



Facilitating students' global perspectives: Collaborating with international partners using Web 2.0 technologies

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ABSTRACT

This research was designed to explore the impact of a wiki-based international collaboration project on pre-service teachers' 1) cultural competencies, 2) comfort using technology, including Web 2.0 tools, to interact and collaborate with unknown colleagues, and 3) perceptions of ideas for using technology, including Web 2.0 tools, in their future classrooms. Survey results showed significant changes in cultural competency and perceived ideas for using technology from pre- to post-semester while interview data provided support for, and greater insights into, survey results. Furthermore, students' perceived comfort for participating in Web 2.0-based international collaborations was the best predictor of changes in cultural competency. Implications for the integration of international collaborations into on-campus courses, using Web 2.0 technologies, are discussed.

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1. Introduction

We live in a world characterized by globalization, emerging new technologies, and a knowledge-based economy. Together, these characteristics impact every aspect of our society including communication channels, legal systems, socio-cultural trends, and educational approaches (Olson & Olson, 2000; Teasley & Wolinsky, 2001). According to West (2010), the success of our future graduates depends on their abilities to be both culturally and technologically competent as they work and interact with diverse, geographically dispersed people, using a variety of technology tools.

Web 2.0 applications have the potential to increase students' cultural and technological competencies by engaging them with diverse others using a variety of digital communication tools. Wikis, particularly, offer a potentially effective platform for facilitating cross-institutional and cross-cultural interactions; as web documents that are automatically published, they are easy to both edit and share. Furthermore, as noted by Gonzalez-Reinhart (2006), wikis have the potential to empower "conversational knowledge creation" across time, distance, and organizational boundaries (p. 6).

According to Bonk, Lee, Kim, and Lin (2009), "wiki-related projects provide opportunities for learning transformation when they expose learners to new points of view or perspectives" (p. 126). However, little is known about how these activities, especially those that are

relatively short-term, impact the development of students' cultural competencies. While wikis make interaction among culturally diverse and geographically dispersed students more feasible, in order to truly benefit, participants must actively collaborate to achieve a common goal (Larrison & Alterman, 2009). To what extent can short-term participation impact students' ideas about and attitudes toward working with diverse others?

To explore these ideas, a wiki-based collaboration project was developed as a five-week unit within an introductory educational technology course in order to provide an international experience for both pre-service teachers from the United States and their partners from England, Russia, South Korea, and Sweden. The primary goal was to involve local and international students in the co-design and co-creation of a wiki repository, focused on Web 2.0 technologies for teaching and learning.

2. Literature review

2.1. Cultural competency

As early as 1969, educators have suggested that students who are preparing to be teachers should engage in cross-cultural experiences in order to enrich and expand their understandings of "a culture different from the one in which they were born and raised" (Taylor, 1969, p. ix). More recently, a number of professional organizations have stressed the importance of producing culturally competent teachers. For example, in their most recent set of standards, the *International Society for Technology in Education (ISTE, 2008)* emphasized the need for K-12 teachers and students to participate in global

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learning communities and to demonstrate “cultural understanding” and “global awareness” (Standard 4.d)

In general, cultural competency is defined as “the ability to effectively interact with people from diverse cultures and recognize the importance of cultural differences” (Bielefeldt & High, 2007, pp. S2–G5). As part of their efforts to measure cultural competency, Miville et al. (1999) proposed the more comprehensive term, “universal-diverse orientation,” (UDO) to encompass “an attitude toward all other persons that is inclusive yet differentiating in that similarities and differences are both recognized and accepted” (p. 293). In contrast to measures of prejudice, which target negative attitudes or behaviors, UDO indicates a general desire to be involved with diverse cultures and people (Singley & Sedlacek, 2004). According to Miville et al., a universal-diverse orientation comprises “a sense of connectedness with people” (p. 293) that enables individuals to effectively interact with multiple diverse others in a variety of situations (Seaman, Beightol, Shirilla, & Crawford, 2009).

Initially, the concept of UDO was used to describe essential personal characteristics, such as empathy and emotional intelligence, of professionals in the medical and counseling fields (Constantine & Arorash, 2001; Miville et al., 1999). Recently, researchers in other disciplines, including engineering (Shen, Jesiek, & Chang, 2010) and education (DeKaney, 2008; Yuen, 2010), have adopted UDO as a more useful definition of cultural competency and have called for increased efforts to develop these essential attitudes and behaviors among today's students. Still, little is known about how best to do this.

In general, approaches to developing cultural competency have typically involved either long-term immersive (e.g., study abroad) or short-term intensive (e.g., experiential education) experiences. For example, Shen et al. (2010) examined the impact of a long-term immersion project, reporting significant changes in cultural competency for the 20 undergraduate and 30 graduate students who participated in a 10–12 week International Research and Education in Engineering (IREE) project in China. Similarly, Seaman et al. (2009) found significant changes in the attitudes, beliefs, and behaviors of 74 middle and high school-aged youth following an intensive short term experience that engaged the students in two half-days of adventure-based and four days of community-service activities.

Unfortunately, despite the potential of such programs, very few students actually participate in these programs due to time or cost constraints (Bellamy, 2006). If all of our pre-service teachers are to benefit from cross-cultural experiences, educators need to provide alternative approaches that decrease traditional costs, while maintaining, or even strengthening, traditional benefits. Although not yet plentiful, there is some evidence to suggest that short-term, non-immersive projects can be as successful as long-term projects. For example, Rosen et al. (2004) examined the effectiveness of a six-week training course focused on developing cross-cultural communication skills among third-year medical students. After a series of case study discussions, a significant increase in students' cross-cultural awareness was noted.

Encouraged by these results, and hoping to find an approach that was both logistically feasible as well as impactful, a five-week class activity, using a wiki application, was designed to facilitate cross-cultural collaborations among our pre-service teachers and students enrolled in similar programs outside the U. S. Although researchers have reported that today's college students have a high degree of tolerance toward people from different backgrounds (Miville, Molla, & Sedlacek, 1992), they also have reported a general ambivalence toward the inclusion of diverse others in their daily activities (Miville et al., 1992). In an attempt to decrease this type of “behavioral distancing,” (p. 95), Miville and her colleagues recommended that universities provide additional opportunities for students to engage in activities that increase their contact with diverse others. While face-to-face interactions can be impeded by a variety of logistical barriers, virtual interactions using Web 2.0 technologies, offer a potentially

simpler means to increase these interactions among diverse others (Hossain & Aydin, 2010).

2.2. Web 2.0 applications, wikis, and communities of practice

Web 2.0 is the term commonly used to refer to advanced Internet applications that do something “unique, practical, and/or powerful” while enabling social connections, and thus, greater collaboration among users (Brandon, 2008, ¶ 3). Compared to Web 1.0 sites, users have more input into the nature and scope of the Web content being published and in some cases exert real-time control over it. Common examples of Web 2.0 applications include social networking sites (Facebook, LinkedIn, etc.), blogs (Blogger, Xanga), wikis (Wikipedia, WikiSpaces), and video sharing sites (YouTube, TED). For the purposes of this project, a wiki (Confluence Wiki) was chosen as the means by which students would collaborate cross-culturally.

