ACTION RESEARCH

BUILDING COMPUTER TECHNOLOGY SKILLS
IN TESOL TEACHER EDUCATION

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This paper reports on an action research study that investigated factors influencing TESOL (teaching English to speakers of other languages) teacher candidates’ (TCs) selection and use of technology in the English as a second language (ESL) classroom and the influence of explicit training in context in the use of computer technology for second language learners at the PreK-12 grade level. The data suggest that developing these skills in a highly contextualized setting enhances ESL teachers’ knowledge, skills, and beliefs in terms of the use of technology in the ESL classroom.

Keywords: Technology in Teacher Education; TESOL Teacher Education

INTRODUCTION

The use of technology in education can no longer be thought of as a choice to be made on the part of teachers, nor can it be considered an add-on to the curriculum or reserved for special occasions in the classroom. It has been argued that there is a gap that continues to widen between the types of knowledge and skills students learn in U.S. schools and the actual types of knowledge and skills they need to be successful in the 21st century workforce and global economy (Partnership for 21st Century Skills, 2005). The U.S. federal government, under the umbrella of the No Child Left Behind Act (NCLB), has made attempts to address this gap. NCLB, through the Enhancing Education Through Technology Act of 2001, requires states to provide evidence that “every student is technologically literate by the time the student finishes the eighth grade, regardless of the student’s race, ethnicity, gender, family income, geographic location, or disability” (U.S. Department of Education, 2001, p. 247).

In addition to federal initiatives, the national technology standards (ISTE, 2008), calls for meaningful and competent integration of technology to be infused within the educational context, and TESOL International provides Technology Standards for both English language learners (ELLs) and English language teachers (Healey, Hanson-Smith, Hubbard, Ioannou-Georgiou, Kessler, & Ware, 2011). The authors, through a review of the relevant literature, address the underlying issues that necessitate the development/revision of the standards (pp. 8-10):

1. Research shows that there are important benefits to be gained from the use of technology in language learning and teaching.
2. Technology should be incorporated into teaching pedagogy so that students will not only effectively acquire a second language but will also develop electronic literacy skills.
3. Research shows that technology in language learning is not being used to its full potential and that inadequate teacher training and learner training are some of the main reasons for this.

The TESOL Technology standards for language teachers are comprised of four goals:

Goal 1: Language teachers acquire and maintain foundational knowledge and skills in technology for professional purposes.

Goal 2: Language teachers integrate pedagogical knowledge and skills with technology to enhance language teaching and learning.

Goal 3: Language teachers apply technology in record-keeping, feedback, and assessment.
Goal 4: Language teachers use technology to improve communication, collaboration, and efficiency.

Together with the above mentioned issues, these goals give clear guidance in terms of the importance of technology use in the language classroom and the types of skills that language teachers need to develop in order to meet the needs of their ELLs, and provide guidance to teacher education programs about the experiences teacher candidates (TCs) should be exposed to during their professional education programs.

In addition to the aforementioned initiatives and policy calls, the Common Core State Standards (CCSSI, 2010, a & b), which have been adopted by 45 U.S. states and the District of Columbia, mention the use of technology throughout the documents related to all content subjects. An example of the requirements for technology use as defined in the CCSS is as follows: “students employ technology thoughtfully to enhance their reading, writing, speaking, listening, and language use” (p. 7), and students “use technology, including the Internet, to produce and publish writing and to interact and collaborate with others” (p. 18).

Based on the aforementioned focus on teachers’ ability to teach using a number of current technologies, the present research seeks to develop an understanding of the ways in which TCs in a TESOL teacher education program think about and use technology with ELLs. If, as was suspected at the outset of this research as a result of a review of classroom observation data, a gap exists between TCs’ underlying knowledge of the importance of integrating technology and their actual facility in the classroom with a variety of current technologies, what role can the teacher education program play in closing this gap?

**CALL and English Language Learners**

When teachers effectively integrate technology into the curriculum ELLs receive direct benefits. Emerging technologies and Computer Assisted Language Learning (CALL) used with ELLs are “ideal for fostering reading and writing skills in the target language” (Johns & Torrez, 2001, p. 11). Use of technology with ELLs can develop language, literacy, and technological literacy skills. It can help teachers differentiate content, process, and product for ELLs so the issues of language proficiency level, motivation, interest, background knowledge, and learning preference are addressed. This enables ELLs to have full access to the curriculum so they are able to reach the same goals as mainstream learners.

