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Social Studies Teachers' Views of ICT Integration

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Abstract

The role of teachers is significant for information and communication technology (ICT) integration, because the use of ICT in the classroom depends on teachers' attitudes towards the concept. In other words, for successful ICT integration, teachers are required to have a positive attitude. Providing well-organized ICT teacher training is essential in encouraging teachers to view ICT positively. However, to develop such training, teachers' opinions, concerns, and needs regarding ICT integration should first be identified. In order to provide better support for social studies teachers using ICT, this article reports social studies teachers' views, experiences, and attitudes towards ICT integration via individual face-to-face interviews with 23 social studies teachers in Colorado, USA. The results of this study found that the majority of the participating teachers had positive attitudes towards ICT as an instructional tool and wanted to learn more about ICT for effective use in their classrooms. However, they identified the low availability of ICT as a major barrier that limited their use of ICT in the classroom.

Keywords

ICT, Educational Technology, Teachers, Social Studies, Geography

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Information and communication technology (ICT) has been implemented in education to provide various learning opportunities and environments for students (Heemskerk, Volman, ten Dam & Admiraal, 2011). Previous studies have reported the usefulness and effectiveness of using ICT for student learning (Ertmer, 2005; Hew & Brush, 2007). For example, according to Luke (2003), ICT can be a potential tool for developing and generating knowledge in a constructive way, incorporating previous knowledge into new knowledge. However, ICT integration does not always produce positive results for students' learning. Several scholars have reported concerns about negative effects of ICT integration for teaching and learning, such as overload of unnecessary and unreliable information and waste of class time (Heafner, 2004; Scott & O'Sullivan, 2000). In order to be valuable in education, ICT should be used at the right time and under the right circumstances (Becker, 2000).

One of the most important factors for successful ICT classroom implementation is teachers' positive beliefs on ICT in education (Gulbahar & Guven, 2008; Kynigos & Argyris, 2004; Muntaz, 2000; Sugar, Crawley & Fine, 2004). The role of teachers for ICT integration is important, because they serve as gatekeepers (Hong, 2014). In other words, students' access to an ICT environment depends on teachers' attitudes towards ICT. If teachers are reluctant to implement ICT, their students may not have an opportunity to use ICT in the classroom.

As previously stated, well-organized and planned ICT teacher training can encourage teachers to have positive attitudes (Reynolds & Morgan, 2001; Zhao & Bryant, 2006). However, identifying what teachers think about using ICT for their teaching, and what kinds of difficulties they face, is critical to the effective development of such training. In order to provide better support for social studies teachers, this study aimed to identify social studies teachers' perceptions of ICT integration.

ICT in Social Studies

ICT integration in social studies was expressed as 'a sleeping giant' by Martorella (1997), because social studies classrooms have not adopted ICT as much as other disciplines have done (Doering, Scharber, Miller & Veletsianos, 2009; Martorella, 1997; VanFossen & Waterson, 2008). The speed of ICT integration in social studies has also been slower than other subject areas (Bolick, Berson, Friedman & Porfeli, 2007; Zhao & Bryant, 2006). In order to promote ICT integration in social studies, several scholars have conducted studies to identify potential of ICT integration in the social studies classroom (Doering et al., 2009; Friedman, 2006; Lee & Calandra, 2004).

Previous studies have proved that ICT can help (1) motivate students' engagement in the social studies classrooms, (2) enhance their social studies learning, (3) make social studies an appealing subject, and (4) improve their problem-solving, communication, decision-making, and research skills (Berson, 1996; Cassutto, 2000; Gulbahar & Guven, 2008; Martorella, 1997; National Council for the Social Studies, 1994). It is also important to train students to become digital citizens in the global world by equipping them with 21st century skills (National Council for the Social Studies, 2013; Partnership for 21st Century Learning, 2015). Specifically, Heafner (2004) conducted a case study

to identify positive effects of ICT use in social studies. In her study, participating students were asked to create an advertisement for political campaigns using Microsoft PowerPoint. Through this case study, she found out that the students improved their self-efficacy and self-confidence by accomplishing this assignment successfully with Microsoft PowerPoint. She also saw that students learned collaboratively by helping each other.

