

TPACK's Pedagogy and the Gradual Release of Responsibility Model Coalesce: Integrating
Technology into Literacy Teacher Preparation

Eutsler, L. (2021). TPACK's pedagogy and the gradual release of responsibility model coalesce:
Integrating technology into literacy teacher preparation. *Journal of Research on Technology in
Education*. <https://doi.org/10.1080/15391523.2020.1858463>

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Abstract

This study explored how the pedagogical element of TPACK and a scaffolded use of the gradual release of responsibility framework helped preservice teachers design literacy instruction with the iPad. This qualitative study used an interpretivist approach and case study design to closely examine each participant's (n = 38) experience to use the iPad to plan instruction. Data were triangulated with observation logs, individual surveys, and lesson artifacts. Thematic analysis revealed three themes: Teacher in Control pedagogical approach raised preservice teachers' concerns about instructional planning; Teacher as Facilitator pedagogical approach led to increased user confidence and exploration; Problem-based Learning pedagogical approach led to in-depth design of comprehensive lessons for individualized student populations. Other teacher educators can adopt this approach when introducing students to technology.

Keywords: teacher education; technology integration; preservice; qualitative methods

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Despite the ubiquitous use of technology, students in higher education primarily use technology to connect socially (Echenique et al., 2015; Gasaymeh, 2018). Consequently, preservice teachers enter the classroom lacking a sense of how to use technology for the workflow requirements of being a teacher (Christ et al., 2019). Teachers are expected to become familiar with and use technology apps and platforms for grading and record-keeping, while implementing strategies for students to practice literacy skills and demonstrate their learning (Author, 2019). Additionally, standards informing teacher preparation (e.g., CAEP, 2016; ILA, 2017; ISTE, 2019) confirm that developing technology integration practices among preservice teachers is a curricular imperative for teacher educators.

Considering the increasing technological skills expected of preservice teachers to enter their first classrooms, many are only partially adept at integrating technology for instructional purposes (Ciampa, 2017; Walsh & Farren, 2018). Technology implementation barriers facing teacher educators include a lack of knowledge and training, and familiarity and access to technology (Kalonde & Mousa, 2016). Beyond access, teacher educators claim the need to engage students in hands-on technology experiences that include exploration and experimentation (Vasinda et al., 2017). A review of literature on technology integration frameworks and models, combined with use of the iPad to support literacy instruction illustrates the complexity facing teacher educators—choosing which framework or integration model to engage preservice teachers in hands-on technology experiences when planning literacy instruction. To improve preservice teacher preparation when planning literacy instruction with the use of technology, this study explores a teacher educator's implementation of three

pedagogical approaches to guide preservice teachers with using the iPad to develop early literacy instruction.

Technology Integration Frameworks and Models in Teacher Preparation

In response to the growth and advancement of new technologies, preservice teachers need hands-on educational technology experiences to practice using the most readily available technologies (Walsh & Farren, 2018). Teacher educators can foster hands-on technology experiences after becoming familiar with theoretical frameworks and technology integration models. Theoretical frameworks (e.g., TPACK) describe an idea or concept that is based on theory, while technology integration models aim to guide instruction (e.g., SAMR).

TPACK framework. Technological Pedagogical Content Knowledge (TPACK) (Mishra & Koehler, 2006; Thompson & Mishra, 2007) is a well-known technology integration framework intended to help teachers think about the integration of new technologies (Anderson et al., 2017; Chai et al., 2010; Wetzel et al., 2014). Developed by educational technology and psychology scholars, TPACK focuses on teacher knowledge required for integrating technology within teaching, while acknowledging that this knowledge is complex and multifaceted (Mishra & Koehler, 2006; Thompson & Mishra, 2007). The TPACK framework focuses on technological, pedagogical, and content knowledge, as well their intersections: technological content knowledge; technological pedagogical knowledge; pedagogical content knowledge. Technological content knowledge is a teacher's knowledge of how to use the technology within their subject area whereas technological pedagogical knowledge is a teacher's ability to incorporate technology using an effective teaching method (Mishra & Koehler, 2006).

The TPACK framework has been applied in a variety of ways within some teacher preparation programs. For example, to serve as a technology integration blueprint for teacher

educators (Thomas et al., 2013), to qualitatively and longitudinally track preservice teachers over their four-year program (Gill & Dalgarno, 2017), and to measure the impact of program support for developing TPACK skills (Baran et al., 2019). One study of 14 preservice teachers who used TPACK to integrate iPads into instruction found that teaching decisions focused on app selection and student inquiries, in response to students' experiences with technology (Anderson et al., 2017). The iPad enabled preservice teachers to respond to student comments, such as, "wait a minute, wait a minute, let me do it" (p. 109). This led preservice teachers to adapt their pedagogy toward a more supportive role, "okay, well, I'll just sit here and monitor" (p. 109).

Pedagogical knowledge, a teacher's method to deliver content (Mishra & Koehler, 2006), is an important predictor of a teacher's ability to integrate technology. As noted within a teacher preparation course on information and communication technology for meaningful learning, pedagogical knowledge was the largest predictor of nearly 500 preservice teachers' use of TPACK (Chai et al., 2010). Similarly, when technology was integrated into teaching and learning, and modules related to specific topics were embedded into 17 sections of language arts and middle-school methods courses, preservice teachers claimed this led them to "expand the range of tools especially age-appropriate ones, provide more instructor modeling of technology infusion, and offer more instructional applications of tools and more pedagogical approaches for using tools" (Wetzel et al., 2014, p. 98).

SAMR model. The SAMR model (Puentedura, 2006) focuses on the ability to Substitute, Augment, Modify, and Redefine learning when using technology. Substitution refers to using technology as a direct substitute (e.g., typing instead of writing) whereas Augmentation adds a layer of functional improvement (e.g., conducting a grammar check). Modification leads to significant task redesign (e.g., ability to use software to create a spreadsheet, organize data, and

display figures). Redefinition, the highest level, emphasizes the ability to engage in a task otherwise inconceivable (e.g., connecting virtually with students from around the world). Cherner and Curry (2017) applied the SAMR model with 15 preservice teachers' integrating technology in the classroom. Across the 60 teaching demonstrations, the most common use of technology occurred at the lowest technology integration level, Substitution (e.g., tracing letters on a tablet). Repetitive use at the Substitution level can be partially explained by the idea that "preservice teachers tend to replicate practices they experienced as K-12 students during their teacher education process" (Cherner & Curry, 2017, p. 285). In accordance with the increasing complexity of the SAMR model, fewest occurrences were noted at the highest technology integration level, Redefinition.

It can be challenging to determine when to rely on a technology integration framework or model. Over a yearlong exploration, Hilton (2016) compared two teachers' ability to implement technology when applying the TPACK framework and the SAMR model. Although both teachers found TPACK overly complex, TPACK was considered the most helpful to integrate technology into lessons already considered pedagogically sound. Additionally, the teachers did not move through SAMR in a sequential manner, but instead used technology to meet the learning objectives. This suggests that teachers should connect curriculum with the technology, rather than use technology in response to integration mandates. Another finding by Hilton indicates that even at the Substitution and Augmentation levels, student focus and motivation increased when using technology, which indicates that using technology may result in more time spent learning and greater opportunities to engage students in academic activities.

