

Assessing Inservice Teachers' Perceptions of Their TPACK Development

Tiffany Ohlson, Florida Institute of Education at the University of North Florida, United States, tiffany.ohlson@unf.edu
Stephanie Wehry, Florida Institute of Education at the University of North Florida, United States, swehry@unf.edu
Heather Monroe-Ossi, Florida Institute of Education at the University of North Florida, United States, h.monroe-ossi@unf.edu
Bronwyn McLemore, Florida Institute of Education at the University of North Florida, United States, bmclemor@unf.edu
Kelly Maki, Florida Institute of Education at the University of North Florida, United States, kelly.maki@unf.edu
Cheryl Fountain, Florida Institute of Education at the University of North Florida, United States, fountain@unf.edu

Abstract: This study provides a description of inservice teachers' perceptions of their technological pedagogical content knowledge following a 9-month professional learning designed to improve teachers' literacy instruction with young children. Participants created Venn diagrams of their TPACK knowledge using various sized-circles and overlaps and provided elucidations of their use of circle and overlap sizes. Results of interpretation of the teachers' Venn diagrams indicated that teachers' perceptions were limited by their professional learning participation: TPACK was using tablet technology to deliver emergent literacy instruction in different contexts rather than more broadly defining TK, CK, and PK. Results from a TPACK component survey indicated that TPK and TPACK were the most well understood of the components with average scores of 4.44 and 4.33 (out of a possible 5), respectively. Thus, participating teachers were comfortable with the degree to which they integrated iPad technology into their teaching practices and their teaching of literacy content.

Introduction

The TPACK (technological pedagogical content knowledge) theoretical framework (see, e.g., Koehler & Mishra, 2005) is the most recognized approach to describing the integration of technology into the teaching practice. Visualization of the framework is a classic 3-circle Venn diagram having a circle for technology knowledge (TK), content knowledge (CK), and pedagogy knowledge (PK). The theoretical TPACK Venn diagram also features equally-sized overlaps described as pedagogical content knowledge (PCK), technological content knowledge (TCK), and technological pedagogical knowledge (TPC). The intersection of these three 2-way overlaps is the heart of the model and represents TPACK. The use of technology in the classroom requires that teachers first possess technology knowledge and then have the ability to integrate the technological knowledge into their teaching practice. Thus, the TPACK model calls for the integration of teachers' technological knowledge into the combination of their pedagogical and content knowledge.

Studies, primarily using preservice teachers as subjects, have mostly focused on the measurement of the TPACK framework components, effects of professional learning on teachers' acquisition of TPACK, and the elaboration of the TPACK framework. For example, even though Schmidt et al. (2009) develop and validated a widely used measure of the TPACK components, Yurdakul et al. (2012) developed and tested the psychometric properties of the TRACK-deep scale used to measure TPACK by using components of the teaching practice (design, exertion, proficiency, and ethics) rather than the theoretical TPACK components. As an aide to the development of professional learning activities for inservice teachers, Krauskopf, Williams, Foulger, and Fulton (2013) used a study designed to learn more about teachers' current knowledge in the three TPACK areas and their abilities to integrate technology in their teaching practice. In building Venn diagrams depicting the teachers' perspective of the integration of technology in their current practice, the participating teachers chose circles of various sizes to represent their knowledge in the TPACK areas and constructed their diagrams using overlaps reflective of their actual practice. To understand teachers' thinking while constructing their current- and ideal-practice Venn diagrams, teachers participated in structured interviews with the researcher.

The study

The purpose of this study is to describe inservice teachers' perceptions of their technological pedagogical content knowledge following a 9-month professional learning initiative designed to improve teachers' emergent literacy instruction in the early grades with young children 3- to 8-years old. Participating teachers were prekindergarten teachers, ESE teachers of young children with special needs, kindergarten teachers, and second grade teachers from a large urban school district and from local childcare centers offering VPK classes (state-funded voluntary prekindergarten). With regards to technology, participating teachers had iPad2 tablets (without G3 capability). Teachers used iPads with the children. The researchers installed five to seven literacy-related applications (apps) that allowed teachers to archive student work and create individual digital portfolios. The professional development addressed how teachers could use the apps in various ways to enhance children's emergent literacy development. The professional learning occurred during the 2012-2013 school year. In July 2013, we invited participants to attend a focus group to discuss how the professional learning impacted their teaching practice including their perspective of TPACK.

Method

Using the study by Krauskopf, Williams, Foulger, and Fulton (2013) as a foundation, researchers designed reflective activities to assess teachers' perceptions of their current and ideal TPACK teaching practice. The purposes of the activities were to gain knowledge of teachers' perspectives on their current TPACK teaching practice and their view of an ideal TPACK practice. This insight could be used to inform future professional learning initiatives and better address the learning needs of the teachers. To help us better understand teachers' perspectives of their current TPACK practice, participants created visual representations of their knowledge based upon the TPACK Venn diagram. These visual interpretations of teachers' TPACK perceptions allowed researchers to interpret both the size and overlap of the teachers' technological, pedagogical, and content knowledge.