Various types of ICT have been developed and implemented for students' social studies learning. In history, some studies have employed various web-based historical materials and databases to enhance students' historical thinking and inquiry skills (Friedman, 2006; Hicks, Doolittle & Lee, 2004; Saye & Brush, 2002). Other researchers have also adopted digital games and historical simulations (Devlin-Sherer & Sardone, 2010; Lee & Probert, 2010). In geography, various geospatial technologies, such as Google Earth, have been used as a visual aid for multimedia learning to illustrate geographic concepts (Campbell, 2008; Cin & Tabanlı, 2015; Meyer, Butterick, Olkin & Zack, 1999). In addition, many researchers have proved that geospatial technologies are useful tools in promoting students' spatial thinking and geographic reasoning skills (Goldstein & Alibrandi, 2013; National Research Council, 2006).

Aligned with the trends in computing technology development and innovation, different types of ICT have been implemented in social studies. Since the late 1990s and early 2000s, a large amount of historical content has been available online (Friedman, 2014). Such materials have impacted enormously on the teaching and learning of social studies (Cohen & Rosenzweig, 2006). Later, via Web 2.0, the Internet in the social studies classroom has been used in a more interactive fashion (Friedman, 2014). Students can create information freely, and can share and collaborate with others using Web 2.0 technology (Alexander, 2006; O'Reilly, 2007). Many mobile apps on smart phones and tablet computers are also available for teaching and learning in a social studies context. Previous studies have shown a high level of student engagement with mobile technology (Schachter, 2009). Currently, more and more social studies teachers are integrating various forms of technology into their teaching (Bolick, Berson, Coutts & Heinecke, 2003; Hicks et al., 2004). The results of previous studies tell us that many social studies teachers recognize the value of ICT integration in their class, and various types of effective and useful ICT are available for social studies learning.

Importance of ICT Teacher Training

Although positive effects of ICT integration in social studies classrooms have been established, several studies have also reported that many social studies teachers lack knowledge and skills in ICT, and that this is one of the main barriers to the widespread adoption of ICT in social studies education (Doolittle & Hicks, 2003; Gulbahar & Guven, 2008; Shriner, Clark, Nail, Schlee & Libler, 2010). Teachers who lack experience and are unfamiliar with ICT tend to hesitate in introducing it into their classrooms. Therefore, in order to improve social studies teachers' ICT knowledge and skills, and to build their confidence, ICT teacher training is necessary (Lanahan & Yeager, 2008; Sahin, 2008).

Identifying the training that teachers actually want and require is important, because the way of teaching ICT might not correspond to teachers' preferred way of learning. Many researchers have concluded that, rather than teaching the basic skills of ICT, curriculum-based ICT training is much more effective for teachers (Baylor & Ritchie, 2002; Reynolds & Morgan, 2001; VanFossen, 2001). That is, ICT teacher training is helpful and useful when teachers are trained using ready-to-use classroom materials that fit into the participating teachers' curriculum.

Similarly, Mishra and Koehler (2006) developed the technological pedagogical content knowledge (TPACK) framework focusing on all three areas for better classroom use of technology. Many scholars have adopted the TPACK framework to provide effective ICT teacher training. For example, under the TPACK framework, Doering et al. (2009) developed an online geospatial technology teacher training environment, called GeoThentic, for social studies educators. Hong and Stonier (2015) also adopted the TPACK framework for their GIS teacher training summer workshop. During the workshop, their participating teachers learned not only the basic GIS skills, but also the integration of GIS skills in their classrooms for improving students' learning.

In regards to the form the training takes, Zhao and Bryant (2006) suggested one-on-one teacher mentoring, with substantial follow-up support to improve teachers' ICT skills and help them to use ICT more often with their students. Effective ICT teacher training will benefit not only teachers' knowledge and skills, but also students' learning (Shriner, Clark, Nail, Schlee, & Libler, 2010; Zhao, 2007).

