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Keywords
Preservice Teacher, Technology, Web-Based Application, Online/hybrid course curriculum, UDL Model, Traditional and Nontraditional Students, Action Research, Professional Development, ISTE Standards

TECHNOLOGY COMPETENCY WITHIN THE NON-TRADITIONAL PRESERVICE TEACHER CANDIDATE POPULATION: SURVEY RESULTS

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Abstract

This study utilized action research with quantitative data analysis to investigate the personal technological skills and use of web-based applications of nontraditional teacher candidates enrolled in elementary education courses at a Historically Black College/University (HBCU) in the southeastern section of the USA. The goal was to gain a better understanding of the technological challenges encountered by non-traditional candidates and to determine how technology can inform instructional delivery of curriculum to improve this population's representation, expression, and engagement of learning outcomes. Data were collected through an anonymous electronic survey distributed to each student enrolled in the elementary education courses. A total of 320 students were enrolled, 148 respondents participated in the survey to equal 46% (N = 148) of the elementary education teacher candidate population. Of the 148 participants, 109 classified themselves age 24 and older; for the purposes of this study, this group is defined as nontraditional teacher candidates. The results revealed that (a) the H0 was rejected for seven of the eight tested categories, therefore strengthening the HA; (b) 50% of teacher candidates, whether traditional or nontraditional, self-reported in the Learner to Basic levels category; (c) 47% of traditional and non-traditional candidates reported Proficient to Advanced level, thereby strengthening the alternative hypothesis. These findings are compelling and led to the development of a new conceptual framework, the Teacher Education Technology and Web-Based Application Survey (TETWAS), which proposes that faculty in an elementary preparatory program could promote and enhance the learning experiences of candidates.

Introduction

This investigation was inspired by over two years of observing the academic challenges encountered by teacher candidates in an HBCU Elementary Education degree program that prepares both pre-school educators and those in the K-6 ranks for professional careers. Specifically, this quantitative-based study examined traditional and non-traditional teacher candidates with respect to their preparation for the rigorous technological skills required for a four year teaching degree. The public HBCU (Historically Black College and University) targeted in this investigation is a member of the University of North Carolina (UNC) System and the College STAR (Supporting Transition Access and Retention) initiative. College STAR, a grant-funded project, enables universities within the UNC System to create collaborative partnerships to assist campuses in becoming more responsive to students with learning differences (Hutson & Downs, 2015).

At the onset of this study, the Universal Design for Learning (UDL) model, which is a group of principles centered around curriculum development that provide opportunities for all individuals to learn, had not yet been identified as an umbrella strategy utilized throughout the

Elementary Education (EE) Department of the HBCU under study, even though components of UDL were embedded in existing coursework. Later, however, UDL as a guiding pedagogy was presented to faculty through professional development opportunities associated with the College STAR initiative beginning in the fall of 2015. The university ultimately adopted the UDL framework for course redesign to improve learning outcomes, and by the close of 2016, all EE faculty were engaged and using UDL in their coursework.

Although more research is needed to determine the impact of the UDL model in higher education, early findings associated with the implementation of the STAR program reveals an increase in the retention rates of students with learning disabilities (Hasselbring, Lewis, & Bausch, 2005). In its conception, the Universal Design for Learning was developed as an aid to students with learning disabilities; however, it is becoming evident that all students can benefit from this framework (Al-Azawei, Serenelli, & Lundqvist, 2016). This wider applicability is important for both college students and higher education faculty because, as confirmed by current research, non-traditional student populations are on the rise (Newbold, Mehta & Forbes, 2010). This increasing diversity has heightened the need to develop strategies for meeting the individualized needs of the non-traditional student.

Non-traditional students (e.g., students 24 years of age and older, first-generation college students, working or part-time students, students with families, and other criteria that are discussed later in this report) can be challenged by factors that their younger counterparts may not face. In particular, these older students may find themselves at a disadvantage in the area of technology competency. Many simply come to colleges and universities underprepared for the variety of technologies that will be used in the classroom. Similarly, teachers, today must be able to engage with high-quality digital content to keep up with increasing investments in devices that maximize the educational benefits of technology in classrooms. If pre-K and elementary education candidates are to excel in the classroom, and later as teachers, they must have a full toolbox of skills and competencies that will enable them to fully integrate technology into instruction.

Two assumptions guided this study. The first assumption is that technology is a tool that should be utilized to positively impact the academic success of all learners. The second assumption associated with this study is that learner outcomes for preservice teachers will be enhanced when students are able to demonstrate new knowledge using multiple methods. Accordingly, the following question guided this investigation:

> Based upon selected self-reported responses from *Teacher Education Technology and Web-Based Application Survey* (TETWAS), what is the level of technological competence among undergraduate candidates in an elementary education program at an HBCU?

This quantitative study was prompted by the need for faculty to understand the importance of preparing candidates who are career-ready, technologically savvy, and highly competent in instructional delivery to meet the needs of today's diverse classroom populations. Based on the premise that preparing highly qualified teachers has long been the mission of education preparatory programs, educators must continue to work diligently to ensure that course content is delivered in a way so that all students—both traditional and non-traditional—will obtain the desired learning outcomes as outlined in course objectives.

It is important to define the terms "traditional" and "non-traditional" students since (a) survey participants were required to identify themselves in this way, and (b) these two descriptors indicate the need for different pedagogical approaches for consistency and effectiveness. A traditional student is defined as one who begins his or her college education directly from high school without a break. In contrast, Trowler (2015) holds that the conception of a “non-traditional student” can encompass a variety of structural characteristics that have little in common, and importantly, can challenge educators in establishing a set of best practices for classroom pedagogy. Indeed, non-traditional students tend to be defined in terms of what they are not—rather than according to any common essential characteristics they share. Crucially, Vale and Roat (2015) asserted that non-traditional students represent the new majority on American college campuses, thus heightening the need to consider non-traditional approaches to curriculum and program engagement. For this investigation, a non-traditional student is defined as a student who is 24 years or older.

Elementary education faculty has long understood the importance of implementing interventions in teacher candidate preparation programs—and, in particular, the standards advocated by the International Standard for Technology in Education (ISTE). Developed in 1998, these standards relate to evaluating the skills and knowledge educators need to teach, work, and learn in an increasingly connected global and digital society (Overbaugh, Lu, & Diacopoulos, 2015). Specifically, the ISTE standards were designed to empower today's students to become more engaged learners with digital technology and to design, construct, create, and communicate more effectively as a global collaborator (International Standards for Technology Education, 2017). According to ISTE, educators can continually improve their practice by exploring both promising and proven practices that leverage technology to enhance student learning (Dondlinger, McLeod, & Vasinda, 2016).

This study, while confronting many concerns associated with meeting the academic needs of traditional and non-traditional students, initially lacked plausible solutions to identify challenges related to technology education. In response to this knowledge deficit, it was suggested that the Universal Design for Learning (UDL) model be implemented for optimal learning outcomes. The term “Universal Design for Learning” (UDL) originated at the Center for Applied Special Technology (CAST, 2011). However, the principles of UDL emerged with the 1997 reauthorization of the Individuals with Disabilities Education Act (IDEA) to address students with special needs who tended to be mainstreamed in regular classrooms. UDL is a course development tool that provides all students with opportunities to learn from multiple means of representation, engagement, and expression of their knowledge and understanding of concepts.

Our challenge as educators is to advance overall academic rigor, while at the same time developing a delivery method that best fits the learning preferences and abilities of our non-traditional teacher candidates—and it was this mandate that prompted this investigation. In terms of the cohort who took part in this study, a total of 156 teacher candidates responded to the *Teacher Education Technology and Web-Based Application Survey* (TETWAS), with 148 individuals completing the survey in its entirety. Of those 148 respondents, nearly three-quarters (74%) classified themselves as non-traditional—namely, over the age of 24.

In addition to determining the level of technological competence among undergraduate candidates enrolled in one HBCU’s elementary education program, this study presents an alternative to traditional methods for meeting the growing needs of diverse students. The authors argue that the UDL model provides a powerful tool for educators that is easily adaptable and has the potential for effective application in transforming traditional pedagogical approaches. The

UDL model can provide a fun, creative, and collaborative tool for improving an educator's professional methodology for the promotion of student learning.

