An English Learner Service-learning Project: Preparing Education Majors Using Technology and the SAMR Model

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Abstract

The growing population of culturally and linguistically diverse students and one-to-one computer initiatives in K-12 schools in the U.S. necessitates higher education institutions to prepare future teachers with effective ways to integrate high quality technology into teacher preparation programs. This mixed methods study focused on an innovative service learning experience (SLE) that integrated the use of the SAMR (Substitution, Augmentation, Modification, and Redefinition) technology framework in an elementary English as a Second Language (ESL) tutoring assignment for 22 undergraduate education majors at a southern university in the United States. Data collected included pre- and post- surveys on the confidence levels of technology use and final reflective papers describing the education majors' perceptions of the SAMR Model. The survey results showed a statistically significant increase (p = .013) in the confidence of education majors using various hardware. There were no statistically significant differences in the applications and perceptions categories. Survey results highlight the need for preservice teachers to gain experience using various technological hardware in educational settings. Reflections indicated that the majority of the education majors used the lower levels of the SAMR Model. Approximately half of the students overestimated or underestimated the level of technology integration in the SAMR framework.

Keywords: English learners, SAMR Model, service learning

Introduction

"ELs, students whose primary language is other than English, are the fastest growing student population in the U.S." (Kreck, 2014, p. 1). In fact, ELs constitute more than 9% of the enrolled K-12 US population. Poverty, two-parent families, attending under-resourced schools, and lagging behind their monolingual English-speaking peers in achievement mark the demographic profile of ELs. The low achievement has a negative impact on the EL's college education and career prospects (National Academies of Sciences, Engineering, and Medicine, 2017). To help ELs achieve better, Vogt (2009) recommends, "planning preservice and professional development programs that: (a) focus on the effective teaching practices that result in improved academic and language proficiency for English learners, and (b) are responsive to teachers' development over the course of their careers" (pp. 23-24). With reference to preservice preparation to teach ELs, several scholars are also of the opinion that teacher

education programs (TEPs) are not adequately preparing education majors to teach ELs (for example, de Oliveira & Shoffner, 2016; Lucas, Villegas & Freedson-Gonzalez, 2008; O'Neal, Ringler, & Rodriguez, 2008; Samson & Collins; 2012). There are efforts to prepare teacher candidates for the linguistic and cultural diversity P-12 students, which "make coursework more influential, fieldwork more educative, coursework and fieldwork more coherent, and community experiences more transformative" (Cochran-Smith, Villegas, Abrams, Chavez-Moreno, Mills, & Stern, 2016, p. 513). Scholars have used autobiography, personal philosophy papers, movies, activities, anthologies, reflections, and so on in coursework. They have also deliberately planned field experiences such as tutoring at school-based settings or volunteering in community-based settings. Service learning experiences (SLEs) with ELs is another approach to aid preservice teachers to be better prepared to teach ELs. While service learning has been used extensively to provide preservice teachers to experience those who are different from themselves, only a few researchers have studied SLEs with ELs (Able, Ghulamani, Mallous, & Glazier, 2014; Bollin, 2007; Szente, 2008; Tinkler & Tinkler, 2013).

The learning of ELs is central to preparing preservice teachers for the culturally and linguistically diverse groups, and the integration of technology enables ELs to achieve better (Freeman, 2012; O'Hara & Pritchard, 2008; Pritchard & O'Hara, 2009; Warschauer, Zheng, Niiya, Cotton, & Farkhas, 2014). But studies also point out that teachers do not use technology for a variety of reasons: time constraints, unavailable resources, inadequate instructions, need for training and support, and fear of technology (Egbert, Paulus, & Nakamichi, 2002). Clark and Luckin (2012) also state the reasons of lack of time and training for teachers to refrain from integrating technology in their teaching. There is also available literature which states that teachers' fears can be replaced by their confidence to integrate technology as a result of professional development training and preparation in preservice (Ertmer & Ottenbreit-Leftwich, 2010; Huang & Oh, 2018, Lei, 2009; McColgan, Colesante, and Andrade, 2018; Zipke, 2017).

Technology can be integrated in teaching using various models: TPACK, TIM, RAT, and the SAMR for example. Koehler, Mishra, and Cain (2013) describe their TPACK model as follows:

> there are three main components of teachers' knowledge: content, pedagogy, and technology. Equally important to the model are the interactions between and among these bodies of knowledge, represented as PCK (pedagogical content knowledge), TCK (technological content knowledge), TPK (technological pedagogical knowledge), and TPACK (technology, pedagogy, and content knowledge). (p. 14)

The Technology Integration Matrix (TIM) consists of 25 cells: five interdependent characteristics of meaningful learning environments, viz., active, constructive, goal directed, authentic, and collaborative as well as corresponding five levels of technology integration: entry, adoption, adaptation, infusion, and transformation (Welsh, Harmes, & Winkelman, 2011). The RAT model considers the integration of technology in terms of Replacement, Amplification and Transformation (Hughes, Thomas, & Scharber, 2006). Authentic technology-based instruction is not about replacing the instructor with technology. Instead, it should focus on designing technology that conforms itself to the student, allowing the redesign and expansion of learning activities, and creation of new learning possibilities that were not available previously. Looked at from this perspective, the Substitution, Augmentation, Modification, and Redefinition (SAMR) model provides a way to categorize and assess learning tasks and activities (Puentedura, 2006). Integrating Technological Pedagogical Content Knowledge (TPACK) is a more complex for a preservice teacher than an interning teacher or a student teacher. Therefore, we chose to use the SAMR model because its four

components, categorizing and assessing learning tasks and activities, fit best into the ESL service learning tutoring sessions and the design of our study.

