NEA, and SCERB have released guidelines on how to teach in an online class in K-12 setting. Similarly, it is a myth that traditional learning can be copied to online learning (Li & Akins, 2005); face–to-face pedagogies cannot be replicated in the often used online asynchronous mode. But, online learners and practitioners still try to replicate face-to-face and old distance learning (non-technology) modes into the e-learning environment (Kanuka & Kelland, 2008). Also, since VS involves the online mode for a younger generation than the regular online learners who are adults, both face-to-face and general online learning should be carefully scrutinized if it is to be adapted in VS.

Contrary to the preconception of replicating face-to-face teaching in online or VS settings is the recent finding that suggested online teaching experience positively influences teaching in the face-to-face classroom (Roblyer, Porter, Bielefeldt, & Donaldson**, 2009)**. In this study, teachers who taught in online setting were encouraged to reflect and work on their communication strategies with students in face-to-face classrooms, integrate technology in

the classroom, and develop empathy and sensitivity towards their students in VS and face-to-face settings. These findings further support the need to prepare future teachers for VS. It also supports to challenge the preconception that teaching in VS is a replication of teaching in face-to-face classrooms.

A comparison of the preconceptions identified in this study with the preconceptions documented in the teacher beliefs literature yield the insight of an overgeneralization effect. For example, the preconceptions in the teacher beliefs literature that teaching is easy and preservice teachers enter teacher education with high confidence about their competence in teaching were also identified as preconceptions in the VS definitions and competence ratings in this study. This coexistence of preconceptions was speculated to be a function of overgeneralization of preconceptions from non VS to VS settings.

2. TEGIVS curriculum can be used in helping students see the complexity of teaching and learning online. The TEGIVS project attempted to build VS competencies by developing a tool or curriculum that can be shared within the teacher education community. Chapter 2 presented the TEGIVS curriculum. This curriculum was tested for usability and effectiveness with a small sample and accordingly the preliminary results were discussed. These initial findings suggested that the curriculum had above average usability and the preservice teachers' perceived ratings on awareness, importance, and competence related to VS significantly improved after their interaction with the curriculum. Results also suggested improvements were needed in both content and delivery. It was suggested that the content could be improved by adding a few more scenarios related to issues in VS, and delivery could be improved by involving a broader community of practice. The improvement in content in terms of including more scenarios was made, and the subsequent implementation of the revised content was part of Chapter 4 in the dissertation.

3. Preservice teachers' competence to facilitate in VS can be assessed through reliable and valid competence assessment instruments. This study was devoted to assessing future teachers' VS facilitator competence. Assessment tools in VS have not kept pace with the growth and success of VS (Black, Ferdig, & Depietro, 2008). The very first assessment tool developed and implemented in this study to assess preservice teachers' competence as VS facilitator was found valid and reliable within the context of the TEGIVS curriculum. An interesting finding, while assessing validity of the competence assessment instrument, was the inconsistency in the perception of teacher and facilitators roles among the VS experts. This provided evidence for the need to educate educators about the multiple roles of VS educators, who largely depend on the type and model of virtual schools (Ferdig et al., 2009).

In summary, this dissertation affirmed the need to prepare preservice teachers for VS and identified their preconceptions related to VS, presented and evaluated the effectiveness of the curriculum to educate preservice teachers on VS, and developed, validated, and implemented a competency assessment instrument within the framework of the TEGIVS curriculum to assess preservice teachers' competence to facilitate in VS. As part of the TEGIVS project timeline, the curriculum was prepared in the second era of the project's life cycle. Data collected during the third year of the project were used for the studies in Chapters 3 and 4, and the rubric (part of competence assessment instrument) was developed and validated only recently as part of this dissertation. Therefore, the findings related to preconceptions and perspectives of preservice teachers about VS, and the rubric in Chapter 4 were not part of the curriculum and assessment during the project phase. The future application of the curriculum should consider and integrate the findings in Chapters 3 and 4 in their attempt to implement TEGIVS curriculum. For example, to address the preconception that technology overpowers the role of the teacher, preservice teachers can be exposed to the day-to-day working schedule and activities of the VS teacher and facilitators via virtual field

trips integrated in TEGIVS curriculum. Other limitations and application of the studies in this dissertation are discussed in the following sections.