Review of the Literature

Regardless of the type of institution, teaching is becoming an increasingly challenging profession as instructors endeavor to familiarize themselves with emerging knowledge surrounding the use of new technology-based tools and approaches (Jung, 2005). As teacher candidates become more aware of these new technologies, instructors must similarly know how to implement them in the classroom in order to make course content more pragmatic and useful, whether online, hybrid, or face-to-face. Also important for this investigation is that recent studies point to steady enrollment growth throughout our institutions of higher education—including community colleges and four-year institutions—and importantly, in our nation's HBCUs (Ashby, Sadera & McNary, 2011). As student populations increase at HBCUs and other institutions, so does the demand for more diverse and flexible approaches for delivering curriculum and programmatic approaches. The demands of life, including financial constraints, work obligations, and family commitments prevent many individuals from seeking a college education in the traditional, post-high school manner. Instead, online learning is becoming a more viable and popular option for post-secondary degree attainment. Consider, for example, that course enrollment in online courses increased 10% during the 2005-2006 school year, while face-to-face courses increased 2% (Allen & Seaman, 2007). Moreover, Sturgis (2012) indicated that students take 80% of their coursework online. Indeed, online courses are becoming increasingly attractive to today's college students—and especially non-traditional students—because they offer considerably more flexibility to the working student.

While online learning may enable many more students to pursue advanced learning options, it is not without specific challenges that can be counter to student success. Specifically, students who are goal-oriented and self-driven will be more successful with this type of teaching/learning approach. Even with such personal persistence, online courses can lack certain components that enable students to complete content in meaningful ways. McClinton and Estes (2013) conducted a study that detailed the challenges of implementing online programs at an HBCU, with the goal of increasing both student enrollment and university income. The authors determined that with an increase in the number of non-traditional students, flexible course delivery options became more relevant.

Bowes (2007) established a positive correlation between an instructor's use of technology and a teacher candidate's interest in and willingness to utilize technology in their own pedagogical practices. Indeed, the integration of technology in classroom instruction at all levels is becoming increasingly evident, which heightens the need for teacher-training programs to address this need. However, preparing teacher candidates to integrate technology into the classroom is both complex and challenging (Guzman & Nussbaum, 2009). In a recent study, Wepner, Bowes, and Serotkin (2012) explored the use of technology in teacher-education programs. The researchers investigated three groups of stakeholders (university faculty and supervisors, cooperating teachers, and teacher candidates) with respect to their impressions of the usefulness of technological hardware, software and technology learning supports, and the efficacy of training, modeling and mentoring in promoting such tools. Their results indicated an attitudinal change toward technology—specifically, a pervasive and growing interest in the potential of technology in the classroom.

Teachers, however, can be informed and effective only when they are confident that they can appropriately utilize new technology (Bowes, 2003). Researchers have stressed that technology integration should be defined more than just in terms of student access, but rather as a tool for improving professional productivity and promoting student learning (Hernández-Ramos, 2005). Thus, the Universal Design for Learning strategy was developed, in part to promote the effective implementation of web-based applications in teacher education programs with non-traditional students—in this instance, those 24 years and older. As stated in the CAST manual, UDL offers educators a design for "creating instructional goals, methods, materials, and assessments that may work for everyone--not a single, one-size-fits-all solution, but rather flexible approaches that can be customized and adjusted for individual needs" (CAST, 2011, p. 4.). UDL relies on two overarching strategies: 1) it varies the manner in which information is presented, and 2) it minimizes barriers by providing accommodations and support for all learners while maintaining high expectations for achievement.

As a framework, UDL is a student-centered approach to learning. It involves multiple means of representation, action, expression, and engagement; as such, UDL purposefully rejects the one-size-fits-all, lecture-delivery method—namely, the teacher-centered approach—that continues to stand as the main instructional delivery strategy in many college classrooms. Importantly, providing a student/learner-centered classroom is needed to positively impact non-traditional and other diverse student populations increasingly represented in college classrooms today. Equally impactful is the utilization of components of UDL that enable professors to provide academically appropriate learning environments that are engaging for all learners (Rose & Meyer, 2002; Foulger, 2013), but especially for a growing cohort of non-traditional learners.

Profile of the Non-traditional Teacher Candidate at HBCUs

Many of the students enrolled in the degree-granting, licensure, and non-licensure teacher education programs at the HBCU that served as the setting for this investigation included candidates who can be considered to be non-traditional. According to the National Center for Education Statistics (2014), there are seven qualities that categorize a student as non-traditional: 1) Delays enrollment or does not enter postsecondary education in the same calendar year that he or she finishes high school, 2) Attends part-time for at least part of the academic year, 3) Works full-time (35 hours or more per week) during enrollment, 4) Is considered financially independent for purposes of determining eligibility for financial assistance, 5) Has dependents other than a spouse, 6) Is a single parent (either not married or married but separated) or, 7) Completed high school with a GED or other completion certificate, but does not have a high school diploma. These students tend to bring with them certain desires and needs that are different from traditional (usually younger) students at other institutions of higher education (Newbold, Mehta & Forbus, 2010; Forbus, Newbold, & Mehta, 2011).

Non-traditional candidates at HBCUs typically meet three to five of these criteria. As such, many of these students find themselves overwhelmed by the rigorous academic challenges of a four-year degree program. Although a great many students have already earned an associate's degree at a local community college, a dismaying number of them are relatively uninformed as to the proper use of technology for learning. For example, Weiler (2001) noted that many lack the skills required to use the Internet for research and were more inclined to believe that a Wikipedia entry was completely factual and a matter of record. This "technology deficit" can present risks to educational programs and hinders the ability of candidates to progress at the same rate as other more technologically savvy learners. Thus, the plight of many

HBCUs is to find a strategy for educating and graduating competent, highly qualified teacher candidates who can enter the teaching ranks with the same knowledge and capabilities as their more technologically skilled counterparts.

Also important to the goal of providing a framework for creating curricula that address the needs of all learners is that the National Center for Education reports that 73% of all students have some characteristics of the non-traditional student (Compton, Cox, & Laanan, 2006). Thus, the shifting campus population towards non-traditional students at HBCUs and other colleges and universities reinforces the need to understand and adapt to these changing student needs by improving student satisfaction and involvement with the college experience—all with the goal of increasing persistence toward degree attainment.

Study Overview and Research Methods

This study employed a practical action research design (Lewin, 1946; Creswell, 2005) as a methodology for gathering information about technology competency levels and usage, with a focus on how that data relates to traditional and non-traditional preservice teacher candidates enrolled in an elementary education program at an HBCU located in the southeastern section of the US. By engaging in practical action research, the faculty is able to focus on a specific issue (Creswell, 2005)—in this instance, identifying levels of technology competence for traditional and non-traditional candidates with the goal of improving teaching and student learning. Additionally, this action research approach will allow faculty the opportunity to reflect on their own practices as they redesign and realign curriculum for maximum output. The knowledge gained from investigations such as this will also offer a means for creating more targeted professional development opportunities (Allen & Calhoun, 1998).

The Teacher Education Technology and Web-Based Application Survey (TETWAS), a conceptual framework, emerged as a result of discussions of survey results. Specifically, by canvassing the views and feedback of faculty in elementary education preparatory program, the results obtained through the application of TETWAS are expected to promote enhanced learning experiences for candidates. Figure 1 provides a conceptual model of the framework. By introducing a conceptual framework to undergird the action research, the faculty and facilitators of learning are able to make sound pedagogical decisions with curriculum opportunities in program coursework and preparation for clinical experiences. Hence, the TETWAS posits that an ideal notion of technology usage does not necessarily provide congruence with the lived experiences of the preservice candidate. However, the items constructed for the TETWAS were conceived with a conceptual model of promoting a learner-centered environment (Machemer & Crawford, 2007), and with a constructivist approach to learning (Wang, Ertmer, & Newby, 2004) that validates the personal knowledge and experience of both teacher and student, thereby producing collaborations and co-constructions of meaning and interpretations of teaching and learning (Von Glasersfeld, 1995). In short, reflective faculty and educational researchers must consider where students are at in terms of their use of technology in educating preservice teacher candidates. As a conceptual model, TETWAS is a demonstrative tool designed to represent the effective engagement of faculty in the preparation of preservice candidates and the potential impact on student learning outcomes.

