TPACK Newsletter, Issue #22: February 2015

Welcome to the sixth anniversary issue and twenty-second edition of the (approximately bimonthly) TPACK Newsletter! TPACK work is continuing worldwide. This document contains recent updates to that work that we hope will be interesting and useful to you, our subscribers.

If you are not sure what TPACK is, please surf over to http://www.tpack.org/ to find out more.

Gratuitous Quote About Knowledge

"Without knowledge, action is useless, and knowledge without action is futile."
- Abu Bakr

In This Issue

1. TPACK Newsletter Update

The TPACK Newsletter has been published via the tpack.news email list since January 2009. It has 1227 subscribers currently. Subscription numbers have held steady (+ or – 1% to 3%) since October 2011.

2. Recent TPACK Publications

Below are recent TPACK publications that we know about: 41 articles, 3 books, 22 chapters, and 12 dissertations that have not appeared in past issues of this newsletter. If you know of

others that were published within the past several months, please let us know at: tpacknews.editors@wm.edu.

Articles

Akman, O. & Guven, C. (2015). TPACK survey development study for social sciences teachers and teacher candidates. *International Journal of Research in Education and Science, 1*(1), 1-10.

Abstract:
"The purpose of this research is to develop a scale for analysing the technological pedagogical and content knowledge (TPACK) and self-efficacy perceptions of the Social Sciences teacher and teacher candidates. During the development a material pool has been generated by evaluating the studies made in body of literature. After opinions have been obtained from the experts who have scale development studies and essential corrections have been made in accordance with these opinions. It has been applied to 285 teacher candidates for making validity- reliability study. As the result of the confirmatory factor analysis, 7 factors have been determined related with the scale. The Cronbach Alpha reliability coefficient of the scale has been found as 0.977. In conclusion it is determined that the scale is valid and reliable for making the study."

Blau, I., Peled, Y., & Nusan, A. (2014). Technological, pedagogical and content knowledge in one-to-one classroom: Teachers developing "digital wisdom." *Interactive Learning Environments*. Advance online publication. doi:10.1080/10494820.2014.978792

Abstract:
"One-to-one (1X1) laptop initiatives become prevalent in schools aiming to enhance active learning and assist students in developing twenty-first-century skills. This paper reports a qualitative investigation of all 7th graders and their 15 teachers in a junior high-school in Northern Israel gradually implementing 1X1 model. The research was conducted during a second year of 1X1 implementation at the school level, which was a first year of teaching and learning with laptops for all study participants. The study triangulates non-participant lessons' observations and semistructured interviews with 15 teachers. The data were collected twice: at the beginning and toward the end of the 2011–2012 academic year – in total, 30 observations and 30 interviews were conducted. The results were examined through phenomenological research techniques and discussed in terms of the technological, pedagogical and content knowledge (TPACK) and "digital wisdom" approaches. The teachers showed significant increase of technological knowledge. However, only moderate connections between technology and pedagogy as well as between technology and content were found. Some of the teachers functioned as moderators, scaffolding students and supporting their individual or collaborative learning. However, many teachers struggled with effective management of 1X1 classroom. Neither conjunction of teacher TPACK nor facilitation of student digital skills was observed. The paper suggests an overlap of the TPACK framework and the digital wisdom approach and provides implications for curriculum developers and educational policy-makers."

Boschman, F., McKenney, S., & Voogt, J. (2015). Exploring teachers' use of TPACK in design talk: The collaborative design of technology-rich early literacy activities. *Computers & Education*, *82,* 250-262. Advance online publication. doi:10.1016/j.compedu.2014.11.010

Abstract:
"Research shows the benefits of collaborative design activity by teachers are that in their conversations (design talk) they develop technological pedagogical content knowledge (TPACK). While more and more teachers engage in collaborative design, little is known about how they use TPACK during design. The main question of this study was: "What is the nature of design talk of a group of teachers during the design of technology-rich early literacy activities?" Using a holistic case study on design talk, the analysis focused on the topics that were under discussion and how these topics were discussed. Three phases of coding were applied: (a) how design represents any of the seven domains of TPACK knowledge (Pedagogical, Content, Technological, Technological Pedagogical, Technological Content, Pedagogical Content or Technological Pedagogical Content Knowledge); (b), how design talk represented three aspects of reasoning (external priorities, practical concerns and existing orientations); and (c), and what levels of inquiry are reached (no-depth; sharing ideas; analyze; and plan). Findings indicate that design talk reflects moments in which teachers reach deeper levels of inquiry. Findings also indicate that TPACK was mostly linked to expressing practical concerns. However when engaging in deeper inquiry, teachers existing orientations featured more prominently in the conversations. External priorities hardly seemed to play any role in design talk. Also, when addressing TPACK or PCK, design talk mostly reflects practical concerns. Pedagogy was addressed not as a single knowledge domain, rather in conjunction with the other two domains. Practical implications are discussed regarding how to support teachers during collaborative design."