Due to the ease with which they can be created, read, and edited (see Table 1), wikis have been embraced as both a practical and effective communication and collaboration tool among participants in numerous online communities, organizations, and schools (Wood, 2005). Specifically in education, wikis are advocated as a potentially powerful tool for bringing geographically dispersed teams of teachers and/or students together (Engstrom & Jewett, 2005). For example, Vratulis and Dobson (2008) engaged over 800 teacher education students across Canada in conversations about how to contextualize specific educational standards within their classroom practice. Bonk et al. (2009) used a wiki to engage students in cross-institutional collaborations in which they critiqued or created a wikibook about a specified topic related to the course content (e.g., learning theories, instructional technology). Matthew, Felvegi, and Callaway (2009) used a wiki as a reflection tool with pre-service teachers enrolled in a language arts methods class while Engstrom and Jewett (2005) used wikis as an exploratory tool with 11 inservice teachers and nearly 400 middle school science students to consider new ways to implement scientific inquiry projects within their classes. As educators continue to find new and innovative ways to take full advantage of these technologies, the potential for impacting student learning continues to grow as well.

According to Larrison and Alterman (2009), wikis provide an ideal framework for facilitating learning across time and place, enabling individuals and communities to reach out across greater distances to engage in innovative boundary-spanning collaborations (Wenger, White, Smith, & Rowe, 2005). As a result, knowledge is not only captured and stored but *created* “via the dynamic interactions between people” (Groff & Jones, 2003, p. 134). As such, these technologies are beginning to play an increasingly important role in the development of *communities of practice* especially when group members are globally distributed and face-to-face time is limited (Wenger et al., 2005). As is true of a community of practice, the primary purpose of a wiki is to develop and share knowledge. Unlike blogs, which focus on an individual's development of personal knowledge and identity, wikis de-emphasize individual authorship and focus on the flexible, social, conversational, and collaborative building of knowledge resources. Engstrom and Jewett (2005) and Sheehy (2008) both provide successful descriptions of the uses of a collaborative knowledge repository wiki within communities of practicing K-12 teachers.

Table 1
Wiki properties enabling cross-cultural collaboration.

Wiki property	Resulting effect
Web 2.0 technology	Familiar to, and within reach for, non-tech savvy students
Document co-editing	Easy to asynchronously produce content
Automatic publishing	Easy to share, exchange, and access material
Non-hierarchical	Student-centered and owned workspace

As a community of practice, wikis comprise participatory communities of respectful members who share a common purpose and goal. In theory, at least, these members are self-regulating caretakers of the content, adding to or revising information, as well as eliminating any unwelcomed modifications. According to Larrison and Alterman (2009), the key to students' success, then, is their ability to effectively 1) *communicate* a shared understanding of the purpose of the product (e.g., wiki chapter), and 2) *coordinate* the activities, roles, and responsibilities required to create it. Unfortunately, these functions are difficult to accomplish in online communities, particularly among students who are new to both wikis and cross-cultural collaborations. Yet, these are exactly the kinds of activities that could engage them in meaningful interactions with their diverse teammates. This, then, was the motivation underlying the implementation of this wiki project: To what extent can students' participation in the development of a wiki chapter engage them in the kind of cross-cultural interactions that lead to increased awareness of and appreciation for the diversity of the contributing members of their wiki community? Can these wiki activities also increase students' confidence for using similar Web 2.0 tools in their future classrooms?

2.3. Purpose

This research was designed to determine the efficacy of using a shared wiki to engage students in international collaborations by examining changes in students' 1) cultural competencies, 2) perceived comfort for engaging in international collaborations using technology, and 3) perceived knowledge for using technology in their future classrooms. The specific research questions included:

- ✓ What is the impact of this approach on students'
 - 1) cultural competencies
 - 2) perceived comfort engaging in collaborations with distant others, using technology
 - 3) perceived knowledge for using wikis (and other technologies) effectively in their future classrooms.
- ✓ What are the relationships among these variables?
 - To what extent can changes in cultural competency be predicted from other defined research (perceived comfort; perceived knowledge) and/or demographic (age, gender, class) variables?

3. Methods

A mixed methods research design was used to examine the impact of this approach on undergraduate students enrolled in an introductory educational technology course at a large midwestern university. Due to the complex and dynamic nature of classroom environments, this study used a convergence triangular mixed methods design in which different but complementary data were collected; that is quantitative results were validated, and expanded upon with, qualitative data (Creswell & Plano Clark, 2007). The design, in particular, employed "sequential exploratory" methods in which survey data served as the primary data source while interview and narrative data (from students' project reflections) provided further insights into survey results (Hanson, Creswell, Clark, Petska, & Creswell, 2005, p. 229). In almost all cases, multiple quotes are used to support each of the major findings. This is done intentionally to enable the reader to see *patterns* of responses, rather than the perspective of a single participant.

3.1. Description of site and participants

Participants included 202 pre-service teachers enrolled in a required 2-credit educational technology course in fall 2009. The majority of the students were female (66.5%), first (37.9%) or second-

year (37.4%) students, studying to be elementary (62%) or secondary teachers (24%). On a scale from 1 to 5 (with 1 being extremely low and 5 being extremely high), students' pre-course ratings of perceived computer skills averaged 3.34 (i.e., "I feel comfortable completing most basic tasks on the computer."). Students met weekly for a one-hour whole-class lecture and a two-hour lab, with 18–24 students assigned to each of 16 lab sections.

Lab teaching assistants (TAs) purposefully divided students into smaller teams composed of seven or eight members (approximately three teams/lab for a total of 41 project teams). In general, TAs assigned students to teams in ways that equalized the number of strong and weak students on each team, based on performance on previous lab projects. Each team was then paired with two to four international students from England ($n=9$), Russia ($n=24$), South Korea ($n=64$), or Sweden ($n=20$). Each team was tasked with creating a wiki chapter about a specific Web 2.0 tool (Twitter, Webnode, Mindomo, etc.). [A complete list of the Web 2.0 tools that have been investigated, to date, can be found at <https://wiki.itap.purdue.edu/display/INSITE>].

3.2. Procedures

To solicit the participation of students from various international universities, the first two authors contacted instructors of similar educational technology courses being taught around the world. In almost all cases, the authors personally knew the international instructors, who had either graduated from the authors' program area, attended conference presentations about the project, or had been visited at their individual universities by the authors. Once the details of participation had been agreed upon, the international instructors created a list of the students in their classes (class sizes varied from institution to institution), including email contact information. The authors then emailed each of the individual students to explain how the project would proceed, on which Web 2.0 application team each would participate, as well as the basic expectations for participation. International students were expected to communicate in English as they were either enrolled in an English-language school (Sweden, England) or were studying English as a second language (South Korea, Russia).

The project occurred during the second half of a semester long course and lasted approximately five weeks. At the start of the project, students were presented with the problem of creating a wiki repository (using Confluence wiki software) about specific Web 2.0 applications (e.g., wikis, blogs, social networking tools) and to describe how each tool could be used within a variety of educational settings. The finished repository needed to be accessible to educators throughout the world who wished to learn about the technologies and who needed to make informed selections of the appropriate tool(s) to use in their specific situations.

To help the students get started, the instructor provided a list of questions that served as an outline for the structure of each chapter. These questions guided the students to provide descriptions of the targeted technologies, examples of how they could be used, explanations regarding how to access and begin using the tools, and lesson plans outlining how they could be utilized within local and international educational contexts. Students were expected to contact the developers of the technologies, examine any and all information available about them, and to compare features among similar technologies (see Figs. 1–4). More specific details about the design and implementation of the project can be found in Newby, Ertmer, and Kenney (2010).