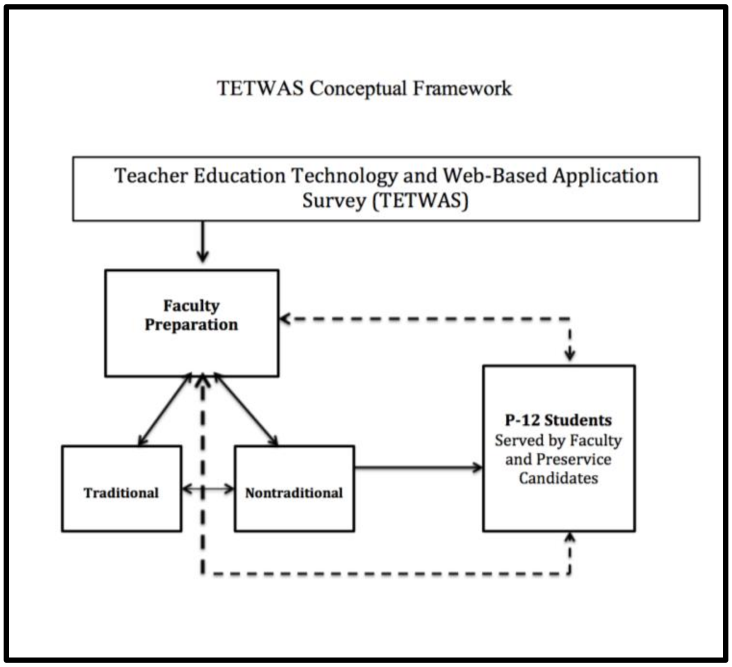

Figure 1. The conceptual model for the study, TETWAS

As noted, this quantitative study was designed to investigate the personal technological skills and use of web-based applications of teacher candidates enrolled in an elementary education program at one HBCU. The research focused on gaining a better understanding of the technological challenges of traditional and non-traditional students so that faculty can determine how technology can inform instruction to improve learning outcomes. Using TETWAS as the theoretical framework for improving learning outcomes, an anonymous electronic survey was distributed to teacher candidates. The survey (detailed below) was structured to determine incoming candidates' overall technological competencies, as well as their specific skill level, usage of patterns, and practice with web-based applications in the completion of undergraduate courses.

Research Population

In total, 320 preservice teacher candidates within the Department of Elementary Education were invited to take part in this investigation by completing an online survey. These traditional and non-traditional candidates were enrolled in one of four programs: K-6 teaching degree, Birth through Kindergarten teaching degree, Birth through Kindergarten non-teaching degree, and Birth through Kindergarten online degree. Candidates were given a clear option to continue the online survey or discontinue at any point in the process without penalty. Of the total 320 enrolled students who could have contributed, 148 respondents fully completed the survey. Thus, this study’s results are based on the responses of 148 preservice teacher candidates in this HBCU.

The Survey Instrument

An electronic survey, which was designed to capture the attitudes, behaviors, and opinions of traditional and non-traditional preservice students in the Elementary Education Department with respect to technology usage, served as the primary data-collecting source for describing trends in this action research study. The primary motivation for using this type of instrument included the research focus, the target audience, and expedient timing; moreover, quantitative data analysis provides quantifiable results that tend to be more easily analyzed in comparison qualitative data.

The survey instrument was divided into three sections: demographic information, use of online applications (Apps), and technology usage and skills. The non-demographic survey questions were designed to gather information about each individual's technological skill level, flexibility with instructional modes, and engagement with learning—all of which were used as a basis for projecting improvement of the program's curriculum delivery. Data were analyzed using descriptive statistics, including minimum and maximum scores, means, ranges, and weighted averages. This information would later be used as a basis for projecting needed improvements to our program's curriculum delivery.

Recognizing that the instrument was designed to measure ideas and concepts that are abstract and non-observable, extra consideration was given to designing the questionnaire in terms of proper phrasing. A four-point Likert scale was utilized to assess candidates' personal skill levels. Candidates evaluated themselves as Learner (*I am not sure how to do this*); Basic (*I have done this before but might need some help*); Proficient (*I can do this without assistance*); and Advanced (*I could train others to do this*). A simplified Likert scale was used for candidates to respond to the use of Web-based applications: Strongly Agree; Agree; Disagree; Strongly Disagree.

A total of three to four items were developed to represent each construct under investigation. Nominal to ratio scales were used to obtain classification demographic information. The projected completion time for the survey was between 10 and 12 minutes. To encourage participation, all respondents who completed the survey were eligible to earn 10-15 bonus points toward a course assignment.

Clarifying the "Non-Traditional" Student

As noted, the "non-traditional" student can include a number of different characteristics that distinguish this individual from the typical 18-year old starting college. One commonality among all definitions is that the student is over the age of 24. Some researchers have added other requirements, such as their marital status, whether they have children or dependents to support, their work status, and whether they are attending college part-time. For this investigation, the term "non-traditional" is defined as not starting college directly after high school. To support current research, the survey also asked respondents to indicate their demographic age group as being under or over the age of 24. Out of the entire sample of 148 participants, 109 classified themselves age 24 or over. Table 1 lists the breakdown of survey respondents.

Table 1. The Respondents

Total number of Elementary Preservice Teacher Candidates	320
Total survey respondents	148
% response rate	46%
N	148
# traditional respondents	39
# non-traditional respondents	109
% traditional respondents	26%
% non-traditional respondents	74%

Data Collection and Hypotheses

Demographics

This study was conducted at the second-oldest state-supported school in North Carolina: an HBCU with a rich history of preparing teachers for service in many disciplines. Important school demographics include the following statistics: approximately 250 faculty members, a student population of 6,000 with 70% female and 65% Black; half the students are age 25 or older; 80% are Pell grant eligible; 25% are militarily affiliated, and the average high school GPA is 2.97. As noted, potential participants in this investigation were the 320 students enrolled within the Department of Elementary Education; in the end, 148 candidates responded to this survey, resulting in over 46% participation.

Hypotheses

Two hypotheses were developed for this investigation:

H_O= There will be no difference in technological competency between traditional and non-traditional candidates.

H_A= There will be an observed difference in technological competency between traditional and non-traditional candidates.

The output was calculated using data from IBM SPSS Web Report. The validity of the responses was examined by Chi-square goodness-of-fit where the samples were compared in two crosstabs by "age" and "experience" in order to observe the existence of possible patterns and how participants responded to the questions. Each technology skill was tested individually. All Chi-squares were set to a critical value of 21.026 (df) (degree of freedom = 12; p-value (p) set to 95% confidence level) to indicate whether samples and subsequently the study, might be projectable to the larger population under study. Crosstabs give the percentage and counts of the age group and experience levels. Results are provided in Table 4.

Descriptive Analysis of Table 2

Table 2 provides the IBM SPSS Web report data from The Teacher Technology and Web-Based Application Survey - TETWAS. Table 2 also includes descriptive statistical data for the population who participated in this investigation (N_{Total}=148). The two subgroups were identified as traditional (n_T=39) and non-traditional (n_N=109). The researchers defined the traditional subgroup as candidates who reported their age between 18-23, and the non-traditional subgroup as those candidates ages ≥ 24.

For Item One of the survey, *Use of Elmo/Document camera for presentations,* the survey sample size (N) was 148, and valid data from which Chi-square was performed (in_{valid}) was 146, with two surveys discarded for having an incomplete dataset. (See Table 4.) Traditional (x_T) candidates aged 18-23 who rated themselves at a Learner level ($x_{T,Ln}$), indicating that they were not sure how to use an Elmo/document camera for presentations, totaled 1.4% ($x_{T,Ln}$ = 2). Basic level ($x_{T,Ba}$) candidates, indicating that they had done this before but may require some help, comprised 9.6% of the sample ($x_{T,Ba}$ = 14). Proficient level ($x_{T,Pr}$) candidates, those indicating that they could perform this task without any assistance, totaled 11.6% ($x_{T,Pr}$ = 17). Finally, advanced level ($x_{T,Ad}$) students who felt they could train others to do this task made up 4.1% of the sample ($x_{T,Ad}$ = 6).

