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Abstract

This study explored pre-service teachers' use of Hutchison and Woodward's (2014) Technology Integration Planning Cycle for instructional lesson planning in literacy. Ten pre-service teachers enrolled in a course entitled Literacy Assessment and Instruction II participated. As part of the course, each pre-service teacher developed and delivered weekly one-on-one instruction for a child in first through fifth grade. The Planning Cycle was used in an effort to increase pre-service teachers' consideration for the use of digital technology tools. The study was conducted as a case study (Yin, 2009). First, all of the data were read and descriptive notes were written (Patton, 1990) using an inductive approach (Miles & Huberman, 1994). Patterns and themes were identified and the coding scheme refined accordingly. Data sources included: pre-service teacher lesson plans, video recordings of pre-service teacher lessons, audio recordings of a mid-term conference with the instructor, and a final reflection paper. Four themes were identified: (1) conscious planning; (2) poorly defined instructional goals; (3) determining an instructional approach; and (4) decisions about digital technology. A nature of technology framework was used to make further meaning of the results and generate implications for pre-service teacher education.

Introduction

The call for meaningful integration of Information Communication Technologies (ICTs) into instruction continues to increase. While arguments against the inclusion of technology exist, the Common Core Standards (CCSS) demand students become proficient at using digital technology to read, write, and communicate (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010). The integration of ICTs is especially important for literacy because the use of digital technologies changes the nature of what it means to be literate and require new literacies, which are defined as the skills, strategies, and dispositions to use and adapt to rapidly changing ICTs (Coiro, Knobel, Lankshear, & Leu, 2008). Selber (2004) notes that the common functional literacies (e.g. student knows how to create a digital document) related to technology use are not enough. He argues students must develop both rhetorical and critical literacies regarding technology. Such literacies ensure students can leverage technology to accomplish goals and identify ways technology might hinder their goals.

Keen (2007) notes the important role familiarity with technology serves in developing technological perspectives beyond the functional use of technology. Thus, the use of technology in instruction is essential (International Reading Association, 2009), but not enough. The International Society for Technology in Education (2000) contends that teachers should be able to design appropriate learning opportunities that use technology-enhanced instructional strategies and experiences that address content standards. Teachers must also learn to be more critical of technology to ensure technology does not inadvertently undermine desired outcomes (Kruse, 2013a ; Olson & Clough, 2001; Waight & Abd-El-Khalick, 2007).

Developing multifaceted perspectives is a daunting task as teachers struggle to integrate technology meaningfully into literacy instruction (Hutchison & Reinking, 2011). Specifically, lack of time, lack of professional development, ability to integrate ICTs and still teach content, and ability to integrate technology specific to literacy instruction are some known barriers to effective integration of digital technology in K-12 literacy instruction (Hutchison & Reinking, 2010). Several of these barriers are related specifically to the planning and delivery of instruction, a cornerstone of pre-service teacher (PST) preparation. Yet, teacher

education programs “do not currently provide prospective teachers with the necessary skills, competencies, and experiences to prepare them to use ICTs effectively in their future profession” (Goktas, Yildirim, & Yilidirim, 2009, p. 193).

Although teacher educators often use digital technology with their students, teacher educators are not preparing their PSTs to meaningfully integrate digital technology into instruction (Theiman, 2008). Beginning teachers regularly report that they do not feel adequately prepared to effectively integrate digital technology into instruction (Sang, Valcke, van Braak, & Tondeur, 2010). This is an interesting assertion considering a significant number of PSTs are regarded as digital natives (Prenski, 2001) and regularly use ICTs (Rainie, 2006). It is possible that the disconnection between personal ICT use and the integration of ICTs into instruction is related to the limited scope of their technology use, which is often focused on social communication and learning activities from a student perspective (Lei, 2009). Therefore, supporting PSTs to integrate technology meaningfully into instruction should be considered carefully.

By modifying Selber’s (2004) framework, teacher educators might consider three perspectives teachers must develop for effective technology integration: functional, pedagogical, and critical. Many teachers already possess functional abilities and can effectively navigate online spaces and use technology to communicate. However, many teachers lack pedagogical perspectives. Specifically, they cannot leverage technology for pedagogical purposes, which indicates that the teachers lack technological pedagogical content knowledge (TPCK) (Mishra & Koehler, 2009). Unfortunately, the critical perspective is rarely made explicit regarding required perspectives for technology integration.