Teacher education programs have increasingly focused on two factors: One, technology, discussed in the previous paragraph, and two, the process of reflection. Preservice teachers are prepared to reflect continuously at every step, about their thinking and actions—to the point that reflection is on autopilot (Larrivee, 2000). Studies on preservice teacher reflections in the contexts of culturally and linguistically diverse groups (for example, Birmingham, 2004; Chubbuck, 2010; Garmon, 2005; Howard, 2003) are gaining momentum. Lin and Lucey (2010) recommended both individual and collaborative reflection for PSTs to learn more about themselves and their students with guided and unguided strategies.

Encouraged by the available, but, limited studies on SLEs with ELs and preservice teachers, reflections involving ELs and SLEs, as well as the lack of research with technology-enhanced SLEs, prompted us to explore the outcomes of teacher candidates engaged in authentic learning opportunities with ELs. The purpose of this research study was to analyze the reflections of education majors and teacher candidates in integrating technology in a 15-hour SLE tutoring program working directly with ELs as part of a one-semester course assignment.

Literature Review

NCES (2019) states that ELs made up 4.9 million public school students in fall 2016 and ranged from 0.9 percent in West Virginia to 20.2 percent in California. Despite these growing numbers, teacher education programs are yet to prepare teachers who can capably:

> teach in ways that advocate for equitable and sound instructional practice for English language learners and bilingual students and that consciously intend to engage these students in acquiring the language and language practices needed for understanding and participating in interaction, interpretation, description, argumentation, and explanation, among other valued school uses of language and thinking associated with student learning. (Faltis & Valdes, 2016, p. 549)

Galguera (2011) is of the opinion that teachers must possess pedagogical language knowledge because of the diversity in English Learners. We would also need mainstream teachers to support EL students (Bunch, 2013). Literature shows that preservice teachers are prepared to support ELs in several ways. In a secondary English Methods course, de Oliveira and Shoffner (2016) used course readings, guest presentations, a variety of instructional strategies, class discussion, reflection journals, action research, and 20 hours of practicum. The 5R instructional model of inquiry, viz., repeating, revealing, repositioning, replacing and reloading language was used with elementary science preservice teachers to help prepare them to teach ELs (Weinburgh, Silva, Smith, Groulx, & Nettles, 2014). Daniel (2014) recommends placing preservice teachers for observation and teaching in schools where there are ELs.

One approach to prepare teacher candidates for ELs is to incorporate Service-learning Experiences (SLEs), so that education majors have direct learning experiences teaching ELs. Tinkler and Tinkler (2013) argue that SLEs provide the "possibility to target experiences with particular populations of students, specifically English language learners" (p.108). López & Assaf (2014) found SLE with ELs "developed generative knowledge about ways to support writing for emergent bilinguals. Likewise, they became keenly aware of their own experiences and beliefs." (p. 25). SLEs with ELs "provides opportunities for teacher candidates (TCs) to

engage in positive interactions that help to address misconceptions about students, families, and communities" (Rodriguez-Arroyo & Vaughns, 2015, p. 18). Crosby's (2018) MATESOL TCs in their service learning using technology with ELs advocated issues such as "combating bullying, becoming members of academic communities, and overcoming poverty and issues of socio-economic status" (p. 51). Service learning experiences in teaching ELs for 10 hours per semester at PreK-12, intensive English program, and community adult ESL programs also increased the efficacy of 200 preservice teachers as measured by the modified version of Yough's (2008) Teacher Efficacy for Teaching English Language Learners (TETELL) pre- and post-survey (Garver, Eslami, & Tong, 2018).

The discussion around the preparation of preservice teachers for teaching ELs better is with the purposes of student-learning, college preparation, and better career prospects. Research has shown that the integration of technology has enabled ELs to achieve better. For example, fourth grade ELs in Saugus, California made significant gains in writing, as the result of The One-Laptop-Per-Child (OLPC) program (Warschauer, Zheng, Niiya, Cotton, & Farkhas, 2014). O'Hara and Pritchard's (2008) study indicated that the use of hypermedia with sixth and seventh grade ELs enhanced the vocabulary of students. The same ELs also understood concepts in science better with the intervention of the hypermedia (Pritchard & O'Hara, 2009). Freeman (2012) studied the use of the personalized digital instruction, *HELP Math*, incorporating audio and video features, with 50 secondary ELs, whose posttest math scores significantly increased from their pretest scores as well as compared to those in the control group. While on the one hand, there is growing evidence that ELs learn better via technology, on the other hand, studies also point that teachers are not confident to use technology (Clark & Luckin, 2012; Egbert, Paulus, & Nakamichi, 2002). However, the studies below indicate that interventions of technology at TEPs help teacher candidates develop confidence and overcome the fear toward technology integration.