For Item One of the survey, *Use of Elmo/Document camera for presentations,* rows B, C, D, and E were combined to represent the responses of non-traditional (x_N) candidates, ages ≥ 24, who participated in the survey. For this item, 7.5% ($x_{N,Ln}$ = 11) of the non-traditional (x_N) candidates rated themselves at a learner level ($x_{N,Ln}$), indicating that they were not sure how to use an Elmo/document camera for presentations. Basic level ($x_{n,Ba}$) ratings comprised 20.6% of the non-traditional sample ($x_{n,Ba}$ = 30), representing students who had done this before but may require some help. Proficient level ($x_{N,Pr}$) ratings captured 35.5% ($x_{N,Pr}$= 52) of respondents—namely, students who believed that they could use the Elmo/Document camera for presentations without any assistance. Finally, the advanced group ($x_{N,Ad}$) of non-traditional students who believed they could train others to do this task comprised 9.6% of the sample ($x_{N,Ad}$ = 14). Two-tailed Pearson Chi-square analysis set to a critical value of 21.026 (degree of freedom (df) = 12; p-value (p) set to 95% confidence level) calculated values of 18.115, indicating a level of non-significance, supporting H_0.

For Item Two of the survey, *Interface Smartphones/iPads for presentations*, the survey sample size (N) was 148, and valid data from which Chi-square was performed (n_{valid}) was 146, with two surveys discarded for having an incomplete dataset. (See Table 4.) Traditional candidates (x_T) aged 18-23 who rated themselves at a learner level ($x_{T,Ln}$), indicating that they were not sure how to interface smartphones or iPads for presentations, totaled 4.1% of the sample ($x_{T,Ln}$ = 6). Students at the basic level ($x_{T,Ba}$) (those who had done this before but may require some help) comprised 8.9% of the sample ($x_{T,Ba}$ = 13). The proficient group of students ($x_{T,Pr}$) who could interface smartphones or iPads for presentations without any assistance made up 3.4% of the sample ($x_{T,Pr}$ = 5). Finally, the advanced candidates ($x_{T,Ad}$) who could train others to do this task made up 9.6% of the sample ($x_{T,Ad}$ = 14).

For Item Two of the survey, *Interface Smartphones/iPads for presentations*, rows B, C, D, and E were combined to represent the responses from non-traditional (x_N) candidates, ages ≥ 24, who participated in the survey. For this item, 7.6% ($x_{N,Ln}$ = 11) of the non-traditional candidates rated themselves at a learner level (x_N), indicating that they were not sure how to interface smartphones or iPads for presentations. Those who self-reported as having a basic level of ability ($x_{N,Ba}$) with respect to interfacing Smartphones/iPads for presentations (indicating that they had done this before but may require some help) comprised 18.4% of the sample ($x_{N,Ba}$ = 37). A slightly higher percentage—namely,19.9% of the sample ($x_{N,P\,r}$= 40)—considered themselves to be proficient ($x_{N,Pr}$), indicating that they could perform this task without any assistance. Finally, the advanced candidates ($x_{N,Ad}$) who could train others to interface Smartphones/iPads for presentations made up 10.9% of the sample ($x_{N,Ad} = 20$). Two-tailed Pearson Chi-square analysis set to a critical value of 21.026 (degree of freedom (df) = 12; p-value (p) set to 95% confidence level), calculated values of 31.230, indicating a level of significance in rejecting H_0.

For Item Three of the survey, *Use of Smartboard*, the survey sample size (N) was 148, and valid data from which Chi-square was performed was (n_{valid}) 146, with two surveys discarded for having an incomplete dataset. (See Table 4.) Traditional candidates (x_T) aged 18-23 who rated themselves at a learner level ($x_{T,Ln}$) (i.e., they were not sure how to use the Smartboard) totaled 2.7% ($x_{T,Ln} = 4$). The basic level ($x_{T,Ba}$) candidates who indicated that they had used a Smartboard but may require some help made up 14.4% of the sample ($x_{T,Ba} = 21$). The proficient level ($x_{T,Pr}$) students—namely, those who could perform this task without any assistance—totaled 2.1% of the sample ($x_{T,Pr} = 3$). Finally, 7.5% of the surveyed candidates ($x_{T,Ad}$=11) considered themselves to be advanced ($x_{T,Ad}$), meaning that they could train others in the use of a Smartboard.

For Item Three of the survey, *Use of Smartboard*, rows B, C, D, and E were combined to represent the responses of non-traditional (x_N) candidates, ages ≥ 24, who participated in the survey. For this item, 6.% ($x_N = 10$) of the non-traditional candidates rated themselves at a learner level ($x_{N,Ln}$), indicating that they were not sure how to use the Smartboard. Those who self-reported as having a basic level of ability ($x_{N,Ba}$) in using a Smartboard (indicating that they had done this before but may require some help) comprised 29.4% ($x_{N,Ba} = 43$) of the sample. Respondents who considered themselves to be proficient ($x_{N,Pr}$), meaning that they could use a Smartboard without any assistance, made up 24.0% of the sample ($x_{N,Pr}$= 35). Finally, 13.0% of the sample ($x_{N,Ad} = 19$) self-reported as advanced ($x_{N,Ad}$), indicating that they could train others to do this task. Two-tailed Pearson Chi-square analysis set to a critical value of 21.026 (degree of freedom (df) = 12; p-value (p) set to 95% confidence level) calculated values of 27.269, indicating a level of significance rejecting H_0.

For Item Four of the survey, *Connect and use of LCD projector with laptop*, the survey sample size (N) was 148, and valid data from which Chi-square was performed (n_{valid}) was 146, with two surveys discarded for having an incomplete dataset. (See Table 4.) Traditional (x_T) candidates ages 18-23 who rated themselves at a learner level ($x_{T,Ln}$), meaning that they were not sure how to connect or use an LCD projector with a laptop, totaled 4.1% of the sample ($x_{T,Ln}$ = 6). The basic level candidates ($x_{T,Ba}$) who indicated that they had done this before but may require some help made up 11.6% of the sample ($x_{T,Ba} = 17$). Candidates in the proficient category ($x_{T,Pr}$) (needing no assistance) totaled 5.5% of the sample ($x_{T,Pr} = 8$). Finally, those at an advanced ($x_{T,Ad}$) level (i.e., those who could train their colleagues in this task) comprised 5.5% of the sample ($x_{T,Ad} = 8$).

For Item Four of the survey, *Connect and use of LCD projector with laptops*, rows B, C, D, and E were combined to represent responses from non-traditional (x_N) candidates, ages ≥ 24, who participated in the survey. For this item, 5.5% ($x_N = 8$) of the non-traditional candidates rated themselves at a learner level ($x_{N,Ln}$), indicating that they were not sure how to connect or use an LCD projector with a laptop. Non-traditional students at the basic level ($x_{N,Ba}$) (those with some experience with the task but likely needing help) made up 28% of the sample ($x_{N,Ba} = 41$). Non-traditional students who self-reported as being proficient in the task ($x_{N,Pr}$) comprised 24.8% ($x_{N,Pr} = 36$) of the sample. Finally, the advanced group ($x_{N,Ad}$) of non-traditional students (those who could train others to connect and use an LCD projector with a laptop) made up 15.1% of the sample ($x_{N,Ad} = 22$). Two-tailed Pearson Chi-square analysis set to a critical value of 21.026 (degree of freedom (df) = 12; p-value (p) set to 95% confidence level) calculated values of 26.968, indicating a level of significance rejecting H_0.

For Item Five of the survey, *Take or download digital photos to the computer*, the survey sample size (N) was 148, and valid data from which Chi-square was performed (n_{valid}) was 147, with one survey discarded for having an incomplete dataset. (See Table 4.) Traditional (x_T) candidates aged 18-23 who rated themselves at a learner level ($x_{T,Ln}$), meaning that they were not sure how to take and download photos to the computer, comprised 9.5% of the sample ($x_{T,Ln} = 14$). Traditional students who had performed this task before but may still need help represent those at a basic level ($x_{T,Ba}$) and made up 4.1% of the sample ($x_{T,Ba} = 6$). The proficient group of students ($x_{T,Pr}$) who could perform this task without any assistance made up 0.7% of the sample ($x_{T,Pr} = 1$). Finally, 12.2% of the surveyed candidates ($x_{T,Ad} = 18$) considered themselves to be advanced ($x_{T,Ad}$), meaning that they could train others in taking or downloading digital photos from the computer.

