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Research Article

Preparing Net Gen pre-service teachers for digital native classrooms

Educación inicial de profesores de la generación.Net para aulas de nativos digitales

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Abstract

This paper explores Net Gen pre-service teachers' perspectives of future digital native classrooms based on the National Education Technology Plan (U.S. Department of Education, 2010). Participants were seven Net Gen pre-service teachers enrolled in a semester-long laboratory of practice project for Literacy Development for English Language Learners. Data were collected using a narrative strategy (Ginsburg, cited in Riessman, 1993) which consisted of analyzing information from participants' life stories produced during two audiotaped focus group conversations. Findings showed that pre-service teachers had positive perceptions and beliefs toward the laboratory of practices based on the experimental cyberlearning workstation framework designed by the authors. The hands-on experiences helped them enhance their digital native-like citizenship in order to meet future students' individual abilities and learning styles, and to encourage teaching with digital technologies. Some recommendations and limitations are also addressed.

Keywords: cyberlearning, cyberlearning workstations, educational technology, Net Gen, pre-service teachers, technology integration.

Resumen

Este artículo explora las perspectivas de profesores de la generación en red en formación sobre futuras aulas de nativos digitales, basadas en el Plan de Educación Tecnológica Nacional (Departamento de Educación de Estados Unidos, 2010). Los participantes fueron siete futuros docentes de la generación en red, inscritos en un laboratorio de un semestre de duración del proyecto de práctica para el Desarrollo de la Alfabetización para estudiantes del idioma inglés. Los datos fueron recolectados a través de una estrategia narrativa (Ginsburg, citado en Riessman, 1993), que consistía en analizar la información de las historias de vida de los participantes, producidas en dos conversaciones grabadas en video con grupos focales. Los resultados mostraron que los profesores en formación tenían percepciones positivas y creencias hacia el laboratorio de prácticas basadas en el marco de trabajo CyberLearning experimental diseñado por los autores. Las experiencias prácticas ayudaron a mejorar su ciudadanía de nativo digital con el fin de satisfacer las futuras capacidades individuales de los alumnos y estilos de aprendizaje, y para fomentar la enseñanza con tecnologías digitales. De igual manera, se abordan algunas recomendaciones y limitaciones.

Palabras clave: ciber-aprendizaje, estaciones de trabajo de ciber-aprendizaje, tecnología educativa, profesores formación de la generación en red, integración de tecnologías.

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Introduction

Information technology advocates strongly believe that the introduction of computers and digital technologies into classrooms opens new avenues not only for curriculum development changes, but also for school reforms (Collins & Halverson, 2009; November, 2010). In 2010, the Federal Government published the National Education Technology Plan (NETP) aimed at transforming the American educational system into one that uses modern technologies in education. The plan calls for applying advanced technologies used in people's personal and professional lives to the entire U.S. educational system to improve P-16 students' learning, accelerate and scale up the adoption of effective practices, and to use data and other information for continuous improvement (U.S. Department of Education, 2010).

Furthermore, the NETP is an invitation to systematically conduct educational technology research that explores how embedded assessment, such as simulations, collaborative environments, virtual worlds, games, and cognitive tutors can be used to engage and motivate learners while assessing complex skills and providing feedback. In other words, the NETP requests third-order (radical) changes to the entire U.S. educational system instead of evolutionary ones.

As Prensky (2001a) stated, "our students have changed radically. Today's students are no longer the people our educational system was designed to teach" (p.1). The natural divergence between today's teachers (net gen, millennial, and digital immigrants) and digital native students are serious threats for the achievement of the NETP's primary objectives. How can Net Gen/Millennial or digital immigrant teachers, who speak an outdated language, effectively teach a population that speaks an entirely new language (Howard, 2006)?

Furthermore, the difference between current and future elementary digital native students and their digital immigrant teachers (Bayne & Ross, 2007) may be due to the incapacity of educators to capitalize on learners' funds of knowledge (Gonzalez, Moll & Amanti, 2005). Lessons from the field suggest that current and future elementary students are surrounded by computers, video games, digital music players, video cameras, cellular phones, instant text messaging, emails, and all other toys and tools of the digital age. They think and process information fundamentally differently from their predecessors.