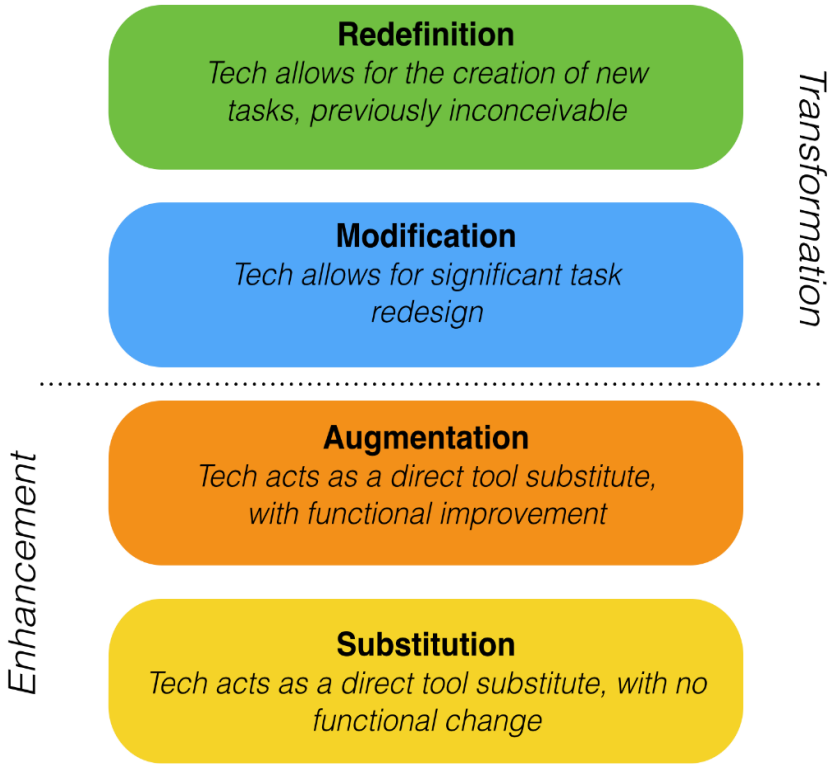
Ertmer and Ottenbreit-Leftwich (2010) suggested that professional development helps to reduce fears and increase confidence in teachers' use of technology in the classroom. McColgan, Colesante, and Andrade (2018) examined the confidence levels of undergraduates, 44% of whom were teacher candidates, before and after the use of a new technology, Minecraft. Responses of the surveys indicated that the confidence levels of the students before the intervention was around 9, on a score range from 0 to 16. After the intervention, the students rated themselves around 11. Results from ANOVA indicated that there was a significant increase in the confidence levels of students. Zipke (2017) states that some teachers possess "technical knowledge" (p. 3), but need "technological pedagogical content knowledge" (TPCK, p. 3). Lei (2009) also found "digital natives" (p. 87) among teacher candidates, but, 22.5% of whom strongly disagreed with the statement on doing well with new technologies, 31.3% who chose to remain neutral, and 48.2% who strongly agreed with the statement (p. 89). While describing the digital pen pal activity with ELs, Hughes and Mahalingappa (2018) report "In their journals, several PSTs communicated initial "anxiety," "uncertainty," or "hesitation at first" (p. 263). Huang and Oh (2018) studied the integration of digital game-based learning environment (DGBLE) with 19 pre-service teachers using the ARCS (attention, relevance, confidence, satisfaction) motivational design model (p. 123). 37% of the responses focused on confidence. This study seeks to expand the current research, specifically in ways to increase technology use with education majors working with our nation's culturally and linguistically diverse students.

Theoretical Framework: The SAMR Model and English Language Learning

We have stated earlier the reasons for our choice of the SAMR model over other available technology integration models. Authentic technology-based instruction is not about replacing

the instructor with technology. Instead, it should focus on designing technology that conforms itself to the student, allowing the redesign and expansion of learning activities, and the creation of new learning possibilities that were not available previously. Viewed from this perspective, the Substitution, Augmentation, Modification, and Redefinition (SAMR) model (Figure 1) was the framework used for this study, because it is one of the K-12 teacher learning and professional development models with respect to educational technology and provides a way to categorize and assess learning tasks and activities (Puentedura, 2006). Substitution is the first level of the SAMR model. This occurs when technology is a substitution for another learning task without major changes. For example, a word processing program replaces a pen/pencil in a writing assignment. Augmentation is the next level of the SAMR model. This happens when the technology acts as a direct tool substitute with functional improvements. Using the same example, a word processing program with the ability to convert text to speech can improve the writing process. Modification is the third level of the SAMR model. Here, the technology permits the learning activity to be a significant redesign. In our example, a paper authored using word processing software with the ability to convert text to speech is a posting on a blog. This would then allow for feedback from other students as replies to help improve the quality of the original paper. Redefinition is the fourth and final level of the SAMR model. This occurs when the technology permits the creation of a new task that, without the technology, was inconceivable. Instead of a word processing document, students could express their logical progression of thoughts through the creation of a multimedia presentation.

Figure 1. The SAMR Model



(Puentedura, 2010)

Although authored in a K-12 context, SAMR has been used in higher education as a framework for evaluating mobile learning (Jude, Kajura, & Birevu, 2014; Romrell, Kidder & Wood, 2014). Used in this manner, SAMR becomes a tool for teachers to integrate technology

into their instruction. Several authors use the SAMR model to develop their own mobile learning models for integrating technology into the undergraduate classroom (Abdullah, 2014; Patton, 2015; Pfaffe, 2017). Other researchers looked at the use of specific technology tools such as Instagram (Al-Ali, 2014) and virtual world avatars (Hopkyns & Nicoll, n.d.) with the SAMR model. In their book chapter on the use of mobile devices in language learning, Kukulska, Hulme, Lee, and Norris (2017) suggest that there are potentially far reaching impacts of the use of mobile technologies at the modification and redefinition levels on language content and curricula and the evolving roles and competencies of teachers. In the field of English language learning, Hockly (2012) suggested the use of the SAMR Model as a way to help teachers of ELs reflect on how they integrate technology into their classroom. Unfortunately, there is little knowledge about the use of the SAMR model as a way to help preservice teachers learn how to integrate technology into their classrooms with ELs. To resolve the gap in the research, the authors sought to investigate an innovative service learning experience project providing direct experiences with education majors tutoring elementary ELs using technology.