Prior to the start of the project, lab TAs selected one member from each team to serve as the project manager (PM). The PM was responsible for coordinating team efforts, attending weekly project meetings, and disseminating relevant information to other team members. At the beginning of the project, team members divided up the various roles (e.g., researchers, designers, writers, lesson plan



What Are the Uses of Facebook Chat?

Facebook is a social networking website that is free to anyone who wants to join. The users are organized by city, workplace, school, and region in order for them to connect and interact with others in their area. As a member of Facebook, you can utilize the feature called Facebook Chat. With Facebook Chat, you can send other users messages in realtime rather than leaving them a message on their wall or message inbox. ^{2, 3}

What Does It Do?

Facebook Chat can be used to communicate in real time with friends online instead of communicating through sending messages or writing on their Facebook walls. It is a free application on Facebook and only requires a computer with an internet connection. Facebook Chat is an instant communication device implemented to make Facebook a more user friendly environment.

Fig. 1. Sample wiki page from the wiki chapter devoted to Facebook Chat.

developers, wiki developers, evaluators) needed to complete the project. Although all members were encouraged to assume a primary role for one task, they often played several additional roles to ensure all tasks were completed successfully. As noted earlier, international partners (IPs) were contacted individually (via email), first by the course instructor and later by their assigned PMs and other group members, welcomed to the teams, and encouraged to volunteer for roles they preferred and/or to contribute to any required project tasks. Students were required to communicate with their IPs at least once synchronously (e.g., using SKYPE, Facebook Chat, Adobe Connect, etc.) and as many other times as needed, asynchronously (primarily using the wiki), to complete the project. As a cumulating experience, teams presented posters of their Web 2.0 applications at a Showcase Event, which was attended by their peers, local teachers, college faculty, and the general public.

3.3. Data sources

Of the 316 students enrolled, 202 completed all pre-post survey measures: 1) a pre and post-survey measuring perceptions of cultural

competency (*Miville-Guzman Universality Diversity Scale, Short Form [M-GUDS-s]*; Miville et al., 1999), 2) a pre and post-survey measuring students' perceived levels of comfort for participating in an international collaboration using Web 2.0 tools (*Perceived Comfort Survey*), and 3) a pre and post survey measuring students' perceptions of their pedagogical knowledge for using technology tools for teaching and learning (*Perceived Knowledge Survey*).

The original *M-GUDS* survey was developed by Miville et al. (1999) to measure students' appreciation for similarities and differences in others, as evidenced by behavioral, cognitive, and affective components. This original scale included 45 items; based on the results of an exploratory factor analysis, the total score (as opposed to subscale scores) was considered the most representative score to report, due to the uni-dimensionality of the scale. Reported alpha coefficients from early pilot studies ranged between .89 and .95 (Miville et al., 1999).

The original scale was subsequently modified (Fuentes, Miville, Mohr, Sedlacek, & Gretchen, 2000) into a shorter version, *M-GUDS-s*, which consisted of 15 items, divided into three subscales. The *Relativistic Appreciation* subscale (e.g., "Persons from other countries can teach me things I could not learn elsewhere.") measures students'

II. How Does Facebook Chat Relate to Other Applications?

II.1 Comparison to Competitors

Facebook Chat could be compared to chat programs such as AOL Instant Messenger (AIM), MSN Messenger, and Google Talk. What makes Facebook Chat stand out is that it is integrated into a social networking site and is not just a program that runs on your computer. Facebook Chat is always available during your social networking ventures and while the Facebook internet window is present. Another feature of Facebook Chat that makes it stand out is that you may chat with your friends that are on Facebook instead of creating a separate friends list for one of the other chat programs.

II.2 Unique Uses

When Facebook first launched, the only way to access it was through the internet on a computer. Now, with the advances of cell phones and the internet, one can access Facebook Chat anywhere. Facebook Chat can be used as an application on any cell phone that has wireless internet. It is very similar to texting, but through Facebook.

Not only can Facebook Chat be used on Facebook, but with the help of an opensource chat client, it can be integrated into other chat programs and have more features. Pidgin, used by Windows, allows you to combine chat programs such as MSN, Google Talk, AIM, Facebook Chat, and others. Adium is another program that is essentially the same as Pidgin, but for Macs. Finally, Digsby is a program that allows you to combine chat, email, and social networking sites such as Facebook and Twitter. ¹²



Fig. 2. Sample wiki page from the wiki chapter devoted to Facebook Chat.

III. Real World Application

III.1 Educational Lesson Plans

i. Elementary Lesson Plans

(1) High-Tech Pen Pals

In this lesson plan, students will use Facebook Chat to communicate with international pen pals in a high-tech fashion.

The students will have to learn how to use Facebook Chat and then will write summaries based on each conversation they have with their pen pals.

[High-Tech Pen Pals \(PDF\)](#)

[High-Tech Pen Pals \(DOC\)](#)

(2) Neighborhood Safari (S.T.E.M.)

In this lesson plan, students will use Facebook Chat to compare their observations with a group in a corresponding class.

The students will have to learn how to use Facebook Chat, observe animals in their neighborhoods, record their observations, and chat with their corresponding group to compare observations.

[Animal Safari \(PDF\)](#)

[Animal Safari \(DOC\)](#)

ii. Secondary Lesson Plans

(1) Virtual Tutor (S.T.E.M.)

In this lesson plan, students will use Facebook Chat to tutor each other in math.

The students will have to learn how to use Facebook Chat, complete their math assignment, receive or give help on the assignment, and write a brief summary explaining the tutoring.

Fig. 3. Sample wiki page from the wiki chapter devoted to Facebook Chat.

cognitive acceptance of the similarities and differences among people. The *Comfort with Differences* (affective) subscale (e.g., “It is very important that a friend agrees with me on most issues.”) reflects one’s degree of comfort with diverse individuals (Note: items on this scale are reverse-scored). The *Diversity of Contact* subscale (e.g., “I attend events where I might get to know people from different racial and cultural backgrounds.”) assesses both *previous and intended* behaviors toward interpersonal contact with people of different backgrounds. Together, these three subscales yield a full-scale UDO score that indicates an overall orientation toward diversity. Students are asked to rate their levels of agreement with each item on a scale from 1 (strongly disagree) to 6 (strongly agree). Fuertes et al. reported inter-item correlations for each subscale ranging from .59 (Relativistic Appreciation) to .92 (Comfort with Differences), while the total score had an inter-item correlation score of .77. For this study, alpha coefficients were calculated; subscale coefficients ranged from .76 (Comfort with Differences) to .82 (Diversity of Contact). The Relativistic Appreciation subscale had an alpha coefficient of .80; the

alpha coefficient for the total score was .85, suggesting moderate to high reliability.

The *Perceived Comfort Survey* consisted of six items for which students rated their perceived levels of comfort (from 1-strongly disagree to 6-strongly agree) for participating in an international collaboration using Web 2.0 tools (e.g., “I am comfortable interacting – through Facebook, etc. – with people I’ve never met face-to-face.”). A calculated alpha coefficient of .80 suggested that the survey was moderately reliable.

The *Perceived Knowledge Survey* consisted of seven items that assessed students’ perceptions of their pedagogical knowledge (from 1-strongly disagree to 5-strongly agree) for using technology tools for teaching and learning (e.g., “I have specific ideas about how to use technology as an effective teaching tool.”). The calculated alpha coefficient for this scale was .95, suggesting high reliability.