Given the proliferation of technology, its integration into classrooms has drawn the attention of many scholars (Hussain, Niwaz, Zaman, Dahar & Akhtar, 2010; Lavin, Korte & Davies, 2010; Mosenson & Johnson, 2008; Prensky, 2001a, 2001b, 2010, 2012). A number of studies (Palfrey & Gasser, 2008; Tapscott, 2009; Zur & Zur, 2011) have been conducted to investigate the effectiveness of the use of technology and the Internet on learning and teaching English as a Second Language. The results are generally positive; technology is seen as a valuable learning/teaching tool. Specifically, research shows that the use of classroom-based technology results in enriching students' engagement in the learning process. Other researchers have taken great interest in comparing teaching with and without technology (Sahin, 2003).

More recent studies (Kim, Jain, Westhoff & Rezabek, 2008; Lavin, Korte & Davies, 2010) suggest that in order for teachers to appropriately and effectively integrate technology into classrooms, training pre-service teachers in university courses is crucial to the future of their teaching behaviors, because simply "access to technology is not enough today" (Mosenson & Johnson, 2008, p.17) to foster a meaningful learning experience. Furthermore, Efe (2011) indicates that "teacher training is very important in the development of future teachers' knowledge and skills regarding educational technology" (p. 238).

Despite the recent calls for proposals aimed at funding research and training projects in the field of educational technology (NETP, 2010), very few new cutting-edge schools exclusively design for digital native children. For instance, Quest-to-learn, in New York/Chicago, a school for digital children where participants play, invent, grow, and explore (Corbett, 2010), is one of the few ground-breaking projects that inspired us in our quest for training current and future net gen pre-service teachers on how to effectively teach current and future digital native students.

This qualitative report was built upon seven selected pre-service teachers' narratives after active participation in the cyberlearning workstations program (CWP), which was a service-learning project sponsored by our university. Using Ginsburg's (cited in Riessman,1993) narrative analysis approach, the authors explored how to effectively train pre-service teachers on how to teach elementary English reading content using the experimental cyberlearning pedagogical model (Ekiaka Nzai & Feng, 2013). To do so, the following research question guided our query: How can Net Gen pre-service teachers be effectively prepared to teach elementary English reading content using the cyberlearning workstation frame as the core medium of instruction?

At this stage, the cyberlearning workstation model can be generally defined as an experimental instructional frame which consists of systematic and intensive use of digital technologies (for example: laptops + Internet, ipad, digital tablets, Smart Buddy devices, PlayStation, PlayStation vita, Nintendo DS, Nintendo Wii, and XBOX 360 Kinect widely used for home entertainment) as well as digital video game curriculums and 3D virtual world learning environments to deliver K-12 content.

Given the absence of a substantive-level cyberlearning pedagogical framework for Net Gen bilingual pre-service teachers' preparation, the answer to our research question will potentially ignite the discussion on how to train future teachers and teacher educators to effectively meet the digital native students' learning needs. To help our readers better understand the structure of this research, in the next section we are going to provide a theoretical overview of this paper before offering a brief description of research subjects and methods. The presentation of research findings, conclusions, and recommendations will immediately follow.

Literature Review

As addressed previously, the NETP (U.S. Department of Education, 2010) is an invitation for radical educational changes powered by digital technologies that people use in their professional and daily lives. Most of new technologies are Internet-based. The Internet has created a fertile ground for creativity at a very low cost and for reaching an enormous audience. New technologies help users enjoy their friends' creations and creativity (Palfrey & Gasser, 2008). This is the background of the majority of children who are born as digital natives (Prensky, 2001a) in the United States.

However, some empirical studies (Helsper & Eynon, 2010; Margaryan, Littlejohn, & Vojt, 2011), carried out since Prensky's article appeared, question whether the categorization of young people as digital natives and older people as digital immigrants has any validity. The aforementioned set of scholars respectively argued that age, experience, and breadth all seem important, but technology adoption is a complex phenomenon rather than a simple binary relationship.

Moreover, the creative revolution in cyberspace is not only about who gets to say what to whom. It is also about the question of who gets to control the shaping of the culture, the making of the meaning, since digital technologies give everyone the means to express themselves

and empower each one to speak and to be heard by others, including those in power, in ways that previous generations could only have imagined. They allow creators to navigate the traditional intermediaries by using the hardware and software in homes (Palfrey & Gasser, 2008; Prensky, 2010, 2012).