Related technology integration models. Beyond technology integration frameworks and models typically situated within educational technology, five other models have attempted to

address the complexity of using technology to support literacy instruction. Within the context of teaching phonics while using the iPad, Northrop and Killeen (2013) advocated for a four-step gradual release of responsibility framework. Under this model, the teacher introduces students to a new skill without the iPad, the teacher explains and models the app, the app is introduced to give students time for guided practice, and finally, students use the app to practice their literacy skills. While this model might be useful in an elementary classroom, more data is needed to support the effectiveness of this model in literacy teacher preparation.

Another possible approach is the Technology Integration Planning Cycle, a seven-step cycle to help teachers integrate technology into literacy instruction, originally designed to meet the Common Core State Standards (Hutchison & Woodward, 2014). The seven steps include: identification of a clear instructional goal; alignment of this goal with the instructor's pedagogy; selection of curriculum content; infer how the content can contribute to the instructional goal; note potential constraints of the tool; understand the need for pedagogical altering in response to the tool; reflection to improve future iterations. Though this technology integration model begins with identifying a clear instructional goal, when implemented, only three of 24 pairs of preservice teachers followed the model. The other 21 pairs began by first identifying a preferred iPad app and then linked the app to an instructional goal (Hutchison & Colwell, 2016). With this model, the greatest challenge was situating the learning in a realistic context because preservice teachers "often revised their instructional goal because they were unable to determine how to integrate technology while teaching that goal" (Hutchison & Colwell, 2016, p. 10).

Some other models developed to help preservice teachers integrate technology, with a focus on pedagogy include TIP: Technology Integration Planning (Roblyer & Doering, 2013), TIM: Technology Integration Matrix (Harmes et al., 2016), and RAT: Replacement,

Amplification, and Transformation (Hughes et al., 2006). Either of these models has yet to be widely adopted by teacher educators.

Use of the iPad to Support Literacy Instruction

Affordances are the action potentials (Bower, 2008) of a technology, more commonly referred to as the possibilities of a technology. The iPad has action potential to enhance literacy instruction because it can be equipped with a variety of apps to support the development of literacy skills and strategies. Since introduced in 2010, equipped with its touchscreen features and portability, the iPad (with a heavy reliance on its apps) offers support for emergent and early learners' literacy development (Kucirkova et al. 2014; McClanahan et al., 2012). Some advantages of reading digitally, as identified by 49 preservice teachers, include highlighting and annotating text, digital bookmarks, a built-in dictionary, and adjustable font size (Larson, 2012).

The iPad has helped preschoolers' read, write, and talk about print (Hutchison & Beschoner, 2015), and has served as an authentic meaning-making writing tool among first-graders (Author, 2019; Dobler, 2012). The iPad can help scaffold initial phoneme acquisition for early learners with developmental delays (Chai et al., 2015). When the iPad was used to support preschoolers' literacy over a seven-week intervention, apps targeted writing, speaking, print awareness, and listening skills; despite these intentions, children preferred to create digital books (Beschoner & Hutchison, 2013). This finding led researchers to conclude that, because children independently authored their own books instead of relying on skills-based apps, the iPad could be an instructional tool to support early childhood literacy.

The iPad continues to be a viable instructional support tool in early childhood literacy contexts. For example, a one-year exploration using the iPad in a kindergarten classroom revealed the importance of designing structured lessons, limiting app selection, and using the

iPad to be a “listener,” allowing students to record personal narratives and engage in storytelling (Toppel, 2014, p. 2). A related study found that children’s gross motor skills improved after using the touchscreen to color, engagement increased because the iPad’s responsiveness enabled children to capture photos and create a digital story, and ultimately, they were more motivated to read print books (Flewitt et al., 2015). An investigation of four early childhood teachers’ instructional practices using one-to-one iPads found that teachers used the iPad to support teacher-directed practices and developmentally appropriate uses (Lu et al., 2017). Teacher-directed practices included drill-and-skill app practice embedded throughout learning stations and transition times, while developmentally appropriate formative assessment focused on student-directed exploration and the design of a storybook about ocean animals (Lu et al., 2017). Lu (2017) concluded the iPad made learning “a little bit more fun, more than just writing down facts, making it more interesting and interactive” (p. 17).

Other research has focused on the teacher’s preference when using technology to support student learning. After learning with the LetterWorks app, first-graders demonstrated literacy gains in concepts about print and letter-name fluency (D’Agostino et al., 2016). Despite these literacy gains, only two out of seven teachers said they would definitely use the iPad app to support students’ literacy because the iPad could save them time. Two teachers reported being undecided, while three unequivocally stated they would not use the iPad because “the iPad tended to freeze or was ‘glitchy’” and because “there were too many screens to move through to get to the actual lesson” (D’Agostino et al., 2016, p. 538).

With careful planning and reflection, preservice and in-service teachers’ considered the iPad an effective tool to support students’ literacy (Santori et al., 2014). As part of iPad initiatives at three universities, approximately 20 literacy apps were preloaded to the iPad, and

preservice teachers followed the SAMR model to integrate iPads into a middle-school summer school program, to help students practice letter writing, complete word sorts, and create digital books and book trailers (Pilgrim et al., 2014). Following a two-year journey of a first-grade teacher's one-to-one iPad integration experience, the iPad was the preferred medium to help construct, record, and share students' thinking (Author, 2019). For example, using paper and pencil, students created flipbooks, followed by the use of the Book Creator app to visually and audibly record their stories. Students uploaded their digital books to Seesaw, a private digital classroom portfolio app that invites families to view their children's work. During a project to emphasize student voice, the teacher shared students' public service announcements via the classroom Twitter account. The teacher selected apps to engage, motivate (e.g., ChatterPix, PicCollage Kids), and practice literacy skills and drills (e.g., Starfall), while ultimately advocating for students' use of apps to create new literacy forms (e.g., digital books) instead of students' consumption of existing apps.

These studies demonstrate how the iPad and its apps have evolved since the introduction of the iPad in 2010. Given a hands-on experience, preservice teachers can become familiar with apps for purposes beyond skill-and-drill practice, which can enable teachers to carefully and meaningfully integrate technology when planning their instruction.

Theoretical Framework

As evidenced in the technology integration frameworks and models in teacher preparation, there appears to be some agreement among scholars that an effective technology integration should be centered on pedagogy (e.g., Harmes et al., 2016; Mishra & Koehler, 2006). Despite earlier work, evidence-based research in higher education contexts is needed to provide tangible strategies for teacher educators to equip preservice teachers to integrate technology into

their instructional planning. To address this need, this study is built on the gradual release of responsibility framework (Pearson & Gallagher, 1983; Pearson et al., 2019) and the pedagogy construct from TPACK (Mishra & Koehler, 2006). With a focus on pedagogy, how technology is integrated takes precedence over what is integrated (Koehler et al., 2013). The gradual release of responsibility model guides a teacher from “total teacher responsibility to total student responsibility,” with teacher guidance at the center (Pearson & Gallagher, 1983, p. 35). This teaching approach allows individuals to become increasingly involved as they become more comfortable with learning new content. In 2019, Pearson and colleagues revisited their model to provide a history of its acceptance (217,000 Google© Scholar citations) and describe how it has been adapted by literacy scholars to support curriculum planning and teacher professional development.

