

# Using Technology for Geography Teacher Education: Web-based Professional Development

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## Abstract

This qualitative study explores the perceived value of a video-based online workshop in Geography, "Watershed Management," part of the Geography: Teaching with the Stars series, a 22 program professional development series for teachers of geography, social studies, and environmental science. Results indicated that teachers reported satisfaction with the online professional development approach and its usefulness for enhancing and supplementing traditional the traditional face-to-face approach to professional development.

**Keywords:** inservice teacher training, geography education, video-based professional development, web-based professional development, Geography: Teaching with the Stars

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## **Introduction**

For the past quarter century, geographic educators have been engaged in processes aimed at increasing and improving teachers' content knowledge (CK) and pedagogical content knowledge (PCK) in geography through professional development. This trend continues today, and geography organizations are, in an effort to reach more teachers, beginning to offer professional development in methods alternative to the traditional face-to-face workshops or summer institutes. It is especially important at this point in time to reach as many teachers as possible as states are continuously updating their content standards for geography as well as implementing new standards-based assessments. There is great potential in alternative delivery models; however, the effectiveness of these advanced methods has not yet been thoroughly evaluated. In this article, a background and context for the research problem is provided, followed by a review of relevant literature on measures of effectiveness for two models of professional development – the traditional face-to-face delivery and an alternative web/video-based delivery system. The literature reviewed has been divided into three sections: effectiveness based on teacher learning, participant satisfaction, and other additional measures of success.

## **Background**

In the United States, geography standards are being updated at both the National and state levels. Changes in standards-based achievement tests coincide with these updates. As an example, the State of Texas will, beginning in the 2011-2012 school year, replace the current criterion-referenced assessment program, the Texas Assessment of Knowledge and Skills (TAKS), with the State of Texas Assessment of Academic Readiness (STAAR) exam as a measure of teacher accountability and student achievement. The STAAR exams consist of twelve end-of-course (EOC) assessments, including one for the ninth grade World Geography course. This exam will test students on the newly revised social studies standards, the Texas Essential Knowledge and Skills (TEKS), which includes physical and cultural geography content as part of the World Geography course (Texas Education Agency, 2010).

Due to geography's relatively minor position within most social studies certification programs, many world geography teachers have completed little, if any, geography coursework as part of their teacher education program. Typically, social studies teacher certification programs in the United States are dominated by U.S. and World History courses. Of the 48 Texas colleges and universities offering secondary social studies teacher certification, 79% require six or fewer credit hours of geography, while 36% require three or fewer, and 15% do not require a single geography course (Frazier, 2010). Yet the teachers who complete these programs are

certified to teach World Geography. As a result, many teachers lack even a basic knowledge of physical and cultural geography, and there is currently a push to provide professional development opportunities to teachers in order to correct this deficiency. To be successful, these programs must be effective in imparting the desired content, pedagogical, and pedagogic content knowledge to the teachers.

### ***Measures of Effectiveness***

Advancements in information technology over the past two decades have led to an increase in the availability of internet access in the home and workplace. As new technology becomes available, so do new methods of conducting training. In the case of teachers, this training is commonly referred to as professional development. While studies (Lin 2009) have been conducted on the effectiveness of traditional training delivery methods, there is currently a dearth of literature of studies undertaken for alternative delivery methods in geography education, particularly training via web-based video. Studies on other measures of success, such as cost-effectiveness of web-based training and teachers' satisfaction and user reaction with the program, with particular respect to the length of the videos its aesthetic qualities, in a variety of subject areas have also been undertaken (Jung, 2005; Pomales-Garcia and Liu, 2006; Prior and Bitter, 2008). Finally, studies have been conducted on the effectiveness of combined training delivery methods, such as workshops that incorporate the use of video into a face-to-face workshop (Harlen and Doubler, 2004; Liu, Chiang, and Huang, 2007; Stockero, 2008; Lin 2009).