The majority of current pre-service teachers (who are between 19 – 24 years old), who are identified as Net Gen/millennial individuals (Tapscott, 2009), will have to teach digital native students. Therefore, it is wise to inquire about the essential differences between current and future digital native elementary students and the Net Gen pre-service teachers who were born when computers were first invented (Tapscott, 2009).

Tapscott (2009) described the characteristics of today's Net Gen pre-service teachers as the following (as cited in Skiba & Barton, 2006, p.15):

1. **Fierce independence:** Their sense of autonomy derives from their experiences of being active information seekers and creators of information and knowledge.
2. **Emotional and intellectual openness:** The Net Gen students value the openness of the online environment, like anonymity, and communicate through numerous tools.
3. **Inclusion:** They view the world in a global context and move toward greater inclusion of diversity.
4. **Free expression and strong views:** With access to knowledge resources at their fingertips, they are assertive and confident.
5. **Innovation:** This group is constantly trying to push the technology to its next level and figure out how to create a better world.
6. **Preoccupation with maturity:** Armed with knowledge, they strive to be more mature than their predecessors.
7. **Investigations:** Curiosity, discovery, and exploration are keys for this generation.
8. **Immediacy:** This generation views the world as 24/7 and demands real time and fast processing.
9. **Sensitivity to corporate interest:** Consumer savvy, these customers like customization and want to have options and to try before they buy.
10. **Authentication and trust:** Net savvy individuals, they know the need to verify and check resources and authenticate people.

Contrary to the Net Gen pre-service teachers, the digital natives actively participate in the creative cyberspace revolution. They break down the old hierarchies and exploit new hierarchies as shapers of the new digital culture (Tapscott, 2009). For instance, our own research (Feng & Ekiaka Nzai, 2013; Feng, Olague, Diaz & Ekiaka Nzai, 2014) in the United States of America suggested that the majority of today's pre-school digital native children in South Texas prefer to watch their preferred Disney channel through apps on ipads, mini-ipads, digital tablets or smart phones where they have the ownership of the watching process instead of being passive digital-consumers of traditional television programs

In this future of digital creativity, certain canons are collapsing since the participatory cyberspace presents opportunities, even for elementary students, to learn how to create and enjoy new expressive works. This process of learning how to create is not led by parents, teachers, and schools. Digital natives often learn from/with others (peers) or through practice by doing (Palfrey & Gasser, 2008; Prensky, 2001a, 2001b, 2010; 2012; Zur & Zur, 2011).

When it comes to media and games, digital natives seem like completely different species from their parents and grandparents. The digital native children do not remember photographs captured on a roll of film that have to be taken to the drugstore to be printed out. They think that digital images are instantly viewable, detachable, and shareable with others on the Internet. Digital Natives do not think of news and information as something that arrives in a mass of pulp on the doorstep in the morning. They think of massive, converged, and digital mash-up headlines, blogs,

videos, and podcasts (Palfrey & Gasser, 2008; Prensky, 2001a, 2001b, 2010, 2012; Tapscott, 2009; Zur & Zur, 2011).

Most of all, digital natives do not think of recorded music and/or games in the form of LPs and CDs purchased at music or game stores. They are not passive consumers of media, music, and games that are broadcasted to them, but rather active designers/creators and producers of the meaning in their digital culture that influence platforms for distribution of digital media (Palfrey & Gasser, 2008; Zur & Zur, 2011)

Maybe these natural qualifications are not well understood by parents and some educators. For instance, many digital immigrant parents and teachers worry that the Internet, with its rip, mix, and burn culture, only fosters forms of creation that are based on the practices of mixing and mashing (Palfrey & Gasser, 2008; Zur & Zur, 2011) that digital native children learn from peers. What those parents do not realize is the fact that peer learning has to be accredited as one of the best instructional strategies aimed at increasing students' learning retention rate (Lalley & Miller, 2007).

The fact is that current and future digital native elementary children process information differently from their predecessors (Prensky, 2001a). Therefore, teacher education faculty (most of them fall into Prensky's classification of digital immigrants) have the daunting mission of training Net Gen pre-service teachers to effectively teach digital native students.

According to Prensky (2001a, 2001b) there is a cultural divide between digital native children and digital immigrant teachers. This disconnect or cultural mismatch should be addressed when training future teachers by giving Net Gen pre-service teachers opportunities to create, innovate, and produce while learning how to systematically and effectively teach with digital technologies. To do so, pre-service teachers should have a chance to tap into the vast funds of knowledge (the skills and knowledge that have been historically and culturally developed to enable an individual or household to function within a given culture) that digital native children bring into classrooms (Gonzalez, Moll & Amanti, 2005) through specific digital technology-based service learning projects such as the cyberlearning workstations program designed by Ekiaka Nzai and Feng (2013).

