Digitally Inclined

Re-Envisioning a Pre-Service Educational Technology Course Through Self-study

Chinwe H. Ikpeze

Technology | Pre-service Teacher | https://equitypress.org/ | Living Theory

According to Pinnegar and Hamilton (2009), self-study gives us the opportunity to explore the gap between who I am and who I would like to be in practice and "studies that self and the others involved as the self takes action to reduce or alter that gap" (p. 12). In doing this, one of the challenges is going beyond one's own perspectives and taken-for-granted assumptions to look at and understand practice in new ways (Loughran, 2007). Deliberately articulating one's pedagogical reasoning and values is one way to understand practice in new ways (Fransson & Holmberg, 2012; Loughran, 2007).

Another way includes using theory to reframe the context and thus challenge one's own understanding of the context and one's own practice. As a teacher educator engaged in self-study, the preservice educational technology course was a concern to me, because while students learned a lot of information from the course, their learning lacked depth and their skill at applying what they learned was low. The purpose of my self-study was to re-envision this course by promoting deeper learning in order to close the perceived teaching-learning gaps. Deeper learning (DL) is defined as the type of learning that activates learners and motivates them to actively explore, engage with, reflect on, and produce knowledge (Maycock, 2019; Pereira & Wali, 2019). It is the process of learning for transfer, which means applying learning to new situations.

I hope to generate living theories that would help explain how to prepare preservice teachers (PSTs) to effectively design and integrate technological tools in their own classrooms. The major research question was "how can I foster deeper learning in a pre-service educational technology course?"

Technology and Teacher Education

In the past decades, there has been a considerable amount of effort and expense on technology adoption in teacher education (Donelly, 2006). Research indicates that an important influence in new teachers' adoption of technology is the quantity and quality of the technology experiences included in their teacher education programs (Agyei & Voogt, 2011; Drent & Meelissen, 2008). To prepare pre-service teachers for effective technology integration, teacher education programs need to help them build knowledge of good pedagogical practices, technical skills, and content knowledge, as well as how these concepts relate to one another (Koehler & Mishra, 2009). It is important to promote best practices in design, integration, and use of learning technologies so that PSTs can apply their learning to their own teaching

situations (Donelly, 2006, Fransson & Holmberg, 2012). This realization is the reason why many institutions have introductory technology courses focused on the development of technological knowledge and skills

However, a gap exists between what pre-service teachers are taught in their courses and how teachers use technology in real classrooms (Ottenbreit-Leftwich et al., 2010). Beginning teachers feel that they are not well prepared to effectively use technology in their classrooms (Tondeur et al., 2012). In a review of literature on preservice technology integration, these researchers noted that aligning theory and practice, using teacher educators as role models, learning technology by design, scaffolding authentic technology experiences, and collaborating with peers, are all critical factors in preservice technology integration (Dourneen & Matthewman, 2009; Kay, 2006; Tondeur, van Braak, Sang, Voogt, Fisser, & Ottenbreit-Leftwich, 2012).

Theoretical Framework

Two major theoretical frameworks are used to address this topic. These include the universal design for learning (UDL), and the SAMR model.

The universal design for learning (UDL) is a framework for learning based on research in the fields of neuroscience, education, and psychology that focuses on a responsive curriculum and how instruction can be better developed and planned for diverse learners (Myer et al., 2014). The UDL framework encourages professionals to develop curriculum that optimizes learning by providing multiple paths to attaining learning goals that meet the needs of all learners (Meyer et al., 2014) in order to increase engagement, attunement, and self-regulation of the learner (Brown, 2009). The UDL posits that the curriculum must provide learners with multiple means of engagement, multiple means of representation, and multiple means of action and expression to optimize how students learn (Meyer et al., 2014). Multiple means of expression help to provide learners with alternatives for demonstrating what they know (CAST), while multiple means of engagement facilitate learners' interests, offer appropriate challenges, and increase motivation. With regard to multiple means of representation, CAST (2009) argues that teachers should ensure that key information is equally perceptible to all students by 1) providing the same information through different sensory modalities and… 2) providing information in a format that will allow for adjustability by the user…. (p. 11).