For Item Five of the survey, *Take or download digital photos to the computer*, rows B, C, D, and E were combined to assess the responses from non-traditional (x_N) candidates, ages ≥ 24, who participated in the survey. For this item, 23.2% ($x_N = 34$) of the non-traditional candidates considered themselves to be at a learner level ($x_{N,Ln}$), indicating that they were not sure how to take or download digital photos to the computer. Those who self-reported as having a basic level of ability ($x_{N,Ba}$) in terms of engaging with digital photos (indicating that they had done this before but may require some help) comprised 21% ($x_{N,Ba} = 31$) of the sample. Respondents who considered themselves to be proficient ($x_{N,Pr}$), meaning that they could take/download digital photos without any assistance, made up 3.4% of the sample ($x_{N,Pr} = 5$). Finally, 25.6% of the sample ($x_{N,Ad} = 38$) self-reported as advanced ($x_{N,Ad}$), indicating that they could train others to do this task. Two-tailed Pearson Chi-square analysis set to a critical value of 21.026 (degree of freedom (df) = 12; p-value (p) set to 95% confidence level) calculated values of 29.519, indicating a level of significance rejecting H_0.

For Item Six of the survey, *Take or download digital videos to the computer*, the survey sample size (N) = 148, and valid data from which Chi-square was performed is (n_{valid}) = 144, with four surveys discarded for incomplete having an incomplete dataset. (See Table 4.) Traditional (x_T) candidates ages 18-23 who rated themselves at a learner level ($x_{T,Ln}$), meaning that they were not sure how to take/download digital videos to the computer, totaled 7.6% of the sample ($x_{T,Ln} = 11$). The basic-level candidates ($x_{T,Ba}$) who indicated that they had done this before but may require some help, made up 7.6% of the sample ($x_{T,Ba} = 11$). Candidates in the proficient category ($x_{T,Pr}$) (needing no assistance) totaled 1.4% of the sample ($x_{T,Pr} = 2$). Finally, those at the advanced ($x_{T,Ad}$) level, namely those who could train their colleagues in this task, comprised 10.4% of the sample ($x_{T,Ad} = 15$).

For Item Six of the survey, *Take or download digital videos to the computer*, rows B, C, D, and E were combined to assess the responses from non-traditional (x_N) candidates, ages ≥ 24, who participated in the survey. For this item, 17.4% ($x_N = 25$) of the non-traditional candidates rated themselves at a learner level ($x_{N,Ln}$), indicating that they were not sure how to take or download digital videos to a computer. Non-traditional students at the basic level ($x_{N,Ba}$) (those with some experience with the task but likely needing help) made up 20.9% of the sample ($x_{N,Ba} = 29$). Non-traditional students who self-reported as being proficient in the task ($x_{N,Pr}$) comprised

12.6% ($x_{N,Pr}$= 18) of the sample. Finally, the advanced group ($x_{N,Ad}$) of non-traditional students (those who could train others to take or download digital videos to a computer) made up 22.3% of the sample ($x_{N,Ad}$ = 32). Two-tailed Pearson Chi-square analysis set to a critical value of 21.026 (degree of freedom (df) = 12; p-value (p) set to 95% confidence level) calculated values of 34.593, indicating a level of significance rejecting H_0.

For Item Seven of the survey, *Analyze data and create graphs in Microsoft Excel*, the survey sample size (N) was 148, and valid data from which Chi-square was performed (n_{valid}) was 147, with one survey discarded for having an incomplete dataset. (See Table 4.) Traditional (x_T) candidates aged 18-23 who rated themselves at a learner level ($x_{T,Ln}$), meaning that they were not sure how to analyze data and create graphs in Microsoft Excel, comprised 2.7% of the sample ($x_{T,Ln}$ = 4). Traditional students who had performed this task before but may still need help represent those at a basic skill level ($x_{T,Ba}$), and made up 12.9% of the sample ($x_{T,Ba}$ = 19). The proficient group of students ($x_{T,Pr}$) who could perform this task without any assistance made up 2.0% of the sample ($x_{T,Pr}$ = 3). Finally, 8.8% of the surveyed candidates ($x_{T,Ad}$ = 13) considered themselves to be advanced ($x_{T,Ad}$), meaning that they could train others in analyzing data and creating graphs in Microsoft Excel.

For Item Seven of the survey, *Analyze data and create graphs in Microsoft Excel*, rows B, C, D, and E were combined to assess the responses from non-traditional (x_N) candidates, ages ≥ 24, who participated in the survey. For this item, 36% (x_N = 53) of the non-traditional students considered themselves to be at a learner level ($x_{N,Ln}$), indicating that they were not sure how to analyze data and create graphs in Microsoft Excel. Those who self-reported as having a basic level of ability ($x_{N,Ba}$) in terms of engaging in this task (indicating that they had done this before but may require some help) comprised 13.6% ($x_{N,Ba}$ = 20) of the sample. Respondents who considered themselves to be proficient ($x_{N,Pr}$), meaning that they could analyze data and create graphs in Microsoft Excel without any assistance, made up 12.6% of the sample ($x_{N,Pr}$ = 20). Finally, 17.7% of the sample ($x_{N,Ad}$ = 26) self-reported as advanced ($x_{N,Ad}$), indicating that they could train others to do this task. Two-tailed Pearson Chi-square analysis set to a critical value of 21.026 (degree of freedom (df) = 12; p-value (p) set to 95% confidence level) calculated values of 34.949, indicating a level of significance rejecting H_0.

For Item Eight of the survey, *Save files in different formats*, the survey sample size (N) was 148, and valid data from which Chi-square was performed (n_{valid}) was 146, with two surveys discarded for having an incomplete dataset. (See Table 4.) Traditional candidates (x_T) aged 18-23 who rated themselves at a learner level ($x_{T,Ln}$), indicating that they were not sure how to save files in different formats, totaled 9.6% of the sample ($x_{T,Ln}$ = 14). Students who self-reported to be at the basic level ($x_{T,Ba}$), or those who had done this before but may require some help, comprised 4.8% of the sample ($x_{T,Ba}$ = 7) of the sample. The proficient group of students ($x_{T,Pr}$) who could perform this task without any assistance made up 0.7% of the sample ($x_{T,Pr}$ = 1). Finally, the advanced candidates ($x_{T,Ad}$) who could train others to save files in different formats made up 11% of the sample ($x_{T,Ad}$ = 16).

For Item Eight of the survey, *Save files in different formats,* rows B, C, D, and E were combined to represent the responses from non-traditional (x_N) candidates, ages ≥ 24, who participated in the survey. For this item, 17.1% ($x_{N,Ln}$ = 25) of the non-traditional candidates rated themselves at a learner level (x_N), indicating that they were not sure how to save files in different formats. Those who self-reported as having a basic level ($x_{N,Ba}$) of ability in performing this task (indicating that they have done this before but may require some help) comprised 25.3%

of the sample ($x_{N,Ba}$ = 37). A much lower percentage—namely, 6.9% of the sample ($x_{N,Pr}$ = 10)—considered themselves to be proficient ($x_{N,Pr}$), indicating that they could save files in different formats without any assistance. Finally, the advanced candidates ($x_{N,Ad}$) who could train others to do this task made up 24.6% of the sample ($x_{N,Ad}$ = 36). Two-tailed Pearson Chi-square analysis set to a critical value of 21.026 (degree of freedom (df) = 12; p-value (p) set to 95% confidence level) calculated values of 34.699, indicating a level of significance rejecting H_0.

To summarize, this study investigated the competency levels of both traditional and non-traditional pre-service teacher candidates in terms of their technological training, as well as the implications of those skill levels. Data were collected and analyzed using descriptive statistics, to include minimum and maximum scores, means, ranges and weighted averages. A tabulation of nominal data resulting from the different variables was then developed, and the responses for each group of participants (by category) were calculated as a percent distribution. Identifying, examining, and interpreting emerging themes aided in determining the level of technological experience among undergraduate candidates in education coursework. The self-reported data from traditional and non-traditional candidates with respect to their personal technology skills for the eight categories under investigation is provided in Table 2.