Brief Overview of the Cyberlearning Workstations Pedagogical Model

As suggested above, the cyberlearning workstations framework is a new instructional approach designed by Ekiaka Nzai and Feng (2013) aimed at training future teachers to meet the learning needs of current and future digital native children. In fact, the above pedagogical framework, which needs further validation and replication, is grounded on Campbell's (1991) learning centers theory, Gonzalez, Moll and Amanti's (2005) notion of funds of knowledge, the digital videogame and information learning theoretical tenets (Collin & Halverson, 2009; November, 2010; Prensky, 2001a, 2001b, 2010, 2012) and recent research findings in fitness and academic performance postulates (Dwyer, Sallis, Blizzard, Lazarus, & Dean, 2001; Dwyer, Coonan, Leitch, Hetzel, & Baghurst, 1983; Grissom, 2005; Linder 1999, 2002; Shephard, 1997; Tremblay, Inman, & Willms, 2000).

The center of this experimental framework relies on a strong commitment to match digital native children's learning styles and natural gifts. Thus, instruction through this pedagogical model is delivered through cyberlearning workstations. There are four to six workstations in each cyberlearning workstation classroom. Figure 1 illustrates the cyberreading classroom layout.

Each cyberlearning instruction session lasts a minimum of 100 minutes and maximum of 130 minutes depending on each lead teacher's lesson plan. Under optimal fidelity conditions, students are divided into four to six teams of

two to four students per team. Students will spend a minimum of 15 to 20 minutes in each cyberlearning workstation. A brief group introduction and conclusion meeting at the beginning and at the end of each session is mandatory (Ekiaka Nzai & Feng, 2013).

A cyberlearning workstation's instruction approach is through team teaching. To be highly effective, there must be one lead teacher and –three to six associate instructors or team leaders within one cyberlearning workstations classroom. Associate instructors or team leaders will be in charge of monitoring and supervising learning activities in their assigned cyberlearning workstations under the supervision of the lead-teacher. The lead-teachers might select associate instructors or team leaders among their own pupils (students can take turns), pre-service and/or graduate students, para-educators and/or parents/ guardians. Associate instructors or team leaders must be systematically trained by the lead teachers (Ekiaka Nzai & Feng, 2013).

Further analysis of the cyberlearning workstations framework establishes the distinction between conventional and transformative cyberlearning workstations that teachers can apply when teaching digital native students. In conventional cyberlearning workstation classrooms, instructions were delivered exclusively in a formal learning setting while in transformative cyberlearning workstations, students received instruction in an informal manner where they were granted access to some digital video game curricula for further practice settings with parents'/guardians' supervision (Ekiaka Nzai & Feng, 2013).

While working at each cyberlearning workstation, students take the built-in content-area module tests or /quizzes (assessments), which will be automatically recorded in the digital videogame and/or 3D virtual world learning environment's performance center. Interactive educational video games and 3D virtual learning environments provide immediate feedback to each student who will be aware of his/her progress immediately without affecting negatively students' self-esteem (Gonzalez, Moll & Amanti, 2005). It does follow from the above discussion that the systematic and intensive use

Figure 1. English Cyberreading Afterschool Classroom Layout

of technology should have a deep impact on teaching and learning.

To move toward a revolutionary or third-order (radical) approach of transforming the American educational system powered by technology, the aforementioned scholars suggested that educational video games, 3D virtual world learning environments and simulators, etc, should be used as core medium of instruction.

Methods

As suggested above, this qualitative report was built upon seven pre-service teachers' narratives after active participation in the cyberlearning workstations program (CWP), a mandatory field-based laboratory practice, sponsored by our university during the academic years 2011 – 2012 and 2012 – 2013.