This lack of critical perspective may follow an instrumental view of technology (Feenberg, 1991). Instrumentalists deny the value-laden nature of technology and claim technology is a tool to use however we desire. However, technology does contain values, most often efficiency (Ellul, 1964). Such values can be destructive when applied to an inherently inefficient process such as learning (Kruse, 2013a). Feenberg (1991) argues for the more critical perspectives that acknowledge both the value-laden nature of technology and the control humans can exert of technology. Kruse (2013a, 2013b) and Kruse and Wilcox (2013) add five dimensions regarding the nature of technology beyond the value-laden nature of technology necessary for a critical perspective of technology. Drawing from Clough (2007), Kruse (2013b) notes that individuals must be able to wrestle with questions rather than spout conclusions. Such questions include (Kruse, 2013b, p. 391):

- How does technology both enhance and limit human activity and thinking?
- What are the gains and losses of technology use? What are the trade-offs?
- What factors affect the development and adoption of new technologies?

These aspects of the nature of technology can enhance teachers’ pedagogical perspectives or TPCK, because a more critical perspective can help teachers make better decisions about how to, and when to, integrate certain technologies. While teacher educators might hope PSTs will develop and draw from these perspectives (functional, pedagogical, critical) when making decisions, consideration must be given to how PSTs can be better supported in making informed pedagogical decisions regarding technology.

Hutchison and Woodward (2014) proposed a technology integration planning cycle (TIPC) that assists teachers in critically selecting appropriate digital and non-digital tools to meet their instructional goals. The TIPC suggests seven elements for instructional planning when considering the use of technology, which are evident in Figure 1, and described later in the paper. This cycle was designed to assist in-service teachers with the instructional planning process as they develop lesson plans that integrate digital technology. However, PSTs’ use of the TIPC has not yet been studied. Therefore, the purpose of this study was to explore PSTs’ use of the TIPC when developing literacy instruction.

Conceptual Framework

The present study employed the TIPC as the conceptual framework (Hutchison & Woodward, 2015). This planning cycle was developed using the Technological Pedagogical Content Knowledge framework as a foundation (Mishra & Koehler, 2006). The TPACK framework suggests that teachers can make high-quality instructional decisions when they draw upon their knowledge of technology, pedagogy, and content (Mishra & Koehler, 2006) and that it is the interaction of these types of knowledge that allow teachers to effectively integrate technology into their instruction (Koehler & Mishra, 2009). The TPACK framework provides a “useful frame for thinking about what knowledge teachers must have to integrate technology into teaching and how they

might develop this knowledge” (Schmidt, Baran, Thompson, Mishra, Koehler, & Shin, 2009, p. 125). This framework is particularly valuable considering that most teachers’ technology integration efforts have focused on uses of technology that center around software, websites, and management rather than tools that support inquiry and collaboration to transform practice (Harris, Mishra, & Koehler, 2009). The TIPC describes seven steps that engage the teacher in applying their knowledge of technology, content, and pedagogy while lesson planning and aims to encourage instruction that utilizes digital technology to enhance and transform instruction. Hutchison and Woodward (2014) suggest questions that the teacher should consider while making decision at each of the seven steps. The steps and related questions are presented in Table 1.

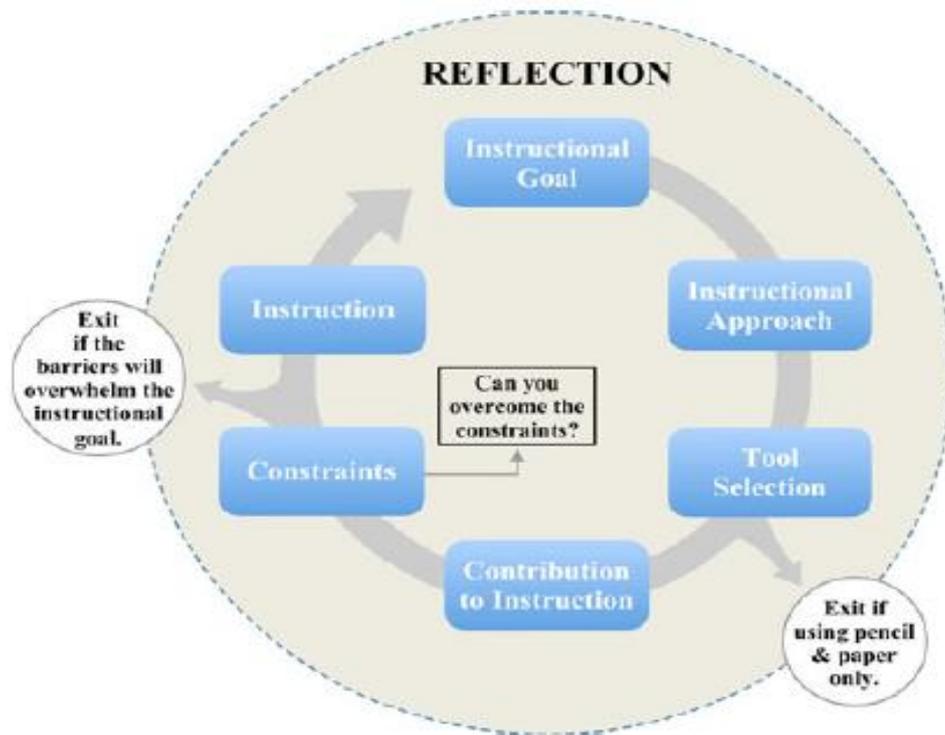


Figure 1. Hutchison and Woodward’s (2014) Technology Integration Planning Cycle. Reprinted from “A Planning Cycle for Integrating Digital Technology Into Literacy Instruction,” by A. Hutchison and L. Woodward, 2014, *The Reading Teacher*, 67. p.459. Printed with permission from *The Reading Teacher*.