Nine teachers, all females, agreed to participate in the focus group. Their teaching experience ranged from one year to 26 years, seven were at least 4-year degreed and two were Child Development Associate (CDA) credentialed (less than 4-year degreed), and their ages ranged from 25 to 55+ years old. The focus group collectively represented the inservice teachers who participated in the 9-month professional learning initiative.

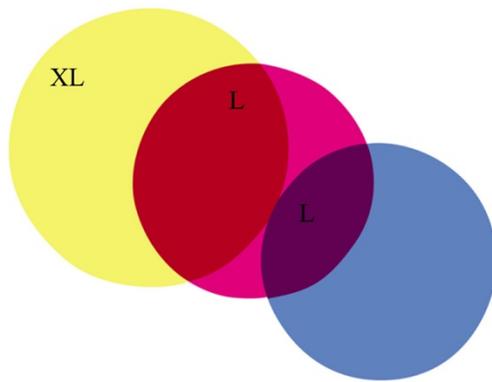
Focus group activities included an opening discussion of the meaning of the theoretical TPACK model components, completing the 47-item *Survey of Teachers' Knowledge of Teaching and Technology* (Schmidt et al., 2009), and constructing current- and ideal-practice TPACK Venn diagrams accompanied by written elucidations of their use of circle and overlap sizes. The opening discussion of TK, PK, and CK provided the spring board for a more in-depth discussion of the theoretical TPACK model including the Venn diagram. Following the discussion, we asked the participants to complete the *Survey of Teachers' Knowledge of Teaching and Technology*.

Finally, we provided each participant with circles in three colors and different sizes cut from overhead transparencies to represent the TPACK sub-domains: TK (blue circle), PK (pink circle), and CK (yellow circle). There were four circle sizes small (S), medium (M), large (L), and extra-large (XL) for each sub-domain, with the small circle representing novice-level knowledge and the extra-large circle representing expert-level knowledge. Each sub-domain set of circles was a different color (blue for technology, yellow for pedagogy, and pink for content). We asked participants to use the circles to indicate their current knowledge in these domains by selecting the appropriate-sized circles, positioning them in a Venn diagram, and then providing a written rationale for their choices. Finally, we asked the participants to indicate their perspective of the ideal TPACK structure by selecting the appropriate-sized circles, positioning them in a Venn diagram, and providing a written rationale for their choices to construct ideal TPACK Venn diagram.

Results

In the opening discussion of the meaning of the TPACK components, participants expressed that technological knowledge focuses on the new world of learning tools such as iPads, opaque projectors, movies, apps, computers, tablets, and other electrical devices that enhance learning. Participants indicated that they thought the focus of content knowledge is the specific concepts to be taught—the teacher's inside knowledge, the integration of knowledge into instruction or practice. Finally, they thought pedagogical knowledge incorporates philosophy of teaching to include planning, classroom teaching strategies, instruction on how to teach, and instructional delivery—knowledge often gained through coursework.

Figure 1 shows three samples of Venn diagrams representing current practice along with the teachers' *Survey of Teachers' Knowledge of Teaching and Technology* scores and explanations of why they chose to construct the Venn diagram as illustrated. Figure 2 shows the same information for three different participants using their ideal TPACK Venn diagram and explanations.

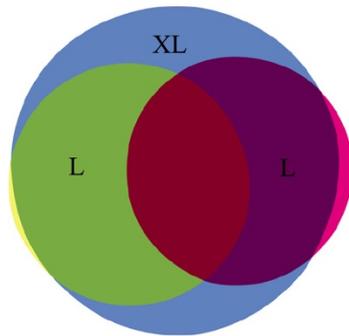


Venn Diagram 1.1

TK = 4.00
 CK = 3.83
 PK = 4.00
 PCK = 3.92
 TCK = 4.00
 TPK = 4.00
 TPACK = 4.00

Teacher A: 46-55 years old; 7 years of experience; VPK PreK; and CDA credentialed.

"I teach more literacy in the morning times. But when the 'wrap program' starts in the evening time, I use more technology teaching because the children are different and want to explore more using the iPad way of learning." [wrap program is an after-school program]

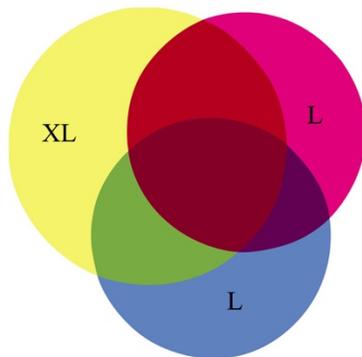


Venn Diagram 1.2

TK = 4.83
 CK = 4.00
 PK = 4.57
 PCK = 4.00
 TCK = 4.67
 TPK = 4.60
 TPACK = 4.00

Teacher B: 26-35 years old; 1 year of experience; Kindergarten; and Elementary Education credentialed.

