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Preservice Teachers' Ability to Identify Technology Standards: Does Curriculum Matter?

Carrie L. Lewis
Minnesota State University

Abstract

Both preservice and in-service PK-12 teachers in the United States are expected to create a classroom environment that fosters the creation of digital citizens. However, it is unclear whether or not teacher education programs build this direct instruction, or any other method of introducing students to the International Society for Technology in Education's Standards for Teachers (ISTE Standards-T; previously known as the National Educational Technology Standards for Teachers), into the curriculum. The data from a mixed-method study was analyzed in order to determine the relationship between the preservice teachers, the ISTE Standards-T, and the role technology plays in the curriculum of the teacher preparation program. Results of the analysis indicate that preservice teachers have a minimum ISTE Standards-T awareness at the Literacy level, indicating that they can use technology skills when prompted and explore technology independently.

General Problem

Professional competency standards for teachers exist to create consistency and accountability in PK-12 education throughout the United States. Standards exist for all content areas, and in the last decade and a half technology standards have also been established not only by state departments of education across the nation but also by professional organizations such as the International Society for Technology in Education (ISTE). More currently, accrediting bodies such as the Council for Accreditation of Educator Preparation (CAEP) have drafted their own standards that include technology themes as integral rather than separate parts of educator competencies.

Prior to the development of the CAEP standards, ISTE drafted National Educational Technology Standards (NETS) for teachers and for students to provide frameworks for the use of technology in an integrative and responsible manner by digital citizens of the 21st century. In other words, students need to be digitally literate, which means that they have the ability to evaluate, integrate, and interpret digital sources of information. Yet, a disconnect seems to appear between the agreed importance of digital literacy skills for today's students and the integration of the necessary digital literacy teaching skills in both undergraduate and graduate programs that prepare future teachers (Johnson et al., 2013).

Current research into the teaching and use of technology in the classroom has focused on ways in-service teachers integrate technology into their lessons (Franklin, 2007; Greenhow, Dexter, & Hughes, 2008; Hogarty, Lang, & Kromrey, 2003; Hsu, 2010), the factors impacting both preservice and in-service teachers' intentions to integrate technology (Çoklar, & Odabasi, 2010; Hutchison, & Reinking, 2011; Jongpil, Jaeki, Jones, & Nam, 2010), and the relationship between preservice teachers' attitudes toward technology and their likelihood of integrating technology into their lesson planning (Anderson & Maninger, 2007; Browne, 2009; Cullen & Greene, 2011; Rehmat & Bailey, 2014; Smarkola, 2007).

Research has been conducted to determine the extent to which the National Educational Technology Standards for Teachers (NETS-T; ISTE, 2008) and confidence impact technology integration (Friedman, Bolick, Berson, and Porfeli, 2009). The NETS-T have been also used as a framework for preservice teachers to self-identify their technology integration skills (Koch, Heo, & Kush, 2012).

Relatively few empirical studies have tried to determine which courses in the teacher preparation programs allow student teachers to begin to dialog about the importance of integrating technology in accordance with the standards. However, with the publication of competencies such as the CAEP (n.d.) as of 2016, accreditation for teacher preparation programs will hinge on the integration of technology skills throughout the teacher education curriculum.

Research suggests that outside of specific educational technology courses (Anderson & Maninger, 2007; Doering, Hughes, & Huffman, 2003; West & Graham, 2007) or direct instruction during the practicum (Graham, Tripp, & Wentworth, 2009), preservice teachers do not learn to integrate technology into their lesson planning in a manner that is consistent with state and national standards during the core courses of their teacher preparation program. One study found that teacher education program graduates claimed to have had limited exposure to technology use in their preservice classrooms and virtually no training on how to integrate technology in their lesson planning (Chelsey & Jordan, 2012). Further, the study revealed that the NETS-T– the proficiencies and practices suggested by ISTE for teachers who work in an increasingly digital world – were not a focus of instruction.

Understanding what motivates preservice teachers to begin integrating standards-based technology into their lesson planning will aid teacher educators in determining the best approach to convey this information during teacher preparation programs. This understanding could potentially help teacher certification programs prepare future teachers by encouraging their students to become digital citizens in accordance with the NETS.