As Table 1 suggests, when utilizing the TIPC (Hutchison & Woodward, 2014) the teacher must carefully consider the use of all instructional tools, digital and non-digital, and may choose to exit the cycle if non-digital tools will most effectively allow the teacher and/or students to meet their instructional goal. If the teacher opts to utilize non-digital tools exiting the TIPC is necessary, because the subsequent steps in the TIPC define additional considerations for the use of digital technology; it does not apply to the use of non-digital technology. It is important to note that, as the teacher uses the TIPC, the focus should always rest on the instructional goal(s) of the lesson plan and not the digital technology.

Because Hutchison and Woodward’s (2014) TIPC explicitly asks teachers to identify constraints and limitations and exit the cycle if appropriate, space is created for teachers to engage Selber (2004) and Feenberg’s (1991) critical perspective. For example, to identify constraints and limitations, teachers must understand that all technologies have trade-offs. Then, educators must understand that technologies have what McLuhan (1964) calls “psychic and social consequences” (e.g. changes to thinking and behavior). While educators easily recognize the trade-offs related to time for students to learn new technology, they may be less likely to recognize how a technologies shape students’ thinking and behavior in both negative and positive ways. For example, if teachers understand the inherent values of a particular technology, they might recognize a trade-off of the computer’s interface may be the encouragement of individual rather than collaborative work (Guzman-Rodriguez, 2007; Kruse, 2009). With explicit space created for applying both pedagogical and critical perspectives, implementation of Hutchison and Woodward’s (2014) TIPC ought to serve as an excellent medium to investigate PSTs’ decision-making about technology.

Methods

The present case study used multiple sources of evidence to investigate “a contemporary phenomenon in depth and within its real-life context” (Yin, 2009, p. 18). Merriam (1988) defines case study as a “description and analysis of a single entity, phenomenon, or social unit” (p. 16). The bounded case in this study was one pre-service teacher education course, Literacy Assessment and Instruction II, and is described in more detail in a subsequent section. The data sources for the study included: lesson plans written by the pre-service teachers, transcribed midterm conference interviews between the instructor and pre-service teachers, reflection statements written by the pre-service teachers, and a final reflective paper written by the pre-service teachers. The purpose of the present study was to explore PSTs’ use of the TIPC.

Table 1. Steps in the Technology Integration Planning Cycle

Step in TIPC	Description of step	Examples of questions to consider
Step one. Identify an instructional goal	Explicitly define the instructional goal	Is the instructional goal aligned to overall outcomes? Is the instructional goal aligned to state and national standards?
Step two. Determine pedagogical approach	Determining the best method to meet the instructional goal	Will instruction be teacher or student centered? Will instruction involve prior experience with the topic (and/or technology)?
Step three. Consider tools	Using TPACK knowledge, the best tool for the instructional goal and approach is selected	Digital or non-digital tool? Would a digital tool complement any non-digital work?
Step four. Contributions to instruction	Identify specific contributions to instruction that the tool provides as related to the instructional goal	Does the tool allow for digital and non-digital literacy skills? Does the tool all of multimodal production or consumption?
Step five. Identify constraints	Determine if there are features of the tool that would reduce the contributions the tool affords	Will constraints overwhelm instruction? Can the constraints be overcome?
Step six. Deliver instruction	Imagine and develop the procedures for the lesson	How much student work time is necessary? How will student work be assessed? What changes need to be made?
Step seven. Reflection	Reflect on the outcome of the lesson	In what areas of TPACK might more information be necessary?

Participants

Ten PSTs enrolled in the course “Literacy Assessment and Instruction II” participated in the project. This course is required for the reading endorsement and is typically completed near the end of the PST’s program immediately prior to student teaching. All of the participants had completed a reading methods course and Literacy Assessment and Instruction I as prerequisites for the course. Additionally, all participants had completed an Educational Technology course where they used a variety of digital tools and considered how they might be useful for instruction. Therefore, all participants should have had some knowledge of digital tools that might be used during instruction. However, this course is typically completed while students are at the beginning of their preparation program, often before they have taken any professional education or methods courses. Nine participants were female and one was male. Eight of the participants were working toward an elementary endorsement and two were working toward a secondary endorsement.