The Cyberlearning Workstations: A Laboratory Practice

Participating pre-service teachers were asked to teach reading to elementary students using the experimental cyberlearning workstations approach (Ekiaka Nzai & Feng, 2013). Pre-service teachers' CWP duties consisted of working as lead or associate CWP teacher according to a schedule designed by their instructor. As lead-teachers, pre-service teachers were invited to upgrade the sample of cyberlearning workstation lesson plan and meet with their assigned associate teachers in order to implement their teaching plan. Pre-service teachers were expected to be highly creative when putting into practice what they learned in classes during face-to-face and online meetings regarding how to effectively teach reading to current and future elementary digital native students. The CWP laboratory practice lasted 10 weeks. Each pre-service teacher was selected to be the lead teacher once, and twice as associate teachers during the semester while actively participating in online classes through Blackboard. At the end of the cyberlearning project, participants were asked to attend focus group sessions using a Ginsburg's (cited in Riessman, 1993) life story format of a narrative study.

The following questions were used to guide all focus group discussions: a) As a future teacher of elementary digital native children, how has the field-based project enhanced not only your teaching skills, but also your "digital native or digital native-like" citizenship? b) What changes would you suggest to your current teacher education program in order to effectively prepare pre-service teachers for elementary digital classrooms? c) What challenges should you overcome in order to use cyberlearning technologies and digital curriculums as core medium instruction in your future classroom?

Sampling, Narrative Strategy, Data Analysis and Interpretation

As suggested above, several pre-service teachers were asked to take part actively in the laboratory practices. Narrative data reported in this paper were selected from seven pre-service teachers enrolled at EDBL 4316 – Literacy Development for ELLs. The theoretical sampling criteria for participants' selection included the following: participants had to be U.S. – born pre-service teachers from South Texas. All participants were female – young adults whose age range varies between 21 and 25. For the sake of confidentiality and clarity in describing the data, we assigned a pseudonym to each participant. Therefore, the participants will henceforth be referred to as Tomoko, Yuki, Wu, Su, Xiaoping, Tomasa, and Yolanda.

Data were collected using a narrative strategy (Ginsburg, cited in Riessman, 1993), which consisted of analyzing information from participants' life stories produced during two audiotaped focus group conversations. In other words, data were gathered through dialogues between a teller and "listener in a relation of power, at a particular historical moment" (p.31).

Generalizing, Ginsburg's strategy consists of comparing plot lines across a series of first-person accounts to locate turning points that signal a break between ideal and real, the cultural script and the counter-narrative. Thus, the researchers searched for similarities and differences among the narrative data and how they were told in the broadest sense. Narrative data analysis was conducted using a comparative technique. Information collected through the two focus groups, which lasted 75 minutes each, were transcribed immediately after realization and stored in the PI desktop. They were reviewed continually to come up with the key categories or themes.

The transcript for a life story report gave active voice to tellers by including abundant direct and illustrative quotes in the findings to unfold/clarify schemata of the tellers. Only the excerpts that strongly represented the topic of inquiry were included in the manuscript to enable the readers to clearly perceive the difference between the story from narrators and the authors' plot in presenting the findings. Data interpretation was performed partially using Yans-McLaughlin (cited in Riessman, 1993)'s approach, which consists of highlighting and arranging some selected snapshots or scripts representing interactive findings from the focus groups, and presenting them in a in a literary manner. In particular, we compared and/or contrasted excerpts which described not only how participants visualized the CWP project in relationship to their future role as teachers of elementary digital native children, but also, how they portrayed their interactions with cyberlearning technologies and digital curriculums as core medium instruction.

Validity of the research project findings was addressed through: a) a constant data comparison process; b) review of findings by two faculty experts in qualitative research; and c) sharing emerging themes with participants and providing feedback as to its accuracy. The process of research participants checking the emerging findings is essential in assuring that conclusions were aligned which participants' narratives.

Findings

The emerging findings from narrative analysis were categorized into four themes: enhancing teaching skills, becoming digital native or digital-native like citizens, identification of three big changes to university-based teacher education programs, and determination of environmental challenges.

Enhancing Teaching Skills

All participants believed that the laboratory of cyberlearning workstation practices was designed to enhance the teaching skills of pre-service teachers to (a) become familiar with technology which is already deeply integrated into their digital native students' daily lives, (b) plan for instruction to suit their students' individual abilities and learning styles, and (c) stimulate teaching with technology. Tomoko remarked:

> *"I had the opportunity to actively participate in a "real laboratory of practice" aimed at unlocking my full-range teaching potential skills, especially my ability to teach elementary children (considered digital native) through cyberlearning workstations. During this time, I was able to see that the younger the generation, the more technologically savvy they are. As I prepared my lesson plans, I always took into consideration the fact that my students knew how to use the different modalities that our "cyberlearning workstations" offered. I believe that using this real laboratory of practice really helped me understand that each student has a different way of learning and understanding educational material presented to him or her … Again, having these real world technology labs was really helpful to me and increased my knowledge of how to incorporate technology when teaching students."*