Significance

This study addresses the need for additional TPACK development (Thomas et al., 2013) by emphasizing a hands-on technology integration model (Vasinda et al., 2017) that focuses on the instructor's pedagogy (Harmes et al., 2016; Mishra & Koehler, 2006) and a flexible implementation process (Pearson & Gallagher, 1983). A gradual release approach to technology integration can guide preservice teachers to use technology in new ways, at a pace dictated by their previous and current experiences, with continued scaffolding as the preservice teacher becomes increasingly familiar with the technology. The gradual release of responsibility framework and TPACK pedagogical element help draw attention to the types of knowledge required to integrate technology into literacy instruction (e.g., when to introduce students to making vs. consuming apps) and awareness of the pedagogical approach needed to scaffold student learning (e.g., teacher directed, teacher guided, student led).

To examine a data-based approach to integrate technology within literacy teacher preparation, this study is guided by the following research question:

How does an emphasis on the instructor's pedagogy and implementation of the gradual release of responsibility model influence preservice teachers' use of the iPad to design early literacy instruction?

Methodology

This is a qualitative study (Merriam, 1998) that uses interpretivism to understand how preservice teachers make sense of their experiences by examining their interpretations of their experiences with technology. A case study design (Yin, 2017) allowed for a close examination of each participant's experience while designing instruction with technology. Typically guided by "how" or "why" questions, case study "is an empirical method that investigates a contemporary phenomenon (the 'case') in depth and within its real-world context, especially when the boundaries between phenomenon and context may not be clearly evident" (Yin, 2017, p. 15). In the present study, the phenomenon is the instructor's exploration of pedagogical approaches and the influence of each approach on preservice teachers' ability to design literacy instruction with the iPad.

Participants

This study took place within a teacher education program at a large public university containing approximately 38,000 students, in the southwestern region of the United States. Participants included 38 preservice teachers enrolled in one early literacy methods course, all in pursuit of teacher certification in early childhood-6th grade. Participants identified as female (97%), between the ages of 20-27 with an average age of 21 years-old, and were of Caucasian

(74%), Latino (21%), and Asian (5%) descent. Of relevance to the iPad devices in this study, 67% of preservice teachers reported owning an iPad compared to 86% who owned an iPhone.

Study Procedures

All participants engaged in five 80-minute hands-on iPad workshops over two-months. Preservice teachers remained in the same groups of three or four, with each group sharing one iPad. Twenty-eight apps to support literacy learning were selected (e.g., Epic!, Phonics Genius, Starfall), with app selection informed by a two-year case study of a first-grade teacher who integrated the iPad into her daily instruction as part of a one-to-one technology initiative (Author, 2019). The iPad workshops focused on designing early learning activities to improve a literacy skill (e.g., read-aloud, phonological awareness, vocabulary, comprehension), with pedagogy aligned with the gradual release of responsibility model (Pearson et al., 2019). Following these guidelines, at a pace dictated by the preservice teachers, the instructor gradually moved from teacher-led to student-led from workshops one through five.

During the first Teacher in Control pedagogical approach workshop, the instructor modeled how to become familiar with the iPad using a think-aloud strategy. This included how to navigate the tool (e.g., swipe down to search), explore apps (e.g., Story Creator, ABCMouse, Epic!), and use an instructor suggested app (e.g., Vocabulary Spelling City) to design a vocabulary activity. During the second workshop, also employed with the Teacher in Control pedagogical approach, the instructor modeled how to use the Epic! app to teach a shared or guided reading lesson. Therefore, workshops one and two learning tasks were very explicit and guided by the instructor, such as “create an activity using the Vocabulary Spelling City app.” After these two workshops, preservice teachers demonstrated increased confidence, therefore the learning tasks in workshops three and four increased in complexity and preservice teachers

located and selected their own apps, and created new digital media to teach vocabulary. Employed with the Teacher as Facilitator pedagogical approach, the purpose of workshop three was for preservice teachers to teach a specific literacy skill by using the available apps. In workshop four, still under the Teacher as Facilitator approach, the instructor read-aloud the story for the vocabulary term, truculent, from the *Weighty Words* book. Preservice teachers had to construct a vocabulary activity based on the new term. By the fifth and final workshop, preservice teachers knew how to navigate the iPad, align apps to standards-based learning tasks, and design unique literacy learning activities. In an effort to portray that every classroom is unique, the fifth and final workshop was executed with the Problem-based Learning pedagogical approach. During this student-led workshop, preservice teachers planned instruction aimed at a broad literacy-learning goal (e.g., science literacy) that referred to a proposed scenario of learners (e.g., English language learners, suburban, Title I). Based on the classroom scenario, preservice teachers designed a weeklong intervention for one hour each day, using an array of iPad apps to plan instruction within the realistic learning context.

Data Collection

Across the five workshops, data were collected in three forms: observation log ($n = 5$), individual surveys ($n = 190$), and iPad designed lessons ($n = 50$). Following each iPad workshop, the observation log helped capture the instructor's witness to preservice teachers' affect and responses to the pedagogical strategy that the instructor implemented within each workshop. Immediately following each workshop, preservice teachers individually completed an electronic survey. Survey items inquired about lesson ideas and activities that preservice teachers created in response to the instructor's pedagogical approach. For example, when using the iPad to support phonological awareness skills, preservice teachers reflected on their ability to: Identify three

apps that can be used to teach phonological awareness. Create a center activity using the iPad and document a reflection of this experience. In addition to completing individual surveys, preservice teachers posted items and responded to one another within the Seesaw app.

Data Analysis

Thematic analysis (Hatch, 2002) was followed to analyze the data sources. During phase one of the analysis, the researcher began by initially reading the data, noting impressions, remarks, and assumptions. Phase two of the analysis revealed distinctions of iPad use in response to the instructor's pedagogical approach (e.g., restrictive uses of the iPad, possibilities of using the iPad). Because of distinct differences in data based on the applied pedagogy, phase three consisted of sorting the data by pedagogical approach and analyzing data inductively within those domains, which led to the arrival of 25 initial codes (Table 1).

Table 1. Codebook according to each pedagogical approach.

Teacher in Control	<ul style="list-style-type: none"> Number of apps is overwhelming iPads are motivating for students iPad can be difficult to manage Fascination with apps Importance of teacher planning
Teacher as Facilitator	<ul style="list-style-type: none"> Explicit uses of apps result from exploration Teacher needs to provide support for app use Challenging to tailor available apps to instruction Collaboration leads to increased planning ideas Apps increase learner engagement Completing app activities is enjoyable iPad apps are easy for children to use App affordances could be improved Classroom management with iPads is a perceived challenge Future iPad accessibility is unknown Desire to individualize student learning experiences Apps can be used innovatively Using new apps requires a learning curve
Problem-based Learning	<ul style="list-style-type: none"> Book identification is unique to students' learning needs Importance of making real-world connections Instructional design helps when divided into learning themes Sensitivity and exposure to multicultural digital literature Extension activities emphasize using iPads for research Integration of reading comprehension strategies Variety of assessment tailored to the case study

Phase four involved comparing codes across the pedagogical approaches to identify patterns and examine differences (e.g., preservice teachers' willingness to participate on their own, asking questions about how to use the device versus ways to scaffold learning). The fifth phase entailed revisiting the data to examine terms, examples, and relationships within and across the domains to discover relationships among the instructor's pedagogy and codes within each pedagogical approach. With data sorted according to the instructor's pedagogy, this deeper analysis revealed clearer distinctions among the codes. Thus, the sixth and final phase exposed three key themes that resulted from analyzing codes within each of the pedagogical approaches.