The second theoretical framework is the SAMR model. The SAMR model is a structure for educators to think about and clarify how they are engaging technology into teaching and learning (Puntedura, 2006). The Model categorizes four different degrees of classroom technology integration. The acronym "SAMR" represents these four levels of integration. The letters stand for substitution, augmentation, modification, and redefinition. While it is often visualized as a ladder or staircase, this might be misleading because substitution (the lowest level of the ladder) could sometimes be the best option in a given pedagogical situation. Therefore, it is better to think of the SAMR model more as a spectrum. Substitution is the lowest level. Here, technology is used as a one-to-one replacement for traditional tools. An example is using the interactive whiteboard to draw a K-W-L chart or take morning attendance instead of doing those on a regular board or on paper. In the augmentation level, technology acts as a direct tool substitute with functional improvements. An example is using a word processor and text-to-speech function to improve the writing process or integrate audio, and video or other multimodal elements to enhance teaching. Modification allows for a significant task redesign. An example is having students create a digital travel brochure that integrates video and voice. At the last stage, which is redefinition, technology enables experiences that cannot be replicated in the classroom. Altogether, these theories helped me to rethink the course and promote deeper learning which helped to generate living educational theories.

Methods

Data were collected from a PSTs' introductory technology course, designed to provide students with the needed foundation in educational technology to help them navigate other courses where technology proficiency was required. The participants were 29 preservice teachers (7 males and 22 females) who took the course in two semesters in a

college in Northeast U.S.A. The major objective of the course was to help preservice teachers learn to advocate, model, and teach safe, cultural, legal, and ethical uses of digital technologies as well as utilize, evaluate, and justify technology decisions to help them support lifelong learning for their future students. Although the course was constantly revised to improve students' learning, deeper learning was never fully achieved.

The living theory methodology (Whitehead, 1989, 2009) was used for this study. Living theory is an aspect of self-study research in which educators research questions that are important to them to generate their values-based explanations of their educational influence on their own learning, the learning of others, and the learning of the sociocultural contexts (Whitehead, 1989, 2009; Whitehead & McNiff 2006). Like self-study, the living theory methodology helps teacher educators engage in a systematic inquiry that focuses on improving practice and generating knowledge by asking the question "How can I improve what I am doing?" The living theory methodology involves methodological inventiveness, action-reflection cycles, narrative inquiry, and personal and social validation. In addition, it is important to consider many elements that facilitate effective instruction such as modeling teaching strategies, explaining theory clearly, devising learning activities, selecting resources and readings, prioritizing topics (Whitehead, 2009, p.110). Using self-reflexive, first-person action research, explanations that I produce of my learning, the learning of others and that of the sociocultural context where I work enabled me to build my own "living theories' (Whitehead, 1989). I gathered diverse data and generated evidence to support my claims and then tested these claims for their validity through feedback from others. Like Sanyal (2018), I came up with some questions:

- What are my concerns about the educational technology course?
- What evidence do I have to show that the educational technology course is having the intended influence on myself and students' learning?
- How do I ensure that my judgments/conclusions about teaching and learning in this course are reasonably fair and accurate?
- How do I modify this technology course in lieu of my inquiry?

My Concerns

My major concern was that students' learning was not as deep as it should be. As a result, their ability to apply theories learned in class to real-life situations or analyze issues in educational technology was mediocre.

Gathering Data to Examine My Practice

My goal for the course was to foster deeper learning through varied learning opportunities. I examined my teaching and students' learning in this course through an action reflection cycle drawing from my personal narratives, my reflective entries after each class meeting, observations from class interactions, video analysis, focus group interviews, students' artifacts including blogs and course surveys. Equally important was feedback from a critical friend (Stolle et al., 2019).

These data reflected multiple layers of interactivity (Fletcher et al., 2016). This is important because multiple perspectives on our practice "help to challenge our assumptions and biases, reveal our inconsistencies, expand our potential interpretations and help triangulate findings" (LaBoskey, 2004, p. 849).

What Evidence Do I Have to Show That What I Am Doing Is Having an Influence?