Research Questions

The following research questions guided the development of this study:

1) What is the effect of the intervention of the use of technology to tutor ELs in the service-learning experience on the confidence levels of integrating technology of education majors?
2) How do the education majors articulate their understanding of the SAMR model framework in their service learning experience?

Methods

One of the researchers, who was the instructor for a course in Multicultural Education, became distinctly aware that the majority of the undergraduate teacher candidates in the Childhood Education and Educational Studies Programs had few experiences working directly with ELs. Because the English Learner K-12 student population is growing rapidly and many of the education majors expressed a desire to obtain an add-on ESL (English to Speakers of Other Languages) Endorsement to their teaching certifications, the instructor decided that a Service Learning component would provide the teacher candidates with the opportunity for direct experiences working with ELs. Working with the university's Center for Community Engagement and Service Learning Departments, the instructor formed a partnership with a local elementary school with a high population of ELs, a perfect fit for the innovative project. To strengthen the partnership, the teacher education program placed the Childhood Education majors at the school site location for the full semester.

For the new Council for the Accreditation of Educator Preparation (CAEP) standards, diversity and technology are two critical areas that cut across all standards and require new learning and substantial innovation by preparation providers (CAEP, 2013). According to the CAEP Handbook (2016), diversity includes the incorporation of multiple perspectives, respect and responsiveness to cultural differences, and candidate understanding of their own frames of reference. This study addresses both CAEP areas with a specific focus on Standard 2: Clinical experiences that prepare candidates to work with all students and the incorporation of technology to improve teaching effectiveness, enhance instruction, and manage student and

assessment data "while engaging students in the application of technology to enhance their learning experiences" (CAEP, 2016, p.13).

Setting and Participants

In this project, there were 24 education majors enrolled in a Multicultural Education course, a required course for both programs, Childhood Education and Educational Studies in a mid-sized mid-south university. Of the 24 students, 22 completed the pre- and post-surveys, 21 identified as females and one preferred not to respond to gender identity. In the racial categories, there were 16 White, 3 Hispanic, 1 Asian, 1 American Indian, and 1 multiracial. The majority of participants were college juniors and seniors between the ages of 20 and 23; two students were non-traditional. Pseudonyms for each study participant matched the survey responses and writing samples.

Data Collection Procedure

A mixed methods approach was used to collect and analyze data, and the SAMR Model was the framework for the study. The Institutional Review Board granted approval, and university students and children's parents signed the required consent forms. Purposive sampling was used, and twenty-two preservice teachers shared their reflections in pre- and post-surveys and reflection papers. The convergence of these two collection methods provided triangulation of data that enhanced validity and strength of the data analysis and research findings.

Quantitative Tools

For the quantitative portion of the study, a pretest-posttest research design was employed. The education majors completed a pre- and post-survey at the beginning and the end of the semester-long course. The SLE served as an intervention. Shirvani (2014)'s modified survey, which evaluates three different categories related to technology use, was modified and administered at the beginning and end of the semester. Likert items assessed participants' (a) confidence using the internet or mobile applications, (b) confidence with specific hardware (such as desktop computers, smartphones, cameras, and tablets), and (c) perceptions of the impact of technology in the classroom. Data were collected through these surveys to help illuminate effects of this study on preservice teachers' perceived self-efficacy with technology tools in an educational setting.

Applications, the first category of survey items, reported participants' perceived competence using technology to conduct research, to differentiate instruction, to develop lesson plans, and to manage student data. Hardware, the second category, reported perceived competence using computers, smartphones, tablets/iPads, and video tools in the classroom. Perceptions, the final category in the survey, reported participant opinions regarding the value of digital vs. print media, the usefulness of technology in instruction, the reliability of technology, and anticipated professional support for teachers attempting to implement technology in their classrooms (Appendix B). Pre- and post-survey data were analyzed using a paired samples *t*-test.

Qualitative Procedures

Final reflection papers included self-reported reflections in a narrative format documenting the students' identification and application of the SAMR Model categories in three separate ESL

tutoring sessions. Qualitative methods included structural coding based on the already established SAMR conceptual framework (Puentedura, 2006), with participants' written reflections serving as the primary data source. By reading the university students' descriptions of technology application, the researchers were attempting to uncover patterns. A grounded theory (Strauss & Corbin, 1998) analysis was the method that attempted to uncover the meaning that the education majors ascribed to their ESL tutoring experiences.

Service Learning Project

In the fall of 2017, the preservice teachers had a school tour and brief orientation session with the ESL Facilitator at the partnership elementary school, comprised of 70% ELs. Each university student received a profile of the assigned EL student with a photo and information about the child's home language and English proficiency level. The assigned tutees were primarily intermediate level ELs ranging from kindergarten to fifth grade. In the university course, the students learned about the 4-Step Model of becoming a multicultural educator. The required textbook was, *Becoming a Multicultural Educator: Gaining Awareness, Skills, Knowledge, and Taking Action* (Howe & Lisi, 2016). In the tutoring sessions, the education majors would be applying the 4-Step model, developing awareness and knowledge of others as cultural beings, applying instructional skills on the incorporation of the culture and experiences, and integrating technology.

