

Professional Learning and TPACK: Examining Teachers' Development

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Objectives/Purposes

A professional learning intervention was designed and implemented in the context of a collaborative partnership between a large urban school district and a university-based state research institute. The purpose of the eight-month intervention was to provide vertically articulated professional learning and job-embedded support to integrate a technology tool i.e., iPad, to support instruction with teachers in 78 Title I classrooms.

This study reports the developmental trends of in-service primary teachers regarding their technological pedagogical content knowledge (TPACK) during the professional learning intervention consisting of more than 30 contact hours. Researchers piloted a survey that followed the development of teachers' technology-related knowledge, and assessed the teachers' TPACK status related to teaching with technology in the primary grades. Researchers also examined the benefits to students, including levels of engagement of iPad implementation, as a result of participating in the professional learning. The current study addresses the following objectives:

1. To assess teachers' perceptions of the complex interaction among their content knowledge, pedagogical knowledge, and technological knowledge
2. To provide evidence of teachers' frequency of iPad use in different learning contexts
3. To gain an understanding of the benefits and levels of engagement for students related to iPad implementation.

Theoretical Framework

Intensive professional development is strongly related to student achievement (Klingner, 2004; Trachtman, 2007). A review of the research on how teacher professional development affects student achievement found that studies that had more than 14 hours of professional development showed a positive and significant effect on student outcomes (Yoon, Duncan, Lee, Scarloss, & Shapley, 2007). Furthermore, preparing teachers on the educational uses of technology appears to be a key component in the majority of educational reform efforts (Angeli & Valanides, 2009). Early childhood educators need training, professional development opportunities, and examples of successful practice to develop the technology and media knowledge, skills, and experience necessary to meet current expectations (National Association for the Education of Young Children [NAEYC], 2012; Chen & Chang, 2006). Unfortunately, traditional methods of professional development are not designed to support teachers' abilities related to this complex process, and as a result, are seldom addressed in PreK-12 professional learning (Lawless & Pellegrino, 2007). The professional learning intervention in this study used a variety of methods including face-to-face workshops, online sessions, and job-embedded coaching, throughout the eight-month professional learning to support teachers' instruction through the integration of iPads, and in turn examines some of the benefits to students as reported by participating teachers.

Effective teaching is a complex and multifaceted process. High quality teachers use two domains, content knowledge and pedagogical knowledge, to promote meaningful learning (Shulman, 1986). Shulman (1987) found that the two domains were often presented to teachers in separate contexts that did not fully support the complexity of effective teaching, so he presented a new way of thinking about the knowledge that teachers need. This new way of

thinking referred to as pedagogical content knowledge (PCK), represented the integration of content knowledge and pedagogical knowledge.

Using Shulman's work as a foundation, a framework was developed to address teachers' technological pedagogical content knowledge or TPACK (Mishra & Koehler, 2006) shown in Figure 1. In this model there are three main components of teacher's knowledge: content, pedagogy and technology. Equally important to the model are the interactions between and among these bodies of knowledge represented as PCK, TCK (technological content knowledge), TPK (technological pedagogical knowledge), and TPACK. PCK, as aforementioned, represents the blending of pedagogy and content into an understanding of how particular topics, problems, or issues are organized, represented, and adapted to the diverse interests and abilities of learners, and presented for instruction (Shulman, 1987). TCK is the understanding of specific technologies that are best suited for addressing subject-matter learning and how the content dictates or changes the technology (Koehler & Mishra, 2009). TPK refers to the understanding of how teaching and learning can change when technology is used in particular ways (Koehler & Mishra, 2009). TPACK can be defined as combined knowledge that a teacher should have regarding the use of pedagogical and technological knowledge together in teaching a certain content area effectively (Koehler & Mishra, 2009).