National Educational Technology Standards

The NETS were first developed by ISTE in 1999 in response to the standards movement in education that failed to address technological competence as a necessary skill of PK-12 students. The NETS were "standards that describe the technology skills that should be interwoven in the curricular fabric of our schools" (Thomas & Knezek, 1999, p. 27). The NETS-T list five standards followed by specific performance indicators that state what teachers should be able to do in order to demonstrate competence under each standard (Morphew, 2012). It has been argued that the NETS-T were constructed to provide an impetus for change in an education system that lacked teachers who were able to use the technology tools that schools were providing to lead their increasingly technologically literate students (Bennett, 2000). The NETS-T were revised in 2008 and, more recently, renamed ISTE Standards-T (NETS are now ISTE Standards, 2013) to reflect the more global nature of the ISTE brand and outreach. This study described in this paper was conducted before the name change, so for the sake of consistency, the standards will continue to be referred to as NETS and NETS-T, as appropriate.

Preservice teachers are now generally expected to complete their preparation programs with the necessary skills to integrate technology in a standards-based manner that will engage students and develop their roles as digital citizens of the 21st century. The use of the NETS-T to frame curriculum development in both PK-12 and teacher preparation program settings supports the notion that meaningful learning experiences for children are not complete without the inclusion of technology (Weinburgh, Collier, & Rivera, 2003).

One study found that high familiarity with the NETS (for teachers and for students) led not only to higher use of technology in the classroom in general, but also higher use of discipline-specific technology tools among teacher educators (Friedman et al., 2009). These findings would seem to support the idea that the NETS-T have done more than provide a framework for in-service PK-12 teachers; they have also played an important role in the design and implementation of curricula for preservice teachers. The NETS-T spelled out the necessary technology skills and competencies for stepping into a classroom for the first time (Bennett, 2000). Use of these standards to enhance teacher education curricula will better prepare preservice teachers to integrate technology effectively in their own classrooms (Koch et al., 2012).

Technology Integration by Preservice Teachers

Though comfortable with the use of certain technologies, today's preservice teachers are not necessarily proficient in the successful integration of technology into lessons in a meaningful way that enhances the learning experience (Joseph, Jared, & Lydia, 2010; Özen, 2013). In addition, preservice teachers may not be comfortable instructing others in the use of technology when and if it is integrated into lessons. Technology integration in accordance with the technology standards goes above and beyond what Graham et al. (2009) called productivity or teacher presentation of information. Studies have shown that preservice teachers are not fully prepared with technology-integration-related computer skills beyond productivity and presentation uses (Jongpil et al., 2010; Kumar & Vigil, 2011; Marvin, 2004). Although many preservice teachers are comfortable with social networking and many Web 2.0 tools, they are reserved when it comes to integrating these technologies in the classroom or when using tools such as blogs or wikis (Lei, 2009).

In order to provide preservice teachers with the exposure and experience they need to become comfortable with technology beyond productivity and social networking, teacher

preparation programs must examine the best methods for providing the needed information, whether through modeling, explicit instruction, or collaboration during the practicum (Jones, Cunningham & Stewart, 2005; Keeler, 2008; West & Graham, 2007; Williams & Foulger, 2007). The journey to meeting NETS-T in the classroom as in-service teachers clearly begins in the teacher education curriculum (Çoklar & Odabasi, 2010; Nolan, Kelly, Carroll, & Conery, 2002; Wetzel & Williams, 2005;).

Teacher Education Curriculum

With the requirements for most public school teachers to address standards in their instruction, the issue becomes how they are being prepared to do so. One study found that an overwhelming majority (80%) of study respondents were enrolled in a teacher preparation program that required a separate course for educational technology (Gronseth et al., 2010). These courses served to introduce basic technology tool usage and skills, including the most common tools for productivity and presentation purposes. Students entered the standalone educational technology course at varying levels of competency, leading some to become bored with the material quickly and others to become extremely frustrated at what they perceived to be above their skill level. In addition, finding qualified faculty to staff these courses can be challenging (Tondeur et al., 2012).

A more integrated model of technology instruction throughout the program curriculum has been suggested as a better method for connecting technology to the content (Chelsey & Jordan, 2012). In order for preservice teachers to develop the skills needed to integrate technology into the classroom for educational purposes, teacher educators must model those same skills, and preservice teachers must have opportunities to practice those skills before and during the practicum (Kumar & Vigil, 2011; Tondeur et al., 2012).

An effective curriculum model for preservice teachers is one that not only shows how to use technology effectively in the classroom, but also requires students to explore, create, and plan with technology, both prior to and during their field experiences (Polly, 2012). Students must have a chance to develop skills with all aspects of technology, including problem solving, using technology ethically and professionally, and engaging students through the use of technology (Chelsey & Jordan, 2012). The problem with this model is that "many researchers have not had training in basic digitally supported teaching techniques, and most do not participate in the sorts of professional development opportunities that would provide them [with that training]" (Johnson et al., 2013, p. 10).