Specifically related to the success of CALL, a meta-analysis of 52 studies was conducted (Felix, 2005) and the general findings were that there are positive effects for ELLs in terms of vocabulary development, reading, and writing and that generally, student perceptions of CALL are positive if the technologies are “stable and well supported” (p.16). This study also highlights negative aspects of CALL which include, “training needs in computer literacy for both students and teachers” (Felix, 2005, p. 16). Based on the extant research relating to ELLs and the benefits they receive when teachers integrate technology, both in terms of the acquisition of their second language and the development of content knowledge, the expectation would be that ESL teachers are proficient with a number of current technologies and are using technology on a daily basis to build skills in the ESL classroom. However, in spite of the positive effects that CALL can have on a number of outcomes for ELLs, there is a lack of effective preparation both in terms of the amount of exposure teacher candidates receive to CALL and the quality of the experiences that programs offer (Kessler, 2006; Peters, 2006).

**The Role of Teacher Education Programs**

Teacher education programs are not immune to the call for the integration of technology into curriculum and many have developed coursework that addresses this issue. However, the efforts are not standard across programs and produce variable results. Efforts have been referred to as “isolated, often uncoordinated, and in some cases, dysfunctional” (Fleming, Motamedi, & May, 2007, p. 208). Research has pointed to the need for modeling of technology in teacher education classes (Albee, 2003; Fleming, et al., 2007; Francis-Pelton, Farragher, & Riecken, 2000; Strudler & Wetzel, 1999) and support with the application of technology during student teaching and field experiences (Dexter & Riedel, 2003; Russell,
Bebell, O’Dwyer, & O’Connor, 2003). When specifically looking at CALL and the knowledge, beliefs, and practices of language teachers, researchers have found that the skills related to effective CALL integration must be “situated in authentic learning contexts” in order to change teachers’ practices (Egbert, Paulus, & Nakamichi, 2002, p. 122). Kessler (2006) found that graduates of TESOL teacher preparation programs were generally not satisfied with the type of preparation they received in terms of effective CALL and felt that there was an overall lack of preparation. Additionally, Kessler (2007) found that language educators, while generally confident in their use of technology with positive beliefs about the use of technology in language education, require development in specific areas of use, specifically in integration of technology in their classrooms (p. 184). Kessler suggests that:

Formal CALL preparation should be at least as influential toward a teacher’s attitude toward technology [sic] informal training if it is to continue. To achieve this, programs of study may need to face revision to include a CALL component in order to adequately address the changing needs of language teaching professionals. Perhaps a CALL component should be introduced into all language teaching masters programs. Perhaps CALL could be integrated into a variety of pedagogical classes, thus allowing it to be introduced in a contextualized and relevant manner. (2007, p. 184).

It is this direct integration that is examined in the current paper.

METHOD

TCs were enrolled in graduate TESOL methods courses and provided with 12 hours of explicit exposure to computer technology for educational purposes where they were able to deconstruct the use of computers as educational tools and develop a knowledge base and experience in applying their theoretical skills to the classroom setting.

The following research questions are addressed by this work:

1. What are ESL teacher candidates’ self-efficacy beliefs about and practices in the use of technology in ESL classrooms or in working with ELLs?
2. What barriers do candidates report in terms of using technology in the classroom?
3. Can candidates’ self-efficacy beliefs and practices relating to technology be influenced through experience, reflection, and focus on process?