### ***Effectiveness Based on Teacher Learning***

Professional development via alternative delivery methods is employed in many disciplines. These web and/or video-based professional development programs are designed to impart content knowledge, pedagogic knowledge, and pedagogic content knowledge to participants. For example, TryScience, a web-based professional development program for science teachers, has explicit goals of "developing teachers understandings in science and improving their pedagogic skills" (Harlen and Doubler, 2004). In a 2009 study, Santaga examined the effectiveness of video-based professional development in improving teachers' pedagogical and content knowledge. Pre and post-surveys revealed that, in most cases, the results were positive. In another study (Lin, 2009), 42 pre-service mathematics teachers were given a pre-test on fraction knowledge. The teachers were then split into two groups, and one group participated in an online professional development workshop and the other in a traditional face-to-face workshop. The group receiving online instruction demonstrated a statistically significant greater improvement in post-test scores compared to the pre and post-test scores of the face-to-face group (Lin, 2009).

Sitzmann, Kraiger, Steward, and Wisher (2006) conducted a meta-analytic study comparing the effectiveness of web-based courses to classroom instruction. The authors concluded that web-based instruction was at least equal to classroom instruction for teaching declarative knowledge and procedural knowledge. The authors define declarative knowledge as it “refers to trainees’ memory of the facts and principles taught in training and the relationship among knowledge elements...learning outcomes include changes in verbal knowledge, how knowledge is organized, and in cognitive strategies for accessing and applying knowledge” (p. 627). Results of the meta-analysis revealed that Web-based training was 6% more effective than classroom instruction for teaching declarative knowledge, and the two delivery methods were equally effective for teaching procedural knowledge.

### ***Participant Satisfaction***

Participant satisfaction is also an important aspect of the success of professional development programs. A 2007 study by Liu, Chaing, and Huang comparing the learning effectiveness and trainees’ reported satisfaction of traditional classroom-based training and web-based training focused on two colleges’ administration application systems by training recipients. The authors analyzed the responses of 288 respondents, revealing that trainees receiving web-based training achieved better learning performance than trainees receiving traditional classroom-based training. Additionally, the authors concluded that trainees receiving web-based training reported higher levels of satisfaction than their classroom-based counterparts.

While the prior two studies discussed multiple-day trainings or web-based courses, another study investigated a single module of a multimedia professional development program. In the study (Pryor and Bitter, 2008), the researchers evaluated the effectiveness of a single module of a multimedia professional development program by investigating participating teachers’ ability to learn, apply in lesson plans, and retain knowledge of classroom discourse. The results indicated that all teachers gained knowledge of the discourse standards, but did not reveal a significant correlation between module use for professional ability and the ability of teachers to reflect on practice or to promote discourse standards.

Research on web-based professional development in geography is scarce, but the results have been positive. In a study of 18 teachers, preliminary research on teacher satisfaction with the Geography: Teaching with the Stars program “Globalization” found that teachers receiving both video-based and face-to-face trainings rated the video-based program at least equal in comparison with the “real teacher” face-to-face approach (Boehm, Brysch, Mohan, & Backler, in press).

### **Other Measures of Success**

While few studies have been undertaken to measure empirically the effectiveness of web-based videos on teacher learning, other studies have shown that it is a cost-effective method of delivery for professional development. A study by Jung (2005) compared face-to-face and online teacher training over the course of a school year. The results revealed that, while learning scores for the online group were slightly lower, the overall cost-effectiveness was evident as the cost per enrolled student in the online training was 43 percent less than that for the traditional face-to-face training group. Pre- and post- survey results showed that there was not a statistically significant difference between the two groups in the general attitudes held by teachers to the subject matter. Moreover, there was no statistical difference in the teachers' satisfaction level with the training between the online and face-to-face groups.

Models of professional development delivery methods do not have to be either face-to-face live instruction or only video based. Many practitioners choose to incorporate the use of videos into face-to-face workshops with positive results. Stockero (2008) conducted a study of 40 preservice mathematics teachers, half of whom received video-based instruction in addition to face-to-face instruction, and the other half received only face-to-face instruction. After analyzing class discussions and completed assignments, the results showed that in many cases the two groups were similar. The preservice teachers who received video instruction, however, had significant gains in their focus on student thinking.