Focus group interviews were conducted with 25 project managers, as well as 11 selected project teams in order to understand the successes and difficulties encountered throughout the project and to

V. How is Facebook Chat Used Internationally?

Facebook Chat is an international application that is used by millions of people all over the world, and it is available in over 70 different languages.

Facebook Chat is the new and innovated way to write to international pen pals. Originally, the idea of having a pen pal was to communicate with an international student by means of writing letters back and forth. Generally how it would work is a teacher from the United States would find a teacher in another country and then they would assign each student in the class a student in the foreign class to be a pen-pals.

Facebook Chat can be used in the same way, except instead of sending letter, each week the partner classes would set up a time to go to the computer labs in their respective schools and talk to one another via Facebook Chat. This would be a new and innovative way to have a pen pal because each student could talk to their international pen pal in real time.

The following is a YouTube video presenting information gained from a survey of students in Korea that use Facebook Chat. ¹³



Fig. 4. Sample wiki page from the wiki chapter devoted to Facebook Chat.

understand students' perceptions of the international collaborations as well as the perceived impact of working with diverse others to create the wiki chapter. Initial questions included, "What specifically did you learn from this project? What did you learn about Web 2.0 tools? and What new perspectives did you gain through your international collaboration?". Probing questions included, "How did you interact with your IPs? How well integrated were they into your group? and How did they contribute to, or hinder your work?".

To analyze the data and address the specific research questions related to impact and relationships, paired t-tests, correlations, and multiple regressions were calculated. To analyze the focus group interview data, the researchers read the interview transcriptions multiple times with the goal of providing additional insights into the quantitative results, specifically related to changes in students' cultural competencies and their perceived comfort and knowledge for using Web 2.0 tools. After reviewing common ideas expressed by the students in the interviews, the researchers identified those patterns that provided additional support for, and greater insights into, survey results. It should be noted that even though some patterns, such as students' perceptions of project barriers and the strategies students implemented to achieve success were identified, these are not reported in this paper as they did not directly relate to the identified research questions.

4. Results

4.1. Changes in cultural competency

A two-tailed paired t-test ($df = 201$) indicated significant increases on two M-GUDS-s subscales, *Comfort with Differences* ($t = -1.94$; $p = .05$; $d = .19$) and *Diversity of Contact* ($t = -6.77$; $p < .000$; $d = .64$), as well as on the total score ($t = -3.64$; $p < .000$). Effect sizes, measured by Cohen's d , would be considered small to medium. There were no significant changes on the *Relativistic Appreciation* subscale from pre to post-semester (see Table 2). Students' judgments on the *affective* subscale, *Comfort with Differences*, increased from a pre-project mean of 4.37 ($SD = .69$) to a post-project mean of 4.5 ($SD = .69$); judgments on the *behavioral* subscale, *Diversity of Contact*, increased from a pre-project mean of 3.75 ($SD = 1.3$) to a post-project mean of 4.48 ($SD = .81$). The total M-GUDS-s score changed from 4.08 ($SD = .57$) to 4.31 ($SD = .64$).

These findings suggest that, through this project, students' intentions to engage in, as well as their actual participation in, cross-cultural activities increased. Perhaps the positive experiences they had working with international partners on this project provided new appreciation for diverse cultures and helped them become more interested in, and more comfortable, participating in cross-cultural events and/or engaging in cross-cultural collaborations. In addition, students seemed particularly amenable to incorporating similar types of interactions in their future classrooms as noted by a number of comments in students' project reflections. For example:

I think that the use of Web 2.0 tools and having my students collaborate with international partners would be beneficial to enhance the learning environment in the classroom. This gives the students the opportunity to not only get hands on experience

with technology in class, but also to work with students in a different culture (Team member, Prezent.it).

A member from another team described the potential of Web 2.0 tools to broaden the cross-cultural experiences and perceptions of his/her future K-12 students:

I felt like this was a great learning experience and I think that my students could take a lot away from interacting with people from other countries. This can broaden a student's thought process and cultural understanding (Team member, Mindomo).

In general, students began the course with relatively high affective scores; the average score on the *Comfort with Differences* subscale was noticeably higher than the other two subscales (i.e., at least .5 point). These results support the findings of Miville et al. (1992), which demonstrated students' relatively high degree of tolerance for and comfort interacting with peers from different backgrounds. By the end of the project, scores on this subscale showed a relatively small but significant increase from pre- to post survey, suggesting that students' initial positive attitudes toward working with diverse others were enhanced, possibly as a result of their interactions with their international partners on the wiki project. Although students were quick to point out some of the difficulties involved in connecting with others across time zones, cultures, and geographical distances, they were also aware of the potential benefits. As described by a Cellblock team member in his project reflection:

When working with the international partners I learned that there are many different viewpoints on how things work, and what should be done. Another thing that I learned is how difficult it is to collaborate with people on the other side of the world. I know that there is a time change, but it really became a reality when we tried to meet with them and that was quite an obstacle. The way that people think on the other side of the world is also very different than the way we think here which was interesting to think about. In seeing the way that they participated, and the way they did things it was neat to try to think from their perspectives.

In similar fashion, a team member from Pix.ie described his/her early frustrations dealing with language barriers, yet still described positive benefits to working cross-culturally:

Working with international partners can be very stressful because of the language barrier. [However] I also learned allowing more minds to work on a project with a different background betters the project. The international partners have a different point of view and contributed different ideas we had not thought of.

Scores on the M-GUDS-s cognitive subscale (*Relativistic Appreciation*) did not change significantly from pre- to post-survey. This is similar to what others have reported (Strauss & Connerley, 2003); that is, changes on the M-GUDS-s cognitive and affective subscales tend to be smaller than those observed on the behavioral subscale. Still, students in this study agreed, at least "a little bit" that knowing how others differed from them "enhanced their friendships" or enabled them "to better understand their own problems." (MGUDS-s

Table 2
Pre- and post-survey Means and SDs on M-GUDS-s assessment of cultural competency.

N = 202	Diversity Of Contact (behavioral)	Relativistic Appreciation (cognitive)	Comfort With Differences (affective)	Total score
Pre-survey Mean (SD)	3.75 (1.30)	3.85 (.76)	4.37 (.69)	4.09 (.57)
Post-survey Mean (SD)	4.48 (.81)	3.94 (.92)	4.50 (.69)	4.31 (.64)
Paired-t statistic	-6.77	-1.04	-1.94	-3.64
p-value (2-tailed)	.00	.30	.05	.00

survey items) Given the relatively short timeframe of this study, students had little opportunity to get to know, or to “become friends with,” their IPs. Thus, as indicated by the following two quotes, establishing “true” connections with the IPs was challenging:

Collaborating with international partners to create a wiki chapter is both challenging and enlightening. The distance from our international partners caused various different obstacles when creating the wiki chapter. Both the language barrier and the methods of communication prevented us from establishing a true connection with our international partners (Team member, Pix.ie).

Being online is easy to do with people of other countries because you can upload something and they can get it instantaneously. However, it is hard to get in touch with people in other countries because of the different time zones (Team member, Cellblock).

In this study, students tended to focus on the task at hand; that is, interactions with their IPs were directed toward completing project requirements within the allotted timeframe. As such, it is possible that students viewed the primary role of the IPs as being that of helping them meet important project deadlines. Future research is needed to examine if cognitive changes are possible after engagement in lengthier or more personal collaborations.