A change to the conceptual framework on a programmatic level is necessary to instill the necessary technological pedagogical content knowledge (or technology, pedagogy, and content knowledge, known as TPACK) that allows future teachers to integrate technology in a manner consistent with national standards (Wetzel, Foulger, & Williams, 2009). This TPACK is a blending of pedagogical knowledge, content knowledge, and technological knowledge that is unique to the idea of teaching content with technology. Expanding on Shulman's (1986) definition of pedagogical content knowledge, technological pedagogical content knowledge implies that pedagogy, content, and technology are not separate entities, but a complex system that supports the learning process (Mishra & Koehler, 2006).

A support network of administration, faculty, and technology professionals is needed to create the framework that would provide the experience and skills preservice teachers need to successfully blend content, pedagogy, and technology in their future classrooms. In addition, adopting or establishing competencies that include technology integration,

such as the CAEP standards, may increase the technological skills that preservice teachers take away from their programs.

Study Purpose and Research Questions

A study was conducted with participants from a teacher preparation program at a large southwestern research university to investigate preservice teachers' self-identified level of NETS-T awareness. A subset of the primary research goal was to determine whether NETS-T awareness levels differed between groups of students of varying characteristics, such as class standing or education specialty. This avenue of secondary research identified trends in awareness levels that may ultimately pinpoint curriculum differences at a programmatic level. These trends would be worthy of examination by administrators wishing to see what programs or courses are leading to higher levels of NETS-T awareness in preservice teachers.

Although little research exists regarding the relationship between characteristics such as education specialty and NETS-T awareness level, current studies tend to focus on the impact of multiple intelligences or socioeconomic status on digital literacy, including NETS usage (Hargittai, 2010; Sherman, 2014). Also included in the research agenda is an examination of the curriculum goals of the teacher preparation program and the corresponding course objectives for five of the core courses required by the program.

The research questions are as follows:

- What degree of awareness do preservice teachers enrolled in the teacher preparation program demonstrate regarding NETS-T?
- To what extent do the curriculum goals and learning objectives of the teacher preparation program include technology integration in accordance with the NETS-T?
- To what degree do core teacher preparation courses include technology integration as course objectives?

Method

Study Setting and Audience

The school chosen for this analysis is a large public research university in the southwestern United States accredited by the Higher Learning Commission. The Teachers College offers six education undergraduate and graduate majors leading to teaching certification: elementary, secondary, special education, early childhood, physical education, and bilingual education. The teacher education program focuses on early integration of the student into the school district by requiring education program seniors to spend one academic year student teaching with onsite faculty as a yearlong student teaching experience. Approximately 4,700 students participate in the education program leading to certification per semester.

In order to accommodate the need for a two-semester teaching practicum for preservice teachers, beginning in 2011 the Teachers College moved away from a required standalone educational technology course to an integration model of technology, where faculty members are encouraged both to model and to require technology usage in the classroom (Foulger, Buss, Wetzel, & Lindsey, 2012). The only exception to this is the graduate elementary education program, in which preservice teachers are required to take a graduate level Teaching With Technology course.

The goal of the integration model is to better connect the infusion and integration of technology with content teaching methods and pedagogy. To help meet this goal, a technology infusion specialist was hired to begin to integrate standards-based technology into selected methods classes in the undergraduate teacher education program. To date, eight methods classes have been revised to include standards-based technology infusion that includes modeling of technology use by the faculty in addition to stringent requirements that preservice teachers must demonstrate standards-based technology usage in their lesson planning.

These technology-enhanced courses adhere to the NETS-T (ISTE, 2008). The NETS-S (the NETS for students) are not addressed in these revised courses at the time of this study. A series of digital citizenship modules were also developed by the technology infusion specialist that have been required for all undergraduate preservice teachers since the fall 2013 semester.

Beginning in the junior year of undergraduate study, preservice teachers are required to complete semester-long field experience courses, which place them in a PK-12 classroom to gain hands-on experience. This practicum series provides "teacher education students with authentic opportunities to integrate technology into teaching and learning activities" (Brush et al., 2003, p. 59). One of the main goals of the curriculum in regard to technology is that preservice teachers complete their program with the skills needed to teach with technology in accordance with the ISTE NETS once they are in their own classrooms (Foulger et al., 2012).