In addition, the majority of participants were able to demonstrate teaching strategies through the use of cyberlearning tools that effectively improved the learning process, such as increasing students' motivation in learning and hands-on interaction. Wu explained:

> "I was able to see first-hand how to incorporate technology into our everyday lessons. This project has allowed me to use technology to interact with the students, to enhance a student's fluency and even to reward students for their accomplishments. I have many different ways in which I can use technology to get students to interact and to stay focused. For example, to help with student's comprehension, the students would go on the study buddies to read passages and then answer questions about the passages. The students were able to stay focused because it was not a worksheet, but a hand-held device similar to a DS. Another thing that I found interesting was using technology to help with a student's fluency. Like in real classrooms, there are some struggling readers, and what better way to get a student to read than with a laptop? By using a laptop, the students record themselves reading. I have found that this can help in so many ways. One is it can be used to assess a student's reading by not having to read in front of a teacher, which can be nerve-wracking for the student. Two, it can be played back for the student to hear how they sound and they can self-correct. Technology can also be used as incentives."

Becoming Digital Native or Digital Native-like Citizens

Half of the participants agreed that this laboratory of practice helped them become more like digital natives or enhance their own digital native-like citizenship. Wu expressed:

> "This service-learning project has helped me to become a digital native-like citizen because now I know a little bit more than what I did before participating in this project. It taught me that using technology is not all bad, and that sometimes it is necessary to use it. An example would be when having the students do research projects or showing the students pictures of historical landmarks."

Even though participants expressed unanimous interest in applying cyberlearning tools in the future, they also highlighted four main obstacles or concerns that they *per se* need to overcome as they move toward becoming digital native or digital-native like citizens: (a) familiarity with technology, (b) the lack of technology skills and knowledge, (c) being up-to-date on the latest in technology and digital devices which they incorporate into lessons, and (d) comfort with and confidence in technology devices. For example, three participants stated:

> *"I feel that a psychological resistance that I must overcome was the fact that I needed help setting up the first time. I was not familiar with how the gaming console worked; therefore, I had no prior schema to activate. I felt that because I was the teacher I was the one who was supposed to know everything on setting up, when in fact, because I did not know I should have allowed my digital native student to help me immediately … When a pre-service teacher or just a teacher is confident in the resources they are using will allow for both teacher and student to exchange their digital native citizenship" (Tomoko).*
>
> *"I also realized that I had a lot to catch up on when it comes to updating myself with the latest technology and games. Often, the students were the ones telling me how to play a game or how to start the game or how to get to the main menu. I realized that I must improve my technology skills if I am to keep up with the needs of my students as each generation relies more and more on technology in their everyday lives … I was a little discouraged by how outdated I was on the technology" (Yuki).*

"I still fear the use of technology due to the fact that technology is unpredictable. Also because there are some forms of technology I still do not know how to use, such as tablets/ ipads, and smart boards, the X Box, and the Wii. Despite my unknowledgeable use of certain technologies, I feel that this pre-service project has allowed me to explore more, while staying in my comfort zone" (Wu).

Three Big Changes to University-Based Teacher Education Programs

Participants in this study proposed several changes needed in current university-based teacher preparation programs for improving future teacher effectiveness. Teacher education programs should consistently include teacher-training emphasizing the introduction of a variety of technology and how it can be integrated seamlessly into classrooms, which was highlighted by Xiaoping:

"Most of the courses do not use technology, and during my field experiences I was not exposed to it as much as it can be used. I've seen some smart boards inside the classes, but I would want to know how to use them before I get into the field. The use of technology inside the classroom courses will benefit all pre service teachers before going into their own classrooms. I would suggest that the course should teach students a "how to" rather than tell us we will have these different types of equipment. When I got into the field I didn't know what some of the equipment being used was for. I think the courses should explain what technologies can be used inside the classrooms; also, how to improve if the technology is not available. Technology is a very crucial role in everyday life. I think if the courses used more of it as a "hands on" tool it would be a great resource."

Similarly, Wu went on to share that it is important to activate bilingual pre-service teachers' prior knowledge on technology since prior knowledge is linked to technology usage that then determines successful technology integration in classrooms.