4.2. Changes in computer skills, perceived comfort, and perceived knowledge for using Web 2.0 Tools

At the end of the course, students rated their computer skills, on average, at 3.98 (i.e., somewhat high) on the same 5-point scale used at the beginning of the course. This difference, from pre-post course, was significant ($t = -12.46$; $p < .000$; $d = .96$). Over 80% of the students rated their computer skills as somewhat or extremely high at the end of the course, compared to 40% with these ratings at the beginning of the course. Post-course, none of the students rated their skills as being either extremely or somewhat low compared to 9.4% with these ratings at the beginning of the course.

There were significant changes, from pre- to post-course, in students' *perceived comfort* for engaging in international collaborations via Web 2.0 tools [$t(201) = -8.62$; $p < .000$; $d = .83$], as well as in their *perceived knowledge* for using technology for teaching and learning [$t(201) = -15.37$; $p < .000$; $d = 1.36$] (See Table 3). Students' ratings of comfort increased from a mean of 3.62 ($SD = 1.02$) to 4.37 ($SD = .68$), on a scale from 1 to 6; ratings of perceived knowledge increased from a mean of 1.75 ($SD = .56$) to 2.58 ($SD = .65$), on a scale from 1 to 5.

These changes in students' survey ratings are supported by comments made during the focus group interviews, as well as in students' final project reflections. Two representative comments include:

Web 2.0 tools will have a huge impact in my future classroom. I think it is extremely important to integrate technology. ... technology can definitely enhance a student's learning experience

in ways teaching through a textbook or lecture can't. ... I think having international experiences is also extremely important in my future classroom. Students should be aware of other nationalities and by the use of technology it may be easier for them to understand. Being able to show pictures of different countries from a tool like pix.ie would be a great experience (Team member, Pix.ie).

I know I can and will use Jing in my future classroom as a means of teaching my students how to use different programs online or giving them examples of different lessons so they can review my lessons online. There are so many Web 2.0 tools I know I can use eventually in preparation or in my classroom. Some examples are blogging, file sharing, surveying tools. Not only can I use these tools for my students, my students can use them for their work and perhaps through the use of them, broaden their horizons to international experiences (Team member, Jing).

4.3. Relationships among variables

To investigate the relationships among the defined research and demographic variables, a correlation analysis was conducted. Since it is fairly easy to achieve high correlation coefficients with larger samples, significance levels were set relatively high in order to discount high coefficients that were not meaningful. That is, coefficients were not considered to be significant unless the probability of occurrence was less than $p = .005$. Thus, based on a critical r value ($df = 200$) of .25, correlations between demographic variables and pre- and post-survey measures indicated no significant relationships among age, gender, or year in school and ratings of computer skills, cultural competencies, perceived comfort, or perceived knowledge. However, students' pre-course ratings of their computer skills were significantly, but negatively, correlated with their pre-course ratings of perceived knowledge for using technology in their future classrooms ($r = -.43$). This means that students with greater perceived levels of computer skills rated their knowledge for using technology in the classroom at lower levels than students who had lower perceived levels of computer skills. Although it is unusual to see a negative correlation between these two variables, low, insignificant correlations have been reported previously (Ertmer et al., 2003; Yildirim, 2000). One possible explanation for this finding is that students with fewer computers skills may have thought they could easily use technology in the classroom, once they gained more skills, while those with more substantial skills may have more readily recognized that, while they knew how to use technology for personal tasks, they did not know how to use those same skills to facilitate teaching and learning. This is similar to what Lei (2009) reported: while digital native pre-service teachers report being very proficient with easy-to-use basic technologies, they lack experience using classroom technologies (e.g., interactive white boards, idea processors, content-related technology, and assistive technology) to help their students learn.

There were no significant correlations between students' perceived knowledge for technology use and the three subscales measuring cultural competency, pre or post. However, students' perceived comfort for engaging in international collaborations using Web 2.0 tools was significantly correlated with cultural competencies (See Table 4). More specifically, students' pre-ratings of comfort significantly correlated with their pre-course ratings on the M-GUDS-s behavior subscale ($r = .72$) as well as on the total score ($r = .37$), indicating a strong relationship between these variables. This is not unexpected given that on the *Perceived Comfort* survey items, students rated levels of comfort for using technology to engage in cross-cultural activities. Items on the M-GUDS-s behavior subscale were worded similarly, but without the technology component. Thus, one

Table 3
Pre- and post-survey Means and SDs on perceptions of computer skills, comfort, and knowledge.

N = 202	Computer skills (5 point scale)	Perceived Comfort (6-point scale)	Perceived Knowledge (5-point scale)
Pre-survey Mean (SD)	3.34 (.71)	3.62 (1.02)	1.75 (.56)
Post-survey Mean (SD)	3.98 (.61)	4.37 (.68)	2.58 (.65)
Paired-t statistic	-12.46	-8.62	-15.37
p-value (2-tailed)	.000	.000	.000

Table 4
Correlation coefficients among pre- and post-survey measures.

	Pre Perceived Comfort	Post Perceived Comfort	Pre M-GUDS 1 Relativistic Appreciation (cognitive)	Post M-GUDS 1	Pre M-GUDS 2 Comfort w/ Differences (affective)	Post M-GUDS 2	Pre M-GUDS 3 Diversity of Contact (behavioral)	Post M-GUDS 3	Pre Total M-GUDS
Pre comfort									
Post comfort	-.02								
Pre M-GUDS 1	.05	.03							
Post M-GUDS 1	.11	.32*	-.08						
Pre M-GUDS 2	-.08	-.02	.53*	-.08					
Post M-GUDS 2	.05	.40*	.01	.59*	-.06				
Pre M-GUDS 3	.72*	.05	.11	.10	-.16	.06			
Post M-GUDS 3	-.04	.27*	-.12	.44*	-.13	.31*	-.01		
Pre total M-GUDS	.37*	.06	.80*	-.01	.60*	.03	.54*	-.11	
Post total M-GUDS	.05	.41*	-.08	.87*	-.11	.77*	.06	.74*	-.04

* $p < .005$.

might expect students' responses to be similar, particularly since students were generally comfortable using the Web 2.0 tools referred to in the items on the *Perceived Comfort* survey (Facebook, wikis, etc.).

Post-ratings of comfort were also significantly correlated with post-ratings on all three MGUDS-s subscales: *Relativistic Appreciation* ($r = .32$), *Comfort with Differences* ($r = .40$), and *Diversity of Contact* ($r = .27$), as well as on the total score ($r = .41$). That is, at the end of the project, students with higher ratings of comfort for using technology to engage in cross-cultural interactions also had higher perceptions of cultural competency than students with lower ratings of perceived comfort.

Finally, significant correlations among subscales of the M-GUDS-s and total M-GUDS-s score were obtained for both the pre- and post-surveys; however, because subscales contributed to the total score this is not particularly meaningful. Interestingly, however, pre and post M-GUDS-s scores were not significantly correlated with each other for any of the subscales or the total score. Although we saw a significant increase, from pre- to post, on two subscales and the total score, the lack of correlation between pre- and post-scores suggests that students' ratings of cultural competency changed in different ways, perhaps due to their different levels of participation on the wiki project.