Method

The author conducted this study using a face-to-face interview method because meeting individual teachers personally and asking questions directly was an effective way to identify social studies teachers' perceptions and experience of ICT integration. Specifically, the open-ended, semi-structured interview method was chosen to broadly collect teachers' experience and preferences. Twenty-three social studies teachers in Colorado, USA, participated in this study, which ran from May 2011–June 2011. The author met each interviewee at a local coffee shop or his/her school. Each interview took less than one hour, and was recorded with an audio recorder.

Table 1 shows sample interview questions. The complete version of the interview questions is available in Appendix A. There were several reasons for asking these questions. The author wanted to know:

- How participants saw their strengths and weaknesses as teachers, and the opinions they held about implementing ICT in the classroom
- How participants typically developed lesson plans and what kinds of resources they usually used, including paper and digital maps
- To what extent the participants already utilised ICT in their lesson planning
- The level of participants' experience with ICT (whether they were experts, intermediate or novice users)
- What types of teacher training participants liked or disliked.

All participants were asked all of the questions, although the author used slightly different versions of some questions at the time of the interview depending upon a teacher’s background and experience. For example, if a teacher answered that he/she was an expert ICT user, then the author asked him/her whether he/she had created websites and had any programming experience. Additionally, if the situation warranted, the author asked related follow-up questions. After the interviews, the author transcribed the recorded interviews into text files using the Express Scribe transcription software. Then the author categorized and coded teachers’ responses and made a table for each question to identify clear patterns.

Table 1
Sample Interview Questions

Categories	Questions
General teaching	What do you see as one or two of your greatest strengths as a teacher?
	What areas are you trying to improve or change?
	What are the barriers you face in using new technology in the classroom?
Learning tool/material	How do you develop lesson plans?
	What resources would help you develop lesson plans using online and paper maps?
	What role do computers and the Internet play in your lesson planning?
	Do you enjoy learning and trying out new technology in your teaching?
	What kinds of computing skills do you want to improve for your class?
Experiences of computer technologies	How do you see your proficiency with computers?
	Do you enjoy working with computers and information technology?
	What is the best way to learn computing technology?
	What motivates you to learn computing technology?
Teacher training	What is your favourite way of learning new techniques?
	What would you find unsatisfactory?

Participants

In Colorado, 23 secondary school social studies teachers participated in this study. In order to recruit participants, the author asked coordinators of the Colorado Geographic Alliance (COGA) if they would circulate a call for volunteers, but only a few COGA members showed any interest. Due to the fact that not all of the social studies teachers were members of COGA (and people tended to pay more attention to emails sent directly, rather than group emails), the author decided to contact teachers individually. Therefore, the author searched all of the secondary school websites in Colorado,

available via the Colorado Department of Education website. The author tried to find social studies teachers' email addresses on the individual schools' websites. Since not all school provided their teachers' email addresses on their websites, the author sent out invitation emails to only teachers whose email addresses were publicly available.

Since the author invited teachers shortly before the summer vacation, the response rate was not high. It was approximately 3% of the total number of emails the author sent. Several teachers showed their interests in this study but could not commit due to time conflicts with their personal plans during the summer vacation. Even though the participants did not receive a reward for participating in the research, a total of 23 teachers agreed to participate in the research, because they were interested in discussing and sharing their experience of using ICT in their classrooms. Among the 23 teachers, five (21.7%) were sixth grade teachers, 11 (47.8%) were seventh grade teachers, six (26.1%) were eighth grade teachers and one (4.3%) was an 11th and 12th grade teacher. Participating teachers were only recruited by the author's invitation, and no snowball sampling technique was involved for recruiting additional participants to this study.