Study Design

This study was completed as part of the dissertation requirements in the educational technology doctoral program, which is part of the same college as the teacher preparation programs being examined. I was not affiliated with the teacher preparation programs in any capacity. The study utilized a QUAN-qual mixed-methods design employing a participant survey, a document analysis of the program curriculum and core course objectives, and follow-up interviews with selected participants.

This design was chosen in order to elaborate upon quantitative results with qualitative data (as in Morse, 2010). While the quantitative data provided an opportunity to assess the trend of a larger number of people from diverse groups, the qualitative data allowed for a more complex image to form around the backbone of the quantitative data (as noted by Creswell, 2008). The data from both the quantitative and qualitative portions of the study were triangulated in order to develop more complete answers to the research questions in this study and to establish the validity of the study results.

In order to control for curriculum differences between majors, methods courses, and programs, the courses examined in this study were those common to education students at a given level (undergraduate or graduate), regardless of specialization. In addition to an analysis of the syllabi and course objectives, participants were recruited from sections of a subset of five core undergraduate courses and two core graduate courses to respond to a survey. Students in these five undergraduate and two graduate classes (N = 250) were asked to take the NETS-T familiarity survey. Approximately 25% responded (n = 62), and of that group 15 students agreed to participate in follow-up interviews. The survey response rate of approximately 25% was slightly lower than a 30% response rate typically seen from an online survey (according to Fowler, 2009). Faculty members from each of the seven selected courses were asked to participate in an interview (n = 6). Administrators from each area of the program (undergraduate, graduate) were asked

to participate in an interview (n = 3). None of the participant interviews were recorded or transcribed.

Midsemester, participants in the study were asked via their course instructor to complete an electronic confidential survey based on the NETS-T (ISTE, 2008). Volunteers from this group were solicited to participate in interviews, and 15 students enrolled in undergraduate programs leading to teaching certification subsequently volunteered. The participants interviewed were at varying points within the program and were either currently or previously enrolled in one of the seven courses being examined in this study.

Six faculty members were interviewed from the Teachers College. All faculty members teaching the core courses at the time of the study were contacted. The six faculty members interviewed were those who consented to participate. Two were teaching assistants in the doctoral program, one was a department adjunct, one was a lecturer, one was a clinical instructor, and one was an associate professor.

In order to answer the second research question and to better understand the Teachers College policies and goals regarding expected technology integration competencies of preservice teachers, I purposefully selected three administrators from the Teachers College based on their areas of administration. One was the director of teacher preparation, supervising all undergraduate teacher preparation programs (elementary, secondary, special education, early childhood, physical education, and bilingual education). The second administrator was the assistant division director of all graduate programs within the Teachers College. The third administrator was the director of the Division of Educational Leadership and Innovation.

Participants

Of the 62 survey respondents from students enrolled in the Teachers College preparation programs, 37% were not currently participating in their student teaching practicum. Many participants had previously or were currently enrolled in more than one core course at the time of participation. The remaining participant demographics can be seen in Table 1.

Measures

NETS-T Knowledge Survey. A cross-sectional survey was adapted from an ISTE NETS-T presurvey created by Naomi Harm as part of an Enhancing Education through Technology grant that allowed the Wisconsin Department of Education to adopt the NETS for their students, teachers and administrators (N. Harm, personal communication, February 20, 2012). This survey has been used to pretest in-service teachers before training courses and the questions are taken directly from the NETS-T (ISTE, 2008; the renamed ISTE Standards-T are identical and can be viewed at http://www.iste.org/standards/standards-for-teachers).

Table 1
Survey Respondent Demographics

Category	%
Class Standing	
Freshman	23
Sophomores	7
Juniors	37
Seniors	26
Graduate	7
Unknown	1.6
Education Specialty	
Elementary	30.6
Secondary	29
Early Childhood	8.1
Special Education	19.4
Other	12.9
Gender	
Male	19.4
Female	80.6
Age	
18-29	84
30+	16

Items were added to the original survey questions requiring the participants to identify the courses they had completed in their program, in addition to their specific content area. Participants were then asked questions related to identification of the NETS-T. Demographic data was also collected, including age, gender, ethnicity, grade point average, class standing, and major. Participants were asked if they were willing to participate in a follow-up telephone interview. The adapted survey consisted of 35 total questions, including items that addressed the NETS-T through a series of five categories containing four questions each. An example of an NETS-T survey item can be found in the appendix.

No previous reliability or validity data was available for this survey. Therefore, it was field tested in a process following Dillman's (2000) recommendation. Content experts first reviewed the survey, and then the format was revised for readability. The standard-specific questions were placed in table format, and changes were made to several of the demographic questions to make them more readable.