After completing the correlation analysis, a series of hierarchical multiple regression analyses were used to examine the extent to which any or all of these variables could predict cultural competency in terms of the cognitive, affective, and behavioral components, outlined by Miville et al. (1999). Before the analyses, assumptions of normality, homoscedasticity, independence of errors, influential observations, and multicollinearity were examined and no violations were detected. Then, correlations were examined to establish the relationship between predictors and outcomes. Direct entry method was used to input predictors, using gap scores to control for pre-survey differences among students and to allow for a more focused emphasis on the *development* of students' cultural competencies over the course of the project. For the second and the third analyses, perceived comfort was observed to have relatively higher correlation coefficients than the other variables.

Table 5 provides a summary of findings from the three hierarchical regression analyses. With respect to *Comfort with Differences*, the M-GUDS-s affective subscale, the model including gender and age was not significant [$F(2, 199) = .48, p > .05$]. After controlling for gender and age, the variables of 1) perceived computer skills, 2) perceived comfort for engaging in international collaborations using Web 2.0 tools, and 3) perceived knowledge for using technology in future classrooms were included in the model. However, this model was not significant either [$F(5, 196) = .93, p > .05$].

With respect to the *Diversity of Contact* behavioral subscale, the first step involving gender and age was not significant [$F(2, 199) =$

1.19, $p > .05$]. After controlling for gender and age, the variables of 1) perceived computer skills, 2) perceived comfort for engaging in international collaborations using Web 2.0 tools, and 3) perceived knowledge for using technology in future classrooms were included in the model. The model was significant [$F(5, 196) = 20.06, p < .001$]. Together, all included variables predicted 34% of variance in the scores on the *Diversity of Contact* subscale ($R^2 = .34$). Among the regression coefficients of this model, perceived comfort for engaging in international collaborations using Web 2.0 tools contributed significantly to the model ($B_{(IC)} = .72, t_{(IC)}(196) = 9.81, p < .001$) and explained 33% of the variance ($sr^2_{(IC)} = .33$), while the contributions of the other variables were not significant.

With respect to the M-GUDS-s total score for cultural competency, the first model including demographic variables was not significant.

Table 5

Hierarchical Multiple Regression (HMR) analysis predicting cultural competencies in terms of Comfort with Differences (CwD), Diversity of Contact with others (DoC), and total M-GUDS-s Score.

Models and predictors	R^2	ΔR^2	ΔF	sr^2	B	β
<i>HMR for Comfort with Differences (affective)</i>						
Model 1	.005	.005	.48			
Gender				.001	.088	.042
Age				.003	-.015	.058
Model 2	.023	.018	1.22			
Gender				.0002	.03	.02
Age				.001	-.01	-.03
Perceived Computer Skills				.01	-.13	-.10
Perceived Comfort				.01	.06	.08
Perceived Knowledge				.001	-.05	-.04
<i>HMR for Diversity of Contact (behavioral)</i>						
Model 1	.01	.12	1.19			
Gender				.01	.33	.10
Age				.001	.02	.04
Model 2	.34	.33	32.26			
Gender				.0002	.05	.02
Age				.004	.03	.07
Perceived Computer Skills				.00003	.01	.01
Perceived Comfort				.33	.72	.58*
Perceived Knowledge				.001	.06	.03
<i>HMR for Total</i>						
Model 1	.02	.02	2.05			
Gender				.02	.26	.14
Age				.00004	-.001	-.01
Model 2	.11	.09	6.95			
Gender				.007	.16	.09
Age				.001	.01	.04
Perceived Computer Skills				.002	-.06	-.05
Perceived Comfort				.09	.21	.30*
Perceived Knowledge				.002	-.06	-.05

* $p < .05$.

When other variables were added to the model, it was found to be significant. Similar to the results obtained for *Diversity of Contact*, perceived comfort for using Web 2.0 tools to engage in international collaborations was the only significant contributor ($B_{(IC)} = .21$, $t_{(IC)}(196) = 4.41$, $p < .001$), and explained 9% of the variance ($sr^2_{(IC)} = .09$).

Comparison of the three hierarchical regression analyses revealed that pre-service teachers' comfort for engaging in Web 2.0-based collaborations was a good predictor of cultural competencies, especially behavioral aspects, as measured by the *Diversity of Contact* subscale. Thus, the findings from this study suggest that participation in a cross-cultural wiki project, which enabled interactions among both local and international peers, was an effective strategy for increasing pre-service teachers' cross-cultural awareness and acceptance of differences among others. From pre- to post-project, there was a general increase in students' attitudes of openness and acceptance of the various cultures to which team members and international partners belonged (Miville et al., 1999).

5. Discussion

Findings from this study demonstrated that engaging in a five-week cross-cultural wiki-development project had a significant impact on the development of students' cultural competencies, particularly in terms of their behavioral and affective competencies. This is a promising result as cultural competencies are generally difficult to change (Nunez, 2000), especially in a short period of time. While previous work has documented, qualitatively, the impact of *immersion* experiences on cultural competency (Dekaney, 2008; Lee, 2009), this study was able to show changes, both quantitatively and qualitatively, after engagement in a relatively short-term project. This suggests that integrated course experiences such as the one described here have the potential to substitute for longer, more expensive programs, at least in terms of increasing students' awareness of and appreciation for diverse others. At the very least, wiki-based collaborations may offer a reasonable pre-cursor or follow-up to a more intensive experience.

Findings from this study also indicated that participation in a cross-cultural wiki-based collaboration had a significant positive impact on students' *perceived comfort* for using Web 2.0 tools to collaborate with diverse others around the world. Given that students of this generation are generally comfortable using Web 2.0 tools for the purposes of social networking (Lei, 2009; Project Tomorrow, 2010), it appeared relatively easy for them to envision being able to use these same tools for networking with an extended group of "friends." In addition, students' *perceived knowledge* for using Web 2.0 tools for teaching and learning increased significantly from pre-post project. According to Lawless and Pellegrino (2007), "Technological literacy has fast become one of the basic skills of teaching" (p. 580). Although most pre-service teachers graduating today are likely to be "digital natives" (i.e., comfortable using a variety of technology tools), their knowledge of how to use these tools to support teaching and learning tends to be underdeveloped (Lei, 2009). Due to the nature of this project, in which students were asked, specifically, to consider how their assigned Web 2.0 tools could be used for teaching and learning, students became aware of the potential pedagogical uses of the tools. Moreover, through the final showcase event, students gained an understanding of the great variety and number of tools available.

Finally, students' *perceived comfort* for participating in Web 2.0-based international collaborations was a relatively strong predictor of changes in cultural competency, explaining 33% of the variance in the behavioral subscale, *Diversity of Contact*, and 9% of the variance on the total M-GUDS-s scale. This suggests as students become more comfortable using technology to engage in virtual collaborations, it may not be too much of a stretch to consider engaging in other types of cross-cultural activities as well. Previous research (Cone, 2009;

Maleski, Phillion, & Lehman, 2005) has reported similar findings: once students have completed initial experiences in cross-cultural settings, they become more open to participating in other experiences. For example, Cone found that pre-service elementary teachers who participated in community-based service-learning in culturally diverse communities were more likely to "change their feelings about diverse student groups before they enter[ed] their student teaching semesters" (p. 28). Similarly, Maleski et al. (2005) described how pre-service teachers, through weekly videoconferencing sessions with low-income, minority students, changed their ideas about where they wanted to teach, resulting in a greater openness to working in urban settings that served diverse groups of students.