I observed students as they engaged in several activities. I wrote reflections after each class session and analyzed the exit tickets. I collected data from my personal reflective entries, students' online discussion entries, Padlet entries, students' blog reflections, and focus group interviews. Data were also collected from recorded class videos and students' surveys at the beginning and end of each semester. Data were analyzed using thematic analysis. Thematic analysis is a method for systematically identifying, organizing, and offering insight into patterns of meaning (themes) across a data set (Braun & Clarke, 2014). I read all data sources thoroughly to make sense of the data. I then annotated

the data and identified initial codes. I used the UDL as a framework and coded for words from students' feedback that indicated multiple means of expression, action, reflection, and multiple means of engagement. For example, for multiple means of engagement, I coded for words from students' reflections such as *like, challenging, fun, engaging, relevant, and critical thinking*. For multiple means of expression, I coded for *choice and agency, and flexibility*. These codes were then examined for patterns and themes. Data were triangulated to enhance validity. The themes indicated that a combination of several strategies led to deeper learning.

Personal Influence: Growth in Knowledge of Technology Pedagogy. In reframing the course, I depended on my reflective entries and personal narratives about course interaction and activities. These reflections enabled growth in knowledge as I analyzed my pedagogical moves and students' feedback. After each class, I analyzed students' exit tickets and reflections and then wrote my own reflections. At midterm, the students assessed their learning using the Padlet. I wrote this in my reflective journal:

> *Today, the students worked in groups in three different stations. In the midterm reflection station, students analyzed their midterm Padlet entries and summarized their findings as to which topics were their favorite, which activities resonated with them, and suggestions for improving the course. In the digital field trip station, students navigated a digital field trip website that had the Seven Wonders of the World. The students were required to explore any one of the Seven Wonders of the World and write about it. In the smartboard station, students were asked to log on to the smart notebook website and download a lesson or an activity and then modify it. I used a timer to ensure that students know when to transition to a new station. At the end of the three stations, we debriefed. Each group talked about what they learned from each station. After that, students completed the exit tickets and reflections on their station activities. I collected students' write up about their leaning in each station and their reflection on the station activities…*

Based on my reflective analysis of class interactions and students' analysis of their own reflections using the Padlet, my living theory is that pre-service teachers like course activities that are fun, engaging, authentic, and foster creativity. These themes were consistent across every feedback that I got from them. Another living theory is that they enjoy collaborative activities.

Using Theory As a Guidepost. The theories UDL and SAMR provided a framework for me to think about how technology could be integrated into this course. In addition, they helped me evaluate the learning activities that I designed for students and facilitated my development of a deeper understanding of their applicability to my own practice.

As I re-envisioned the course, I not only emphasized the frameworks but also ensured that the students had several activities where they learned to use the frameworks to analyze several course assignments and frequently practiced several scenarios in which the theories can be applied in real life. For example, using UDL as a guide, I worked to increase student engagement. I provided them with an array of choices in regard to course activities so as to meet their personal and professional needs for learning. A variety of assessments were integrated throughout the course, which provided the PSTs with the opportunity for multiple means of expressing what they had learned. Quizzes were taken via Quizlet, Plickers, Kahoot, and on paper and pencil, individually and sometimes collaboratively. For major course activities like creating WebQuests, digital field trips, and web pages, students decided on their own topics and ideas and worked with a partner if they desired. The hybrid nature of the course afforded students the opportunity to work online and offline, which added more choice.

The living theory from my reflections is that the theory-practice connection is critical for PST technological proficiency. It is important to explain theories clearly and integrate them across all course activities and assignments so that PSTs practice using them to explain their own pedagogical decisions.

Thematically Organized Authentic Coursework. The problem with stand-alone technology courses is that they may inadvertently promote learning of discreet skills whereby course topics are disconnected and exist in isolation. This was one of my concerns for this course. As I re-envisioned the course, I thought about how to appropriately select and

organize course topics so that students see more clearly how they would use the knowledge in real life. To this end, I added infographics to the digital field trip. An infographic helps students present their projects in a multimodal format with videos, text, pictures, and audio. A voice thread assignment was also added whereby students created a voice thread based on their digital field trips. Peers responded to their lectures through audio, video, or text. Students created webpages where they published aspects of their course work and research. They also had a page dedicated to reflecting on their learning in the course while also responding to each other's blog posts. For WebQuest, the students first completed and critiqued a WebQuest of their choice before redesigning the WebQuest for another grade level. They then analyzed the WebQuest using the SAMR model etc. These course assignments helped students to research, analyze, and present work while being positioned as learners and novice teachers. Opportunity or self-regulation was maximized.