It is important to be transparent about the role of the researcher in the present study. The researcher was also the instructor of the technology training workshops. A member check (Creswell & Miller, 2000) helped temper issues of validity. To accomplish this, the researcher provided the preservice teachers with the raw data, along with the researcher's interpretation of the data (e.g., initial list of codes, themes, explanation). This strategy allowed preservice teachers to verify the data and gauge the accuracy of the interpretation. Preservice teachers reviewed the data and four contributed a question or additional input (e.g., "I feel much more prepared to teach with technology," "It was nice to work together but I wish we all had our own iPad"). After discussion and/or explanation, 100% expressed agreement with data interpretation. Data collection and interpretation had no impact on the course grade and study participation was optional.

Limitations

A limitation of this study is that the sample size of 38 indicates that the results cannot be generalized to other contexts. Next, because approximately two-thirds of the preservice teachers owned an iPad and 86% owned an iPhone, there is a possibility that study participants may have

acquired technology skills more quickly than those who are less familiar with the iPad and related Apple™ products. Though, research indicates students primarily use these technology devices to connect socially (e.g., Gasaymeh, 2018).

Results

To examine a strategy for teacher educators to integrate technology into planning for literacy instruction (CAEP, 2016; ISTE, 2019) and contribute to research on technology integration frameworks and technology integration models (e.g., Mishra & Koehler, 2006; Thomas et al., 2013), this study explored the instructor's pedagogical approach in accordance with the gradual release of responsibility model (Pearson et al., 2019). Evidence collected from this study shows that within each pedagogical approach, preservice teachers used the iPad to plan instruction as influenced by the instructor's pedagogical approach.

Teacher in Control Raised Concerns about Planning

Teacher in Control is a teacher-centered instructional approach where the instructor provides step-by-step directions on how to use a specific app to teach a targeted reading skill or strategy. When the instructor implemented the Teacher in Control pedagogical approach during the first and second iPad workshops, preservice teachers expressed concern for their ability to identify and integrate apps into their curriculum planning.

Workshop one. During the first workshop, preservice teachers required prompting by the instructor to explore the preloaded apps. Here, preservice teachers repeatedly requested directives on how to navigate the iPad and use each downloaded app, and generated the highest frequency of inquiries. A repetitive concern made by preservice teachers included, "I just don't know what to do with the apps." This required the instructor to show preservice teachers an exact app to use and what to do within each app. Interestingly, preservice teachers only used apps that

were preloaded to the iPad, rather than exploring the enabled app store to discover and download new apps. Data-based observations during workshop one indicate preservice teachers were reticent to explore the technology.

Survey data provides additional support to demonstrate preservice teachers' concern about how they could integrate the iPad into their future classrooms. Preservice teachers noted that using technology "certainly takes time" because "the teacher must be prepared and fully understand how the app works before allowing the children to use it." Another preservice teacher expressed a similar focus on the need to be intentional, "it takes a lot more planning than I would have thought. You also have to think about incorporating a technology aspect into lesson plans WHILE creating the lessons, and not after." To echo the need for thoughtful planning, "teachers also need to incorporate technology when beginning lesson planning so they do not have to redo the entire thing." Because once a lesson plan is developed, "teachers have to make sure the students know how to use the app and the assignment is appropriate for the students' level." Also emphasized was the importance for teachers to become familiar with an app "before starting on an assignment to prevent any confusion or frustration for the students."

Following workshop one, it was clear that preservice teachers did not feel comfortable using the iPad as a part of their instructional planning. For example, using the iPad to support learning "was more difficult than I thought it would be. Making the technology age appropriate and usable was a challenge." Others shared that using technology is "going to be difficult because I'm not tech savvy despite growing up with technology. I have a tablet that I use once every two weeks so it's not something I'm extremely familiar with." Another preservice teacher worried about students' use of the technology in the classroom because, "I also feel it could be distracting. I've seen other teachers ask students to lower volume and after so many requests the

iPad is confiscated.” Based on the expressed concerns during the initial workshop, preservice teachers were hesitant to integrate iPads into their future classrooms.

Workshop two. Although preservice teachers were given the choice to conduct a shared or guided reading lesson using any app of their choice, approximately 60% selected the same app demonstrated by the instructor.

Following workshop two, there appeared to be an overall positive shift in thinking toward how the iPad could be integrated into future literacy instruction. For example, “I have learned it's easier than I thought.” After some time becoming familiar with educational affordances of the iPad, one preservice teacher said, “I found out that iPads can be used in many more ways than I thought. They can let the students create things and are also great for read aloud and can be used in stations or small groups.” Moreover, another started to recognize these action potentials of the iPad, “there's a lot of free and very cool resources that I never even knew existed! This makes me very excited to integrate technology into my class to make learning more interactive and enjoyable for my students.”

Despite an increased understanding of the iPad and its affordances, not all preservice teachers were eager to use the iPad to plan literacy instruction. For some, the experience of using the iPad to plan instruction was “not my favorite. I prefer books over tablets. I have a nook that was gifted to me for Christmas & I have no idea where it is because I never used it. It's still in the original packaging.” Others felt that the iPad “can be pretty difficult,” with one reason being, “not all apps are user friendly and should be taken into consideration for your students.” Upon reflection of the mixed emotions on the potentials and pitfalls of using the iPad to support literacy development, the next two workshops examined the influence of the Teacher as Facilitator pedagogical approach.

Teacher as Facilitator Led to Increased User Confidence and Exploration

Under the Teacher as Facilitator pedagogical approach during workshops three and four, the instructor provided a target literacy skill and suggested apps. In this way, the instructor acted as a guide, to assist preservice teachers in developing early literacy learning activities. Therefore, preservice teachers made the decision of how to align a literacy skill to an app, with little instructor assistance. This approach helped preservice teachers gain confidence to explore apps, which led to increased inquiry and broadly applied uses of iPad apps.

Workshop three. To demonstrate the task of connecting literacy skills with apps, this preservice teacher is showing how to teach diphthongs with an app she found on her own (Figure 1).

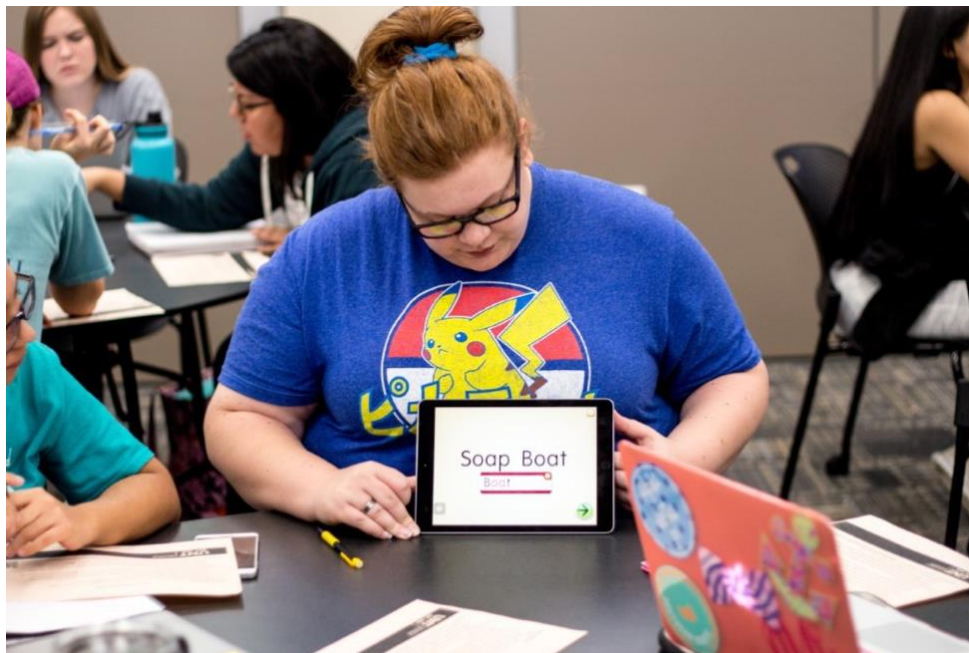


Figure 1. Preservice teacher demonstrates an app during iPad workshop three (Teacher as Facilitator).