"I would create a class such as this one, but I would allow the students to explore all types of technology before going into the field. This way the pre-service teachers can already have some prior knowledge about the different technology they will be using, and so that they can identify which kind of technology would benefit them in certain situations."

Another change identified in this study was the collaboration of teachers to design technology-mediated lessons and sharing technology-mediated teaching experiences, materials and lesson plans. Experienced teachers also provide pedagogical support by assisting pre-service teachers in differentiating lessons to meet their students' learning styles through the use of technology. By working together, pre-service teachers may be able to use technology to develop meaningful lessons.

"In respect to the lesson planning, "I feel that the teacher education professors should try to have a former teacher help pre-service teachers understand how to make viable lesson plans. This is important because although we have studied the theory behind lesson plans, the art of making lesson plans is a bit more complex. Having to take into consideration the different learning styles of each student, as well as determining the overall objective of the lesson is important. Experienced teachers will be able to give the pre-service teachers useful insight of students' response to particular lesson plans" (Tomoko).

Besides learning in schools, one teacher highlighted that as the technology integration in classrooms gains momentum, there is also crucial to link home and school with technology. For example, Tomasa said:

"The changes that I would suggest to the current teacher education programs would be how to be able not just to teach in their classroom but how to be able to teach kids after school from home. The first idea I would have is podcast. Teachers would be able to record their class and put it online for students to see. This would not only help students but it could also benefit parents who want to see what their child is learning in class, or it could help them understand how to help their child. Even online tutoring could be another benefit to the school system. Nowadays every computer has a built-in web cam that could potentially help make the connection from school to home."

Challenges in the Home and School Environments

Integrating technology into future classrooms is an aim that many pre-service teachers strive for but some of them were faced with challenges in environments that may impact their effective integration. What students lack, in most cases, is the shortage of technology in home learning environments. Therefore, students were not able to expose themselves to lessons fully designed with technology tools at homes. Tomoko illustrated this point:

"A challenge for the students might be their own family. Many students here come from low-socioeconomic families. Most of the families' concerns revolve around when and how they are going to get their next meal or have a safe place to sleep at night … These real world laboratories also give the students a chance to interact with technologies that they might not have available to them at home. By being exposed to the XBOX with Kinect, Nintendo Wii, Smart Buddies, laptops, and tablets, students either knew or learned to use them. They were also able to see how technology could be fun and educational."

Tomasa also made similar comments:

"There are three types of challenges that I will face while trying to implement this new way of learning. The first would be families with a low income and their lack of technology. Even though technology is very popular and can be found in almost every household, there are still households that do not get these types of privileges. So for those students I would have to find another way to come into contact with this student."

Yuki identified family support for teachers as a challenge that prevents her from using technology effectively in learning environments:

"I believe that I will encounter many challenges when it comes to teaching my future digital students. As far as family goes, there may be parents or guardians that do not agree with my method of teaching and do not support me as their child's teacher. As everyone knows, parental support is essential for a healthy line of communication and cooperation between the teacher and the parent. This is unfortunate for the student who suffers by not being able to bring home the strategies being taught at school."

Regarding support from family and parents, Tomasa suggested that teachers should explain the specific benefits that technology can afford to their bilingual children's education to parents.

Finally the third challenge will be getting parents and students to use these resources. According to Tomasa:

" Anyone can send out a flyer or note home saying that the student has this resource, but I think it is the teacher's job to fully explain to parents about how this can help their child. This means they would have to show factual evidence. A parent's night would be best in order for teachers to explain how we are trying to make education better."

In addition to home-environmental challenges, pre-service teachers will need school

support in purchasing appropriate and suitable technology, gaming systems, and tablets. For example, Wu explained:

> "I believe that some of the environmental challenges that we future pre-service teachers will face in the classroom will be that not all students will have access to certain technology, the school may not have enough funds to provide technology or updated technology, which can disrupt the systematic use of instruction … As for the school not having access to technology could limit what the teacher teaches. For example, if a school does not provide computers for their students, then the students will have fewer resources to use. If the school does provide technology but is not up to date, then it could result in major time wasting, due to the equipment not functioning properly, as well as not providing the accurate information, due to outdated information. These are just some of the challenges I think we will face as future teachers in our classrooms."