A field trial of the survey was completed with a graduate class for elementary education majors. Responses from the field trial, n = 20, were judged to be reliable with a Cronbach's α = .977.

A think-aloud pilot was conducted with four experienced in-service teachers. This think-aloud pilot asked the participants to share their thoughts as they moved through the survey items. The major theme emerging from this process was that the standards-based questions themselves were "wordy" and lengthy. Since these questions are taken directly from the NETS-T, no changes were made to the questions in order to accurately reflect the language of the standards.

The survey questions required participants to identify their level of awareness of each NETS-T. The NETS-T indicate that teachers must:

- Facilitate and Inspire Student Learning and Creativity
- Design and Develop Digital-Age Learning Experiences and Assessments
- Model Digital-Age Work and Learning
- Promote and Model Digital Citizenship and Responsibility
- Engage in Professional Growth and Leadership.

The levels of awareness of the NETS-T, as defined by the original Harm (2008) survey, are as follows:

- Awareness: Learners are exploring technology and developing foundational skills but have not developed sufficient expertise to use the skills in daily life.
- Literacy: Learners continue to explore technology and have developed the skills enabling them to use technology when prompted.
- Integration: Learners select and apply appropriate technology to successfully complete tasks.
- Leadership: Learners share new knowledge through proactive modeling, peer coaching, and mentoring.

The Harm survey was chosen for its direct relation to the NETS-T, making it ideal for determining the level of NETS-T awareness in preservice teachers. Other surveys concerning standards-based technology integration are largely attitudinal or do not ask questions directly related to the NETS-T, focusing more on TPACK (Ash, Sun & Sundin, 2002; Schmidt et al., 2009). Some surveys such as the MITTEN Technology Survey (Taylor & Duran, 2006) focused on standards-based technology use; however, the intended audience for the MITTEN survey was primarily in-service teachers who were already experienced in integrating technology. Moreover, the MITTEN survey does not specifically address NETS-T awareness.

Course Objectives Coding Template. A document analysis of the Teachers College curricula and program requirements was conducted to determine the policies and goals of the College in terms of technology integration. Syllabi were the only course-specific documents requested and received for each core course from the college's administration. A thematic analysis was performed on the documents to determine if technology integration was included in course objectives and planned activities.

The coding template (Crabtree & Miller, 1999) was based on the criteria set forth by Graham et al. (2009) of productivity, pedagogy, student use of technology, teacher presentation of information, and the themes set forth by the NETS-T. Following the Crabtree and Miller approach, the coding template was developed a priori and defined based on the research questions and theoretical framework of the NETS-T. Nine broad categories were identified as relevant:

1. Use of technology for productivity purposes
2. Use of technology for pedagogy purposes
3. Planning for student use of technology
4. Using technology for teacher presentation of information
5. Using technology to facilitate and inspire student learning and creativity
6. Using technology to design and develop
7. Digital-Age learning experiences and assessmentsUsing technology to model Digital-Age work and learning
8. Using technology to promote and model digital citizenship and responsibility
9. Using technology to engage in professional growth and leadership

When reviewing the documents, whenever there was only a vague description using the word *technology* or the phrase *technology integration*, these items were placed under a general categorization of "Use of technology for pedagogy purposes," due to the definition of that category ("Technology Assists With Teaching"), as no clear intention for use can be inferred from either the single word or phrase.

Participant Interviews. Follow-up individual interviews averaging approximately 10 minutes each were conducted via telephone or in person with those student participants (n = 15) who expressed interest in participating in an interview after taking the survey. The interview questions allowed me to obtain a more in-depth understanding of the participants' reflections on their familiarity with the NETS-T and technology integration, in general.

Faculty members (n = 6) were asked questions regarding the degree of their use of modeling and direct instruction of technology integration in their courses during the course of individual interviews conducted in person or via phone. Each interview lasted approximately 20 minutes in length. Faculty members were also asked to identify the degree to which they required standards-based technology integration in their students' assignments.

Administrators (n = 3) were asked for their expectations of standards-based technology integration from both students and faculty. Administrators were also asked to describe their policies and support for faculty in terms of modeling and direct instruction of technology. Each of these in-person or phone interviews lasted approximately 20 minutes

Results

NETS-T Awareness

A descriptive analysis was performed on the student survey data to determine the mean, variance, and range for each question. The data for questions about the specific NETS-T categories were coded in order to compare means (*I have not learned this* = 1; *Leadership in this area* = 5). The coded responses from the 20 NETS-T survey items were judged to be reliable with a Cronbach's a = .976. A factor analysis was also completed on the NETS-T survey items. However, as all items were highly correlated, as seen by a = .976, all items were placed in one factor.