Under Teacher as Facilitator, preservice teachers demonstrated critical thinking regarding strategies for how apps could support literacy learning and connect to state and national

standards. Preservice teachers admitted the task “was difficult for my group to figure out how to implement the app into a center but when we figured it out, it was a good idea.” Once in agreement, “we decided on using Starfall, there's an interesting component to it named Chunk that Word. It teaches the student how to decode, and blend. I thought it was really interesting how the turkey chops the word into syllables.” In another group, Starfall was also the selected app, and the proposed plan was to use “the app to sound out each word to read the story Gus The Duck,” and “after reading the book they will play both literacy games that go along with the story (e.g., word making game, matching game). This activity is an interactive way to slow down and clarify words and to read a story.” A second group took the initiative to download a new app to the iPad:

We used the app Chicken Little. The group is expected to read a story (it plays out loud) and then they have to sequence events of the story by matching pictures (scenes) in the order they happened. Then they have to retell the story in their own words by recording their voice.

Other preservice teachers demonstrated how a traditional print method could be combined with the iPad. To illustrate, “we used partners in rhyme to find five different pairs of rhyming [words] and write them on note cards. We then posted it to Seesaw for them to get with a partner and read their rhymes.”

Workshop four. During this workshop, preservice teachers were encouraged to locate an app that would enable them to create a vocabulary video (e.g., Adobe Spark Video, iMovie). All but one preservice teacher responded positively to the workshop and said they could envision themselves using the iPad to support students' vocabulary development. Overall, the survey data indicated that “video creator apps can help support traditional print instruction through providing

student chosen visual aids that they are more likely to remember.” The act of creating a video “is definitely a more interactive learning experience and it gets you up and moving around.” Others raved about how “super easy and user-friendly” it would be to have students create their own vocabulary videos to acquire new vocabulary because it “allows students to make a connection to a vocab word in their own way, ultimately helping them remember it easier.” Data also highlights how the iPad can support language development and students’ varying learning preferences. To illustrate how this vocabulary strategy was helpful, one preservice teacher reflected,

I wish this was a thing back when I was in elementary/middle school. When studying for these types of tests when I was younger, I would make little connections in my head. But it's super helpful if not only you have a verbal connection, but a visual connection as well.

In thinking further about individual learners, this activity “can help ELL (English Language Learner) students learn the meaning of words by looking at pictures and words that go along with the pictures leading up to the vocabulary word instead of reading a long definition of the word.” One preservice teacher thought using the iPad to support vocabulary instruction,

was by far one of the coolest ways that I have learned in my pre-service teaching career to introduce new vocabulary words to students. It was a great way to personalize what we gained from the reading and express our thoughts about what the word, truculent, means to us.

During these two Teacher as Facilitator workshops, preservice teachers became more confident with the idea of integrating technology into their future instruction, evidenced by their increased willingness to navigate to the apps downloaded to the iPad. Under this pedagogical approach,

this was the first instance where preservice teachers searched for other apps in the Apple™ store, and made connections between app functions and alignment to literacy skills and standards. With this demonstrated increase in confidence and familiarity with the iPad, preservice teachers appeared ready for the instructor to shift to the student-led Problem-based Learning pedagogical approach.

Problem-based Learning Led to Comprehensive Instructional Planning

The Problem-based Learning approach reflects the most student-centered pedagogical approach, in accordance with the gradual release of responsibility model (Pearson et al., 2019).

Workshop five. Preservice teachers valued the Problem Based Learning pedagogical structure because it led to the design of more comprehensive lessons that could be implemented within their future classrooms. A request was made to “have more scenarios that apply to us like the last workshop,” because as stated by another preservice teacher, it was “my favorite day.” Moreover, the last workshop “was my favorite one and I feel like I learned a lot more today and it helped having an actual student to apply it to.”

Survey data indicates the importance of engaging preservice teachers in activities that mimic student use in the classroom. One preservice teacher shared how this workshop “really helped me understand how to truly implement technology into lessons and be creative. I love that we got to learn how to use the apps and actually make what the students would make.” For example, the group that designed an intervention to support kindergarten Science literacy selected eight bilingual and Spanish only books from the Epic! app (an interactive digital book app, free for teachers). One of the digital books included in the list for students to read was *El Mamut Lanudo*, which translates in English to *The Woolly Mammoth*. Preservice teachers constructed guided reading questions to scaffold students’ comprehension while they read the

digital book. The lesson involved students reading both books as many times as needed to improve fluency and work together to discuss the text. Then, students would retell the story in their own words using the Story Creator or Toontastic app. This was also the first time a preservice teacher suggested more than one app to teach a specific literacy skill.

The Problem-based Learning approach situated instructional planning within a realistic setting, and led preservice teachers to engage in rich discussions and imagine how they would design instruction within their own classroom. To emphasize its value, one preservice teacher begged, “one thing you must keep in the curriculum is the case study. I liked it because it was an actual application of what the workshop taught me, and it could, and probably will, happen in our careers as teachers.” Ultimately, data from this workshop resulted in the design of more comprehensive instruction. Lessons were more comprehensive because they included students using the iPad to read, write, and collaborate with peers to discuss and analyze text. Applying the Problem-based Learning pedagogical approach enabled preservice teachers to use the iPad to create individualized literacy-learning opportunities.

Collective Workshop Reflection

Reflections from preservice teachers indicate they valued the hands-on technology experiences because they were able to explore the technology, and this enabled them to envision themselves using technology to design future instruction. Preservice teachers appeared appreciative of the preloaded apps, with similar requests that the instructor “must keep a list of iPad apps to use in the classroom.” One preservice teacher admitted that initially they “struggled in the beginning because I had no clue about some of these apps.” To explain, with no prior technology integration experiences within the teacher preparation program, “things took longer

than necessary due to user inability.” A preservice teacher echoed the importance of being able to engage with the technology,

I found the workshops useful for introducing me to apps that are easily incorporated into students' learning. I knew there were apps out there for this of course, but being able to experiment with HOW to use the apps was helpful. I was even able to use what I learned from these workshops in multiple lesson plan activities.

Another preservice teacher described an increase in her self-efficacy, emphasizing how much she “really liked the iPad workshops, because it makes me more confident in using technology for teaching.” Engaging with hands-on technology experiences “gave me insight into an aspect of teaching that I had never considered before.” Working together in small groups was also valued because this technique was helpful “pairing up [with] groups and having them do the other groups assessments/work so we can get more ideas.” Ultimately, preservice teachers “really enjoyed this experience. I learned a lot of different ways that we can use iPads in the classroom in order to teach children literacy.”