Table 2: Distribution of count and percentage of candidate's responses to personal skills level and use of technology

Survey Item	**Learner:** I am not sure how to do this		**Basic:** I have done this before but might need some help		**Proficient:** I can perform this without any assistance		**Advanced:** I could train others to do this		**Totals**	
1. Use Elmo/Document Camera for Presentation	**Count**	**% of Total**	**Count**	**% of Total**	**Count**	**% of Total**	**Count**	**% of Total**	**Count**	**% of Total**
A:18-23 years	2	1.4%	14	9.6%	17	11.6%	6	4.1%	39	26.7%
B: 24-30 years	7	4.8%	9	6.2%	17	11.6%	5	3.4%	38	26.0%
C: 31-40 years	4	2.7%	2	1.4%	12	8.2%	2	1.4%	20	13.7%
D: 41-50 years	0	0.0%	14	9.6%	17	11.6%	6	4.1%	37	25.3%
E: Above 51 years	0	0.0%	5	3.4%	6	4.1%	1	0.7%	12	8.2%
2. Interface Smartphone/ iPad for Presentation	**Count**	**% of Total**	**Count**	**% of Total**	**Count**	**% of Total**	**Count**	**% of Total**	**Count**	**% of Total**
A:18-23 years	6	4.1%	13	8.9%	5	3.4%	14	9.6%	38	26.6%
B: 24-30 years	8	5.5%	10	6.8%	9	6.2%	12	8.2%	39	26.7%
C: 31-40 years	3	2.1%	7	4.8%	6	4.1%	4	2.7%	20	13.7%
D: 41-50 years	0	0.0%	15	10.3%	18	12.3%	4	2.7%	37	8.2%
E: Above 51 years	0	0.0%	5	3.4%	7	4.8%	0	0.0%	12	8.2%
3. Use of Smartboard	**Count**	**% of Total**	**Count**	**% of Total**	**Count**	**% of Total**	**Count**	**% of Total**	**Count**	**% of Total**
A:18-23 years	4	2.7%	21	14.4%	3	2.1%	11	7.5%	39	26.7%
B: 24-30 years	8	5.5%	12	8.2%	8	5.5%	10	6.8%	38	26.0%
C: 31-40 years	2	1.4%	7	4.8%	9	6.2%	2	1.4%	20	13.7%
D: 41-50 years	0	0.0%	18	12.3%	13	8.9%	6	4.1%	37	25.3%
E: Above 51 years	0	0.0%	6	4.1%	5	3.4%	1	0.7%	12	8.2%
4. Connect/Use LCD Projector with Laptop	**Count**	**% of Total**	**Count**	**% of Total**	**Count**	**% of Total**	**Count**	**% of Total**	**Count**	**% of Total**
A:18-23 years	6	4.1%	17	11.6%	8	5.5%	8	5.5%	39	26.7%

B: 24-30 years	7	4.8%	13	8.9%	6	4.1%	13	8.9%	39	26.7%
C: 31-40 years	1	0.7%	6	4.1%	9	6.2%	4	2.7%	20	13.7%
D: 41-50 years	0	0.0%	18	12.3%	16	11.0%	2	1.4%	36	24.7%
E: Above 51 years	0	0.0%	4	2.7%	5	3.4%	3	2.1%	12	8.2%
5. Take/Download Digital Photos to computer	**Count**	**% of Total**	**Count**	**% of Total**	**Count**	**% of Total**	**Count**	**% of Total**	**Count**	**% of Total**
A:18-23 years	14	9.5%	6	4.1%	1	0.7%	18	12.2%	39	26.5%
B: 24-30 years	20	13.6%	4	2.7%	0	0.0%	15	10.2%	39	26.5%
C: 31-40 years	7	4.8%	8	5.4%	0	0.0%	5	3.4%	20	13.6%
D: 41-50 years	6	4.1%	13	8.8%	4	2.7%	14	9.5%	37	25.2%
E: Above 51 years	1	0.7%	6	4.1%	1	0.7%	4	2.7%	12	8.2%
6. Take/Download Digital Video to computer	**Count**	**% of Total**	**Count**	**% of Total**	**Count**	**% of Total**	**Count**	**% of Total**	**Count**	**% of Total**
A:18-23 years	11	7.6%	11	7.6%	2	1.4%	15	10.4%	39	27.1%
B: 24-30 years	16	11.1%	6	4.2%	0	0.0%	15	10.4%	37	25.7%
C: 31-40 years	5	3.5%	4	2.8%	6	4.2%	5	3.5%	20	13.9%
D: 41-50 years	4	2.8%	16	11.1%	9	6.3%	8	5.6%	37	25.7%
E: Above 51 years	0	0.0%	4	2.8%	3	2.1%	4	2.8%	11	7.6%
7. Analyze Data/Create graphs in Microsoft Excel	**Count**	**% of Total**	**Count**	**% of Total**	**Count**	**% of Total**	**Count**	**% of Total**	**Count**	**% of Total**
A:18-23 years	4	2.7%	19	12.9%	3	2.0%	13	8.8%	39	26.5%
B: 24-30 years	6	4.1%	14	9.5%	2	1.4%	17	11.6%	39	26.5%
C: 31-40 years	3	2.0%	10	6.8%	4	2.7%	3	2.0%	20	13.6%
D: 41-50 years	0	0.0%	23	15.6%	8	5.4%	6	4.1%	37	25.2%
E: Above 51 years	0	0.0%	6	4.1%	6	4.1%	0	0.0%	12	8.2%
8. Save files in different formats	**Count**	**% of Total**	**Count**	**% of Total**	**Count**	**% of Total**	**Count**	**% of Total**	**Count**	**% of Total**
A:18-23 years	14	9.6%	7	4.8%	1	0.7%	16	11.0%	38	26.0%
B: 24-30 years	17	11.6%	6	4.1%	0	0.0%	16	11.0%	39	26.7%
C: 31-40 years	5	3.4%	7	4.8%	3	2.1%	5	3.4%	20	13.7%

D: 41-50 years	2	1.4%	19	13.0%	5	3.4%	11	7.5%	37	25.3%
E: Above 51 years	1	0.7%	5	3.4%	2	1.4%	4	2.7%	12	8.2%

Preliminary Findings

The two crosstabs of “age” and "experience" with technology represent the two categorical tested variables, with resulting data shown in distribution in the count, as well as the percentages for how each group of candidates responded to the questions. Data are summarized both for age and experience by a question (Table 3).

Table 3: Age Groups of Respondents

<table>
<tr><td>A)</td><td>18-23 years</td><td>Traditional Candidates</td><td>26% (n_T = 39)</td></tr>
<tr><td>B)</td><td>24-30 years of age</td><td rowspan="4">Non-traditional Candidates</td><td rowspan="4">74% (n_N = 109)</td></tr>
<tr><td>C)</td><td>31-40 years of age</td></tr>
<tr><td>D)</td><td>41-50 years of age</td></tr>
<tr><td>E)</td><td>Above 50 years of age</td></tr>
</table>

As shown in Table 3, there were five distinct age groups. Group A, which encompassed traditional candidates ages 18-23 years, comprised 26% of the total sample (n_T = 39). The remaining four groups (B-E) were combined, representing non-traditional candidates ages ≥ 24-51 (and older), which made up 74% of total respondents (n_N = 109). Four distinct levels of technology experience were presented to respondents to indicate their perceived level of competency for each of the eight items: learner, basic, proficient and advanced. With a particular interest in the number of candidates below proficiency level, the original four categories were collapsed into two. The responses to the learner and basic levels were combined and totaled to determine how many candidates self-reported that they could not perform the given skill or needed assistance in doing so. The findings revealed that the number of non-traditional candidates who considered themselves to be at the learner or basic level in these skills exceeded the number of traditional teacher candidates by 47%. This difference is due to the sample size. (See Figure 2 for a complete listing of percentages for those two skill-level categories.)

Totaling Items 1-8 from the survey determined an overall mean score for the Learner/Basic rating and the Proficient/Advanced rating for both traditional and non-traditional candidates (see Figure 2). A mean of 54% was found for traditional candidates who scored themselves at the Learner/Basic level, while a mean of 50% was found for non-traditional candidates who, likewise, scored themselves at Learner/Basic. Averaging score percentages for traditional (54%) and non-traditional (50%) candidates at the Learner/Basic levels reveals an overall mean of 52%. Thus, 52% of traditional and non-traditional candidates self-reported Learner/Basic levels of competency in the eight technology skills measured.