Participants

Fifty-three teacher candidates (TCs) were enrolled in three different methods courses over a two-year period in an M.S.Ed. TESOL program at a public college located within the City of New York. The groups consisted of 46 female and 7 male TCs who ranged in age from 22 years of age to 51 years of age (average age 28 years). The coursework leads to a Master of Science in Education or to an Advanced Certificate in TESOL or Bilingual Extension (for candidates who already have a master’s degree) and to state certification in ESOL PreK-12 or Bilingual Education. Of the fifty-three TCs included in this research, three were pre-service teachers. Fifty were in-service teachers who had certifications in Childhood education (32), English 7-12 grade (7), Social Studies 7-12 (4), Spanish (5), Special Education (2). During the first semester 18 graduate students enrolled in a secondary (middle and high school level) ESL methods course participated in the study, during the second semester 19 TCs enrolled in a Teaching ESL through the Content Areas course participated, and during the third semester 16 TCs enrolled in a pedagogical grammar course participated. The goals of the project were as follows:
• Determine self-efficacy beliefs and practices of technology use in the ESL classroom.
• Develop candidates’ skills in integrating technology in a meaningful way into their curriculum.
• Create learning activities where technology is a natural part of the experience that enhances learning.

Procedures
Students were administered a computer self-efficacy and use survey (8 item, 5-point Likert scale) at the beginning and end of each semester which asked a variety of questions regarding their personal use of computers, their beliefs on the effectiveness of computer use in the ESL classroom, and barriers that they identify in integrating computer technology in their classroom practice. A set of course readings on a variety of issues relating to teachers’ technology use formed the foundation for the loop input component of the course. Loop input integrates process and content in a way that provides “experiential learning, but with the added advantage of involving self-descriptivity and recursion” (Woodward, 2003, p. 303). These readings were a supplement to the required text readings relating to the actual content of the course. Each weekly class included one hour of explicit instruction in using instructional technology that were developed using a model set forth by Mistretta (2005) during training sessions for pre-service mathematics teachers. In part, this study replicates Mistretta’s work with pre-service mathematics teachers (2005) to extend knowledge of integrating technology to other educational disciplines. Finally, TCs were provided with an evaluation framework, discussion points for the collaborative development of technology based lessons, and lesson plan criteria all adapted to the context of TESOL methods courses from Roblyer (2003).

The class time set aside for this project included dedicated time in the computer lab (classes were scheduled in smart classrooms that had computer stations for all students and internet connections) where TCs were able to evaluate, use, and develop technology based lesson/unit plans. Collaborative teams worked throughout the semester to develop technology-based learning activities for ELLs and reflect on the process. Reflective discussion and writing were weekly features, which often took place online using Blackboard Academic Suite Inc. The course structure is outlined in Table 1.

Table 1. Course Structure (Adapted from Mistretta, 2005)

<table>
<thead>
<tr>
<th>Session type</th>
<th>Description</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>Modeling of instructional technology; discussions of readings on technology &amp; CALL in ESL classrooms; self-evaluation survey</td>
<td>3 hours (3 1-hour blocks)</td>
</tr>
<tr>
<td>Guided evaluation</td>
<td>Evaluation of instructional technology, Web resources; opportunity to share insights &amp; findings. (Materials included digital cameras, flip cameras, ipods, Skype, Websites, social networking, software)</td>
<td>3 hours (3 1-hour blocks)</td>
</tr>
<tr>
<td>Collaborative learning</td>
<td>Collaborate /actively participate in research &amp; evaluation of instructional technology &amp; Web-based resources &amp; create technology experiences for the ESL &amp; college classroom</td>
<td>3 hours (3 1-hour blocks)</td>
</tr>
<tr>
<td>Collaborative lesson planning sessions</td>
<td>Use skills and knowledge built in the course to select, create, and integrate appropriate technology into ESL lesson/unit plans aligned with the course goals: for example, grammar based units in the pedagogical grammar course and content based instruction in the ‘Teaching ESL through the content areas’ course</td>
<td>3 hours (3 1-hour blocks)</td>
</tr>
</tbody>
</table>
RESULTS

Data Analysis

The pre and post course survey responses were analyzed by first determining the mean and standard deviation for each survey item. Percentages were computed based on the raw responses. In addition, a paired, single tailed t-test was used to determine the difference of the means and the significance between pre and post course survey responses.