The Course and Instructional Context

The purpose of Literacy Assessment and Instruction II was to provide PSTs with the opportunity to develop an in-depth understanding of struggling readers by exploring how to develop, implement, and evaluate instruction

to support a struggling reader. This course has two segments: participation in an after school reading clinic and a weekly one-hour face-to-face course. During the reading clinic, PSTs provided weekly intensive, one-on-one instruction for a child in first through fifth grade. Thus, PSTs were required to plan, implement, and evaluate one hour of literacy instruction each week. During the face-to-face coursework the instructor supported PSTs' ability to design and implement instruction to meet the specific needs of the struggling reader the PSTs worked with during the reading clinic. Specifically, instructional approaches were presented, the use of digital and non-digital tools was discussed (e.g., Storykit, Drawing Pad, paper and digital graphic organizers, etc.), and PSTs reflected upon their instruction and shared their successes and challenges with one another. During the reflective conversations, PSTs often shared the instructional approach they had selected as well as the tool they used. In this way, PSTs frequently learned new instructional approaches and tools, digital and non-digital, from their peers.

In past semesters a variety of lesson plan frameworks had been utilized. However, when utilizing these frameworks, PSTs rarely considered using digital technology and used paper and pencil tools almost exclusively. Thus, the TIPC was used as the planning framework in an effort to support PSTs consideration of the use of digital technology for instruction. In order to teach students about the TIPC, Hutchison and Woodward's (2014) article describing the TIPC was read and studied in the first two weeks before tutoring sessions initiated. Each step in the cycle was discussed and questions were asked and answered. The questions that should be asked and answered throughout the TIPC (See Table 1) were the foundation for much of the in-class introduction to, and discussion, of the TIPC.

As PSTs planned instruction each week, they used a form that aligned with the questions that support the use of the TIPC. The form is included as Appendix A. The purpose of the form was to support the PSTs thinking about each step of the cycle and required PSTs to record a rationale for how the tool would support the instruction. This form encouraged the PSTs to consider some of the questions that Hutchison and Woodward (2014) recommended (e.g. how will you know the students met the instructional goal is related to how will student work be assessed). Components of the TIPC were re-visited over the course of the semester as issues or concerns arose. For instance, several PSTs asked for information about digital tools they could use. Thus, the instructor shared a variety of digital tools (e.g., Popplet) during class each week. The data sources are discussed in the following sections.

Lesson Plans

The PSTs developed lesson plans for their tutoring sessions. These lessons included authentic reading and writing opportunities for the child and focused on reading and writing for a meaningful purpose and defined audience (Duke, Caughlan, Juzwik, & Martin, 2012). The PSTs used the TIPC (Hutchison & Woodward, 2014) to define instructional goals, determine the pedagogical approach that will be used, and select appropriate tool(s) for the lesson.

Video Recordings Lessons

All of the PSTs conducted two video recordings that focused on the PST's instruction. Following the video recording, the PST reflected on their instruction and submitted a written response to the following questions: (a) Did the pedagogical approach(es) and instructional tools support the learning goals as you anticipated? Why or why not? (b) What would you do differently? What specific changes would you make? How do you anticipate that these changes would facilitate improved student learning?

Audio Recordings of Conference

All of the PSTs completed a mid-term conference in which they discussed the lesson planning process and the implementation of the lessons. The guiding questions for this conference were: (1) Describe your lesson planning process. (2) What information have you used to create instructional goals? (3) How have you selected tools to meet these goals? (4) Talk about the implementation of these lessons and the tools that you selected. What has gone well? What has not? (5) What might help you plan and provide instruction as we move into the second half of the semester? The conferences were audio recorded and transcribed.

Final Reflection Paper

The PSTs wrote a final reflective paper at the conclusion of the course. This paper answered the following prompts: (1) Describe your biggest instructional success. (2) Describe your biggest instructional challenge. (3) Reflect upon your use of the planning cycle. Did the use of the planning cycle assist you in meeting course objectives and the needs of the child you were working with? Discuss the cycle's merits and limitations. (4) What actions will you take to continue to improve your practice?

Data Analysis

First, all of the interviews were transcribed by the first author. Next, all of the data were read and descriptive notes were written in the margins on data sources (Patton, 1990) using an inductive approach (Miles & Huberman, 1994). Following the initial read of the data for each case, a memo was created, which was a write up of impressions and their relationships as "they strike the analyst while coding" (Miles & Huberman, 1994, p.83). This memo was dated, included key concepts, and contained links to specific notes (Miles & Huberman, 1994). Next, provisional codes were created by placing segments of ideas into categories (Strauss, 1987). After provisional codes were applied, another memo was written and the frequency with which each code was applied was counted. Using the memos and frequency counts, patterns between themes were identified and the coding scheme refined accordingly. Therefore, some themes were folded into others in the final coding scheme.