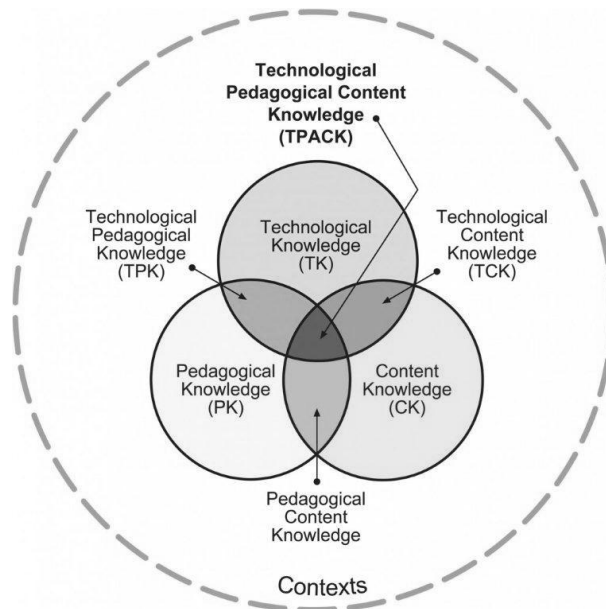


Figure 1. The TPACK model for technology integration supporting effective teaching. Reproduced by permission of the publisher, © 2012 by tpack.org

Methods/Techniques

In the context of a collaborative partnership between a large urban school district and a university-based state research institute, a professional learning intervention was designed and implemented in 78 Title I prekindergarten, kindergarten, and second grade classrooms. Of the 78 classrooms, 13 were designated as Exceptional Student Education (ESE) serving students with developmental delays and communication and social skills disabilities. Participants were certificated and non-certificated teachers, all of which were female with teaching experience ranging from beginning teachers to 33-year veterans. The classrooms were located in 20 elementary schools representing a diverse student population with an average minority rate of 87% and free and reduced lunch status of 90%.

The goal of the eight-month intervention (October 2012 through May 2013) was to provide vertically articulated professional learning integrating technology i.e., iPads, to support instruction. The delivery model included face-to-face and online workshops in conjunction with

job-embedded coaching. Participants attended six workshops and received bi-weekly coaching visits. All participants received an iPad and a credit to purchase specific iPad applications.

Data Sources/Evidence/Materials

Participants completed an anonymous 39-item survey in November and May of the intervention year. Initial surveys were distributed after all participants had received iPads. Items 1-26 of the self-reported survey were adapted with permission from Kabakci-Yurdakul, et al., (2012). These items related to three factors from the Kabakci-Yurdakul, et al., (2012) TPACK-deep scale survey: *Design*, *Exertion*, and *Proficiency*. The *Design* factor refers to teacher competencies in designing and instructing to enrich the teaching process with the help of their technological and pedagogical knowledge before teaching the content. The *Exertion* factor refers to teacher competencies in using technology for the execution of the teaching process and for the measurement and evaluation of the effectiveness of the process. Lastly, the *Proficiency* factor refers to teachers' leadership ability to integrate technology into content and pedagogy by becoming expert users in the classroom. Researchers modified "technology" to "iPad" on the survey to provide specificity in regards to the primary technology tool used in the professional learning intervention. Researchers selected specific items to collect information about teachers' perceptions of their ability to use iPads to design and deliver instruction and their level of proficiency in using the iPad. For each factor, teachers rated items from *Strongly Disagree*, *Disagree*, *Neither Agree nor Disagree*, *Agree*, to *Strongly Agree*.

Researchers designed and field-tested thirteen additional items relative to the intervention to include on the survey. Items 27-30 inquire about the frequency of teachers' use of the iPad in four learning contexts: one-on-one, small group, center, and whole group settings. Teachers rated these items *Not at All*, *1-2 Times*, *3-5 Times*, *6-8 Times*, *9 or More Times*, or *Don't Know* during

a typical 5-day school week. Items 31-36 address teachers' perceptions of students' use of the iPad including their engagement levels during instruction and the usefulness of accessibility features of the iPad. Teachers rated these items (1) *Not at All*, (2), (3), (4), (5) *Very*, or *Don't Know*. Open-ended items 37-39 seek specific information about teacher's iPad use in the classroom. For example, item 37 prompts teachers to describe an experience they had using the iPad in their classroom using details of what they hoped to accomplish and what actually occurred.

As part of the collaborative partnership, professional development evaluation forms mandated by the school district were collected in May to examine the effectiveness of the job-embedded coaching and face-to-face workshops of the professional learning intervention.

Results

In this section, results of the survey are reported in the following order: 1) TPACK-deep scale items, 2) frequency of use in learning contexts items, and 3) benefits and levels of engagement for students items. Results from the district professional development evaluation forms conclude this section.

TPACK-deep scale Factors

The three factors of the survey were reliable across both assessments with Cronbach's Alphas ranging from a low of .886 to a high of .963. Teachers reported greatest confidence in their abilities measured by the *Design* and *Exertion* factors compared to the *Proficiency* factor. The point estimates of the mean scores for these two factors is slightly less than 4.00 in November and slightly greater than 4.00 in May, indicating the teachers agreed that they have ability in these two areas. Point estimates of the mean scores suggest that teachers' self-confidence increased over time and also that their responses were more varied.