Candidates’ Computer Use, Outcomes Beliefs, and Self-Efficacy

At the beginning of each semester TCs provided information on their personal and instructional use of computers. Initial survey results (N = 53) showed that 47% of TCs had been using computers for personal use between three and five years, 15% reported using computers for less than three years, and 30% reported using computers for five to eight years, and eight percent reported using computers for more than eight years. The mean weekly use was 10.2 hours. In terms of how participants viewed their computer use profile, 60% of participants rated themselves as users, 20% responded that they were good users, 10% identified themselves as experts, 6% reported that they were novice, and 4% reported that they were non-users (using the computer infrequently and not using email). As far as access to computers, 85% of the participants reported that they had access to computers and the Internet in their homes, while 100% had access to computers and the Internet in their homes, schools (PreK-12), or college setting. Participants gained their knowledge of computer use from a variety of sources. The majority, 60%, reported that they learned to use computers on their own. Twenty-three percent pointed to college course work requirements as the source of learning (not formal training in computer use but rather a need to accomplish tasks given for course assignments). The rest of the respondents reported that they either learned from others, but not from formal computer teachers (7.5%), through professional development and in-service education/training (6%), and from formal coursework/computer training (3.5%).

Professional access to computers was not an issue for these TCs: 100% reported that they either had a computer or computers in their classrooms or the school had dedicated computer space with Internet access. When asked, ‘How often do you use the computer in the classroom for group learning activities and lessons”, 49% responded that they rarely use the computer, 30% reported that they use the computer on a monthly basis, 16% reported weekly use, and 4% reported daily use.

Finally, participants were asked to identify barriers to computer use in their teaching. The majority, 87%, reported that knowledge of how to integrate instructional technology was a major factor in their actual use of the computer in their teaching. This can be related to teacher knowledge. Eighty-four percent reported that they experienced management issues when they used the computers, which caused them to not use it as frequently. This barrier can be related to teachers’ skills. Ninety-two percent of teachers who had to schedule time in the computer lab (as opposed to having equipment in their own teaching space) reported that the time was inadequate and a barrier to use. This speaks to effective use of resources. Eighty-three percent reported that they were unaware of the types of computer-based technologies that would be most effective for their learners, again, relating to teacher knowledge. Finally, 88% reported that the time and effort required to implement a technology component to their instruction wasn’t worth the outcome. This speaks directly to teacher beliefs about the effectiveness of instructional technology.

Pre and Post Course Survey Data

With regard to self-efficacy in the integration of computer technology in the classroom, the majority of participants reported very low levels of ability in all survey areas except their ability to enhance students’ technological skills while integrating computer technology into the classroom.

Sixty-four percent of participants and 59% of participants respectively reported that they were either not skilled or somewhat skilled in their ability to address ESOL and content standards when using computer
technology in their lessons (Items 1 and 2). Fifty-eight percent felt that they were not skilled or somewhat skilled in enhancing students’ critical thinking ability with computer technology in their lessons (Item 3). However, 81% felt that they were skilled, very skilled, or expert in their ability to effectively enhance students’ technological skills through the integration of computer technology in the classroom. However, when it came to issues of management, Seventy-one percent of participants, nearly three quarters of the group, reported that they felt they were not able to manage instruction when they used computers in their lessons (Item 5). Participants also felt their abilities were low in terms of targeting the needs of all learners when using computers in their lessons (Item 6) and in their ability to select appropriate materials that would be used with the computer (Item 7). Participants rated their ability to facilitate the English language development of their ELL students (Item 8) and 53% reported that they were not skilled or skilled in their ability to do this. This compares to 47% of participants who felt they were skilled, very skilled, or expert in this area.

At the end of the semester TCs were administered the follow-up survey and pre and post course responses were compared. Table 2 provides a summary of the pre and post course survey data which includes a single tailed t-test on the mean value of the difference for the paired data.

Participants exhibited positive change in their self-perceived skills in the use of computer technology between the pre-course and post-course survey responses.