Figure 1 shows the locational distribution of participants in this study. A majority of the participants were from schools in the metropolitan Denver region including Adams County, Arapahoe County, Boulder County, Clear Creek County, Denver County, Douglas County, Elbert County, Gilpin County, Jefferson County and Park County. These counties are home to approximately 58% of the students from pre-kindergarten to the 12th grade in Colorado (Colorado Department of Education, 2014). However, there were a small number of participants from schools in the Pikes Peak and northeast regions of Colorado, although these numbers were not enough to represent teachers outside of the metropolitan Denver region. Therefore, the author was able to obtain information on different classroom environments, financial support from school districts and the state department and students' lives in both urban and rural areas in Colorado.

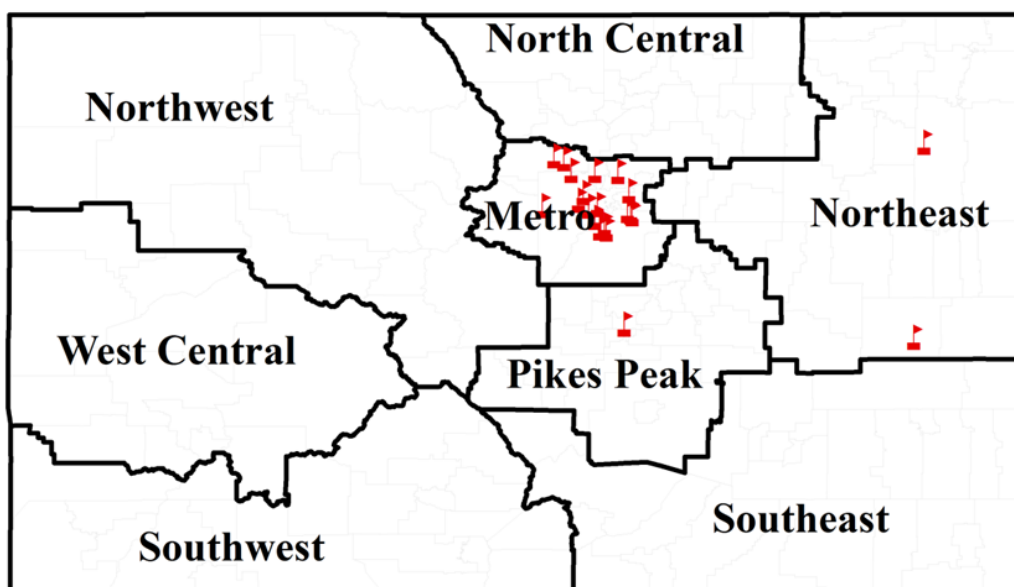


Figure 1. Geographical distributions of participants in Colorado

Findings

Social Studies Teachers' Perceptions and Experience of ICT

Many participants wanted to learn new ways of using ICT to deliver classroom materials to their students effectively, and demonstrated their desire to incorporate ICT in their classrooms more frequently. The main reasons teachers wanted to embrace ICT were that they felt it was a current trend (12 participants), it was out of personal interest (eight participants) and that it would help their careers (seven participants) and benefit their students (four participants).

Apart from one participant, the rest reported that they enjoyed working with ICT. They valued the ability to learn, teach, and share information with ICT (10 participants). They also appreciated its speed (eight participants) and the wealth of information available (five participants). Specifically, participants liked ICT as an effective instructional tool, and as a resource bank for their teaching. They said that they could learn and disseminate new knowledge quickly as a result of its multimedia functionality. They could also rapidly find useful resources and information for their classrooms and discover various ways to deliver course materials. In addition, four participants mentioned that both they and their students had used ICT since they were young, and that using ICT was a familiar way of learning new knowledge.

Although the majority of the participants enjoyed working with ICT, some teachers stated that 'not all good teaching includes the use of ICT'. In other words, depending on the topic or unit being taught, ICT might not be helpful for teaching and learning. As one teacher remarked: 'ICT should be used at the right times and for the right reasons to enhance the lesson or the learning'. However, many participants believed that the advantages of using ICT as an educational tool outweighed the disadvantages.