Table 1.

TPACK-deep scale Factors Mean Scores (Survey Items 1-26)

Factor	November				May			
	α	n	M	SD	α	n	M	SD
Design	0.903	62	3.96	0.58	0.963	70	4.15	0.84
Exertion	0.934	61	3.91	0.74	0.961	67	4.15	0.85
Proficiency	0.886	66	3.59	0.78	0.927	72	3.72	0.96

Frequency of Use in Learning Contexts

These four survey items were designed to obtain information about the instructional context of iPad use. In May, teachers reported using the iPads across all instructional contexts with noticeable increases in one-on-one and small-group instruction use. Also of note is the increased use in whole-group iPad instruction. As the school year progressed, kindergarten and second grade teachers became able to project iPad content for whole-group instruction and often used projection to introduce students to new apps.

Table 2.

Frequency of Use in Learning Contexts (Survey Items 27-30)

Question	Time	% Not at All	% 1-2 Times	% 3-5 Times	% 6-8 Times	% 9 or More Times	% Don't Know	% Missing
During a typical 5-day school week, how many times do you use the iPad one-on-one with a student?	November	7.5	29.8	38.8	7.5	6.0	10.4	0.0
	May	4.1	17.8	42.5	17.8	16.4	0.0	1.4
During a typical 5-day school week, how many times do you use the iPad during small-group instruction (for example, a rotation of the class through a small-group lesson counts as one time)?	November	9.0	25.4	29.8	17.9	6.0	10.4	1.5
	May	5.5	16.4	45.2	16.4	15.1	0.0	1.4
During a typical 5-day school week, how many times do you use the iPad as part of a center activity?	November	13.4	14.9	32.8	14.9	13.4	10.4	0.0
	May	5.5	16.4	32.9	15.1	28.8	0.0	1.4
During a typical 5-day school week, how many times do you use the iPad during whole-group instruction?	November	32.8	32.8	11.9	6.0	6.0	10.4	0.0
	May	13.7	35.6	32.9	11.0	5.5	0.0	1.4

Note. November Survey, $n = 67$; May Survey, $n = 72$.

Levels of Engagement and Benefits for Students

These six survey items were designed to obtain information about the engagement of students in iPad instructional contexts and the benefit of iPad features to students in the teachers' classes. Overall, teachers responded that their students were engaged when using the iPad by themselves, without assistance, or when the teacher was using the iPad as part of instruction, and the point estimates of the percentage of *Very* engaged increased in May. Point estimates of the *Very* percentages indicate that, in November and May, more teachers rated that *iPad content is visually stimulating, provides dimensionality, and includes animation* as *Very* beneficial than other iPad features.

Table 3.

Levels of Engagement and Benefits for Students Related to iPad Implementation (Survey Items 31-36)

Question	Time	% Not at All	% 2	% 3	% 4	% Very	% Don't Know	% Missing
When using the iPad without your assistance, how engaged are your students?	November	0.0	3.0	9.0	13.4	59.7	13.4	1.5
	May	0.0	0.0	4.1	15.1	78.1	1.4	1.4
When you are using the iPad as part of instruction, how engaged are your students?	November	0.0	1.5	1.5	13.4	68.7	14.9	0.0
	May	0.0	0.0	5.5	15.1	76.7	1.4	1.4
When using the iPad, how beneficial is it for your students to hear content read to them by the iPad?	November	1.5	4.5	9.0	11.9	56.7	16.4	0.0
	May	1.4	4.1	11.0	13.7	67.1	1.4	1.4
When using the iPad, how beneficial is it for your students to listen to word/sound pronunciation?	November	3.0	1.5	6.0	9.0	70.2	10.4	0.0
	May	0.0	4.1	11.0	12.3	68.5	2.7	1.4
When using the iPad, how beneficial is it for your students that content is visually stimulating, provides dimensionality, and includes animation?	November	0.0	1.5	3.0	9.0	74.6	11.9	0.0
	May	0.0	0.0	4.1	5.5	89.0	0.0	1.4
When using the iPad, how beneficial is it for your students to manipulate material and information on the iPad screen?	November	0.0	1.5	7.5	17.9	61.2	11.9	0.0
	May	0.0	0.0	9.6	15.1	72.6	1.4	1.4

Note. November Survey, $n = 67$; May Survey, $n = 72$.