Conclusions

There were three major findings in this study. First, data analysis suggested that Net Gen pre-service teachers had positive perceptions and beliefs toward the laboratory of cyberlearning workstation practices. The hands-on experiences helped them enhance their future teaching skills to become familiar with technology, plan for instruction to suit their students' individual abilities and learning styles, and stimulate teaching with technology.

Similarly, Hofer and Grandgenett's (2012) study proposed that adequate teacher preparation in M.A. Ed. programs greatly improved pre-service teachers' technological pedagogical knowledge (TPK) and technological pedagogical content knowledge (TPACK). Pre-service teachers had opportunities to think systematically about teaching, instructional planning, and technology integration. Kim, Jain, Westhoff, and Rezabek (2008) also found that faculty modeling of computer-based technology in a university course which was required for students majoring in education impacted pre-service teachers' intent to use computer-based technology.

Second, the researchers identified some crucial obstacles or concerns that pre-service teachers *per se* need to overcome as they move toward becoming digital native or digital-native like citizens, such as (a) familiarity with technology, (b) the lack of technology skills and knowledge, (c) being up-to-date on the latest in technology and digital devices which they incorporate into lessons, and (d) comfort with and confidence in technology devices. Consistent with past research, (Başer & Yildirim, 2012; Keengwe, Onchwari, & Wachira, 2008; Kopcha, 2010; Staub & Stern, 2002), individual teachers have been identified as the key element in determining success of technology integration for student learning, such as teachers' knowledge and skills to teach educational technology, philosophy, pedagogical perceptions about learning and technology, confidence with technology, or professional development.

Finally, findings suggested that environmental factors influence the effective use of technology in future digital native classrooms among per-service teachers. The researchers distinguished between home and school learning environments. Home factors refer to the lack of technology in home settings and family support, whereas school factors refer to the lack of budget in purchasing up-to-date instructional technology in school settings. The findings were also partially consistent with other studies (Park & Ertmer, 2008; Wachira & Keengwe, 2011). For example, Wachira and Keengwe (2011) found that barriers to using technology in mathematics classrooms includes "(a) unavailability and unreliability of technology, (b) lack of technology support and technology leadership, (c) anxiety and lack of confidence in using technology and (d) lack of knowledge" (p. 22).

Recommendations and Limitations

This study explored Net Gen Bilingual pre-service teachers' narratives on cyberlearning workstations after participating in a field-based laboratory of practice designed by the researchers. Findings (at this stage, they cannot be generalized yet; further field-based experimentations are needed) have critical significance for educators involved in teacher preparation of today/future elementary digital native students using the NETP's (U.S. Department of Education, 2010) transformative approach. In fact, the NETP's (U.S. Department of Education, 2010) objectives are a radical call for structural changes of the entire U.S. educational system. These cannot be achieved without the adoption of technologies that the majority of digital native children use in their daily lives as supplemental resources by school districts.

Based on the research findings, the researchers recommend the following to enhance technology use in education:

1. Adoption of digital technologies as supplemental resources can be considered an evolutionary approach of promoting educational changes powered by technology. It fosters only first or second order educational changes (Bartunek & Moch, 1987) within the old box (schools district system). To move toward a revolutionary or third order (radical) approach of transforming the American educational system, digital learning, educational video games, 3D virtual world learning environments and simulators, etc must be used as core media of instruction aimed at fostering students' learning motivation, engagement and learning retention rates at highest level.
2. The adoption of cyberlearning technologies and 3D virtual world learning platforms as core media of instruction encompasses not only current and future digital native students' natural gifts of creativity and production, but also best learning style: peer – learning (which was accredited as one of the best instructional strategies to increase student learning retention rate at the highest level (Lalley & Miller, 2007). Therefore, it is imperative to train future elementary teachers to become not only content experts, but also designers/ developers and independent providers of digital game-based curriculum and 3D virtual world learning environment.
3. Teachers should take advantage of existing technology resources in their communities (Wachira & Keengwe, 2011). Wachira & Keengwe (2011) suggest that "to mitigate the effects of inadequate technology or lack of appropriate software … teachers can seek out and take advantage of free and easy to use technology resources" (p. 24) in local libraries.

This research had some limitations. First, it was conducted at an after-school learning program. The researchers explored how cyberlearning workstations are integrated into informal learning settings from perspectives of pre-service teachers. These findings cannot be generalized. Second, there were limited pre-service teachers participating in this study. The project should be conducted in formal learning settings with more participants.

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