ICT played an important role when participants developed lesson plans. Eighteen participants (78.3%) mentioned that they used ICT as a research tool to find information and resources, better understand material and prepare for class. Those participants believed that they 'couldn't be an effective teacher without ICT. [Because there are] not a lot of resources at schools, ICT is basically a free resource, offering tools and maps that [they] don't have'. Fourteen participants (60.9%) used ICT for classroom activities. They used ICT at a teacher station to show some information to students, or allowed students use ICT on their own. Five participants stated that they usually used ICT to create lesson plans and classroom materials.

Among the various software tools, the most frequently used was Microsoft Office (Word, PowerPoint and Excel). Teachers also used Microsoft Publisher to make brochures and pamphlets, and sometimes made movies and presentations using iMovie, iPhoto, Admoto, Prezi, Keynote, Movie Maker, Photo Story, and SlideRocket. Participants sometimes used Google Docs and mapping tools such as Google Earth in their classrooms.

In order to maximize the effectiveness of their classes, participants wanted to improve various computing skills. Twelve participants (52.2%) wanted to improve

information retrieval skills—knowing what information is out there, which information is most up-to-date and how to find the information they wanted to know. These participants thought that they ‘did not know what [they] did not know’. They wanted ‘to be a person who knows what is out there,’ and how to use it. Eight participants (34.8%) mentioned that they wanted to learn geospatial and mapping tools. Some of them used Google Earth, but they just used basic functions such as search location, zoom in/out and fly-by, and wanted to know how to utilise Google Earth for educational purposes. In addition, they wanted to learn about geospatial technologies and what kinds of geospatial tools were available for the classroom. Four participants mentioned that they wanted to improve their general computing skills, including trouble-shooting. If something went wrong with the technology, they wanted to be able to deal with the problem without being scared and having to ask computer teachers or technicians. Three participants wanted to learn how to use Google Docs. They said that this would be useful because it was available to share with others and could be saved over the cloud. Therefore, students would not need to bring their own flash drives to save their assignments.

Major Barriers to Using ICT

Participants identified various barriers to implementing ICT in their classrooms (Table 2). The barriers fall into four categories—economic/social issues, lack of teacher background or time, technological issues and additional issues.

Table 2

Participants' Identified Barriers to Limit Using ICT in the Classroom

		Times Responded	As % of Total Respondents
Economic/social issues 15 (65.2%)	Low availability	14	60.9%
	Costs of software	1	4.3%
Teacher related issues 10 (43.4%)	Lack of teachers' knowledge	7	30.4%
	Lack of teachers' time	3	13.0%
Technological issues 8 (34.7%)	Unreliability	5	21.7%
	Long set-up time	3	13.0%
Additional issues 4 (17.4%)	No technical support	2	8.7%
	Disparity in students' level of ICT	2	8.7%

Barriers due to economic and social issues. The most commonly identified issue was the low availability of ICT, something directly related to the digital divide issue in education. The digital divide refers to differences between who uses, has access to and has knowledge of ICT, and who does not. This has been a much considered issue in education since the late 20th century (Hargittai, 2002). The results of the interviews show that ICT is still not readily available for every student in the USA. Many teachers

seem to believe that the digital divide starts in the classroom. Some schools have computers for every student, but other schools have only a few computers. Some teachers mentioned that they had computer labs and laptop carts to be used for classroom purposes. However, there were limited quantities of computing facilities at their schools, so teachers needed to share with other classrooms. 'There is always high demand,' so 'teachers need to fight to use [computers]'. If teachers wanted to use computers, they needed to sign up in advance. Therefore, 'it's difficult to have lessons with ICT every day,' and teachers 'can't count on always having computers'. From their responses, it can be assumed that if they had computers in their classrooms, they might use them more often.