My living theory is that stand-alone technology courses can be useful to pre-service teachers but only when course topics are carefully selected and thematically organized, and students have the opportunity to apply their learning in authentic contexts.

Course Influence On Students

Feeling Prepared to Teach with Technology. Evidence of my pedagogical influence on my students can be gleaned through various course reflections and feedbacks from students collected from course surveys, focus group interviews, and students' blogs. During the end-of-semester course surveys, I asked the students if they felt the course prepared them well to teach with technology. Below were some of the responses:

> *I think it prepared me well. I learned a lot about different apps and other projects that I can implement into my future classroom one day.*
>
> *I feel moderately prepared; I was exposed to a series of new technologies that will be useful in my future classroom*
>
> *I knew a lot about educational technologies before taking this course.*
>
> *However, I did learn about the different theories to better incorporate technology in my classroom.*
>
> *I think I learned a lot about how to evaluate myself when it comes to teaching with technology and the technology standards that exist.*
>
> *I believe this course is a good way to prepare future teachers for the education field.*

As can be seen from the sample above which represented most students, they believed they were well prepared to teach with technology after taking the course.

Deeper Learning through Critical Thinking Activities. Deep learning was enhanced through assignments that promoted critical thinking. One such assignment was WebQuest revision. In this assignment, the students first critiqued a selected WebQuest, and then redesigned the WebQuest for another grade level. They then analyzed the WebQuest using the SAMR model etc. This process enhanced their research, analysis, and critical thinking skills. In a post-survey administered to candidates, all of them (100%) agreed that the WebQuest assignment promoted critical and creative thinking. Rebecca reflected on this assignment:

> *The WebQuest revision was challenging; yet, an enjoyable and engaging assignment. I found this assignment to be enjoyable not only from accomplishing its tasks but first reading what a WebQuest was from the course material. Then, I enjoyed being able to recreate the WebQuest that would serve the needs of my chosen grade level. It was a long and tedious assignment but helped me to think critically.*

To reiterate Rebecca's perspective, the survey also indicated that all the PSTs identified the WebQuest assignment as one of those that promoted critical and creative thinking.

My living theory is that students need activities that promote critical and creative thinking because it motivates them especially if the activity is also fun and engaging.

Opportunity to Apply Learning to Field Experience. In reframing the course, I reevaluated the field experience component of the course and the activities that the candidates carried out in the field. Initially, the candidates were only asked to observe mentor teachers and analyze what they observed. Later, I added an interview whereby they interviewed their mentor teachers about their use of technology. As part of this self-study, I added another dimension. The candidates were also required to analyze the mentor teachers' use of technology through the theoretical frameworks of SAMR model and TPACK. With SAMR, they analyzed how their mentor teachers used technology by classifying them into substitution, augmentation, modification, and redefinition. These steps deepened the candidates' knowledge as expressed below by a student:

> *Before this course, I did not know about SAMR and TPACK theory of technology use. Knowing these new theories, I was better able to observe and analyze my SBE's [mentor teacher's] technology use. It was valuable to see what levels of technology she covered in her instruction and for me to give her pointers on where to go from there.*

As noted by this student, using theories to analyze the use of technology by mentor teachers deepened the TCs understanding of technology integration.

My living theory is that field experience is essential for making theory-practice connection. This connection became more effective as students observed, interviewed, and analyzed their mentor teachers' technology utilization using SAMR and TPACK frameworks.

Peer Collaboration. Throughout the course, students expressed interest in working with their peers. They found collaborative learning the most rewarding part of their classroom experience. In a survey that asked them if working in groups helped them make sense of the course. All the PSTs (100%) agreed that group work was key to making sense of their learning in deeper ways and doing so in a fun and engaging way.

My living theory was that interaction with peers through collaboration was effective in helping students make sense of their course topics, fostered engagement, intellectual challenge, and motivation to learn about technology. Throughout this self-study, students reiterated their love for group work, bouncing ideas off each other, and having a choice in their learning.