The number of responses from all survey participants (n = 62) across all four categories of each awareness level (20 possible responses per category) shows that Literacy and Integration levels received the highest number of responses, 227 and 240, respectively (Figure 1). This finding indicates that for most NETS-T items, typical respondents felt that they could both continue to explore technology and had developed the skills enabling

them to use technology when prompted and select and apply appropriate technology to successfully complete tasks.

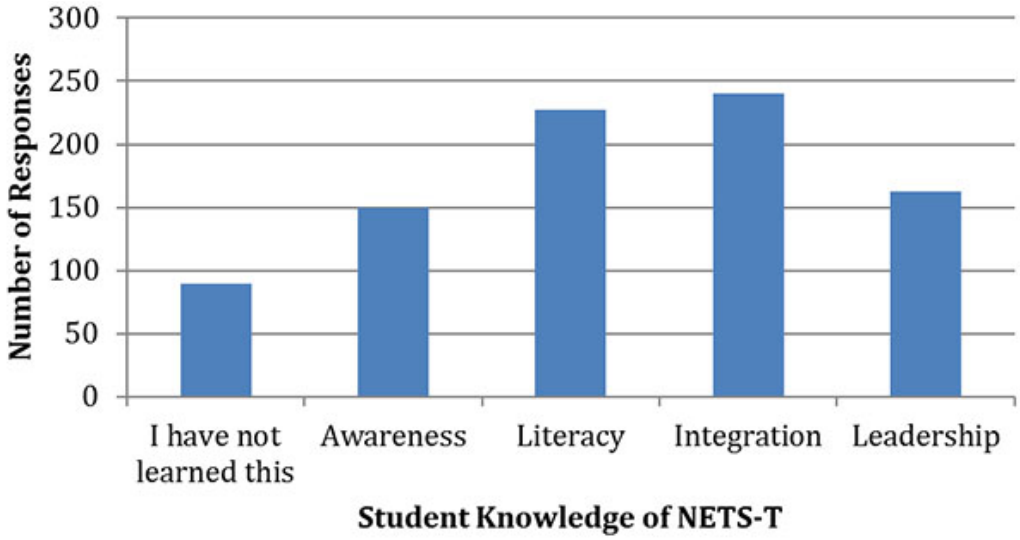

Figure 1. *Number of survey responses by student knowledge of the NETS-T.*

When the 15 participants who volunteered to be interviewed were asked about their knowledge of NETS-T, a majority of them (55.6%) reported that they were at the Literacy level of NETS-T knowledge awareness, indicating that they can "continue to explore technology and have developed the skills enabling them to use technology when prompted" (ISTE, 2008). This conclusion is based on responses naming technology tools the participant was able to use in the classroom or for an assignment (e.g., Google Docs, Prezi, Smartboards), in addition to the stated and implied uses of these tools (for presentation of information or productivity purposes).

While 60% of respondents indicated that they were unfamiliar with the NETS-T, 38.9% indicated that they integrated technology into their assignments, including lesson plans. None of the respondents were able to articulate this integration as compliance with the NETS-T.

Sixty percent of the 15 respondents interviewed were unfamiliar with the terms *National Educational Technology Standards* and *digital citizenship*. When questioned about the type of technology they or their instructor used in class, respondents indicated that technology usage largely fell into the presentation of information or productivity categories. All but one respondent replied that adequate resources existed to allow them to explore unfamiliar technology topics. More than half (62.5%) of the respondents also indicated that they had significant concerns about integrating technology into their own lessons due to a variety of reasons, including lack of skill and availability of technology in their future classrooms.

Technology Integration in Curriculum Goals and Learning Objectives

The results from an analysis of the Teachers College website indicated that technology-related themes were present only in certain areas of focus for the education major. The

Professional Learning Library contains resources in the form of articles and web links about subjects such as "Technology NETS-S," "Technology NETS-T," and "Technology Infusion." The early childhood program description is the only program description that mentions technology at all. This description was categorized into "Use of technology for pedagogy purposes," as it was not clear what the single phrase *technology integration* entailed.

An analysis of the course requirements for the various education areas of emphasis indicated that all undergraduate majors, with the exception of the physical education majors, must choose one of two computer literacy courses. The early childhood, special education, elementary education, and secondary education (mathematics and science) majors required an additional Teaching With Technology course beyond the computer literacy course.