Barriers relating to teacher background, confidence and time. Barriers involving teacher background were of two types. The first type was teachers' lack of knowledge about (and comfort using) ICT. Those teachers who do not have a strong ICT background are not comfortable using ICT in front of students, because they 'don't want to mess up with computers'. Therefore, teachers are 'hesitant [and reluctant] to use ICT' in the classroom. In other words, less experienced teachers face confidence issues in terms of incorporating ICT as an instructional tool. One participant said:

I think the biggest barrier [against using ICT in the classroom frequently] is me. If I knew better, I could advocate what I need. And a technological barrier is still me. If I understood what I was doing more, I would be able to advocate better. I think the district will support me if I said I need this, this and this, but I don't know enough to do [it].

Participants did not want to (and would not) use any type of teaching or learning tools with students, unless they had full confidence in their ability to use the tool effectively. Participants felt they should learn the tools before bringing them to the classroom. Teachers would like to use only 'fool proof and guaranteed' tools and materials with students. Some teachers said that they were scared, believing that 'it's too intimidating' when ICT goes wrong. Once they failed the trial, they 'got frustrated', and did not want to try anymore. In order to prepare for the possible failure of the technology, teachers need to have a back-up plan, which requires double the amount of preparation time.

The other type of teacher issue is the lack of time available to learn and practice technology. Most participants mentioned that they were busy during school hours teaching and preparing classes. When participants went back home, they took care of their own children, enjoyed their hobbies, or cleaned their homes. While some motivated teachers eagerly invest their time in learning and testing ICT for their students, many teachers do not have enough time, and do not want to spend their personal time learning and practicing ICT.

Technological issues. Several technological issues were identified as barriers. The first issue is the unreliability of the technology and the event of a network server going down or a website freezing. When this happens, many teachers (who are novice ICT users) are scared, and do not know how to solve such technical issues. The second identified issue in this category is long set-up times. Compared to traditional textbooks

or paper-based materials, using ICT takes more time to begin the class, and there are a lot of things to be controlled. For example, all computers should be turned on, software or websites should be easily accessible, and all computing hardware and software should be turned off when the class is over. In addition, teachers need to check the availability and accessibility of every machine before class. Therefore, a certain amount of class time is used in the setting up of equipment, something many teachers find to be problematic.

Additional barriers. Two important barriers did not belong to the above three categories—the lack of helpful technical support (especially from the IT department at school) and the huge disparity in students' level of technical ability. Two participants said that they had an IT department at their schools, but the main task of the IT department mostly involved checking machines and installing hardware and software. According to these participants, the IT staff did not explicitly understand instructional tools. Once a teacher 'requests specifically [a certain tool that he or she] wants to implement in the classroom,' the IT staff might help the teacher to find and use the tool. However, they said that, most of time, teachers do not know about the appropriate teaching tools. Because the IT staff are 'not educators', they have a lack of knowledge about instructional technologies. 'If [teachers] ask [IT people] what software [teachers] need to use to teach a certain topic to students, [IT people] have no clue'. Therefore, IT people 'wouldn't help [teachers] to figure out which technologies [teachers] can use'.

Another identified barrier is the disparity in students' levels of ICT knowledge and experience. These days, some students have advanced levels of ICT knowledge and experience. Generally, those students with high levels of ICT have been exposed to ICT since they were young, and/or have had personal interests in ICT. For advanced students, the ICT that teachers use in the classroom might be easy, and these students might know how to use and manage ICT better than their teachers. However, less experienced students might have difficulty following the teachers' instruction. In order to make students engage in the classroom activities, regardless of their experience levels, teachers need to determine the right level of differentiation using ICT for all students. This will enable them to provide advanced tasks for more experienced students and to spend extra time helping less experienced students.

Preferred and Non-Preferred Training Styles

When asked about the best way to learn ICT, teachers most frequently responded that simply 'doing it' was preferable. They cited hands-on activities and trial and error as being effective. Participants mentioned that they were 'not able to learn [a new technology] until [they could] do it [themselves]'. When participants learned a new technology, they wanted to follow up and test the instruction. Otherwise, they felt they would quickly forget how to use the technology. Many participants liked a trial-and-error approach because they saw it as a way to improve their computing skills. One participant mentioned that 'I think [we] really have to get in dirty with [the technology]. The reason [we] don't know how is [we] don't try it'.