Results

The PSTs' use of the TIPC for lesson planning revealed several themes regarding its use: (1) conscious planning; (2) instructional goals; (3) deciding on an instructional approach; and (4) decisions about digital technology.

Conscious Planning

Although the PSTs' lesson plans were at a novice level, congruent with the expectations of a beginning educator, their thoughtful planning was evident and they reported making decisions at multiple points in the lesson planning process. Kathryn (all names are pseudonyms), an elementary education major, shared in her final paper, "I think that the cycle helped us to think through each piece [of instruction] and helped us to carefully select what we wanted to do with our students". Similarly, Stacy, an English education major, wrote in her final paper:

The cycle itself was almost like a checklist to me, with the essentials to student learning all right in front of me: instructional goal, tool selection, instructional approach, and instruction....I was able to put down first what it was that I wanted Alyssa to accomplish in our lessons and then figure out activities that would accomplish these goals, instead of planning an activity and then crossing my fingers in hopes we meet the goal somehow.

Jenna, an elementary education major mentioned in her final paper, "as I planned lessons for Jasmine, I thought a lot about tool selection... After thinking hard about this step of the planning cycle, I realized Jasmine could do the same things and achieve the same goals without the technologies." Thus, it was evident that these teacher candidates gave considerable thought to the decisions that they made as they moved through the steps in the TIPC.

However, they often reported feeling unsure of their decisions, which resulted in reflection throughout the use of the TIPC. Specifically, although they did consider the contributions of the digital tool while planning, they often felt uncertain about whether those contributions outweighed the constraints of the tool, using phrases like, "I am not sure...". Alexandra, an elementary education major working with a fifth grader, Casey, reflected after recording her instruction, "The tools that I used (computer, poster) were good tools, but I don't know that they necessarily enhanced my instruction or helped Casey meet the instructional goals any more effectively... While Casey was making progress at meeting the goals, I am not sure the tools were enhancing his learning process." Similarly, Lauren, an elementary education major working with a fifth grader, Corey, reflected, "I don't know if the laptop was all that useful... although Corey was fired up about using it, he is a very slow typer. I think he needs to work on this but I do not think that tutoring is necessarily the best time." It is possible that some of this

reflection would have occurred with or without the use of the TIPC. However, the TIPC organized these considerations into steps that encourage teacher candidates to be thoughtful (e.g. What is my goal? How should I teach to meet this goal? etc.), even though they were not always confident in their decisions.

Instructional Goals

PSTs frequently wrote instructional goals that described what they wanted the student to do and how they wanted them to do it. Thus, because they knew what they wanted the student to do and how they were going to approach what they wanted the student to do, they were able to consider what tool(s) they might use for instruction. However, it is important to note that the PSTs often did not connect their instructional goals to state and national standards as Hutchison and Woodward (2014) suggested. Rather, some PSTs wrote short instructional goals that provided information like predicting, determining importance, which are concepts embedded in the CCSS. An example of this type of goal was written on a lesson plan as, “listening to an advanced reader read a text out loud”. This instructional goal could certainly have been improved, perhaps by adding information about fluency. Yet, it is clear that the PST has identified what will happen during the instruction. Lauren wrote about this issue in her final paper stating:

Midway through the semester I realized my focus in the lesson planning process was off. I was focusing too much on activities, ones that would help Korey and that he would like, but there was no concise instructional purpose to go along with those activities. Specifically, the PSTs were able to determine what the student was going to do and, thus were able to determine if digital technology would contribute to the lesson, but the goals were typically not tied directly to state and local standards. The use of a standards document was not emphasized in the discussion of the use of the TIPC, because the instructor assumed that, considering the candidates’ previous coursework, they were likely able to do this proficiently. Moreover, given the nature of the political climate around the standards at the time of data collection, using CCSS was not a focus of the course.

Determining an Instructional Approach

The PSTs were generally able to determine appropriate instruction that would meet the individual needs of their student (e.g., explicit comprehension instruction, decoding, etc.) and were able to clearly articulate the procedures for the approach on their lesson plan template. When PSTs began to consider the pedagogical approach, they relied primarily on two sources: (1) activities that had been explained, modeled, or read about during coursework and (2) Internet searches for related activities.

The instructional approaches were often heavily influenced by activities PSTs learned in coursework. While it is to be expected that PSTs would use the methods that they had become familiar with, they often selected an activity because they remembered it and not necessarily because it was the best choice for the child. For instance, Breanna, an elementary education major that was concurrently enrolled in a content area reading course, wrote about her teaching, “I learned about Preparation, Assistance, and Reflection (PAR) techniques. After I learned about PAR, began incorporating them into my lessons.” Breanna went on to explain that she also used an approach called Tarzan and Jane Notetaking, which requires the reader to record a one sentence summary on a sticky note after each paragraph of the text. This was clearly evident and described in her lesson plans. Similarly, an examination of Stacy’s lesson plans and videos of teaching indicated that she often used a Know-Want to know-Learner graphic organizer as an instructional approach and also had the student create a double entry journal, both instructional strategies that were introduced in the course.