"I chose to put my content and pedagogy knowledge inside my technology knowledge because technology is the base of everything in my classroom. I am more comfortable using various forms of technology than not. Being an upcoming second year teacher, my content and pedagogy knowledge is steadily evolving—also being a kindergarten teacher is a new environment."



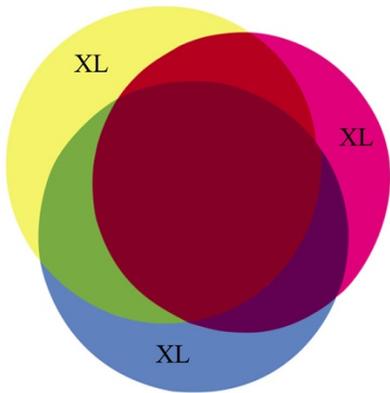
Venn Diagram 1.3

TK = 4.17
 CK = 3.83
 PK = 4.86
 PCK = 4.67
 TCK = 3.86
 TPK = 4.80
 TPACK = 4.83

Teacher C: 55+ years old; 10 years of experience; K-12 ESE, K-6 Elementary; and Early Childhood credentialed.

"Biggest overlap is between CK and PK – I am comfortable with how and what to teach—although I am very comfortable with technology, the struggle is making sure that students' understand and are able to effectively use the technology."

Figure 1. Examples of teachers' Venn diagrams, survey results, and explanations of their current TPACK practice.

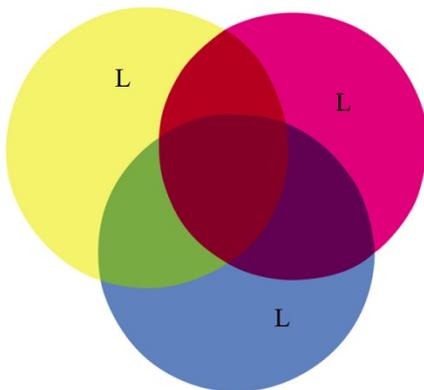


Venn Diagram 2.1

TK = 4.83
 CK = 5.00
 PK = 5.00
 PCK = 4.67
 TCK = 5.00
 TPK = 5.00
 TPACK = 5.00

Teacher D: 26-35 years old; 2.5 years of experience; VPK PreK, and CDA credentialed.

“I feel that it is important for children to become more familiar with using technology as a way of learning. I also feel that it is still important to have one-on-one teaching with children both with technology as well as without.”



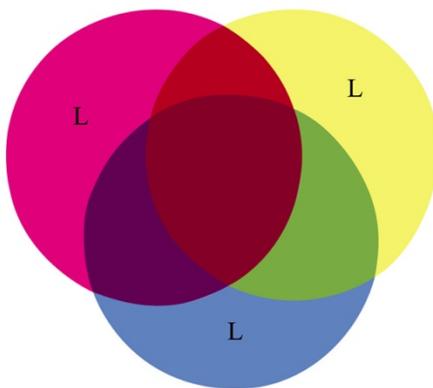
Venn Diagram 2.2

TK = 4.17
 CK = 4.00
 PK = 4.00
 PCK = 4.00
 TCK = 4.00
 TPK = 4.00
 TPACK = 4.00

Teacher E: 36-45 years old; 15+ years of teaching; PreK, K, and 1st Grade; and Elementary, Early Childhood, and PreK ESE credentialed.

“This is ideal for me because all three areas work hand-in hand to create an environment open for self-expression and learning experiences (developmentally appropriate for young children):

- Providing easy access
- Child-friendly
- Guided instruction
- Educational value
- Problem solving
- Interactive and integrated learning.”



Venn Diagram 2.3

TK = 5.00
 CK = 4.50
 PK = 5.00
 PCK = 4.33
 TCK = 4.83
 TPK = 5.00
 TPACK = 5.00

Teacher F: 46-55 years old; 7 years of experience; PreK and 2nd Grade; and Elementary Education and Early Childhood credentialed.

“Ideally I want to increase/become more effective in my knowledge and use of content and pedagogy. With the increase in these two areas, I would like to effectively integrate technology to keep pace the increase in CK and PK.”

Figure 2. Examples of teachers’ Venn diagrams, survey results, and explanations of IDEAL TPACK practice.