Limitations of the studies

One of the limitations of the studies in Chapters 2 and 3 was that these studies were based on self reports. This limitation was due to the absence of assessment tools in VS and teacher education. The validation and implementation of competence assessment instrument in the fourth article was a step towards developing valid and authentic assessment tools in the area of VS in teacher education. However, use of this assessment tool in a different curriculum that integrates the three aspects should be piloted and can be further validated for use outside the TEGIVS context. Furthermore, the survey instrument in this study was not specifically designed to study preconceptions in VS and, therefore, the scope of the findings and its implications are limited to the extent of data collected in the form of VS definitions and self ratings on competence.

Applications of the tools and findings

The TEGIVS curriculum presented and tested for effectiveness and usability in Chapter 2 was implemented to over 1,350 future teachers through this project. Besides the participating universities, the curriculum resources have already been taken up by several programs and departments involved in teacher education. This includes uptake in several new states, including Boise State University, Idaho, Wayne State University, Michigan University of Nevada, Las Vegas, Nevada (TEGIVS Evaluation Report, 2008). The TEGIVS curriculum materials were also implemented in New Zealand by the principal investigator of the TEGIVS project. Although the images and particularly the voices of Americans were somewhat humorous to New Zealanders, the content was appreciated and preservice teachers indicated they were glad to have their awareness raised and look forward for such interventions in the future (Davis, Charania, & McGrath, 2009).

The utilization of the TEGIVS curriculum can be further extended to teacher education programs across the globe that have joined the mission of preparing future teachers for VS. Preservice teachers were found to be overconfident about their competence to teach and facilitate in VS (Chapter 3, findings). The scenarios presented in the curriculum will help future teachers reflect on their overconfidence and acknowledge the complexity involved in facilitating and teaching online. In order to expose preservice teachers to VS and to prepare them to be competent educators of VS, curriculum like TEGIVS can be integrated in the course like methods and technology integration. The curriculum can be also adapted (with acknowledgement to the TEGIVS curriculum) to fit the curriculum and pedagogy of the teacher education course in which it is planned to be implemented.

On the other hand, the rubric, as part of the competence assessment instrument, was developed only recently as part of this dissertation and has not been implemented outside the TEGIVS project. Teacher education programs can also use this very first competence assessment instrument to assess VS facilitator competence of preservice teachers in the three aspects of technology, mentoring, and collaboration. Both the TEGIVS curriculum and the competence assessment instrument belong to the same package, since it has been developed within the same content and context. Apart from integrating it in teacher education programs, this package can be offered as a certification for future teachers, who wish to venture as future VS educators.

The study in Chapter 3 informs teacher education programs that preservice teachers hold preconceptions about VS, novice preservice teachers are overconfident about facilitating and teaching in VS, and these preconceptions could be a result of overgeneralization of preconceptions about non VS settings. Thus, teacher education programs should consider methods and strategies to identify and address the preconceptions preservice teachers hold about teaching, in general, and about VS, in particular. One of the strategies documented

recently is virtual field exposure that enables preservice teachers to appreciate the complex and significant role teachers play in VS. Such exposures can potentially influence an increase in familiarity and reduce preconceptions about VS.

Recommendations for future research

First, the TEGIVS curriculum and competence assessment instrument can be piloted in teacher education programs across the globe, which will strengthen its validity, quality, and usability. Second, since the survey instruments were not designed to gauge preconceptions, new studies should be designed specifically to study preconceptions related to VS. Third, the overgeneralization effect of preconceptions can be taken forward and future studies can assess the overgeneralization effect of preconceptions and other beliefs across virtual and non virtual settings. Fourth, the multiple roles played by the VS teachers in different type and models of VS need to be analyzed through further research. This will help understand the range and variety of competence required of preservice teachers to teach and facilitate in VS.

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