Technological developments and increased internet access has provided new pathways for professional development. There is a wide gap in the research literature comparing the effectiveness of delivery models. The studies reviewed here have revealed that video-based professional development is an effective and cost-efficient method of imparting content, pedagogic, and pedagogic content knowledge to teachers. Additionally, studies have shown that, overall, teachers are generally satisfied with video-based programs. Finally, positive results have also been revealed when studying the effectiveness of using combined models of delivery in which video is used as an enhancement to the traditional face-to-face professional development delivery model.

### **Research Aim and Questions**

This qualitative research study is designed to reveal and better understand the experiences and perspectives of inservice teachers participating in an online video-based professional development program. This research has the potential to

influence the design of future video-based professional development programs, as well as contribute to the existing literature on the effectiveness of online professional development. More specifically, this research seeks to gain an understanding of the experiences of earth science and geography teachers participating in an online workshop on watershed management.

To heighten the understanding of participants' experiences, the following research questions guide the study:

1. How do teachers participating in an online workshop on watershed management describe the experience?
2. What perceptions do the teachers have about the viability and usefulness of an internet-based delivery method for professional development?

The purpose of these questions is to “give direction to the study, limit the scope of the investigation, and provide a device for evaluating progress and satisfactory completion” (Hatch, 2002, p. 41).

## **Method**

This qualitative study examines the experiences and perceptions of teachers participating in an internet video-based teacher professional development program designed to improve teachers' content knowledge, pedagogical knowledge, and pedagogical content knowledge in geography, more specifically, watershed management. A qualitative research design is preferred for this study due to the integral role of the researcher in the data collection and analysis, the inductive process, and descriptive nature of the final report (Creswell, 2007; Hancock & Algozzine, 2006; Lichtman, 2006; Hatch, 2002; Merriam, 1998). Creswell (2007) describes qualitative research as “the study of research problems inquiring into the meaning individuals or groups ascribe to a social or human problem” (p. 37). In addition, Hancock and Algozzine (2006) describe the purpose of qualitative research as emic (the insider's view) where the “goal is to understand the situation under investigation primarily from the participants' and not the researchers' perspective” (p. 8). Thus, the primary goal of the researcher is to glean an understanding based on the meaning the study participants have constructed about their world and experiences. It is based on an assortment of interpretive techniques employed by the researcher to reveal meaning, not frequency, of the phenomena under study (Merriam, 2009).

### **Context of the Study**

The study was set in the context of professional development for inservice secondary geography teachers. Participating teachers took part in an online video-based professional development workshop on watershed management. This workshop is part of the Geography: Teaching with the Stars (GTWS) professional development series produced by the Gilbert M. Grosvenor Center for Geographic Education in partnership with The Agency for Instructional Technology.

Geography: Teaching with the Stars is a video-based professional development series created to fill the gap between what geography teachers are expected to teach according to Geography for Life: National Geography Standards and the coursework teachers completed as part of a social studies composite or similar multi-disciplinary preservice education program (Geography Education Standards Project, 1994). The objectives of the programs are to increase the pedagogic knowledge as well as content knowledge and pedagogic content knowledge in geography. The professional development program chosen for this study, “Watershed Management” consists of five components:

- In-class demonstrations by experienced teachers and reflections on the lessons by those teachers
- A pedagogical enhancement in which a mentor teacher provides commentary on the pedagogic strategies employed in the classroom demonstrations
- A content enhancement consisting of a seven minute video case study of a complete watershed system.
- Supplemental materials such as lesson plans, graphic organizers, and other print resources that may be downloaded and printed for use.
- A web-based forum for asynchronous dialog between teachers, facilitators, and mentor teachers.

### **Study Participants**

Fifteen in-service ninth grade World Geography teachers from Texas participated in this study. These teachers were purposefully selected from two traditional (face-to-face) professional development programs held at Texas State University-San Marcos during the summer of 2011. The participants were chosen for this study through a sampling strategy because “they can purposefully inform an understanding of the research problem and central phenomenon in the study” (Creswell, 2007, p. 125).