Discussion

After an exploration of the instructor's pedagogical approaches to help preservice teachers integrate technology as guided by the gradual release of responsibility model (Pearson et al., 2019) and TPACK (Mishra & Koehler, 2006), findings indicate discrete responses and planning outcomes occurred within each approach. Teacher in Control, Teacher as Facilitator, and the Problem-based Learning pedagogical approaches provide a framework to integrate technology into teacher preparation programs (Figure 2).

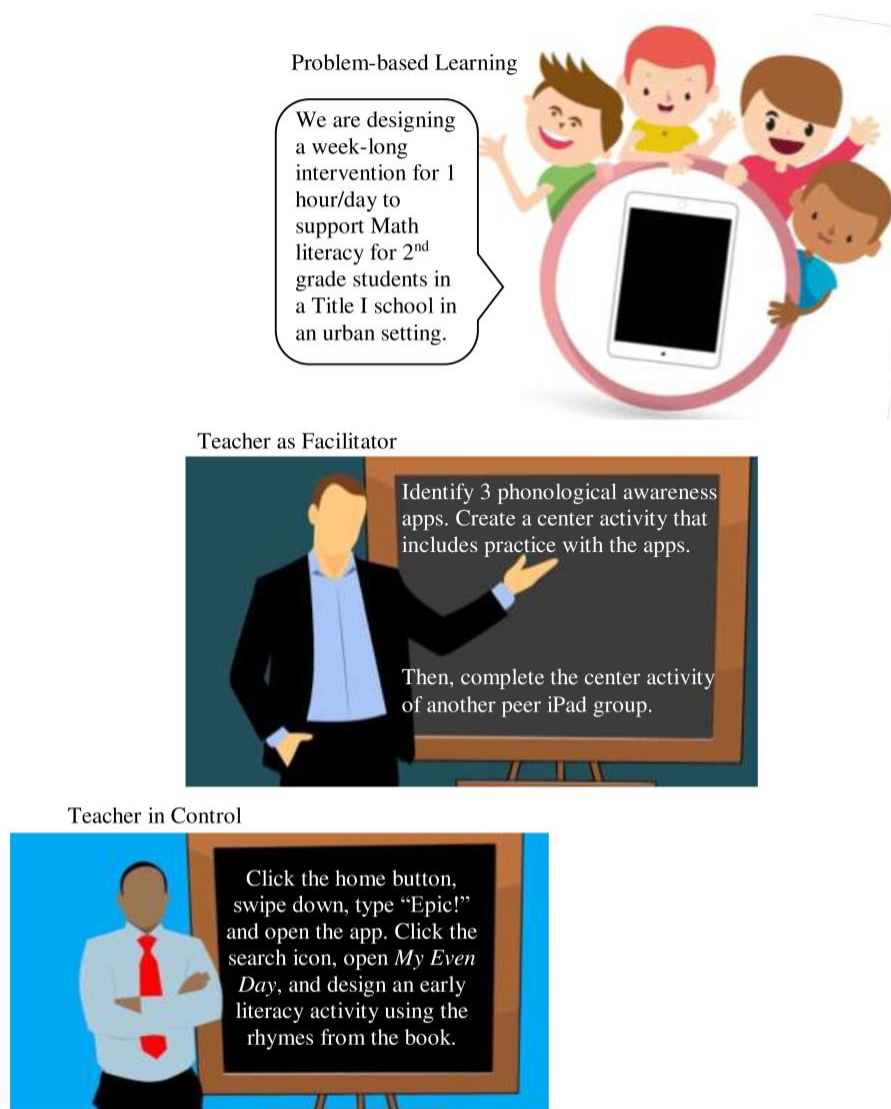


Figure 2. Implementation approach for integrating iPads into literacy instruction. (royalty-free images obtained from <https://pixabay.com>).

Though all pedagogical approaches are necessary and should be applied in this order, they are unequally impactful. Each of the pedagogical approaches employed across the iPad workshops contributed to preservice teachers' ability to plan for literacy instruction since each workshop was thoughtful and intentionally planned (Flewitt et al., 2015) and emphasized pedagogy (Wetzel et al., 2014). Interestingly, the Teacher in Control and Teacher as Facilitator

pedagogical approaches were essential to increase preservice teachers' confidence with educational technology. These earlier, more guided pedagogical approaches contributed to preservice teachers' ability to create comprehensive lessons by the time they arrived at the Problem-based Learning pedagogical approach.

During the first two workshops under the Teacher in Control pedagogical approach, preservice teachers expressed concern for using the iPad as an instructional tool. For example, few preservice teachers accessed all the apps, potentially because 28 apps preloaded to the iPad may have been too overwhelming. It is also possible that because the instructor took control of the iPad activities, this approach could have restricted preservice teachers from thinking about how they could envision designing meaningful learning opportunities with the iPad. Earlier research identified the importance of instructor modeling when using technology (Baran et al., 2019; Gill & Dagarno, 2017), so this initial approach was essential to develop preservice teachers' technological and pedagogical skills. Perhaps the instructor's clear lead in these workshops led preservice teachers to believe they needed to rely on the instructor to become familiar with the app, which led to preservice teachers' repeated inquiries about device navigation and alignment of apps with learning standards. A similar challenge was encountered by a kindergarten teacher who found it difficult to manage the barrage of questions students asked when they used an app for the first time (Toppel, 2014).

The Teacher in Control approach created an uncomfortable state of vulnerability. Some preservice teachers experience difficulty using a technology tool in ways that contradict the way they learned (Cherner & Curry, 2017). Findings that preservice teachers were overly concerned with identifying apps and discovering how to use the apps to design literacy instruction suggests that they may need to detach from their traditional methods of learning to read without

technology. The difficulty of teaching a skill contradictory to the way preservice teachers were taught to read and write became a state of necessary vulnerability when planning instruction with technology. These feelings of confusion and wonder were reduced as the instructor moved from the Teacher in Control to Teacher as Facilitator pedagogical approach.

Perhaps because of the increased demand for preservice teachers to engage with the technology (Vasinda et al., 2017), the Teacher as Facilitator approach appeared to increase preservice teachers' confidence and ability to use the technology to design instruction. The implementation of the Teacher as Facilitator pedagogical approach revealed the emergence of some independent thinking and increased exploration of apps, evidenced by preservice teachers' ability to use, identify, and download apps to create activities and collaborate with other groups. To illustrate more independence, preservice teachers asked the instructor fewer questions, and instead geared more questions toward one another. The increase in designing instructional materials with the iPad could have also been influenced by the recommendation to explicitly teach a skill first without the iPad (Northrop & Killeen, 2013). The combination of print and digital literacy instructional methods was evident when the instructor read-aloud a vocabulary story from a print book before using the iPad to create a vocabulary video. This approach to include both print and digital text may have provided a strategy to help preservice teachers' recognize how the iPad can be integrated into literacy, thereby boosting their confidence when planning literacy instruction with the iPad.

Equally as important as the Teacher as Facilitator approach, the Problem-based Learning approach instilled a sense of authenticity, as if designing instruction for a specific classroom. When preservice teachers predict how they might use technology, they have difficulty aligning learning goals with technology use (Hutchison & Colwell, 2016). However, aligning instruction

with realistic early literacy teaching scenarios appeared to give preservice teachers a clear purpose for their instructional planning. Engagement and collaboration also increased; preservice teachers were required to problem-solve and decide what to design based on the unique learning scenario.