Each education major had an assigned teacher who provided the tutoring materials or general tutoring directions, and the school's ESL (English for Speakers of Other Languages) Facilitator helped coordinate mutually convenient weekly tutoring sessions, approximately 30 minutes per session. Towards the middle of the semester, education majors had an assignment to add 21st Century skills to begin exploring ways to integrate technology into the tutoring sessions through the lens of the SAMR Model. The university students had the assignment to use three pieces of technology to assist and enhance the tutoring experience.

Prior to the integration of technology, the instructor provided a sample demonstration in class of how to use voice-recognition on an iPhone. Students were provided time to practice voice recognition on their personal phones, and they had the option to check out iPads or voice recognition devices, which were purchased with internal grant funds to develop and investigate the innovation. The university students were to document the integration of culturally relevant pedagogy and technology into each tutoring lesson. Each university student had a journal, in the form of 3-ring binder, to reflect on their learning and growth working with the young ELs.

The goal of the SLE was to deliver a high-quality service learning engagement model incorporating culturally relevant pedagogy and technology serving both preservice teachers and elementary ELs. The elementary ELs would gain by the mentoring of older students, and the education majors would improve their practice and become positive role models for the EL children who would increase in English language development. The integration of technology would be another layer providing additional tools for the preservice teachers to explore further engagement by incorporating culture, language learning, and technology. The education majors were encouraged to integrate technology using voice-recognition, handheld devices, or other technology to capture student voices and language development while incorporating culturally relevant pedagogy into the tutoring practices

Reflective practices were also critical to the study. After each tutoring session, the university students completed short audio-self-reflections to document the tutoring session topics, what went well, what did not, and their plans for the next session. The promotion of voice-recognition recordings and handheld devices were an intentional component of the SLE assignment to increase reflective techniques with technology. According to Bergman (2015), "preservice teachers need to get beyond the discomfort with recording and inexperience with

equipment" (p. 140). With ongoing practice using self-recording or video-recording devices, teachers can further develop the habit of self-reflection, a key characteristic of highly effective teachers.

The SAMR Model was a brief introduction in one class and the education majors watched two videos on their own. In addition to an introduction to the SAMR Model and the introduction of one app, Duolingo.com (https://www.duolingo.com/), the education majors received no other technology ideas, except for some directions and websites (See Appendix C):

RESULTS

Quantitative Findings

Descriptive statistics were used to analyze the confidence levels for using the technology before and after the SLE tutoring of education majors. The means for all the three categories in the survey show an increase on the post-test as compared to the pre-test (Table 1). This indicates that the SLE increased the confidence of the education majors to use technology and on their perceptions about technology.

In order to find out if the difference in the means between the pre- and post-tests were significant, a paired *t*-test was computed. The results are in Table 1.

Table 1
t-Test for Pre-and Post-Surveys

	Pre-survey		Post-survey			
	M	SD	M	SD	*t*	*P*
Applications	15.68	2.25	16.86	2.21	-1.85	.079
Hardware	13.00	2.07	14.27	1.75	-2.73	.013
Perceptions	19.82	2.84	19.91	2.39	-0.16	.871

Note. n = 22 for all categories. Survey items were rated from strongly disagree (1) to strongly agree (4). Significance level at $\alpha = .05$.

Table 1 answers Research Question 1:

> What is the effect of the intervention of the use of technology to tutor ELs in the service learning experience on the confidence levels of integrating technology of education majors?

The pre-and post-survey results of the *t*-test indicated that there was no significant difference (at $\alpha = .05$) in the education majors' confidence with desktop or mobile device applications after the intervention of the use of technology in tutoring ELs ($M_{pre} = 15.68$, SD = 2.25; $M_{post} = 16.86$, SD = 2.21; $t = -1.85$, $p = .079$).

The pre- and post-survey results showed that there was a statistically significant increase in participant confidence in the use of various hardware, such as computers, phones, tablets, and cameras ($M_{pre} = 13.00$, SD = 2.07; $M_{post} = 14.27$, SD = 1.75; $t = -2.73$, $p = .013$) .

The results of the *t*-test also indicated no significant difference (at $\alpha = .05$) in the education majors' perceptions of technology use in classroom settings after the intervention of the use of technology in tutoring ELs ($M_{pre} = 19.82$, SD = 2.84; $M_{post} = 19.91$, SD = 2.39; $t = -0.16$, $p = .871$).

Qualitative Findings

The students' reflection papers served as the data to answer Research Question 2: How do the education majors articulate their understanding of the SAMR model framework in their service learning experience?

According to Lincoln and Guba (1985), one way to establish "credibility" of the coding is to ask other researchers to code the same transcript and then discuss the similarities and differences of the resulting sets of codes. Therefore, to strengthen inter-rater reliability, four researchers analyzed the narrative textual data separately and reconvened to discuss their findings (See Appendix D). The researchers read the education majors' reflection papers line by line and used open coding to write notes about what the students had explained regarding the use of the SAMR Model technology in their tutoring sessions.

The reflections were given a rating of 1, if the researchers and students agreed on the SAMR category.

A score of zero (0) was the rating, if the students incorrectly identified the use of the SAMR category.