Blended Learning, Varied Activities, and Assessment. Deeper learning was enhanced through a blended course design that allowed PTs access to a variety of course activities online and in face-to face formats. In addition, using asynchronous discussions, VoiceThread, and other tools were effective. Assessment was done using a variety of digital tools such as Kahoot, Plickers, Padlets, Poll everyone etc. These ensured that students had multiple means of expressing their learning.

My living theory is that creating several modalities for course delivery and multiple ways of presenting what students had learned helped to deepen the learning of digital technologies because they enabled the PTs to express themselves and their work in multiple ways.

How do I Ensure That My Conclusions Are Reasonably Fair and Accurate?

I believe my conclusions are reasonably fair and accurate because they were subjected to personal and social validation. I engaged in personal validation through critical self- reflection of my teaching and student learning, and a detailed documented analysis of students' feedback on course activities from diverse data sources. Social validation was obtained through a critical friend who observed my lesson several times and offered feedback. After one of her visits, she wrote this report:

> *You continue to show strength in the area of knowledge of pedagogy and content. You provide activities that are engaging and support the content that you are teaching. Another strength is your purposeful attempts to engage with the students at a personal level. During the last conversation, you were able to reflect on the lesson and comment on changes that you made based on previous conversations. You named objectives for each center as was discussed at our last post-conversation. Areas that you need to continue to address include pacing and organization…*

The above feedback from my critical friend indicated that I was making progress toward my goal of being an effective teacher educator with regard to technology integration. The critical friend report and my own personal validation allowed me to draw conclusions about students' learning and my own growth.

How Do I Modify My Practice in Lieu of My Inquiry?

Technology integration is a complex ill-structured problem but a necessary skill for PSTs. Engaging in critical self-reflection, becoming more aware of, and reframing my practice allowed me to reevaluate and improve on this course by introducing activities that deepened my pedagogical knowledge and students' learning. Reframing is an important aspect of self-study because it acts as a mediating factor in decision-making, which in turn influences responses and actions (Berry, 2007).

Self-study and examination of professional practice should be an ongoing process because student groups change, requiring a continual evaluation of teaching-learning situations. The living theories generated from re-envisioning this course indicated that using theory as a guide to explain and evaluate many course topics and activities, integrating field experience components, and infusing critical thinking activities promoted deeper learning. In addition, the use of blended course design (Ikpeze, 2016) and collaborating with peers were equally effective. The result was that the PTs felt well prepared to teach with technology. Findings also suggest the need for continuous course improvement. These findings are supported by previous research (Kay, 2006; Ikpeze, 2016; Tondeur et al., 2012).

The multiple layers of interactivity (Fletcher et al., 2016) promoted personal validation, while the use of a critical friend enabled social validation (Whitehead, 2009). Based on my reflections and feedback from students, continuous course improvement is needed. In addition, students' technological proficiency needs to be sustained by integrating technology in other courses across the teacher education program.

References

Agyei, D. D., & Voogt, J. M. (2011). Exploring the potential of the will, skill, tool model in Ghana: predicting prospective and practicing teachers' use of technology. *Computers* & *Education,* 56, 91–100.

Berry, A. (2007). Reconceptualizing Teacher Educator Knowledge as Tensions: Exploring the tension between valuing and reconstructing experience. *Studying Teacher Education,* 3 (2), 117–134

Braun, V., & Clarke, V. (2014). Thematic analysis. In A. C. Michalos (Ed.), *Encyclopedia of quality of life and well-being research* (pp. 6626–6628). Springer.

CAST. (2011). *The universal design for learning guidelines* 2.0. Wakefield, MA: Author Center for Applied Special Technology (CAST) (n.d). About CAST. https://edtechbooks.org/-qKch

Donnelly, D. (2006) Integrating Learning Technologies with Experiential Learning in a Postgraduate Teacher Education Course, *Studying Teacher Education,* 2(1), 91-104, DOI: 10.1080/17425960600557512

Dourneen, J., & Matthewman, S. (2009). Seeing through ICT: Re-viewing student teachers' transformation of practice from university session to school placement. *Studying Teacher Education,* 5 (1) 61–74.