The second approach that was often used to determine an instructional approach was conducting an Internet search. The PSTs reported using a search engine to find activity types using key phrases (e.g. comprehension activities, running record passages, etc.). For example, James, an elementary education major, described a website that he had the student use. When asked how he found the resource, he explained, “Searching Google... I searched for reading comprehension activities online or something like that.” James’ lesson plans and videos of teaching clearly supported that he was regularly using the game in his instruction. Similarly, Breanna stated in her mid-term conference that she had been using multiple sites to find activities and lesson plans for comprehension. She said, “I just Googled reading comprehension and stuff just came up.” In addition to searching for activities, teacher candidates also reported that they searched the Internet to find texts to use during tutoring sessions. This pattern of searching for activities might reinforce the idea that PSTs knowledge of pedagogy is still developing. It is important to note that it is possible that if the instructor required PSTs to use a

standards document to explicitly connect the instructional goals for the lesson to a standard, the ways in which PSTs considered their pedagogical approach might have changed. For instance, PSTs might have continued to search the Internet for activities, but they may have done so using more specific search terms from the standard.

Decisions about Digital Technology

While PSTs were open to utilizing digital technology, they reported having a limited knowledge of potential tools to use. Heather, an elementary education major, shared in a reflection toward the beginning of the course, “I am currently unaware of ways to integrate technology for student on both an individual and whole group level. I search a lot and get frustrated trying to find apps or ideas to use technology, so instead I use traditional resources and methods.” and Alexandra, an elementary education major, wrote, “I only incorporated the technologies I was aware of.” She suggested that using resources like teacher blogs, Twitter, and research could help her to find other digital technologies to use in instruction. Similarly, when Catherine was asked, “Did you use a digital tool today?” after a reading clinic tutoring session, she responded by writing, “No (picture of a sad face). Will you create a list (maybe something we can also add to) of good technologies to use with students in reading?” Further, she wrote, “I want to use a digital tool soon but I know Jasmine would get too excited and I wanted to get into the content first. I also didn’t choose to use a digital tool because I don’t know of very many or how to use them effectively.” This suggests that she has a limited knowledge of digital tools and that, even though she had taken an educational technology course and had been introduced to some digital tools in class, it was not enough. Further, she seemed to view the use of technology as separate from the teaching of content. This is in direct contrast with the assertion that children can learn digital and literacy skills simultaneously (Hutchison, Beschoner, & Crawford-Schmidt, 2012). As a result of these types of comments throughout the course, the instructor introduced digital tools, like Storykit and KidBlog, each week. However, as noted earlier and discussed later in the paper, this was likely not enough to give PSTs the amount of technological knowledge that they needed to make high-quality decisions about the use of digital tools.

As the PSTs designed instruction, they reported considering the use of digital technology when they previously may not have. However, as the TIPC suggests, they did not always use digital technology. Stacy enacted instruction that utilized paper and pencil in one of her reflections. She decided to read aloud *The Magician’s Nephew* to her student. While Stacy read, the student used paper and pencil to take notes making connections to the book. This instructional approach could have easily used digital tools, but the teacher candidate opted for paper and pencil. It is not possible to determine why Stacy, and other PSTs that made similar instructional decisions, did so or further, if they were, in fact, the most appropriate choices for instruction. However, it does suggest that using the TIPC does not mean that teacher candidates will always choose to utilize digital technology for instruction.

Reflecting a more critical perspective of technology, PSTs recognized that they knew they should not just use technology to use technology. Rather, they knew it should enhance their instruction. During the midterm conference, Breanna mentioned, “So, I guess I would like to incorporate more technology..., but I want him to gain something out of it versus just being like, well, here’s the computer. Just do whatever.” This suggests that Breanna may be reluctant to use digital tools, because she is uncertain about how to evaluate the use of digital tools and, although she did not state this, she may have a limited knowledge of possible digital tools to use. Other PSTs’ lesson plans reported regularly using digital tools and, as part of the planning process, they recorded a rationale for using each digital tool. However, perhaps because of their limited experience, several PSTs reported being unsure if the rationale for using the digital tool outweighed the limitations or constraints of doing so. The rationales that the PSTs wrote in their lesson plans indicated that they had considered the contributions of the technology before teaching. Yet, they reported uncertainty as to whether or not their rationale for using a tool was strong enough to outweigh any limitations of using the tool. For instance, Alexandra shared:

I just don’t know that my use of tools and technology has been like beneficial. Like, I don’t know if there is something else out there, whether it is like an app or something else out there that I just don’t know of that might help with this. It’s like there’s a difference between writing on a computer and a piece of paper, but in this situation, is writing on the computer like that much better? You know, that’s where I am stuck with it...with the computer it chomps into my time. I don’t know. I have difficulty justifying why I am doing that other than just to use the technology, which is not good.