Reflection Journal Narratives Examples

The SAMR Model framework helped students focus specifically on the use of technology tasks or activities in three of their tutoring sessions. The two narratives selected below are typical examples of the students' responses to how they perceived using the SAMR Model categories, Substitution, Augmentation, Modification, or Redefinition. The narratives provided the raters with documentation to evaluate the students' responses with a correct rating of one (1) or an incorrect rating of zero (0).

Narrative 1

> ***RATING of "1" -*** *In one session, Veronica stated, "I used* ***Substitution*** *a cordless keyboard replaced an A-B-C chart. The keyboard is to improve skills in what letters look like while also learning about computer key placement. Instead of a basic A-B-C chart, students convey analytic thought using the keyboard, rather than just memorization of the chart. Using items that will be used daily, such as a keyboard can create excitements for students while also learning curriculum."*

In this sample narrative, Veronica correctly identified that the cordless keyboard was replacing an A-B-C chart, and the researchers agreed that ***Substitution*** was the correct level of the SAMR model.

Narrative 2

> **RATING of "0"** – *The 3rd technology we used, was* ***Google Earth.*** *On our first day together, we were talking about her family and she told me she had family in Mexico, but she did not know what Mexico looked like and where it was on a map. On our last session together, I brought my Chromebook and used Google Earth to see pictures of*

> *Mexico. This would be an example of transformative learning, because it helped gain insight into who her family is and where some of them still live. This would be an example of* ***Augmentation.*** *Using a normal map, we would not have had access to the satellite pictures that Google Earth provides. Using the interactive map, my student was able to see different parts of Mexico and the vast difference between the small villages and large city. Without this technology, this activity would not have had the profound impact that it did. Seeing these images helped both of us to learn more about the country of her family. She did not know the name of the town they were from, so we used the map to find random towns, then we used the Internet to look up the population, business, and traditions of the places. This was a fun activity, and I think my student learned that learning is at the tip of her fingertips.*

In this example, the researchers agreed that the university student incorrectly identified the use of the SAMR model (rating of "0"). While the student felt as if the task was the ***Augmentation*** level of SAMR, the researchers agreed that the student underestimated the SAMR level description. Because the task created a completely new task design, visiting the child's home country neighborhood and surrounding areas, the researchers agreed that ***Modification*** was the correct SAMR level.

The reflection paper responses indicated that only three of the 23 education majors were able to provide a successful identification of the level of SAMR in each of their three practices. Conversely, another three of the 23 education majors labelled all three SAMR levels incorrectly. In the first attempt using technology in a tutoring session, 13 of the 23 education majors accurately used the first two levels, Substitution and Augmentation. By the second attempt at integrating technology, 11 education majors moved to the next level of the SAMR model, and by the third round of technology integration, 3 education majors implemented a task using Redefinition. Ten (10) overestimated the level of technology integration and 11 underestimated the level of technology integration, according to the SAMR framework. Students accurately identified the correct level of technology integration according the SAMR framework 50.7% of the time (35/69 attempts). Some students either did not follow the directions correctly or had no technology integration (10/69 attempts). See Appendix D.

Final Papers and Technology Use

The education majors' final reflection papers consisted of an analysis using the SAMR Model. Appendix E reports the technology used in the service learning tutoring assignment describing the types of technology each education majors used in three tutoring sessions. After the university students learned about the language and content area needs of their assigned ELs, they looked for technology (See Appendix A) that could further assist language and content learning. Some of the university students who were completing teaching internships at the assigned school used technology they had observed in the mentor teachers' classrooms. Chromebooks, iPads, USB recorders, mobile phones, and a cordless keyboard were the devices mentioned in the reflection papers. See Appendix E.

Discussion

As we strive for high quality technology integration in our schools, it is becoming clear that Teacher Preparation Programs (TPPs) need to increase the ways to prepare future teachers to use technology effectively. Referring to Research Question 1: *What is the effect of the*

intervention of the use of technology to tutor ELs in the service-learning experience on the confidence levels of integrating technology of education majors? The survey results highlight the need for preservice teachers to gain experience using various technological applications in educational settings.

It is encouraging that the direct use of different devices with K-5 students enabled preservice teachers to feel comfortable to integrate technology in the tutoring sessions. The increase in confidence in the education majors in the use of hardware is in consonance with findings that teachers' fears for technology can be replaced by their confidence to integrate technology as a result of professional development training and preparation in preservice (Ertmer & Ottenbreit-Leftwich, 2010; Huang & Oh, 2018, Lei, 2009; McColgan, Colesante, and Andrade, 2018; Zipke, 2017).

With regard to Research Question 2: *How do the education majors articulate their understanding of the SAMR model framework in their service learning experience?* The results of this exploratory study indicated that although the education majors tried to integrate technology in their ESL tutoring sessions, they mostly integrated it at a low level (Substitution or Augmentation), and only half of the education majors' attempts accurately identified the level of the SAMR framework at the correct level of technology integration performance. This may be because the students had only a brief training along with several resources to read and view on the SAMR framework, and then they were to select a technology and integrate it without any one-on-one mentoring or modeling.

Some of the students who were interning at the assigned school modelled the use of technology observed in the mentor teachers' classrooms. Therefore, observing an experienced teacher who models technology use with ELs is one way to increase the use of technology integration for education majors. Cradler et al. (2002) recommend subject faculty and teacher education program (TEP) faculty should model the use of technology for preservice teachers. Preparation of preservice teachers must integrate national, state, English language proficiency, and local technology standards. Teachers with exceptional skills for using technology ought to serve as mentors for preservice teachers. School leaders should use technology for teachers to model and assist with training and resources. The use of technology should undergird assignments, field observations, and practice. Based on their experimental study, Kazakoff and Bers (2012) recommend that TEPs focus on engaging preservice teachers in technology use within their classrooms. Elwood and Savenye (2015) report that TEPs used three models for integrating technology: "methods/content infusion, field-based experience, and stand-alone educational technology course" (p. 2297).