### Table 2. Comparison of Pre and Post Survey Responses (mean Likert response 0-4 scale)

<table>
<thead>
<tr>
<th>Prompt: Rate yourself in terms of your ability to effectively integrate computer technology into the classroom in a meaningful way that:</th>
<th>Pre-survey mean</th>
<th>SD</th>
<th>Post survey mean</th>
<th>SD</th>
<th>Mean difference Pre/Post</th>
<th>t</th>
<th>p *</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Addresses ESL standards</td>
<td>1.26</td>
<td>1.15</td>
<td>2.77</td>
<td>.67</td>
<td>1.51</td>
<td>13.74</td>
<td>p &lt; .001</td>
</tr>
<tr>
<td>2. Addresses content standards</td>
<td>1.34</td>
<td>1.27</td>
<td>2.77</td>
<td>.61</td>
<td>1.43</td>
<td>10.98</td>
<td>p &lt; .001</td>
</tr>
<tr>
<td>3. Enhances critical thinking</td>
<td>1.49</td>
<td>1.27</td>
<td>2.42</td>
<td>.95</td>
<td>.92</td>
<td>9.22</td>
<td>p &lt; .001</td>
</tr>
<tr>
<td>4. Enhances students’ technological skills</td>
<td>2.28</td>
<td>1.01</td>
<td>3.25</td>
<td>.43</td>
<td>.96</td>
<td>9.23</td>
<td>p &lt; .001</td>
</tr>
<tr>
<td>5. Allows you to effectively manage instruction.</td>
<td>.89</td>
<td>1.03</td>
<td>2.36</td>
<td>.83</td>
<td>1.47</td>
<td>21.26</td>
<td>p &lt; .001</td>
</tr>
<tr>
<td>6. Targets the needs of all learners</td>
<td>1.42</td>
<td>1.22</td>
<td>2.21</td>
<td>.95</td>
<td>.79</td>
<td>9.61</td>
<td>p &lt; .001</td>
</tr>
<tr>
<td>7. Selects appropriate materials, resources, etc.</td>
<td>1.21</td>
<td>1.08</td>
<td>2.89</td>
<td>.78</td>
<td>1.68</td>
<td>17.44</td>
<td>p &lt; .001</td>
</tr>
<tr>
<td>8. Facilitates the development of English language skills</td>
<td>1.55</td>
<td>1.15</td>
<td>2.47</td>
<td>.95</td>
<td>.92</td>
<td>17.49</td>
<td>p &lt; .001</td>
</tr>
</tbody>
</table>

Note. The computed p values were expressed in negative exponentials. For example, the p-value for question number 1 is: 3.0261E-19. The E-19 is exponential notation (a way to present very small numbers without a string of zeros) and indicates that the decimal place is 19 places to the left, giving us .00000000000000003026. This is reported as p < .001.

Participants experienced positive growth on all items relating to the effective integration of computer technology into their ESL lessons. In terms of their ability to address ESL and content standards, 93% and 96% respectively reported that they felt skilled, very skilled, or expert in their ability to address standards when integrating computer technology in their lessons (items 1 and 2). More importantly, none of the participants reported that they were not skilled in either of these areas. Eighty-three percent of participants felt that their ability to enhance critical thinking skills of ESL students when implementing computer...
technology into their ESL lessons was skilled, very skilled, or expert (item 3). Moreover only 17% reported that they were either not skilled or somewhat skilled, as compared to 58% who responded this way at the beginning of the course. While 81% of participants reported that they felt skilled, very skilled, or expert in their ability to enhance ESL students’ technological skills at the beginning of the course, the shift to participants feeling very skilled to expert represented 62% change in a positive direction. After the course participants felt they possessed the skills necessary to effectively manage instruction (Item 5) while integrating computer technology (58% change in a positive direction) and there was a 39% change in participants belief about their ability to target the needs of all learners (Item 6) when using computer technology in the ESL classroom. The change in beliefs about participants’ ability to select appropriate materials (Item 7) related to integrating computer technology positively shifted 65%. Finally, in terms of participants’ beliefs in their ability to develop English language skills (Item 8) there was a 30% shift towards enhanced efficacy beliefs among the respondents.