It is important to note that although the regression analyses accounted for a moderate amount of the possible variance, an even greater portion was not explained. What additional factors may need to be considered? For example, it is fairly clear that students in this study did not participate equally in the wiki collaboration (especially given their different roles and responsibilities) and that some teams had more robust interactions with their international partners than others. For example, it is possible that teams who interacted with IPs whose first language was English experienced more immediate benefits than those who interacted with IPs from Russia, South Korea, or Sweden. Furthermore, demographic data about students' cultural or ethnic backgrounds or information about their previous cross-cultural experiences were not gathered. It is quite possible that these additional factors influenced students' individual responses to the international, wiki-based collaboration and, ultimately, to their perceived willingness to go beyond the project boundaries to engage in additional cross-cultural activities.

5.1. Limitations and suggestions for future research

Participants in this study were pre-service teachers, enrolled in a required introductory educational technology course. As such, generalizability is limited to similar students enrolled in similar courses. Additionally, the project occurred over a five-week time period, which may have limited the types of changes we were able to observe. Given that students did not get to know their international partners on a personal basis, little change was observed in the value they assigned to these types of activities, at least as measured by the cognitive subscale of the M-GUDS-s. Future research is needed to examine changes in other groups of participants who engage in integrated course experiences, especially those involving different time frames and different course structures. Future efforts might also be directed toward providing increased opportunities or more explicit encouragement to students to interact with their IPs on a more personal level. Finally, the contributions of individual team members to the wiki chapters were not examined; it is possible that changes in students' post-survey scores were influenced by factors we did not measure, such as previous knowledge, skills, and/or experiences with diverse others and/or levels of participation on the wiki. It would be useful to gather this data in future studies to determine how these factors impact initial and changing cultural perceptions.

5.2. Implications

The results of this study have implications for colleges and universities tasked with preparing their students for a knowledge-based global economy. Given that the participants in this study were enrolled in a *required* course that engaged them in a *short-term* cross-cultural experience, observed changes in cultural competency are particularly promising. Previous studies (Causey, Thomas, & Armento, 2000; Pence & Macgillivray, 2008) have demonstrated the difficulties involved in changing cultural competencies through voluntary, short-term experiences, including those with an immersion component (e.g., study-abroad). Thus, a wiki-based collaboration may offer

instructors the opportunity to increase their students' appreciation for other cultures with fewer issues than a full immersion program involves (Bellamy, 2006; Willard-Holt, 2001). With careful planning and cooperative international relationships, Web 2.0 technologies have the potential to prepare our current students for the diverse populations they are likely to face in their future classrooms (Maleski et al., 2005; Schoorman, 2002). Finally, because the participants of this study were pre-service teachers, there are additional implications for their future students. That is, students in this study indicated a strong desire to incorporate international activities within their future classrooms using the tools they learned about in this project.

6. Conclusion

Regardless of discipline, today's employers are seeking graduates who possess skills and knowledge that go beyond basic technical proficiencies. According to the *Partnership for 21st Century Skills* (2007), the workforce of the 21st century must be digitally literate and globally competent, possessing effective communication, collaboration, and problem-solving skills. This is particularly true of our future teachers, who will prepare our children for a workplace that depends on these skills (U. S. Department of Education, 2004). As universities heed the call to expand pathways to global education, integrative course experiences offer a cost-effective alternative to traditional study abroad programs. Particularly in the current economy, infusing international experiences into on-campus courses offers a means by which every student can participate. According to Larrison and Alterman (2009), "using collaborative technology [such as wikis] to extend the physical borders of the classroom can be of significant value" (p. 397).

As noted by Brown (2006) and his colleagues (Brown & Adler, 2008), the emergence of Web 2.0 tools has generated enormous possibilities for international collaborations by shifting attention from access to information to access to other people. Wiki technology, in particular, provides students with collaborative opportunities that, in the long run, can initiate them into a knowledge creating culture and enable them to see themselves as part of a global effort to advance knowledge (Huijser, Bedford, & Bull, 2008; Parker & Chao, 2007; Pfeil, Zaphiris, & Ang, 2006). In this study, students' wiki experiences resulted in an expanded view of working with diverse others; that is, at the end of this project team members understood and valued input from others, both locally and at a distance, who were from their own, as well as other, cultures. Students gained a greater appreciation and respect for the differences of others and other cultures. In addition, the international collaboration using Web 2.0 technologies created a greater awareness among our pre-service teachers of the benefits (ease of use, relevance, and importance) that various Web 2.0 technologies can play in their future classrooms.