Participants were asked to choose their preferred and non-preferred ICT teacher training styles. The top three preferred training styles were one-on-one coaching, any types of published lesson plans, and in-service workshops. Interestingly, all three training styles were in the scope of ‘doing it’. Eleven participants identified one-on-one coaching as their favourite training style. They liked one-on-one coaching because ‘everyone has a different pace’. With one-on-one coaching, participants could learn new knowledge at their own pace. If someone is a fast learner, he or she does not need to wait for others to catch up, and vice versa. If a teacher’s school has only a few computers, the teacher could ask a coach how to use ICT in his or her school environment, which ‘makes better sense to [teachers]’. One participant wanted to have a coach ‘who [can] go over and over again until [the participant] get[s] it’. Another participant mentioned that ‘I need to be coached while I’m learning it, because sometime there’s the slightest little thing you don’t get. It doesn’t take long if I’m coached’. However, the participants who liked one-on-one coaching realised that, in reality, one-on-one coaching was not always feasible.

The second most popular training type was using published lesson plans. Seven participants liked to learn new knowledge with any type of published lesson plans, including manuals, books, and tutorials. They liked this style because they could learn anytime and anywhere, based on their availability. This response was common among the younger participants (in their 20s and 30s), who identified themselves as fast learners with an existing level of ICT experience. The third preferred form of training style was in-service workshops. Five participants liked in-service workshops, because they could learn, share, and discuss their work with other teachers. They also liked it because they could obtain professional development credit hours when they attended the workshops.

The author also asked participants to identify ICT teacher training styles that they did not like. The top three non-preferred styles were lectures without hands-on activities, in-district professional development, and any type of published lesson plan. Four participants who disliked lecture-style training felt that they would forget what they had learned if they did not have an opportunity to try the techniques during the training session. Three participants who did not like in-district professional development felt that such sessions usually mixed together too many teachers with different knowledge levels and from too many different settings. Another three participants did not want to learn from reading and following along, so they chose published lesson plans as a non-preferred training style.

Conclusion and Discussion

The goal of this study was to analyse social studies teachers’ perceptions and experience of ICT and their preferred and non-preferred ICT teacher training style. From individual face-to-face interviews, the author was able to collect and analyse detailed information of social studies teachers’ needs, background, attitudes, and preference of teaching with and learning about ICT. However, two limitations of this study affect these results. First, the 23 teachers who participated in this study cannot

represent all of the social studies teachers in Colorado, although the number of participants was adequate for this study. Second, participating teachers may already have an interest in and perhaps, more familiarity with ICT integration in class than teachers who did not participate. This self-selection effect may be related to the overall positive responses in this study. Although there were some limitations and room for improvement, this study seemed to reach its goal of identifying social studies teachers' perspectives of ICT integration.

Overall, participants' responses regarding ICT integration showed similar patterns to previous findings (Guha, 2003; Kurt, 2012; Pelgrum, 2001). However, the roots of the major barriers of ICT integration were quite different. Even though several recent studies have addressed that a lack of technology accessibility is no longer a major barrier (Ertmer, 2005; Mueller, Wood, Willoughby, Ross & Specht, 2008), it turns out that many social studies teachers still struggle to use ICT due to this reason. Therefore, in order to encourage teachers to more frequently use ICT in the social studies classroom, schools should ensure that enough computers are available. In addition, other types of barriers, such as lack of teachers' time to learn about and practice ICT integration and unreliable Internet connection, cannot be ignored. These barriers require long-term solutions on the institutional and societal level.