### **Research Process**

There were two parts to the data collection process for this study. In the first part, eight teachers participated in the workshop in both the traditional face-to-face setting and the web-based setting. For the traditional delivery setting, the teacher (“Star”) featured in the Geography: Teaching with the Stars videos conducted the workshop. For the web-based session, the teachers were provided a computer lab and instructed to work through the web-based professional development workshop on their own. This strategy allowed the participants to make comparisons between the two methods of professional development. In the second phase, seven teachers completed only the online workshop. These participants were asked to compare the web-based delivery method with other traditional face-to-face professional development workshops in which they had participated. Participants completed an open-ended questionnaire upon the completion of each workshop.

### **Data Collection**

Data for this study was collected via open-ended questionnaires, which were completed upon the conclusion of the web-based workshop. Participants were asked to describe their experiences, opinions, feelings, and knowledge about participating in the program, as well as their perceptions of the usefulness of the program. Measures were taken to protect the identity of participants in accordance with the National Institute of Health and the Texas State University-San Marcos’s Institutional Review Board (IRB) for the protection of human research subjects.

### **Results**

Data collected for this study focused on the two central questions: (1) How do teachers participating in an online workshop on watershed management describe the experience, and (2) What perceptions do the teachers have about the viability and usefulness of an internet-based delivery method for professional development? The analysis was conducted by organizing the responses in such a way that patterns and themes became evident (Patton, 2002; Merriam, 2009).

#### Perceived Value of the Web-based Teacher Professional Development Program “Watershed Management”

Overall, participants from both parts of the study indicated a high value of the web-based professional development program “Watershed Management”. One participant from part one (N=8) responded:

It is of great value. It gives teachers an opportunity to see a teacher model the lesson, introduce the material, and also acquire a video from the program. It allows the teacher to use the same format or change it to his or her style.

Another participant from phase two responded:

I could see many teachers gaining a tremendous amount of knowledge and information. Teachers would gain both content and class materials and activities for their students.

### ***Strengths and Weaknesses of Web-based Professional Development***

Participants outlined the strengths and weaknesses of each delivery method as compared to the other. Three perceived benefits of the web-based approach became apparent; (1) time management/convenience and ability to work at one's own pace, (2) cost effectiveness of reaching a large audience, and, (3) the supplemental materials. Participants also voiced weaknesses of the web-based program when compared to traditional face-to-face workshops, including barriers that may exist to the availability of the web-based program such as a lack of internet access. Perhaps the largest weakness reported, however, was the lack of personal interaction with the instructor and other participants.

#### ***Strengths***

Many participants felt that the ability to review multiple times the materials presented in the web-based program was a major strength of the web-based delivery approach. As one participant described:

The video allows you to see the lesson being done within an actual class and the preferred outcomes of the lesson. You have the benefit of being able to re-watch the video and all the other resources on the website. You have the time to digest and absorb what you viewed and read.

These sentiments were echoed by the participants in part two, with one teacher responding that:

The web-based [workshop] allows for a more non-regimental training. If it is online, I can view it at 3:30 in the afternoon when students have left, or at midnight when I finally get a chance to relax. It also allows me to refer back to information I may not have written down.

Another teacher added:

Viewers are able to manage their own time and can review the videos numerous times, [whereas in face-to-face] time is limited and information cannot be repeated once the session ends.

Another benefit of web-based delivery reported by the participants was cost-effectiveness and the ability to reach a larger audience, particularly important to teachers in underserved or rural districts where financial resources and geographic limitations prohibit them from attending trainings offered in the traditional setting. As an example of this benefit, one participant from part two related the situation in her own district:

Most rural teachers and others not so rural could benefit if there is a low charge or no charge. I know in our district, due to budget constraints, many summer teacher trainings were canceled. The district has also reduced the number of individuals that they are willing to pay or assist with travel expenses for trainings.

Likewise, a teacher from part one felt that:

This would be useful for rural teachers who may be too far to travel to other workshops or districts that do not have money to send teachers to workshops or conferences.