Drent, M., & Meelissen, M. (2008). Which factors obstruct or stimulate teacher educators to use ICT innovatively? *Computers & Education,* 51, 187–199

Fletcher, T., Choinin. D. N., & O'Sullivan, M. (2016). The multiple layers of interactivity in self-study of practice research: An empirically based exploration of methodological issues. In D. Garbett, A. Owens, (Eds.), E*nacting self-study as methodology for professional Inquiry*. Herstmonceux, UK: SSTEP.

Fransson, G., & Holmberg, J. (2012). Understanding the theoretical framework of technological pedagogical content knowledge: A collaborative self-study to understand teaching practice and aspects of knowledge, *Studying Teacher Education,* 8:2, 193-204, DOI: 10.1080/17425964.2012.692994.

Ikpeze, C. H. (2016). The blended Course Design: The role of agency in a pedagogical shift, in D. Garbett & A. Ovens (Eds.), *Enacting self-study as methodology for professional inquiry* (pp.463-469). Herstmonceux, UK, S-STEP

Kay, R. K. (2006). Evaluating Strategies used to incorporate technology into pre-service education. *Journal of Research on Technology in Education*, 38:4, 383-408.

Koehler, M., & Mishra, P. (2009). What is technological pedagogical content knowledge (TPACK)? *Contemporary Issues in Technology and Teacher Education*, 9(1), 60–7.

LaBoskey, V. K. (2004). The methodology of self-study and its theoretical underpinnings. In J. J. Loughran, M. L. Hamilton, V. K. LaBoskey & T. Russell (Eds.), *The International Handbook of self-study of teaching and teacher education practices* (Vol. 2, pp. 817- 869). Kluwer Academic.

Maycock, K. W. (2019). Chalk and talk versus flipped learning: A case study. *Journal of Computer Assisted Learning*, 35(1), 121–126. https://doi.org/10.1111/jcal.12317

Myer, A., Rose, D. H., & Gordon, D. (2014). *Universal design for learning: Theory and Practice.* CAST.

Ottenbreit-Leftwich, A., Glazewski, K., Newby, T., & Ertmer, P. (2010). Teacher value beliefs associated with using technology: addressing professional and student needs. *Computers & Education,* 55, 1321–1335.

Pinnegar, S., & Hamilton, M. (2009). Self-study as a genre of qualitative research: Theory, Methodology and Practice. Springer.

Preira & Wahi (2019). Deeper Learning Methods and Modalities in Higher Education: A 20-year Review. *Journal of Higher Education Theory and Practice,* 9(8) 2019, 48-71.

Puentedura, R.R (2006). Transformation, Technology, and Education [Online Forum Post]. Hippasus: https://edtechbooks.org/-BjY

Sanyal, C. (2018). Learning, action and solutions in action learning: Investigation of facilitation practice using the concept of living theories. *Action Learning, Research and Practice*, 15 (1), 3-17.

Stolle, E.., Frambaugh-Kritzer, C., Freese, A., & Persson, A. (2019). Investigating Critical Friendship: Peeling Back the Layers, *Studying Teacher Education,* 15:1, 19-30, DOI: 10.1080/17425964.2019.1580010

Tondeur, J., Van Braak, J., Sang, G., Voogt, J., Fisser, P., & Ottenbreit-Leftwich (2012). Preparing Preservice teachers to integrate technology in education: A synthesis of qualitative evidence. *Computers & Education, 59* (134-144).

Whitehead, J. (1989). Creating a living educational theory from questions of the kind, "How do improve my practice?" *Cambridge Journal of Education,* 19 (1), 41-52.

Whitehead, J. (2009). How do I influence the generation of living educational theories for personal and social accountability in improving practice? Using a living theory methodology in improving educational practice. In D. L. Tidwell, M. Heston., & L. M. Fitzgerald (Eds.). *Research Methods for the Self-Study of Practice*. Springer.

Whitehead, J. (2009). Self-study, Living Educational Theories and the Generation of Educational Knowledge. *Studying Teacher Education,* 5(2), 107-111, DOI: 10.1080/1742596090330647

Whitehead, J., & McNiff, J. (2006). *Action Research Living Theory*. Sage.

Chinwe H. Ikpeze

St. John Fisher College