Although the PSTs were able to identify the reasons that the digital technology might contribute to their instruction, they were often unsure if the benefits outweighed the constraints. Catherine was a notable exception to this. In her final paper she wrote:

The blog allowed Jasmine to write for the real purpose of having others read her writing. Finally, the blog created a safe space for her to interact with and discuss aspects of the topic with others so she could get feedback and be involved in social learning...I believe one constraint of the blog was that Jasmine typed her posts on a computer. This slowed her down slightly but overall, it did not overwhelm the instructional goal so I decided that the technology should still be implemented.

One way that PSTs were able to identify how the use of digital technology influenced their lessons was on the timing of their instruction. Alexandra, reported, "Typing alone takes a while... He doesn't have any concept of the keyboard. So, that makes it hard... he literally pokes the keyboard. It takes forever." Similarly, in her final report she wrote:

The instructional challenge that I did not foresee during my planning period was the effects that incorporating certain types of technology would have on the pace of the lesson. By having Casey use the computer to record his information, the recording process was slowed down substantially, which did not allow for as much content about the long term project to be covered as I had initially hoped. I planned for the first activity to take two sessions. Unfortunately, this process took almost five sessions because Casey typed slowly. While using a computer to type is a useful 21st century skill, it hindered the progress of the long-term process.

James also recognized the way that the use of digital technology influenced the timing of the lesson. While reflecting on his second tutoring session he wrote, "The only thing that I would have changed about the lesson is that I should have made more time for computer work. Searching the Internet and showing the student Microsoft Word took longer than I thought."

Discussion

Results of the present study suggest that PSTs' use of the TIPC to plan and implement literacy instruction is meritorious. The TPACK framework asserts that teachers draw upon their knowledge of technology, pedagogy, and content to make high-quality instructional decisions (Mishra & Koehler, 2006). PSTs do not need to know about TPACK theoretically, but they do need knowledge in each "area" before they can begin to make decisions using overlapping areas of knowledge and PSTs' knowledge in each area is still developing. Thus, it was evident that to maximize the potential of the TIPC, PSTs need more scaffolding and direct modeling than was provided. Thus, it is possible that PSTs could initially benefit from support in each separate knowledge area before they can consider overlapping knowledge (e.g. technological-content knowledge). Developing a solid foundation of knowledge in each area independently may provide the foundation that PSTs need to later consider the interaction of these types of knowledge that allows effective integration of technology into instruction (Koehler & Mishra, 2009). Thus, it is possible that focusing on the following features of technology, pedagogy, and content would bolster PSTs' knowledge in these areas and, subsequently, improve their ability to consider the interactions between these areas of knowledge to effectively integrate digital technology into instruction.

Writing Instructional Goals

In many ways, the ability to write a well-structured instructional goal creates the context on which the rest of the TIPC depends. Considering PSTs' tendency to write instructional goals that describe the behavior of the student during the instruction, but not necessarily the specific condition in which the student will conduct or complete the behavior (e.g., The student will make predictions.) or instructional goals that describe the condition but not the behavior (e.g., The student will participate in a read aloud.), careful attention to writing clearly structured objectives is essential. It is possible that attending to literacy standards, like the CCSS, might be helpful to PSTs' content knowledge and influence their pedagogical decisions. Additionally, using a text such as Fountas and Pinnell's (2010) *Continuum of Literacy Learning* that provides grade-level expectations in literacy (e.g., writing, shared and performance reading, etc.) would help PSTs to identify appropriate content to teach and, further, write instructional goals related to that content. Going forward, considering the instructional goal is the

foundation for the TIPC, efforts to support PSTs in writing well-defined instructional goals based on relevant standards must be considered, and perhaps explicitly required, if the TIPC is to be of value.

Choosing an Instructional Approach

The results of the present study suggest that PSTs are often activity-centric when making instructional decisions. This is in direct contrast to the recommendations made by Hutchison and Woodward (2014) and Harris and Hofer (2009), which both contended that the instructional goal should be the focus throughout the planning process. This finding may illustrate the value-laden nature of technology (Feenberg, 1991) discussed previously. That is, with the tremendous access the Internet provides to potential activities, teachers may be more likely to find an interesting activity first and working to connect to learning outcomes second. This idea reinforces the importance of requiring PSTs to use specific language from a standards document, because it is possible that this might encourage PSTs to consider goals first. Moreover, it may be useful to create a lesson-planning template that requires PSTs to provide a rationale for, not only their tool selection, but also for the instructional goal that was written and, further, how the instruction will help support the student to meet the instructional goal. This might encourage PSTs to begin with, and not deviate from, the instructional goal.