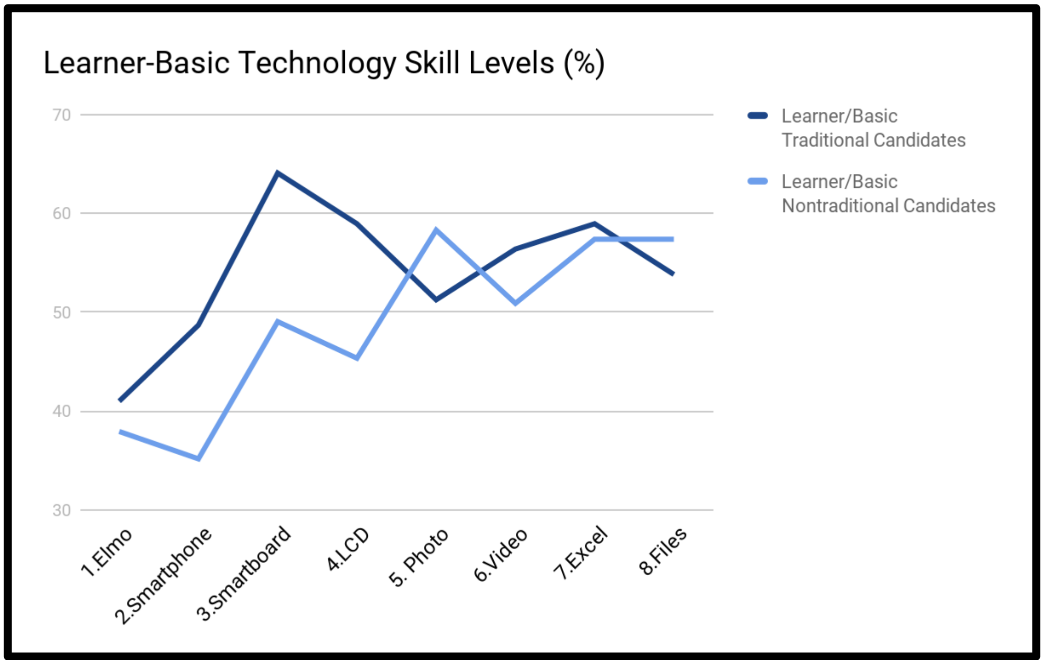

Figure 2. Reported Technology Skill Levels – Learner-to-Basic

A mean of 45% was found for traditional candidates who scored themselves at Proficient/Advanced levels; in comparison, the corresponding percentage for non-traditional candidates was 49%. Averaging score percentages for traditional (45%) and non-traditional (49%) students at the Proficiency/Advanced levels reveals an overall mean of 47%. Thus, 47% of traditional and non-traditional candidates self-reported Proficient/Advanced levels of competency in the eight technology skills measured (Figure 3).

Figure 3. Reported Technology Skill Levels – Proficient-to-Advanced

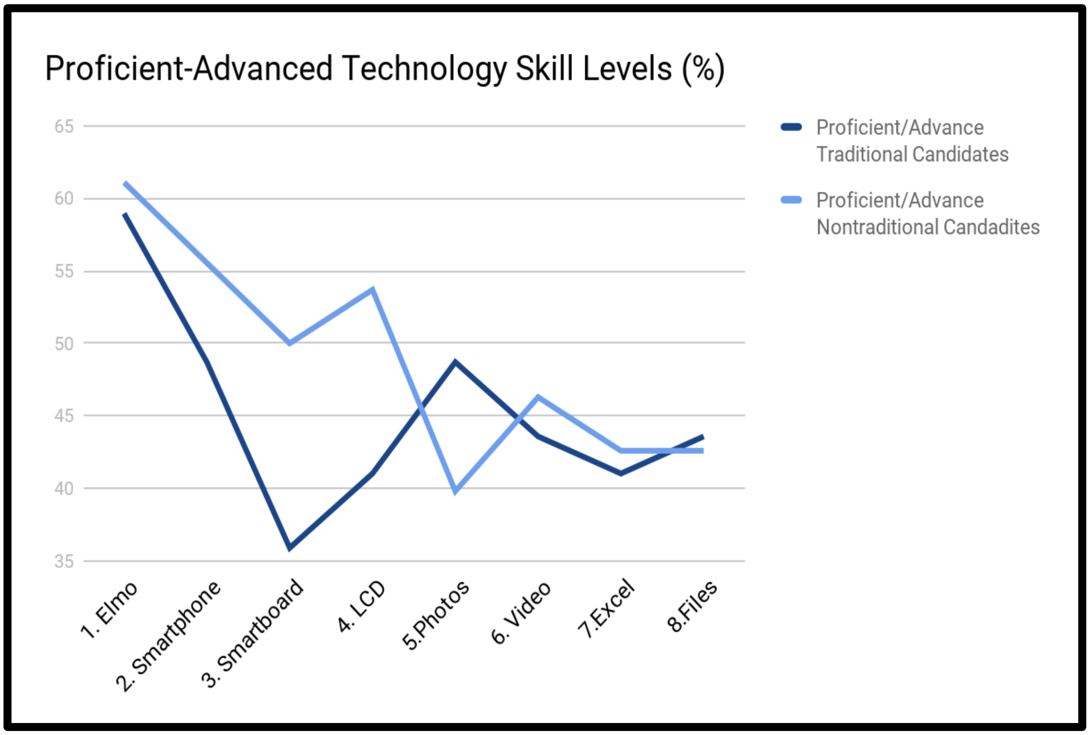

Figure 4 provides the mean technology skill levels of traditional and non-traditional candidates. These findings are compelling in that if only half of the candidates in teacher education programs consider themselves to be technologically competent, the work of professors and clinical evaluators is even more challenging if they are to prepare these candidates for the 21st-century classroom as technologically savvy instructors.

Figure 4. Technology Skill Levels of Traditional and Non-traditional Candidates (%)

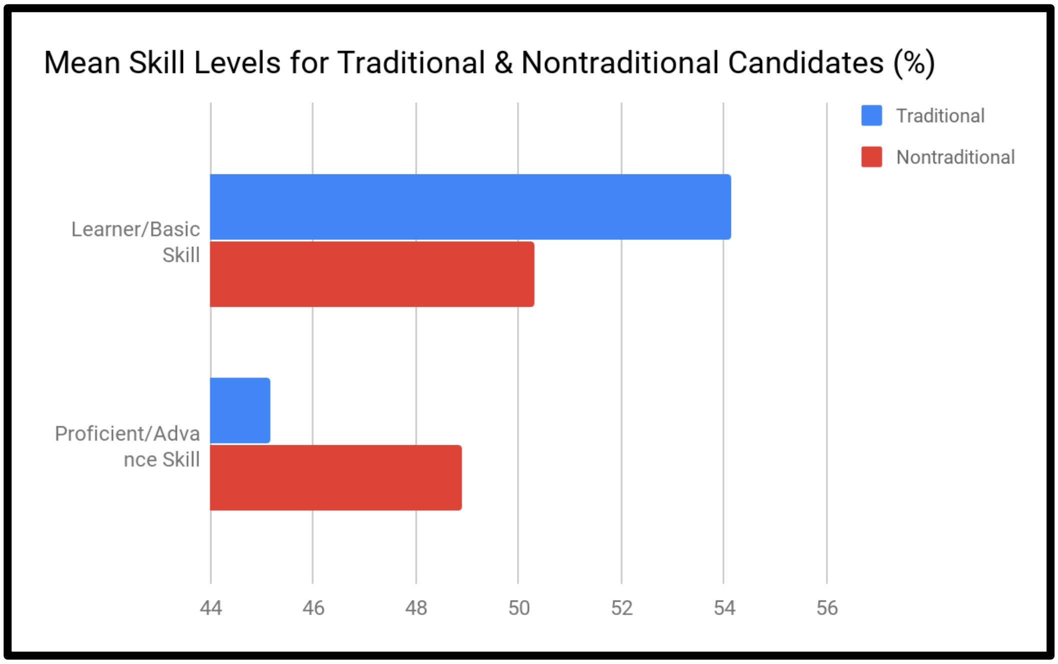

Table 4: Technological Skill Levels Chi-Square Tests and Crosstab Summary

Pearson Chi-Square Tests				**Crosstab Summary**					
				Valid		**Missing**		**Total**	
Technology Skill	**Value**	**df**	**Asymptotic Significance (2-sided)**	**N**	**%**	**N**	**%**	**N**	**%**
1. Use of the Elmo or Document Camera for presentation	18.115*	12	.112	146	98.6%	2	1.4%	148	100%
2. Interface Smartboard/iPad for presentation	31.230[a]	12	.002	146	98.6%	2	1.4%	148	100%
3. Use of Smartboard	27.269[a]	12	.007	146	98.6%	2	1.4%	148	100%
4. Connect/Use of LCD Projector with Laptop	26.969[a]	12	.008	146	98.6%	2	1.4%	148	100%
5. Take/Download Digital Photos to Computer	29.519[a]	12	.003	147	99.3%	1	.075	148	100%
6. Take/Download Digital Video to Computer	34.593[a]	12	.001	144	97.3%	4	2.7%	148	100%
7. Analyze Data/Create graphs in Microsoft Excel	34.949[a]	12	.000	147	99.3%	1	0.7%	148	100%
8. Save files in different formats	34.699[a]	12	.001	146	98.6%	2	1.4%	148	100%

Discussion

An analysis of the technology competency levels of teacher candidates in one HBCU's elementary education program indicates a significant difference between traditional candidates and non-traditional candidates, which supports the alternative hypothesis. In truth, this finding was not surprising, since anecdotal evidence provided by teaching faculty to the authors of this study also supported the expectation that traditional candidates would exceed non-traditional candidates in self-reported skill levels for most of the technology skills examined in the survey.