The participants from both phases of the study also agreed that the supplemental materials available with the “Watershed Management” program were beneficial. As one teacher from part one noted:

There are a lot of supplemental materials available that will be valuable to any teacher who may need some direction on both content and on how to deliver the lesson. Being able to view the video and then go back and read the material and have the handouts available will be very helpful. Having this material available also makes it more likely that teachers will use the lessons, even if the entire lesson is not taught.

Another teacher added, “All are wonderful! Teachers can never have enough!”

### ***Weaknesses***

While the participants generally had positive perceptions of the web-based delivery method, there were two main weaknesses that were found. First, some participants felt that technological barriers may exist that would prevent teachers from taking part in the web-based trainings, particularly in rural areas where internet access is limited or restricted. More than half of the participants, however, responded that a major weakness of the web-based program was the lack of interaction between the

facilitator and participants. One participant from part one, when asked to compare the two delivery methods of the same workshop, responded:

The similarity was that the exact same lessons were shown with both the video presentation and the face-to-face. The difference was getting a more detailed explanation on some aspects of the lesson plan that was not shown in the video and being able to ask if you were not sure of something. Also, you have the opportunity to complete parts of the lesson and do the hands-on activities.

This perceived weakness was shared by teachers in part two, one of whom noted:

The cons of the online program are that it is less personal and participants can't pause to ask questions and receive an immediate response.

As one teacher related:

Unfortunately, it [the web-based delivery] doesn't allow for interaction between the speaker and participant. That is immediate interaction.

Despite these weaknesses, however, participants reported an overall high level of satisfaction with the online workshop. These findings fall in line with preliminary research on another program from the GTWS series, "Globalization," in which teachers rated the video-based professional development to be at least equal to face-to-face professional development when comparing the two approaches, with face-to-face faring slightly more favorable for interaction with the workshop facilitator (Boehm, Brysch, Mohan, & Backler, in press). It should be noted that the producers of the series *Geography: Teaching with the Stars* are attempting to address the interaction concern by providing a "teacher's forum" where questions may be submitted, with the expectation of a 24-hour maximum turnaround for answers. This service is still in the design phase, but will be available to counter the criticism of a low level of teacher to teacher communication.

### ***Discussion***

This study provided insight into inservice teachers' perspectives of an online video-based professional development program in which participants were provided the opportunity to compare online delivery of professional development with the traditional face-to-face model. Results show that while overall satisfaction with the online program was high, teachers' perceived many strengths and weaknesses of participating in professional development online. Most participants found the self-paced environment and time-and-place flexibility of the online program to be the primary benefits. Conversely, many participants felt that the lack of interaction with other participants and the facilitator was a major weakness.

Prior studies (Sitzmann, Kraiger, Steward, & Wisner, 2006; Lin, 2009; Fischer, Schumaker, Culbertson, & Deshler, 2010; Baran & Cagiltay, 2010; Duncan-Howell, 2010) have shown internet-based professional development to be an effective method of training, with the majority of participants finding the trainings to be useful and satisfactory (Levy, 1999; Yang and Liu, 2004; Liu, Chaing, & Huang 2007). This model of professional development has other benefits, including increased access to those in geographically remote areas in a cost effective manner (Birman, Desimone, Porter, & Garet, 2000; Brown & Green, 2003). Indeed, Yang and Liu (2004) found that the success of an online workshop was dependent on access to technology equipment and the internet itself. Others (Schrum, 1995; Brown & Green, 2003) also found internet access to be an obstacle. While the worldwide telecommunications infrastructure has seen massive growth over the past decade, as the teachers in this study noted access may still be limited by restrictions put in place by individual schools and districts.

While effective, internet-based workshops are not without disadvantages. Many of the teachers in this study, while reporting an overall satisfaction with the online program, revealed that they missed the personal and immediate interaction that takes place in face-to-face workshops, and indicated that interaction as the primary reason for preferring traditional face-to-face professional development. This finding falls in line with results of other qualitative studies on participant satisfaction with online workshops (Brown & Green; Lebec & Luft, 2007; Fischer, Schumaker, Culbertson, & Deshler, 2010). Lebec and Luft (2007) found that social learners in particular may need the social context of face-to-face training and may not experience the full benefits of trainings conducted online.