References

- Ertmer, P. A., Conklin, D., Lewandowski, J., Osika, E., Selo, M., & Wignall, E. (2003). Increasing preservice teachers' capacity for technology integration through use of electronic models. *Teacher Education Quarterly*, 30(1), 95–112.
- Newby, T. J., Ertmer, P. A., & Kenney, E. (2010). The INSITE project: Engaging students in international team collaborations to create a Web 2.0 repository. *International Journal of Designs for Learning*, 1(1), 1–18. Available online: <http://scholarworks.iu.edu/journals/index.php/ijdl/index>
- Bellamy (2006, Fall). Creating global citizens through study abroad connection. *The Journal of the New England Board of Higher Education*, 20–21.
- Bielefeldt, A. R., & High, K. A. (2007, October). Work in progress: Assessing the cultural competency of engineering students. *Paper presented at the 37th AASE/IEEE Frontiers in Education Conference Milwaukee, WI*.
- Bonk, C. J., Lee, M. M., Kim, N., & Lin, M. F. G. (2009). The tensions of transformation in three cross-institutional wikibook projects. *Internet and Higher Education*, 12, 126–135.
- Brandon, J. (2008). Web 2.0 definition for non-techies. *Computer World* Retrieved April 18, 2011, from http://blogs.computerworld.com/web_2_0_define_2_0
- Brown, J. S. (2006, December 1). Relearning learning—Applying the long tail to learning. Presentation at MIT iCampus, Available from MITWorld. Retrieved Feb 24, 2009, from <http://mitworld.mit.edu/video/419>
- Brown, J. S., & Adler, R. P. (2008, January/February). Minds on fire: Open education, the long tail, and learning 2.0. *EDUCAUSE Review*, 43(1), 16–32 Retrieved Feb 28, 2010, from <http://connect.educause.edu/Library/EDUCAUSE+Review/MindsonFireOpenEducation/45823>
- Causey, V. E., Thomas, C. D., & Armento, B. J. (2000). Cultural diversity is basically a foreign term to me: The challenges of diversity for preservice teacher education. *Teaching and Teacher Education*, 16(1), 33–45.
- Cone, N. (2009). Community-based service-learning as a source of personal self-efficacy: Preparing preservice elementary teachers to teach science for diversity. *School Science and Mathematics*, 109(1), 20–30.
- Constantine, M. G., & Arorash, T. J. (2001). Universal-diverse orientation and general expectations about counseling: Their relation to college students' multicultural counseling expectations. *Journal of College Student Development*, 42, 535–544.
- Creswell, J. W., & Plano Clark, V. L. (2007). *Designing and conducting mixed methods research*. Thousand Oaks, CA: Sage.
- Dekaney, E. (2008). Students' pre-departure expectations and post-sojourn observations in a short-term international program aboard on the culture, music, and art of Brazil. *International Education*, 37(2), 17–29 129.
- Engstrom, M., & Jewett, D. (2005). Collaborative learning the wiki way. *TechTrends*, 49(6), 12–68.
- Fuertes, J. N., Miville, M. L., Mohr, J. J., Sedlacek, W. E., & Gretchen, D. (2000). Factor structure and short form of the Miville-Guzman Universality-Diversity Scale. *Measurement and Evaluation in Counseling and Development*, 33, 157–169.
- Gonzalez-Reinhart, J. (2006). Wiki and the wiki way: Beyond a knowledge management solution. Retrieved April 16, 2011, from http://www.uhisrc.com/FTB/Wiki/wiki_way_brief%5B1%5D-Jennifer%2005.pdf
- Groff, T. R., & Jones, T. P. (2003). *Introduction to knowledge management: KM in business*. Burlington, MA: Butterworth-Heinemann.
- Hanson, W. W., Creswell, J. W., Clark, V. P., Petska, K. S., & Creswell, J. D. (2005). Mixed methods research designs in counseling psychology. *Journal of Counseling Psychology*, 52, 224–235.
- Hossain, M. M., & Aydin, H. (2010). Web 2.0 in teaching-learning multiculturalism. *Proceedings of the 9th international conference on Information Technology-based Higher Education and Training* (pp. 355–362). Piscataway, NJ: IEEE Press.
- Huijser, H., Bedford, T., & Bull, D. (2008). OpenCourseWare, Global Access and the Right to Education: Real access or marketing ploy? *International Review of Research in Open and Distance Learning*, 9(1), 1–13.
- International Society for Technology in Education (2008). *National educational technology standards for teachers (NETS-T)* (2nd ed.). Retrieved May 14, 2009, from <http://www.iste.org>
- Larrison, J. A., & Alterman, R. (2009). Wikis to support the "collaborative" part of collaborative learning. *Computer Supported Collaborative Learning*, 4, 371–402.
- Lawless, K. A., & Pellegrino, J. W. (2007). Professional development in integrating technology into teaching and learning: Knowns, unknowns, and ways to pursue better questions and answers. *Review of Educational Research*, 77, 575–614.
- Lee, J. F. K. (2009). ESL student teachers' perceptions of a short-term overseas immersion programme. *Teaching and Teacher Education*, 25(8), 1095–1104.
- Lei, J. (2009). Digital natives as preservice teachers: What technology preparation is needed? *Journal of Computing in Teacher Education*, 25(3), 87–97.
- Maleski, E., Phillion, J., & Lehman, J. D. (2005). A Freirian framework for technology-based virtual field experiences. *Contemporary Issues in Technology and Teacher Education*, 4, 410–428.
- Matthew, K., Felvegi, E., & Callaway, R. (2009). Wiki as a collaborative learning tool in a language arts methods class. *Journal of Research on Technology in Education*, 42(1), 51–72.
- Miville, M. L., Gelso, C. J., Pannu, R., Liu, W., Touradj, P., Halloway, P., et al. (1999). Appreciating similarities and valuing differences: The Miville-Guzman Universality-Diversity Scale. *Journal of Counseling Psychology*, 46, 291–307.
- Miville, M. L., Molla, B., & Sedlacek, W. E. (1992). Attitudes of tolerance for diversity among college students. *Journal of the Freshman Year Experience*, 4(1), 95–110.
- Nunez, A. (2000). Transforming cultural competence into cross-cultural efficacy in women's health education. *Academic Medicine*, 75, 1071–1080.
- Olson, G. M., & Olson, J. S. (2000). Distance matters. *Human-Computer Interaction*, 15, 139–179.
- Parker, K. R., & Chao, J. T. (2007). Wiki as a teaching tool. *Interdisciplinary Journal of Knowledge and Learning Objects*, 3, 57–72.
- Partnership for 21st Century Skills (2007). Framework for 21st century learning. Retrieved April 27, 2009, from <http://www.21stcenturyskills.org/>
- Pence, H. M., & Macgillivray, I. K. (2008). The impact of an international field experience on preservice teachers. *Teaching and Teacher Education*, 24(1), 14–25. doi:10.1016/j.tate.2007.01.003.
- Pfeil, U., Zaphiris, P., & Ang, C. S. (2006). Cultural differences in collaborative authoring of Wikipedia. *Journal of Computer-Mediated Communication*, 12(1) Retrieved February 24, 2010, from <http://jcmc.indiana.edu/vol12/issue1/pfeil.html>
- Project Tomorrow (2010). Unleashing the future: Educators "speak up" about the use of emerging technology for learning. *Speak Up 2009 National Findings*. Retrieved August 3, 2010, from http://www.tomorrow.org/speakup/speakup_reports.html
- Rosen, J., Spatz, E. S., Gaaserud, A., Abramovitch, H., Weinreb, B., Wenger, N., et al. (2004). A new approach to developing cross-cultural communication skills. *Medical Teacher*, 26(2), 126–132.
- Schoorman, D. (2002). Increasing critical multicultural understanding via technology: "Teachable moments" in a university school partnership project. *Journal of Teacher Education*, 53, 356–369.

- Seaman, J., Beightol, J., Shirilla, P., & Crawford, B. (2009). Contact theory as a framework for experiential activities as diversity education: An exploratory study. *Journal of Experiential Education*, 32, 207–225.
- Sheehy, G. (2008). The wiki as knowledge repository: Using a wiki in a community of practice to strengthen K-12 education. *TechTrends*, 52(6), 55–60.
- Shen, Y., Jesiek, B., & Chang, Y. (2010, November). IREE 2010 Program evaluation, learning assessments, and research findings: Developing globally competent engineering researchers. *Proceedings of the 13th Annual International Colloquium on International Engineering Education* Newport, RI.
- Singley, D. B., & Sedlacek, W. E. (2004). Universal-diverse orientation and precollege academic achievement. *Journal of College Student Development*, 45(1), 84–89.
- Strauss, J. P., & Connerley, M. L. (2003). Demographics, personality, contact, and universal-dimension orientation: An exploratory examination. *Human Resource Management*, 42(2), 159–174.
- Taylor, H. (1969). *The world as teacher*. Garden City, NY: Doubleday.
- Teasley, S., & Wolinsky, S. (2001). Scientific collaborations at a distance. *Science*, 292, 2254–2255.
- U. S. Department of Education (2004). *Toward a new golden age in American education: How the Internet, the law and today's students are revolutionizing expectations*. Washington, D.C.: Office of Educational Technology.
- Vratulis, V., & Dobson, T. (2008). Social negotiations in a wiki environment: A case study with pre-service teachers. *Educational Media International*, 45, 285–294.
- Wenger, E., White, N., Smith, J. D., & Rowe, K. (2005). Technology for communities. Retrieved October 14, 2009, from http://technologyforcommunities.com/CEFRIO_Book_Chapter_v_5.2.pdf
- West, C. (2010). Borderless via technology. *International Educator*, 19(2), 24–33.
- Willard-Holt, C. (2001). The impact of a short-term international experience for preservice teachers. *Teaching and Teacher Education*, 17(4), 505–517.
- Wood, L. (2005). Blogs & wikis: Technologies for enterprise applications? *The Gilbane Report*, 12(10) Retrieved April 20, 2011, from http://gilbane.com/gilbane_report.pl/104/
- Yildirim, S. (2000). Effects of an educational computing course on pre-service and inservice teachers: A discussion and analysis of attitudes and use. *Journal of Research on Computing in Education*, 32, 479–497.
- Yuen, C. Y. M. (2010). Dimensions of diversity: Challenges to secondary school teachers with implications for intercultural teacher education. *Teaching and Teacher Education*, 26, 732–741. doi:10.1016/j.tate.2009.10.009.