Current practice

Teacher A (top panel, Figure 1) uniformly expresses through her survey responses that she feels equally efficacious at the ‘agree’ level across all nine areas of the theoretical TPACK Venn diagram. However, her Venn diagram omits two of the competencies altogether, the integration of content and technology and the integration of pedagogy, content, and technology. She has content as her strength (XL circle) but it is the lowest of her survey responses at 3.83. Her explanation of her Venn diagram only addresses the use of the iPad in her teaching practice.

Teacher B (center panel, Figure 1) a young, new teacher, chose to place her content and pedagogy circles inside the technology circle because “technology is the base of everything in my classroom.” However, TPACK survey

responses are one of her lowest. Her explanation supports her Venn diagram as both indicate that she is more comfortable with technology and sees her pedagogy and content knowledge as evolving

Teacher C (bottom panel, Figure 1), a middle-aged very experienced teacher, credentialed to teach young children as well as K-12 children with special needs, is more traditional with her Venn diagram which supports her confidence in her content and pedagogy knowledge and her ability to integrate all three aspects in her teaching practice. Her Venn diagram, survey responses, and explanation all support each other. As a seasoned teacher she is also concerned with her student's understanding of what they are learning.

Ideal practice

Next, we focus on the Ideal Venn diagrams constructed by three sample teachers (Figure 2). We asked the focus group participants to select circles with the size representing their view of the relative importance of content, pedagogy, and technology to ideal practice and then to depict the view of ideal integration of the three areas.

Teacher D (top panel, Figure 2), a young, beginning teacher, expresses through her survey scores, confidence in her ability and skills in integrating content, pedagogy, and technology. Ideally, she sets the three areas of equal importance and a very large, balanced overlap of the three areas. However, in her explanation, she is concerned about integrating technology to replace all other strategies and does not explain her Venn diagram.

Teacher E (center panel, Figure 2), an experienced teacher having experience in most areas of early childhood education including teaching young children with special needs, depicts the three areas as having equal importance and equally integrated in ideal practice. However, unlike Teacher D, her ideal Venn diagram closely resembles the theoretical model. Her explanation provides insight into her teaching philosophy. Her survey responses indicate her confidence in her practice which is equally evolving in all areas of integration.

Teacher F (bottom panel, Figure 2) is an older lady with modest experience. Even though, her survey responses indicate high confidence in her ability to integrate content, pedagogy, and technology in her practice. Her Venn diagram of ideal practice closely resembles the theoretical model with equal sized circles and overlap. Interestingly, even with her confidence, she expresses her interest in continual improvement and expects to effectively integrate technology as her content and pedagogy knowledge grows.

Discussion

We convened the focus group to explore inservice teachers' perceptions of their technological, pedagogical, content knowledge following a 9-month professional learning initiative designed to improve teachers' emergent literacy instruction in the early grades. The theoretical TPACK framework was not part of the professional learning. However, similar to Krauskopf, Williams, Foulger, and Fulton (2013), we were interested in using insight gained by measuring TPACK to inform future professional learning initiatives and to better address the learning needs of the teachers. However, the teachers' perceptions were actually limited by having participated in the professional learning initiative. Participants' perception of TPACK was using tablet technology to deliver emergent literacy instruction in whole groups, small groups, and individually rather than more broadly defining TK, CK, and PK. Depending upon the years of teaching and credentialing, teachers' view of pedagogy stemming from coursework may be old-fashioned or non-existent if the teacher had not participated in coursework dealing with pedagogy.

Survey of Teachers' Knowledge of Teaching and Technology results provided different insight than the current practice Venn diagrams about the teachers' understanding of TPACK. Component averages indicated that the TPK and TPACK components were the most well understood of the seven components with average scores of 4.44 and 4.33, respectively. Thus, the participating teachers were comfortable with the degree to which they integrated iPad technology into the teaching practice and into their teaching of literacy content. The lowest score was for content knowledge (0.95) which is often expected when working with teachers of very young children.

The constructed Venn diagrams of current practice frequently did not correspond to the component scores on the *Survey of Teachers' Knowledge of Teaching and Technology*. Two reasons could account for this finding. First, the survey was designed to assess preservice teachers' understanding of TPACK, and we used it to assess inservice teacher understanding. Second, the teachers' understanding of Venn diagrams and the resulting components may not have been adequate. If we were to repeat this study, we would provide more work with the theoretical framework components and discussion of Venn diagrams.

Future studies could also involve quantifying the Venn diagram areas as proportions of the 3-circle, the three 2-way interactions when using varying sized circles and overlaps. This would allow statistical inferences to be made with the results. We found the methods used in this study to be labor intensive using nine participants. Before

embarking on a future study, we would want to explore additional avenues to gain useful information to guide the development of professional learning involving technology.

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