One way to increase the social context of an online setting is to include, as Geography: Teaching with the Stars is currently developing, a forum to enable program participants to communicate with each other as well as program facilitators. This forum will allow teachers to collaborate, share resources, and exchange anecdotal evidence of how successful certain aspects of the program were in the classroom (Baran & Cagiltay, 2010; Duncan-Howell, 2010). Teachers may need additional encouragement, however, to participate in forum discussion. Prior research (Levy, 1999; Fusco, Gehlbach, & Schlager, 2000; Yang & Liu, 2004; Lebec & Luft, 2007) has indicated teachers often are only infrequent contributors to online forums with few sustained in-depth discussions taking place, with the pace of asynchronous discussion and lack of time as the primary reasons for this trend. Teachers participating in two of these studies (Levy, 1999; Lebec & Luft, 2007) indicated that they did not become as involved as they would have liked in the online discussions and as a result missed opportunities for collaboration and interaction with peers and experts.

### ***Implications and Suggestions for Future Research***

The participants in this study voiced both satisfaction and concerns of both the traditional face-to-face and alternative web-based professional development delivery methods. The primary disadvantage of the web-based delivery cited was the lack of interaction and immediate feedback from the facilitator. While the availability of an online forum makes it possible for participants to interact with each other, the existence of the forum alone does not guarantee they will. Steps should be taken by facilitators of online professional development to encourage use of the forums. These steps could include using social networks (such as Facebook, Twitter, etc.) as a medium for an online community (Baran & Cagiltay, 2010); providing a discussion list for forums (Yang and Liu, 2004; Baran & Cagiltay, 2010); or making participation in the forums a requirement for receiving continuing professional development credit (Fusco, Gehlbach, & Schlager, 2000; Yang and Liu, 2004).

As Geography: Teaching with the Stars will soon offer an online forum, further longitudinal research will be needed to determine the extent of its use by participants and discussion topics that develop. Upon completion of data collection for the current study, participants were introduced to a prototypical online forum like that to be included with Stars; however, time constraints did not allow an indepth analysis of the discussions. Preliminary analysis, however, suggests that initial posts by teachers were to share additional resources they felt may be relevant to the lessons presented in the program with other participants. Furthermore, as the workshops were held during the summer months, not enough time has elapsed for the participants to have used the lessons and pedagogic strategies presented in the “Watershed Management” program in their classrooms. The researchers hope that in the future participants will revisit the forums and share anecdotal evidence of experiences with their peers.

Despite the concerns voiced by participants about the web-based program, all indicated that they were satisfied with the program. As the internet has been shown to be a cost-effective means of reaching the masses with satisfactory results in increasing teachers’ content knowledge, pedagogical knowledge, and content pedagogical knowledge, many teachers stand to benefit from professional development offered in this way. Geography: Teaching with the Stars has been designed to supplement and enhance by increasing opportunities for professional development in geography. Geography teachers and the discipline stand to benefit greatly from the use of technology in this way.

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### **Biographical statement**

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**Richard G. BOEHM**, Ph.D., was one of seven authors of Geography for Life, national standards in geography, prepared under Goals 2000: Educate America Act. He was also one of the authors of the Guidelines for Geographic Education, in which the five themes of geography were first articulated. In 1990, Dr. Boehm was designated "Distinguished Geography Educator" by the National Geographic Society. In 1991, he received the George J. Miller award from the National Council for Geographic Education (NCGE) for distinguished service to geographic education. He was President of the NCGE and has twice won the Journal of Geography award for best article. He has received the NCGE's "Distinguished Teaching Achievement" award and presently holds the Jesse H. Jones Distinguished Chair in Geographic Education at Texas State University –San Marcos. Dr. Boehm is the Director of Texas State's Gilbert M. Grosvenor Center for Geographic Education and is the Co-coordinator of the Texas Alliance for Geographic Education, a grassroots network of educators that, in partnership with the National Geographic Society, is dedicated to improving the quality and quantity of geography in Texas schools.

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