Informed by the pedagogical knowledge construct from TPACK (Mishra & Koehler, 2006), the implementation of Teacher in Control, Teacher as Facilitator, and Problem-based Learning pedagogical approaches at a pace dictated by the preservice teachers (Pearson et al., 2019) contributed to their ability to plan literacy instruction with the iPad. As preservice teachers became familiar with the iPad and gained confidence from teacher-guided instruction (Baran et al., 2019), they created more comprehensive curriculum material. A focus on pedagogy is the largest predictor of technology integration (Chai et al., 2010), and the implementation of a three-phase gradual release pedagogical model illustrates the influence of the instructor's pedagogy on preservice teachers' ability to use the iPad to design literacy instruction. Though Northrop and Killeen's (2013) model contains elements similar to the gradual release model, their model is situated within the context of K-12 learning environments and does not emphasize the pedagogical element from TPACK (Mishra & Koehler, 2006), a critical element when integrating technology.

Findings from this study contribute a new lens to the importance that teacher educators need to provide teachers with formal technology experiences (Christ et al., 2019; Ciampa, 2017). Even when students make clear literacy gains with the iPad, some teachers continue to resist adapting their pedagogy to include teaching with technology (D'Agostino et al., 2016). In general, findings show that the approach to integrate iPads into literacy instruction (Teacher in Control, Teacher as Facilitator, Problem-based Learning), were supportive of preservice

teachers' ability to use iPad apps to design instruction. All pedagogical elements are important and should be implemented in this order to help scaffold each user as they become familiar with integrating technology for educational purposes.

Implications and Future Research

Implications apply directly to teacher educators and indirectly to preservice teachers. Teacher educators can benefit from emphasizing TPACK's pedagogical knowledge construct and the scaffolded gradual release of responsibility when integrating the iPad and related technologies to plan instruction. Of particular importance, this is a flexible and adaptable model that can be tailored to design instruction in other content areas, in accordance with varying levels of technology experiences of the instructor and preservice teachers.

Results from this study demonstrate a change in preservice teachers' intention to use technology from one pedagogical approach to another, which provides an opportunity for future researchers to investigate how this study's framework for integrating iPads into planning for literacy instruction compares with related technology integration frameworks (e.g., Hutchison & Woodward, 2014; Northrop and Killeen, 2013). Additional research might examine how certain pedagogical approaches are more appropriate to teach a specific literacy skill. For example, a lesson on phonemic awareness might benefit from the Teacher in Control pedagogical approach because of the explicit skills and drills practice needed when teaching phonemic awareness. However, a lesson on comprehension may best be accomplished through a Problem-based Learning approach because it enabled preservice teachers to design more inclusive reading comprehension experiences.

Findings also suggest the need to replicate this research in other higher education contexts, with other technological innovations, with more teacher educators, spanning across the

content areas. A longitudinal approach which investigates the extent to which the same preservice teachers integrate technology within their future classrooms could also shed light on future technology integration approaches within teacher preparation programs.

Conclusion

To provide a model for teacher educators to help preservice teachers design literacy instruction with the iPad, the purpose of this study was to explore a technology integration approach that emphasized TPACK's pedagogical knowledge construct (Mishra & Koehler, 2006) and the gradual release of responsibility framework (Pearson et al., 2019). This study demonstrates the value of using a scaffolded approach to allow preservice teachers to navigate the device, explore apps, and understand ways to connect these affordances with instructional goals. This study emphasizes the importance for teacher educators to create space and time in their literacy teacher preparation courses to allow preservice teachers to experiment with and learn how technologies can support literacy instruction, while providing a safe space where they can try, fail, and hone their technological and pedagogical skills.

Declaration of interest statement: The author declares no conflicts of interest.

References

- Anderson, S., Griffith, R. & Crawford, L. (2017). TPACK in special education: Preservice teacher decision making while integrating iPads into instruction. *Contemporary Issues in Technology and Teacher Education*, 17(1), 97-127.
<https://www.learntechlib.org/primary/p/173323/>
- Author. (2019). A teacher's 2-year journey to implement a one-to-one iPad initiative.
- Baran, E., Canbazoglu Bilici, S., Albayrak Sari, A., & Tondeur, J. (2019). Investigating the impact of teacher education strategies on preservice teachers' TPACK. *British Journal of Educational Technology*, 50(1), 357-370. <https://doi.org/10.1111/bjet.12565>
- Beschorner, B., & Hutchison, A. (2013). iPads as a literacy teaching tool in early childhood. *International Journal of Education in Mathematics, Science and Technology*, 1(1), 16-24.
https://lib.dr.iastate.edu/edu_pubs/26
- Bower, M. (2008). Affordance analysis—matching learning tasks with learning technologies. *Educational Media International*, 45(1), 3-15.
<https://doi.org/10.1080/09523980701847115>
- Chai, C. S., Koh, J. H. L., & Tsai, C. C. (2010). Facilitating preservice teachers' development of technological, pedagogical, and content knowledge (TPACK). *Journal of Educational Technology & Society*, 13(4), 63-73. <https://doi.org/10.2307/jeductechsoci.13.4.63>
- Chai, Z., Vail, C. O., & Ayres, K. M. (2015). Using an iPad application to promote early literacy development in young children with disabilities. *The Journal of Special Education*, 48(4), 268-278. <https://doi.org/10.1177/0022466913517554>

- Cherner, T., & Curry, K. (2017). Enhancement or transformation? A case study of preservice teachers' use of instructional technology. *Contemporary Issues in Technology and Teacher Education*, 17(2), 268-290. <https://www.learntechlib.org/primary/p/173575/>
- Christ, T., Arya, P., & Liu, Y. (2019). Technology integration in literacy lessons: Challenges and successes. *Literacy Research and Instruction*, 58(1), 49-66.
<https://doi.org/10.1080/19388071.2018.1554732>
- Ciampa, K. (2017). Building bridges between technology and content literacy in special education: Lessons learned from special educators' use of integrated technology and perceived benefits for students. *Literacy Research and Instruction*, 56(2), 85-113.
<https://doi.org/10.1080/19388071.2017.1280863>
- Council for the Accreditation of Educator Preparation. (2016). CAEP accreditation standards.
<http://caepnet.org/standards/introduction>
- Creswell, J. W., & Miller, D. L. (2000). Determining validity in qualitative inquiry. *Theory into Practice*, 39(3), 124-130. https://doi.org/10.1207/s15430421tip3903_2
- D'Agostino, J. V., Rodgers, E., Harmey, S., & Brownfield, K. (2016). Introducing an iPad app into literacy instruction for struggling readers: Teacher perceptions and student outcomes. *Journal of Early Childhood Literacy*, 16(4), 522-548.
<https://doi.org/10.1177/1468798415616853>
- Dobler, E. (2012). Using iPads to promote literacy in the primary grades. *Reading Today*, 29(3), 18-19.
- Echenique, E. G., Molías, L. M., & Bullen, M. (2015). Students in higher education: Social and academic uses of digital technology. *International Journal of Educational Technology in Higher Education*, 12(1), 25-37. <http://dx.doi.org/10.7238/rusc.v12i1.2078>