Exposure to a Variety of Digital Technologies

Many of the participants noted their lack of knowledge regarding digital tools despite their participation in an educational technology course. While the participants are all digital natives, this finding reinforces that many teachers are limited to functional perspectives of technology. PSTs can use technology for their own purposes but have not developed the pedagogical perspectives regarding technology. Teacher educators must consider this lack of perspective and make purposeful efforts to make teachers aware of available digital tools throughout a preparation program. This might be done by regularly introducing digital tools to PSTs across courses, not just educational technology courses. Although PSTs were exposed to digital tools in this course, that alone was not enough to give the PSTs the kind of technological knowledge they needed. PSTs seem to need opportunities throughout their preparation program to practice using digital tools and, further, to discuss the content and pedagogy the tool might be useful or not useful for as they gain knowledge about content and pedagogy. Additionally, regular exposure across a preparation program to types of digital technology allows for a space to encourage thinking about affordances and constraints.

Encourage Thinking About Affordances and Constraints

Although the PSTs held some critical perspectives regarding technology and acknowledged that technology should not be used for technology's sake, the depth and application of this perspective was lacking. Similar to Kruse and Buckmiller (2015), who investigated the technological decision-making of aspiring administrators, the participants in this study limited their consideration of constraints to time concerns. While these constraints are important, they do not reflect an ability to consider deeper issues regarding student learning. For example, an individual with a more robust critical perspective rooted in the nature of technology might go beyond time concerns and note that a blog entry might encourage children to associate value with receiving comments or "likes" on their blog and not value the role of personal reflection for its own sake. While such limitations and constraints may not result in rejection of the technology, teachers who can identify such issues are more likely to effectively adapt technologies or allow students to use multiple technologies in their work.

Applying a robust critical perspective to technological decision-making requires that teachers also have a strong understanding of pedagogical issues. Therefore, including strategies to engage PSTs with critical perspectives in many different contexts and courses throughout their preparation program will help the PSTs more rigorously apply their knowledge of teaching and learning. To include these more critical perspectives, recommendations from Kruse (2013a) might be incorporated. For example, PSTs might be asked to explain how a simple technology (e.g., a ruler) promotes some goals over others (value-laden nature of technology) or how telephones have both pros and cons (technological trade-offs). Then, as teacher educators introduce instructional technologies, they can ask PSTs to identify the goals a particular technology promotes and those it neglects and what trade-offs exist for a particular instructional technology.

Study Limitations

The present study has limitations. First, this study was conducted at one university with PSTs with similar levels of experience. Thus, PSTs at other universities may use the TIPC differently. Further, the instructional planning in the present study was completed for one-on-one tutoring. Therefore, determining if the TIPC would be used similarly for whole-class or small group instruction is not possible. Additionally, the participants in the present study were PSTs. Thus, implications for practicing teachers with more experience with instructional planning, making pedagogical decisions and, possibly, utilizing digital technology tools are impossible to determine.

Future Research

Further research exploring the viability, affordances, and constraints of the TIPC are necessary. Similar research should be conducted at other universities, because teacher education programs likely emphasize different aspects of instruction and it is possible that these emphases influence the use of the TIPC. Further, the use of the TIPC for whole-class planning should be studied. Additionally, the use of the TIPC with more support and guidance, as suggested in the previous section of this paper, is worthy of further study.

In using a nature of technology framework we recognize that technologies are not limited to digital technologies. Therefore, the TIPC might be expanded to include planning for non-digital technologies. As with digital technologies, non-digital technologies ought to align to well-defined instructional goals and the affordances and constraints ought to be weighed. Thus, investigation of PSTs' use of the TIPC with non-digital technologies may prove valuable.

Conclusion

If the TIPC is operationalized as a technology itself, the values, limitations, and trade-offs of structuring planning around this cycle should continually be considered. Because effective planning is not limited to straightforward processes or cycles, we consider the TIPC as a useful scaffold for teachers rather than an idealized final state. Finally, because critical, but not necessarily negative, perspectives of technology are too often ignored in educational research and policy (Waight & Abd-El-Khalick, 2012), we hope the explicit space made for such perspectives in the TIPC will continue to shift the dialogue around educational technology from instrumental views toward more critical perspectives. Inclusion of these important perspectives may help guard against proposals and efforts in which technology is the constant and learning is the variable.

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Appendix A

Name:	Date:
Brief Description of Activity:	Time: <i>How long do you expect this instruction to take?</i>
Instructional Goal:	Evidence of Instructional Goal: <i>How will you know that the student met the goal?</i>
Text(s) used in the lesson: Approximate level of text:	
Tool Selection: <i>What tools will you use? How will the tool(s) support the instruction?</i>	
Description of Instruction (should almost always include reading and writing): <i>What will you do? What will you expect the student to do? How will you use the tools you selected?</i>	