However, offering in-service teacher training can address the limitation of lack of teachers' knowledge. From the results of the preferred and non-preferred ICT teacher training styles, the author found that it is important to provide various types of training styles to satisfy teachers with different preferences of learning. Their responses seemed to be related to personal preferences regarding learning styles, suggested by Kolb (1984). According to Kolb (1984, p. 42), most people have preferences for how they like to learn new concepts and skills. These have been characterized as 'feeling, watching, thinking, and doing'. He argues that the most effective learning experiences involve all four organized together into what he terms a 'learning cycle'. However, individuals often prefer to start their learning at one of the four basic styles. Some teachers like to learn by doing activities; others want to learn by watching how others do them. Therefore, there is no one training style that every teacher likes, and depending on the situation, teachers prefer different training styles.

In order to provide effective and efficient ICT teacher training, content and formats of teacher training should be designed and developed based on participating teachers' background and level of expertise. To do so, teachers' opinions, concerns, and needs have to first be identified. This information can then act as a source for developing useful and effective teacher training to improve teachers' ICT knowledge and skills and to build their confidence.

One-time training cannot be a solution; instead, teachers need ongoing and long-term support to continuously develop their knowledge and skills of teaching with ICT. Additionally, encouraging teachers to build a professional learning community, where a group of teachers work together to achieve the same goal (DuFour, 2004), would help them save their preparation time to develop ICT-integrated activities or lesson plans and create a collaborative learning environment among colleagues. Developing partnerships

with higher education institutions and educational industries are also recommended to receive technical and professional support from other organizations. Developing teachers' ICT skills should be a priority for schools, because teachers can change our students' lives (Day, 2000). Investing in teachers through continuous professional development is essential to developing education and enhancing students' learning.

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Biographical Statement

Dr. Jung Eun Hong is an Assistant Professor of geography in the Department of Geosciences at the University of West Georgia. She teaches introductory and advanced level GIS, with a research focus on GIS in K-12 and higher education.

Appendix

Interview Questions

1. General teaching questions: experience as teachers and teachers with technology
 - 1) What do you see as one or two of your greatest strengths as a teacher?
 - 2) Daily teaching
 - a) What areas you are trying to improve or change?
 - b) What makes you feel challenged in explaining a new concept?
 - 3) Using information technology
 - a) What are the barriers not to use a new technology in the class?
 - b) What are advantages and disadvantage to use computer software in the class?

2. Learning tool/material questions
 - 1) Lesson plans
 - a) How do you develop lesson plans?
 - b) Do you use paper maps often in your lesson plans?

- c) How about digital maps or Internet resources like satellite images, Google Earth, etc.?
 - d) What is the purpose to use the above tools in class? (to show location, to explain social phenomena, to introduce topology, etc.)
 - e) What resources would help you develop lesson plans using online and paper maps?
- 2) Roles of computers and Internet in lesson plans
- a) What role do computers and the Internet play in your lesson planning?
 - b) If you use computer software, what kinds of software do you use?
 - c) Do you enjoy learning and trying new technology for your class?
 - d) What kinds of computing skills do you want to improve for your class?
 - e) Do you share your lesson plans with other teachers?
3. Experience and "comfort" computer technology questions
- 1) Self-rating for computer experience and computer usage
- a) How do you see your proficiency with computers? (expert, intermediate, or novice)
 - b) On average how many days a week do you use a computer?
 - c) On average how many hours do you spend on your computer per day?
- 2) Activities
- a) Apart from your teaching, what kinds of activities on the computer do you usually do? (email, web surfing, social networking, watching video, office work, etc.)
- 3) Website development experience
- a) Have you ever created websites?
 - b) Do you have any programming experience?
- 4) Attitudes of using and learning computers and information technology
- a) Do you enjoy working with computers and information technology?
 - b) Why is it enjoyable, or not?
 - c) What's the best way to learn computing technology?
 - d) What motivates you to learn computing technology?
4. Teacher training questions: the method to get most useful help and assistance
- There are lots of ways for helping teachers like you get started with new technologies and concepts—in-service workshops, other types of in-district professional development, activities at professional meetings, one-on-one coaching, published lesson plans (either paper or digital).
- 1) What is your favorite way of learning new techniques?
 - 2) What wouldn't work for you?