While measuring the effect of the service learning experience was not the only focus of the article, we believe that the findings from both the quantitative and qualitative research indicate indirectly that the service learning experience had a positive impact on the education majors. In the study, university students who expressed getting to know the child's cultural background helped them to develop more meaningful tutoring sessions with technology. For example, one university student used Google Earth to help transform the learning environment for the tutee by sharing the landscape of the child's home country in relation to the child's current community. Forming relationships assisted the tutors in gaining cultural awareness that could enhance language learning with technology integration.

By utilizing technology from the time ELs enter school, educators can capitalize on students' background knowledge, work in the students' ZPD (Zone of Proximal Development), foster motivation, and enhance students' learning environments. The concept of the zone of proximal development (ZPD) gap introduced and developed by Vygotsky (1980) states that there is a gap between what an individual can perform on his own and what he is capable of performing with peer/expert help. Therefore, social interaction, which takes place during a

tutoring SLE, is important in creating language-learning environments using technology to help create a bridge to learning, thereby reducing the digital divide and creating educational equity.

Limitations and Suggestions for Future Studies

There are limitations when teacher educators conduct research in their own classrooms. For example, the study focused on the education majors' self-reported responses in one semester, a short timeframe. Students may have felt obliged to participate in the study and respond in a particular way to the pre-and post-surveys and reflection paper questions, even though the researcher explained that grades were not involved in their participation in the study. While the research obtained informed consent from each participant, there was a relatively small sample.

Suggestions for future studies could analyze reflective journals for notetaking and the voice recording data of preservice teachers involved in SLEs with ELs. For future studies with SLEs and ELs, intentionally identify experienced mentor teachers or faculty members to serve as mentors and coaches who could effectively model tutoring activities, technology integration, and language tasks. Additionally SLE studies could address cooperative learning practices with university students connecting their course content, readings, and learnings by sharing in class their strategies and resources for technology integration with ELs.

Conclusion

Because our nation's EL population will continue to rise, integration of service-learning experiences and technology in teacher education programs could be a promising practice for traditional educational foundations or methods courses, and not only in courses directly related to multicultural issues. Technology practices could be structured in ways where there are multiple opportunities to practice under the direction of a mentor teacher, media specialist, or university faculty member, as well as ongoing engagement in reflective practices about the benefits and ways to make technological improvements in instructional practices for ELs.

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Appendix A.

Web-based Tool	**Website**
Brain Pop	https://www.brainpop.com/
Duolingo	https://www.duolingo.com/
Free Rice	http://freerice.com/
Front Row	https://www.frontrowed.com/
Google Earth	https://earth.google.com/web/
IXL	https://www.ixl.com/

Prodigy	https://www.prodigygame.com/
Quizlet	https://earth.google.com/web/
Reflex Math	https://www.reflexmath.com/
Spelling City	https://www.spellingcity.com/
Story Bots	https://www.storybots.com/
Weirdwood	http://weirdwood.com/

Mobile Apps	**Link**
Doodle Buddy	https://www.microsoft.com/en-us/store/p/doodle-buddy/9wzdncrfhzq4
Futuba	https://itunes.apple.com/us/app/word-games-for-kids-futaba/id426517722?mt=8

Appendix B: Pre- and Post-survey Items

Category	**Item**	**Pre-M**	**Pre-SD**	**Post-M**	**Post-SD**
Applications	I can competently guide student research using the Internet.	3.14	0.64	3.32	0.57
	I can use technology to differentiate instruction.	3.09	0.53	3.41	0.50
	I can use the Internet to develop lesson plans.	3.32	0.57	3.55	0.51
	I can competently use tablet apps.	3.32	0.57	3.36	0.49
	I can use a digital program to manage student data.	2.82	0.73	3.23	0.53
Hardware	I can competently use a computer in the classroom.	3.32	0.57	3.68	0.48
	I can competently use mobile devices in the classroom.	3.41	0.59	3.68	0.48
	I can competently use tablets (e.g., iPads) in the classroom.	3.27	0.63	3.64	0.49

	I can competently use a video camera in the classroom.	3.00	0.62	3.23	0.69
Perceptions	Electronic media will replace printed text within five years.	2.77	0.75	2.82	0.59
	Most technology would improve my ability to teach.	3.00	0.62	3.00	0.62
	Technology can change the way that I teach.	3.23	0.43	3.36	0.49
	Students are more knowledgeable than I am using technology.	2.68	0.72	2.64	0.73
	School systems expect us to learn new technologies without formal training.	2.82	0.73	2.77	0.69
	There is too much technological change coming too fast without enough support.	2.77	0.61	2.82	0.80
	Technology is unreliable.	2.55	0.74	2.50	0.74

Appendix C

Complete the following activities to learn more about SAMR:

1. View this introduction video on SAMR by its creator, Rueben Puentedura https://www.commonsense.org/education/video
2. Read this in-depth overview of SAMR by Kathy Schrock, an expert in the field of K-12 technology integration. http://www.schrockguide.net/samr.html
3. Read through these examples of lesson plans using the SAMR model. http://www.emergingedtech.com/2015/04/examples-of-transforming-lessons-through-samr/