DISCUSSION

The initial setting where TCs have the opportunity to build the skills necessary to create learning experiences that integrate computer technology in their PreK-12 grade ESL teaching placements is in their teacher preparation programs. However, several sources have reported that pre-service teachers do not use computer technology in their preparation programs and may not be exposed to effective models of computer technology use during their professional education (CEO Forum on Education and Technology, 2000; Kessler, 2006; 2007). Additionally, researchers have argued that while there have been numerous calls for teachers to be prepared to integrate technology in their teaching, and coursework relating to technology has become part of many teacher education programs, pre-service teachers have not been required to apply what they have learned (Albee, 2003; Dexter & Riedel, 2003; Fleming, Motamedi, & May, 2007; Russell, Bebell, O’Dwyer, & O’Connor, 2003). It is not surprising that previous research has found a strong correlation between the amount of hands-on practice with technology during teachers’ professional education and enhanced self-efficacy beliefs and confidence in their skills (Fleming, Motamedi, & May, 2007). The present study offers additional support for the importance of providing contextualized, hands-on practice with computer technology during pedagogy courses to authentically develop a strong foundational knowledge base on which to build technology into teaching and actual practice to facilitate the development of skills related to computer technology use in the ESL classroom, as called for by Kessler (2006; 2007). Combined, these activities enhance TCs’ self-efficacy relating to computer technology and promote positive beliefs about the integration of computer technology into their ESL classrooms.

CONCLUSION

Although this study investigates the experiences of a small group of ESOL and TCs (N = 53) in a single higher educational setting, the findings reinforce previous investigations of teachers’ technology use in that the participants in this research used computers in their personal lives, but personal use did not translate to classroom use. Additionally, teachers in this study report that they experience a variety of barriers to successful integration of technology. Combined with these real barriers, the participants display low levels of self-efficacy regarding the successful integration of computer technology in their teaching at the start of the course. The structure of the described courses was one that had a positive effect on these self-efficacy beliefs. These positive changes may be a result of the contextualized nature of the introduction of current technologies and the inquiry-based way in which the participants approached learning about CALL. As Kessler recommends, “Perhaps CALL could be integrated into a variety of pedagogical classes, thus allowing it to be introduced in a contextualized and relevant manner” (2006, p. 184).

The importance of developing technological literacy skills for ELLs is critical to equitable access and
participation in the types of 21st Century language skills that are a requirement in our increasingly technological society, and this need is underscored in the TESOL technology standards (2011).

Teacher education programs are responsible for developing pedagogical skills in their candidates, and computer technology is a part of the curriculum that falls within that domain. It is not enough to simply state that candidates are required to integrate technology in their lesson and unit planning. Teacher educators and programs must develop ways to build these skills in their candidates in a contextualized way. Like their PreK-12 grade students, those enrolled in teacher education courses need explicit instruction. Research has shown that there is little transfer between personal technology use and classroom practice, so opportunities for learning these skills must be part of the fabric of certification programs. In addition, the skills are best built in context rather than in a general technology course since the lessons learned in such courses, while valuable, may not transfer in a discipline specific way to the candidates’ specific subject area.

Participants in this study were exposed to ways in which computer technology might be integrated into the ESOL classroom through critical readings, the collaborative construction of meaning, and example lessons. In addition, they were asked to evaluate themselves as computer users and teachers, which provided the jumping off point for a series of reflective conversations that problematized the issue of successfully integrating computer technology in the ESL classroom. Candidates were then able to investigate and evaluate a variety of computer based- resources, which then led to the creation of a class-created annotated bibliography which became a resource for their own instruction. Candidates then extended this research into a collaborative activity in which they continued their research and evaluation and developed a series of learning experiences for the PreK-12 communities of which they were a part. The course provided structured opportunities to critically analyze issues relating to the use of computer technology, collaboratively research and evaluate Web-based materials and software, and plan learning experiences aligned with content and TESOL standards. The contextualized nature of the course gave a framework within which to operate. For example, during the pedagogical grammar course candidates were investigating Web-based grammar materials and software designed to teach grammar to ESOL students then were required to develop lesson plans that seamlessly integrate some of the materials they investigated. This made the candidates’ task very focused, specific, and manageable.

While the course structure described in this study may not solve all of the challenges related to integrating computer technology, the structure described does provide evidence for the positive effects such a structure can have on teacher candidates, and ultimately on PreK-12 grade student outcomes.

ACKNOWLEDGEMENTS

I would like to thank the TESOL graduate students who participated in the courses described in this article. I also thank my colleague, Orlando Alonso, for his valuable input on earlier versions of this manuscript. All errors are my own.

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