In terms of programmatic goals and policies, the administrators in charge of the teacher certification programs indicated that there was a programmatic expectation that students would graduate with the ability to integrate technology in the classroom in accordance with NETS-T.

Technology Integration as Course Objectives

The analysis of the course objectives and syllabi indicated that the assignments and activities in core classes common to all education majors included little technology use beyond productivity and presentation of information purposes, with the exception of the two computer literacy courses offered by the program. Four of the courses examined contained elements that could be placed in the "Using technology to Design and Develop Digital-Age Learning Experiences and Assessments" category, either by assignment design or course objective. The two computer literacy courses reflected the most standards-based design, addressing both "Using Technology to Promote and Model Digital Citizenship and Responsibility" and "Using Technology to Engage in Professional Growth and Leadership" categories, both of which adhere to the NETS-T.

Eighty-three percent of the faculty participants interviewed recognized and could identify the NETS-T and the term *digital citizenship*. Although most of the participants reported that they attempted to model and integrate technology on some level, technology integration was not prominent in the requirements for student lesson planning, and the decision to integrate technology was generally not based on the NETS-T. Most instructors felt that technology, as a whole, was undervalued or underutilized by the College, although the majority of the participants felt that they had adequate resources available to them should they wish to explore a technology tool or topic.

Discussion

The main purpose of this study was to determine preservice teachers' level of awareness of the NETS-T and the extent to which the curriculum goals of the examined teacher preparation program, core course objectives, and course activities influence this level of awareness. This study revealed five main findings:

1. Preservice teachers' average self-identified awareness level of NETS-T fell between the Literacy and Integration levels.
2. Administrators, instructors, and students varied in terms of programmatic expectations and awareness of resources.

3. The integration of standards-based technology was limited in the core courses common to almost all education majors, regardless of specialty, as reflected in course objectives and requirements
4. The meaning of standards-based technology integration (beyond the productivity and presentation level) appeared to be limited among instructors and students
5. Programmatic policies and procedures were in place within the Teachers College that indicated an intent to revise courses to include standards-based technology and to train instructors to integrate technology beyond the presentation level.

NETS-T Awareness

There seemed to be a difference between preservice teachers' general knowledge of the NETS-T and the ability to name or identify specific NETS-T content. Rather than being consciously aware of the NETS-T vocabulary, it would appear that preservice teachers are instead beginning to develop their TPACK (Wetzel et al., 2009). This finding would seem to indicate that NETS-T may not be the best framework for helping preservice students develop appropriate technology integration skills; building a curriculum framework around TPACK or CAEP standards may be more effective.

The current study did not directly examine the extent to which education faculty members were practicing standards-based technology integration in the common core classes. Despite this circumstance, the findings from the study suggest that the technology integration model adopted by the Teachers College curriculum may benefit from inclusion of explicit instruction of both the NETS-T and technology integration that supports pedagogical use and promotion of digital citizenship beginning in the lower level required courses. In addition, requiring students to create lesson plans that include standards-based technology integration to support pedagogy and not only the presentation of information might also serve to raise the level of NETS-T awareness (Angeli & Valanides, 2005; Brantley-Dias, Kinuthia, Shoffner, de Castro, & Rigole, 2007; Chelsey, 2012; Graham et al., 2009).

Technology Integration in Curriculum Goals and Learning Objectives

At face value, the analysis of the curriculum goals of the Teachers College, as described on the program website, does not reveal a policy of standards-based technology integration. A closer investigation of the policies and views of the program administration indicates more support for technology and standards-based technology integration than the curriculum goals would suggest. This finding, along with the relatively low levels of NETS-T awareness, would seem to indicate that there were the beginnings of a curriculum framework (Polly, 2012) that included at least some technology competencies. It is this supportive network, rather than the overt written program requirements and policies, that likely contributed to the NETS-T awareness levels of the students.

Technology Integration as Course Objectives

Only the course objectives for the computer literacy courses mentioned technology. In general, course objectives hold both instructor and learner accountable for achievement within the confines of a course (Allison, 2012; Combs, Gibson, Hays, Saly, & Wendt, 2008). The presence of course objectives that contain standards-based technology goals for the course would demonstrate alignment with both NETS-T and with the larger program goals that include a technology integration emphasis. This alignment could help create the framework for instructors and students to begin to integrate technology into lessons and assignments (Mishra & Koehler, 2006; Polly, 2012; Wetzel et al., 2009).