District Professional Development Evaluation

The largest percentages of *Strongly Agree* (SA) responses were for the job-embedded coaching portion of the professional learning intervention. However, the percentages for the face-to-face workshops were not that different from the job-embedded coaching responses. Ten percent of the responding teachers made comments about the coaching and the amount of knowledge acquired, the amazing support, and the overall help offered during classroom visits.

One teacher with more than 20 years of classroom experience indicated the school year was her best ever because of the coaching provided during classroom visits.

Teachers also made comments about the face-to-face workshops. Most complimented the informative nature of the workshops and the willingness of researchers to offer extra assistance. One prekindergarten teacher indicated having the opportunity to collaborate with other teachers was invaluable given that she was the only prekindergarten teacher at her school.

Table 4.

District Professional Development Evaluation

Strand	Benchmark	%SA	%A	%N	%D	%SD	%NA
Job-embedded Coaching							
<i>Planning</i>	1. The professional learning aligned with my goals and/or my individual needs for professional development (based on student learning needs and my IPDP or LPDP).	82	17	0	0	1	0
<i>Learning</i>	1. The professional learning focused on developing content knowledge and research-based instructional strategies and interventions.	87	12	0	0	1	0
	2. The professional learning included theory, modeling, practice, feedback, and learning strategies consistent with adult learning and change.	84	15	0	0	1	0
	3. The length of time for the professional development was adequate for the completion of the objectives.	74	20	3	0	1	3
	4. Technologies that support and enhance professional learning were integrated in the professional learning.	91	8	0	0	1	0
<i>Implementing</i>	1. The knowledge, skills, and ideas learned will enable me to improve my practice.	86	13	0	0	1	0
	2. The demonstrated web-based resources will be used to support the newly acquired knowledge, skills, and practices learned.	80	16	3	0	1	0
<i>Evaluations</i>	1. I believe the newly acquired knowledge and skills will change my instruction practice, have a positive impact on student learning in my classroom, and lead to student performance gains.	84	15	0	0	1	0
Face-to-Face Workshops							
<i>Planning</i>	1. The professional learning aligned with my goals and/or my individual needs for professional development (based on student learning needs and my IPDP or LPDP).	83	16	0	0	1	0
<i>Learning</i>	1. The professional learning focused on developing content knowledge and research-based instructional strategies and interventions.	86	13	0	0	1	0
	2. The professional learning included theory, modeling, practice, feedback, and learning strategies consistent with adult learning and change.	84	15	0	0	1	0
	3. The length of time for the professional development was adequate for the completion of the objectives.	70	20	3	3	1	4
	4. Technologies that support and enhance professional learning were integrated in the professional learning.	88	12	0	0	0	0
<i>Implementing</i>	1. The knowledge, skills, and ideas learned will enable me to improve my practice.	83	16	0	0	1	0
	2. The demonstrated web-based resources will be used to support the newly acquired knowledge, skills, and practices learned.	77	19	1	0	1	0
<i>Evaluations</i>	1. I believe the newly acquired knowledge and skills will change my instruction practice, have a positive impact on student learning in my classroom, and lead to student performance gains.	84	13	1	0	1	0

Note. SA is Strongly Agree, A is Agree, N is Neutral, D is Disagree, SD is Strongly Disagree, and NA is Not Applicable.

Survey results suggest positive developmental trends of teachers' TPACK development over the course of the professional learning intervention. Data from the district professional development evaluation forms indicate that teachers would prefer additional time spent on professional development and coaching to meet learning objectives.

Scholarly Significance

This study contributes to the research on professional development that integrates iPad implementation into instruction in Title I primary classrooms. First, this study provides evidence demonstrating developmental changes in in-service teachers' perceptions of their TPACK development over the course of an eight-month professional learning intervention. Second, this research provides support for better understanding of different learning contexts, student engagement levels, and benefits of technology implementation in primary instruction.

The survey was useful in helping researchers identify positive trends in teachers' confidence integrating iPads into instruction. Additionally, the survey suggests increased frequency of use, higher levels of student engagement, and increased benefits for student learning over the duration of the intervention. The data highlights a need for increased support to assist classroom teachers in integrating technology into effective instruction. In conclusion, our results call for the research community to develop and assess innovative professional learning interventions that impact children's learning through primary teachers' development of their technological pedagogical content knowledge.

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