- Flewitt, R., Messer, D., & Kucirkova, N. (2015). New directions for early literacy in a digital age: The iPad. *Journal of Early Childhood Literacy*, 15(3), 289-310.
<https://doi.org/10.1177/1468798414533560>
- Gasaymeh, A. (2018). A study of undergraduate students' use of Information and Communication Technology (ICT) and the factors affecting their use: A developing country perspective. *EURASIA Journal of Mathematics, Science and Technology Education*, 14(5), 1731-1746. <https://doi.org/10.29333/ejmste/85118>
- Gill, L., & Dalgarno, B. (2017). A qualitative analysis of pre-service primary school teachers' TPACK development over the four years of their teacher preparation programme. *Technology, Pedagogy and Education*, 26(4), 439-456.
<https://doi.org/10.1080/1475939X.2017.1287124>
- Harmes, J. C., Welsh, J. L., & Winkelman, R. J. (2016). A framework for defining and evaluating technology integration in the instruction of real-world skills. In S. Ferrara, Y. Rosen, & M. Tager (Eds.), *Handbook of research on technology tools for real-world skill development* (pp. 137-162). IGI Global. <https://doi.org/10.4018/978-1-4666-9441-5.ch006>
- Hatch, J. A. (2002). *Doing qualitative research in education settings*. Suny Press.
- Hilton, J. T. (2016). A case study of the application of SAMR and TPACK for reflection on technology integration into two social studies classrooms. *The Social Studies*, 107(2), 68-73. <https://doi.org/10.1080/00377996.2015.1124376>
- Hughes, J., Thomas, R., & Scharber, C. (2006). Assessing technology integration: The RAT–replacement, amplification, and transformation-framework. In *Proceedings of Society for*

- Information Technology & Teacher Education International Conference 2006* (pp. 1616-1620). AACE. <https://www.learntechlib.org/primary/p/22293/>
- Hutchison, A., & Beschorner, B. (2015). Using the iPad as a tool to support literacy instruction. *Technology, Pedagogy and Education*, 24(4), 407-422.
<https://doi.org/10.1080/1475939X.2014.918561>
- Hutchison, A. & Colwell, J. (2016). Preservice teachers' use of the technology integration planning cycle to integrate iPads into literacy instruction. *Journal of Research on Technology in Education*, 48(1), 1-15. <https://doi.org/10.1080/15391523.2015.1103146>
- Hutchison, A., & Woodward, L. (2014). A planning cycle for integrating digital technology into literacy instruction. *The Reading Teacher*, 67(6), 455-464.
<https://doi.org/10.1002/trtr.1225>
- International Literacy Association. (2017). Standards for the preparation of literacy professionals. <https://literacyworldwide.org/docs/default-source/.../draft-ila-standards-2017.pdf>
- ISTE. (2019). ISTE standards for educators. <https://www.iste.org/standards/for-educators>
- Kalonde, G., & Mousa, R. (2016). Technology familiarization to preservice teachers: factors that influence teacher educators' technology decisions. *Journal of Educational Technology Systems*, 45(2), 236-255. <https://doi.org/10.1177/0047239515616965>
- Koehler, M. J., Mishra, P., Akcaoglu, M., & Rosenberg, J. (2013). The technological pedagogical content knowledge framework for teachers and teacher educators. In R. Thyagarajan (Ed.), *ICT integrated teacher education: A resource book* (pp. 2–7). Commonwealth Educational Media Centre for Asia.

- Kucirkova, N., Messer, D., Sheehy, K., & Panadero, C. F. (2014). Children's engagement with educational iPad apps: Insights from a Spanish classroom. *Computers & Education*, 71, 175-184. <https://doi.org/10.1016/j.compedu.2013.10.003>
- Larson, L. C. (2012). It's time to turn the digital page: Preservice teachers explore e-book reading. *Journal of Adolescent & Adult Literacy*, 56(4), 280-290.
- Lu, Y. H., Ottenbreit-Leftwich, A. T., Ding, A. C., & Glazewski, K. (2017). Experienced iPad-using early childhood teachers: Practices in the one-to-one iPad classroom. *Computers in the Schools*, 34(1-2), 9-23. <https://doi.org/10.1080/07380569.2017.1287543>
- Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, 108(6), 1017-1054. <https://www.learntechlib.org/p/99246/>
- McClanahan, B., Williams, K., Kennedy, E., & Tate, S. (2012). A breakthrough for Josh: How use of an iPad facilitated reading improvement. *TechTrends*, 56(3), 20-28.
- Merriam, S. B. (1998). *Qualitative Research and Case Study Applications in Education*. Jossey-Bass.
- Northrop, L., & Killeen, E. (2013). A framework for using iPads to build early literacy skills. *The Reading Teacher*, 66(7), 531-537. <https://doi.org/10.1002/TRTR.1155>
- Pearson, P. D., & Gallagher, M. C. (1983). The instruction of reading comprehension. *Contemporary Educational Psychology*, 8(3), 317-344. [https://doi.org/10.1016/0361-476X\(83\)90019-X](https://doi.org/10.1016/0361-476X(83)90019-X)
- Pearson, P. D., McVee, M. B., Shanahan, L. E. (2019). In the beginning: The historical and conceptual genesis of the gradual release of responsibility. In M. B. McVee, E. Ortlieb, J.

- Reichenberg, J., & P. D. Pearson, (Eds), (2019). *The gradual release of responsibility in literacy research and practice* (pp. 1-21). Emerald Group Publishing.
- Pilgrim, J., Vasinda, S., Leavell, J. A., & Hollier, D. R. (2014). Case studies of one-to-one iPad initiatives in teacher preparation programs. *The Texas Forum of Teacher Education*, 4, 19-41.
- Puentedura, R. R. (2006). Transformation, technology, and education. [weblog post] <http://hippasus.com/resources/tte>
- Roblyer, M. D., & Doering, A. H. (2013). *Integrating educational technology into teaching* (6th ed.). Pearson.
- Santori, D., Smith, C. & Schugar, H. (2014). iTeach literacy with iPad devices: Preparing teachers for effective classroom integration. In D. McConatha, C. Penny, J. Schugar, & D. Bolton (Eds.), *Mobile pedagogy and perspectives on teaching and learning* (pp. 205–210). IGI Global.
- Thomas, T., Herring, M., Redmond, P., & Smaldino, S. (2013). Leading change and innovation in teacher preparation: A blueprint for developing TPACK ready teacher candidates. *TechTrends*, 57(5), 55-63.
- Thompson, A. D., & Mishra, P. (2007). Breaking news: TPCK becomes TPACK!. *Journal of Computing in Teacher Education*, 24(2), 38-64.
- Toppel, K. (2014). Accelerating learning: Making the most of iPads in kindergarten. *IRA E-ssentials*, 1-10. <https://doi.org:10.1598/e-ssentials.8047>
- Vasinda, S., Ryter, D. A., Hathcock, S., & Wang, Q. (2017). Access is not enough: A collaborative autoethnographic study of affordances and challenges of teacher educators' iPad integration in elementary education methods courses. *Contemporary Issues in*

Technology and Teacher Education, 17(3), 411-431.

<https://www.learntechlib.org/primary/p/173508/>

Walsh, V., & Farren, M. (2018). Teacher attitudes regarding barriers to meaningfully implementing iPads in a primary school setting. *Computers in the Schools*, 35(2), 152-170. <https://doi.org/10.1080/07380569.2018.1462674>

Wetzel, K., Buss, R., Foulger, T. S., & Lindsey, L. (2014). Infusing educational technology in teaching methods courses: Successes and dilemmas. *Journal of Digital Learning in Teacher Education*, 30(3), 89–103. <https://doi.org/10.1080/21532974.2014.891877>

Yin, R. K. (2017). *Case study research and applications: Design and methods* (6th ed.). Sage.