Limitations of the Study

As with any study, a number of important limitations need to be considered when interpreting these findings. First, a large portion of the study depended on self-reported data from the participants in both the survey portion and the interview portion. These self-reported data relied on the participants' interpretations of the survey and interview questions. In addition, the participants' responses may have been biased, based on their attitudes toward technology, in general. In an attempt to address this limitation, data were gathered from documents and follow-up interviews with faculty members and administrators in order to triangulate the responses.

Future studies should include in-class observations, perhaps over the course of a semester, to gain an expert-evaluator's insight into the role technology plays in the classroom itself. Artifacts such as student-created lesson plans, teacher-created activities, grading rubrics or assignments would provide another valuable glimpse into how standards-based technology is incorporated into the classroom.

A final concern regarding the student survey is that, of the students who completed the survey (n = 62) at least 27% did not respond to the standard-related questions on the survey. This lack of response could have been due to a lack of knowledge or understanding of the question wording or impatience with the length of each subcategory. This noncompletion of the full survey by 27% of the participants could contribute to both an increase in sampling variance and bias of the estimates, depending on the demographics of those participants who chose not to complete the NETS-T portion of the survey.

Little prior research has considered the question of NETS-T recognition in either preservice or in-service teachers. While attitudes toward technology and actual use of technology in the classroom are both areas that have been examined, the concept of NETS-T recognition in teachers, either preservice or in-service, provides an opportunity for future studies.

Conclusion

Awareness of NETS-T has been -shown to have a positive impact on the practice of technology integration by preservice teachers (Friedman et al., 2009). Overall, the teacher certification program participants at the institution where this study was conducted reached at least a Literacy level of awareness of the NETS-T. While the stated curriculum goals and the course objectives of the five core courses common to all undergraduate education majors contained little in terms of standards-based technology goals, preservice teachers gained some exposure to technology tools through the modeling done by their instructors and through hands-on activities and assignments.

The program administrators expressed support for technology integration on a program-wide level, and faculty members interviewed indicate an interest of learning and doing more with standards-based technology in the classroom. However, data from this study revealed an overall lack of understanding from both students and instructors as to how to use standards-based technology at a pedagogical level—that is, beyond the presentation of information or the organization of the course. Although assignments existed that allowed students to create with technology, few assignments presented them with the opportunity to develop lessons that would potentially develop better digital citizens or encourage them to teach others about meaningful technology usage in the classroom (i.e., the Leadership level).

This program needs a clearer policy regarding standards-based technology. Clear expectations regarding how instructors should integrate technology and how they should require students to use technology should be communicated, and the faculty should have access to professional development to support the integration of standards-based technology into courses. This action would ensure consistency across all program courses in terms of exposure to technology-rich curriculum. This type of initiative may require the services of more than one technology infusion specialist.

The qualitative nature of this study allows only for the examination of the particularities of this specific teacher education program rather than generalization to teacher education programs, in general. However, the results of this study open the door for a discussion on the relationship between curriculum and technology integration. Implications for teacher education, in general, include the need to identify what frameworks and models best encourage the development of technology integration skills. Based on this study, the NETS-T may not be the ideal framework for meaningful, lasting, and effective technology integration skills in preservice teachers. Rather, TPACK or the adoption of CAEP standards may be more meaningful in connecting technology integration theory into practice beyond productivity and the presentation of information.

Finally, explicit instruction of the NETS-T or some other technology integration model should be incorporated into courses early in the program, and standards-based technology integration should become the norm for preservice teacher lesson planning, not the exception. Explicit instruction of NETS-T would allow students to be clear about their technology literacy skills, and allow them to begin connecting that awareness with the importance of standards-based technology in their future teaching experiences.

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Author Note

Carrie L. Lewis
Minnesota State University
Email: carrie.lewis@mnsu.edu

Appendix
Example of Survey Question

I feel that the courses in my Teacher Prep program have prepared me to integrate the following into my lesson plans and my future classroom:

Facilitate and Inspire Student Learning and Creativity

Teachers use their knowledge of subject matter, teaching and learning, and technology to facilitate experiences that advance student learning, creativity, and innovation in both face-to-face and virtual environments.

	Awareness- I am aware but do not use this in my practice	**Literacy- I am literate and integrate some of the indicators**	**Integration- I integrate this into my teaching**	**Leadership- I am able to teach others**	**I have not learned this**
Promote, support, and model creative and innovative thinking and inventiveness					
Engage students in exploring real-world issues and solving authentic problems using digital tools and resources					
Promote student reflection using collaborative tools to reveal and clarify students' conceptual understanding and thinking, planning, and creative processes					
Model collaborative knowledge construction by engaging in learning with students, colleagues, and others in face-to-face and virtual environments					