The instructor used a constructivist approach and encouraged the interns to get to know their tutors and explore one or more technology tools that would assist in the tutoring sessions. Directions for the reflection paper were as follows: For the final paper, you are going to use the SAMR model to evaluate the technology integration activities you completed with your ELL students. For each of the three technology uses you chose, answer the following questions:

1. Is this an example of an enhancement or transformation learning activity? Why?
2. Make an argument for how you used each of the three technologies according to one of the four levels of SAMR model.
3. If you choose Substitution, answer:
   "What will I gain by replacing the older technology with the newer technology?"
4. If you choose Augmentation, answer:
   "Have I added an improvement to the task process that could not be accomplished with the older technology at a fundamental level?"
   "How does this feature contribute to the design of my learning activity?"
3. If you choose Modification, answer:
   "How is the original task being modified?"

"Does this modification fundamentally depend on the new technology?"
"How does this modification contribute to the design of my learning?

4. If you choose Redefinition, answer:
"What is the new task?"
"Will any portion of the original task be retained?"
"How is the new task uniquely made possible by the new technology?"
"How does this new task contribute to the design of my learning activity?"

Appendix D

SAMR Technology Integration

	Name	Tech 1 (SAMR)	Teacher	#	Tech 2 (SAMR)	Teacher	#	Tech 3 (SAMR)	Teacher	#
1	Sadie	S	S	1	A	A	1	S	S	1
2	Becky	S	R	0	None	N		None	None	
3	Cara	S	S	1	A	A	1	M	M	1
4	Taylor	S	S	1	A	S	0	S	S	1
5	Yvette	S	R	0	A	S	0	S	M	0
6	Fiona	S	S	1	A	A	0	S	S	1
7	Chris	S	S	1	A	A	1	R	M	0
8	Harrah	S	S	1	S	S	1	A	A	0
9	Iliana	A	A	1	A	S	0	A	A	1
10	Joanna	none	A		A	A	1	none		
11	Laura	none	N/A		None	N/A		none	N/A	
12	Kara	A	A	1	A	A	1	A	A	1
13	Nancy	S	M	0	A	A	1	S	S	1
14	Odelia	S	S	1	A	M	0	A	M	0
15	Regan	M	A	0	M	A	0	M	M	1
16	Sabrina	A	A	1	M	M	1	A	M	0
17	Alice	M	M	1	M	M	1	A	M	0
18	Diana	S	A	0	M	M	1	A	A	1
19	Uma	A	S	0	A	S	0	R	A.	0
20	Vera	S	S	1	S	S	1	M	A	0
21	Wendy	A	S	0	M	S	0	R	unsure	0

22	Eva	A	A	1	A	A	1	A.	A.	1

Appendix E

Technology Use in ESL Service Learning Project

	Name	Tech 1	Tech 2	Tech 3
1	Sadie	App with simple words	Story Bots	Long Vowel Word Study
2	Becky	iPad for letter recognition.	N/A	N/A
3	Cara	iPad. Teacher reads a word and students write on the iPad	Brain Pop Video-students learn about the water cycle	USB recorder. Student self-records and listens to the teacher; then student re-records voice for inflection
4	Taylor	iBooks	IXL (student could listen)	Google docs
5	Yvette	iPhone reading app	iPad (read & write app)	MacAir to read a book
6	Fiona	Paint app	IXL	Smart Board Word Sort
7	Glenn	Chromebooks	Reading National Geographic with glossaries	Researching with audio and video for a presentation.
8	Harrah	Geoboards	Magnetic Alphabet	Epic! App-student chose a book to read
9	Iliana	Grammar Up app	Text with Audio	Text with cursive writing and moving animals
10	Joanna	Online games for vocab.	YouTube-3 Little Pigs	
11	Laura	Kahoot	Duolingo	Todor K-2 Math
12	Kara	Weirdwood Book Series	Weirdwood Book Series	Weirdwookd Book Series
13	Nancy	App for site word recognition	YouTube with rap songs for site words.	Apple emojis for math problems (iPhone)
14	Odelia	Doodle Buddy. Students draws letters & words with different colors or glitter.	Phonics song on YouTube. Students would sing along, speaking and listening.	Sight Words, Kids Learn app. Student can press on a star to get hints while reading aloud. S can record own voice
15	Regan	Prodigy	Reflex Math	Tape Recording
16	Sabrina	Google images video	Futuba. Activity is redesigned	Spelling City with different spelling games such as a word search.
17	Alice	N/A	Reflex Math	Front Row
18	Diana	Used an iPad to type words	Quizlet-several different games with student choice	Spelling app. Drag letters to bottom and spell words
19	Uma	Free Rice app. Multiple choice answers with motivation of rice increasing	Kindle book. Green Eggs and Ham. Highlights a word and adds examples.	Google Earth. Interactive map allowing student to search visuals of her hometown.

		to feed the hungry. Social justice.		
20	Veronica	ABC Chart; used a cordless keyboard	Bingo Game on iPad	iPad app with SnapChat filter
21	Wendy	The iPad auto-corrected misspelled words that the student had types with "q" and "g"	Google-search provided a way for the student to look up words and pictures to understand space terms	iPad Camera "largest" and "huge". Students took photos of familiar items to learn the adjective vs. comparative forms
22	Eva	iPad table to spell out words and count by 5s. Motivational level increased with a timer.	Same app used for Tech 1	N/A