In contrast, a surprising finding pertained to the comparison of the two groups at the Proficient-to-Advanced levels. Due to the younger age of traditional candidates (and them entering college directly after graduating from high school), the technology skills advocated by the ISTE for completing high school would appear, to represent more of a continuation or further expansion of those already-acquired technology skills during their college years (ISTE, 2017). According to the survey results, however, the opposite was found to be true. Overall, non-traditional candidates self-reported scores at higher levels in the Proficient-to-Advanced categories in comparison to traditional candidates. This finding was substantiated in all but two categories: *(a) Take and download photos to computer, and (b) Saving files in different formats.* We attribute this outcome to the belief that non-traditional students (who are older, may already be working, and have dependents to support) tend to have a higher level of desire for developing and preparing for career goals in comparison to traditional students (Choa & Good, 2004).

The survey data also confirmed that non-traditional candidates scored themselves as more proficient in the use of the Elmo and document camera for presentations than their younger counterparts, which resulted in a Proficient-to-Advanced level rating. These results showed that the differences regarding proficiency levels between the candidates were insignificant for Item One of the survey—thereby supporting the null hypothesis. This lack of difference in skill level could be due to the ease of use of the Elmo and document camera—typically requiring only the toggle of a switch. Moreover, if the apparatus was already set up and ready for use, it would not require more advanced skills of setup, login, and navigation.

Items Two thru Four encompassed skills such as interfacing with a laptop, the Smartboard, iPad and LCD projectors. These tasks, which require more processing skills for operation and navigation, as well as multi-step processes for application, would be analogous to skills that non-traditional candidates, who are more liable to be employed, would likely practice in their places of work.

Items Five and Six consisted of skills such as the candidate's ability to download digital photos and videos. These skills also require multi-step processes that sometimes are problematic for candidates and may explain the low ratings.

Item Seven pertained to analyzing and creating graphs in Microsoft Excel. Based on the low ratings for both subgroups, their ability to create graphs in Excel appears to be challenging. The utilization of Microsoft Excel tools and formulas tends to be a multi-step process. Although the program does provide shortcuts, it requires users to enter Excel-specific formulas that may not be understood or used correctly by students who are new to Excel or have little prior experience in its application.

Finally, in terms of the overall key outcome, there was a significant difference in the competency levels of traditional and non-traditional teacher candidates. Our original supposition—that there would be an identified difference in competency levels between the two cohorts—turned out to be true, just not in the way we expected. We anticipated that traditional students would generally be more technologically skilled than non-traditional candidates. Data results, however, showed the opposite to be true. Thus, the assumption cannot be made that, because traditional candidates are routinely exposed to technology in more immediate curricular settings, they are more “technology savvy” when it comes to the utilization and application of technical skills in comparison to non-traditional teacher candidates.

Implications

If faculty expect teacher candidates to be able to use a range of technology tools to facilitate learning, then opportunities for professional development so that faculty and students can become proficient with these tools become more imperative. Preliminary results suggest that teacher candidates are lacking in basic technology skills, as evidenced by the high scores in the Learner-to-Basic levels. Therefore, both faculty and their students may benefit from the incorporation of UDL principles as they relate to technology (Evans, Williams, King, & Metcalf, 2010). The results reported herein indicate that faculty within this HBCU elementary education program should assist candidates in improving technology usage by incorporating more practice within coursework. Results also support a redesign of course curricula to meet current trends to improve candidate performance and output for both traditional and non-traditional students (Forbus et al., 2011). And indeed, some faculty have begun to participate in course redesign through the College Star Program initiative. Findings obtained from this quantitative study indicate that instructors who incorporate UDL-based approaches are better positioned to prepare teacher candidates for careers in an increasing number of classrooms that rely on technological tools to support pedagogical goals. The decision to redesign the curriculum based on this assumption may be of value in seeking strategies to enhance the effectiveness of educational program planning. However, more research is needed in this arena to focus efforts where it is needed.

Limitations and Future Research

Despite the interesting findings reported herein, a limitation of this investigation, which assessed the ability of traditional and non-traditional teacher candidates to perform eight novice technological skills, is that data were obtained using a single construct. This limitation is one that could be addressed in future research by including additional constructs. Given ongoing technological advancements, additional constructs should be included that incorporate contemporary technological applications, thus leading to a stronger conclusion.

Future research is also needed to better understand the balance between teaching and learning, curriculum and instruction, and the effective infusion of technology to enhance teacher candidate preparation within a demanding global society. Recommendations for future research include a more robust analysis of the data collected about the technology-related experiences and goals of traditional and non-traditional candidates. Secondly, this study could be replicated to include elementary education programs at other colleges and universities. Lastly, we recommend administering the instrument to each cohort entering an elementary education program, which would increase the sample size—thereby leading to a more robust size effect. While acknowledging that it is difficult for universities to devise pedagogical strategies that address the collective needs of a growing population of both traditional and non-traditional teacher candidates, the increasing diversity of student populations in today's college classroom demands that we try. Perhaps research should be conducted as to the *whys* instead of the *hows* pertaining to the divergence between traditional and non-traditional candidates. We must also point out that these students were not asked to *demonstrate* their skill levels, but only to self-report their beliefs about their own technological proficiencies. Thus, we acknowledge that their responses may carry some risk of self-serving bias. A future investigation, therefore, should require respondents to perform the technological skill, as well as rate themselves on their ability to do so.

Conclusion

This study was designed to gain a better understanding of the technology preparedness of preservice candidates for a rigorous teacher-education program. In addition, the impact of flexible delivery on student representation, expression, and engagement utilizing UDL principles was examined. As college classrooms become more diverse—and more reflective of society at large—it is essential that pedagogical practices be aligned in a manner that is respectful to the ways that *all* students learn. College teachers, cognizant that varied learners are represented in their classrooms, should be willing and able to provide instruction tailored not only to their students' learning needs but also to their particular strengths. College educators must realize that learning and learners take on various personas and that the traditional lecture model is no longer relevant for an increasing cohort of non-traditional learners. This pedagogical shift heightens the importance of UDL in today's college classrooms—and this is particularly true for non-traditional learners, as findings of this research suggest.

A significant focus in today's college classroom concerns the most appropriate technology-based methods and content-delivery systems for increasing student performance across all demographics—but particularly for the growing population of non-traditional students who may or may not enter a degree program with the same skills as younger college students. As research indicates, when Universal Design for Learning principles are implemented, both the delivery by instructors and performance of candidates are positively impacted (CAST, 2011). Thus, teacher candidates will benefit from professional development in the use of technology and UDL for coursework, especially with online and hybrid courses. Support, continued preparation, and education for both teacher candidates and instructors that will help them design more flexible curricula designed to maximize output for a range of learners will ultimately improve learning outcomes.

At the HBCU where this study was conducted, the UDL approach was first introduced during professional development sessions by two faculty members who successfully implemented the principles, and who subsequently and easily convinced the department of its potential. Nonetheless, further research is required to better understand the role that technology plays in teacher education programs, as well as discover the most appropriate and effective methods for providing instruction to preservice teachers so that they can maximize the growing toolbox of technological strategies available to them.

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