Brueck, J. S. & Lenhart, L. A. (2014). E-books and TPACK: What teachers need to know. *The Reading Teacher*, *68*(5), 371-374.

Abstract:
"Today's tech savvy young learners are equipped with a variety of technological tools used as easily as pencils and paper. Many reach for the laptop first when it's time to write or look for an ebook when it's time to read. Ebooks are increasingly viewed as an appropriate source for literacy exposure to books and reading by parents and educators, as net sales revenue from ebooks surpassed hardcover books in the first quarter of 2012 (Boog, 2012).

As educators consider adopting ebooks as instructional resources, we must consider how to effectively merge content, pedagogy and technology in the early literacy classroom. In this article we discuss the emerging role of ebook technology in early reading instruction, along with describing how the Technological Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler, 2006) can assist teachers in understanding the dynamic relationship between content, pedagogy and technology in the literacy classroom."

Burrow, L. E. & Smith, S. (2014). Updating and upgrading early elementary school writing experiences with storytelling and technology. *Perspectives and Provocations, 1*(1). Retrieved from http://www.earlychildhoodeducationassembly.com/updating-and-upgrading-early-elementary-school-writing-experiences-with-storytelling-and-technology.html

Abstract:
"This article uses classroom-based examples to advocate for the use of digital storytelling as a 21st-century update to Vivian Paley's storytelling and story acting curriculum in elementary grades (K – 3). The article describes Paley's traditional early childhood writing process and outlines how to update and upgrade it with technology in order to better engage modern-day, young writers. Discussions of how to leverage a technological pedagogical and content knowledge framework (or TPACK) to assist educators in considering the benefits, capabilities, and limitations of digital storytelling as related to the potential enhancement of young students' digital writing is also presented."

Byker, E. J. (2014). Needing TPACK without knowing it: Integrating educational technology in social studies. *Social Studies Research and Practice, 9*(3), 106-117.

Abstract:
"Preparing future elementary teachers to connect social studies content and skills with technology necessitates the integration of technology into teacher preparation methods courses. Such integration hinges on the identification of pre-service teachers' level of Technological, Pedagogical, and Content Knowledge (TPACK). These three knowledge areas help shape smart uses for educational technology beyond entertainment that utilize technology in educationally profitable ways. The TPACK model is useful for identifying the knowledge required by pre-service teachers for the purpose of wedding instructional technology to social studies content and instruction. The purpose of this mixed-methods study was to describe and to analyze the integration of an instructional technology lesson in an elementary social studies methods course in a large Midwestern university. The study, specifically, describes and reports on 25 pre-service teachers' perceptions of the utilization of a social studies software technology called Timeliner. The study reports on the level of TPACK awareness of the study's pre-service teachers and offers implications related to instructional technology integration in elementary social studies methods courses."

Cacho, R. M. (2014). TPCK assessment of pre-service teachers toward enhancing teacher educators' modeling. *Asian Journal of Education and E-Learning, 2*(5), 349-356.

Abstract:
"This study explored the pre-service teachers' perceived Technological Pedagogical Content Knowledge (TPCK) level and its relationship to teacher educators' TPCK modeling through a descriptive-correlation method. Data were gathered among 47 graduating pre-service teachers who turned in self-report Liker-type instruments. Findings reveal that the graduating pre-

service teachers felt very good about their TPCK levels. Nonetheless, they would benefit from intensive training on upgrading their Technology Knowledge (TK) level to reach balance with Content Knowledge (CK) and Pedagogical Knowledge (PK) levels. Participants likewise perceived that their university-based teacher educators have high competence and oftentimes model TPCK, while cooperating or supervising teachers have shown some competence and sometimes demonstrate TPCK in their student teaching program. Through Pearson r, it is established that significantly strong positive relationship exists between TPCK levels of pre-service teachers and their university-based teacher educators' TPCK modeling. Implications germane toward enhancing the teacher educators' instruction toward the 21st century education paradigm are forwarded."

Chittleborough, G. (2014). Learning how to teach chemistry with technology: Pre-service teachers' experiences with integrating technology into their learning and teaching. *Journal of Science Teacher Education, 25*(4), 373-393. doi:10.1007/s10972-014-9387-y

Abstract:
"The Australian Government initiative, Teaching Teachers for the Future (TTF), was a targeted response to improve the preparation of future teachers with integrating technology into their practice. This paper reports on TTF research involving 28 preservice teachers undertaking a chemistry curriculum studies unit that adopted a technological focus. For chemistry teaching the results showed that technological knowledge augmented the fundamental pedagogical knowledge necessary for teaching chemistry content. All the pre-service teachers demonstrated an understanding of the role of technology in teaching and learning and reported an increased skill level in a variety of technologies, many they had not used previously. Some students were sceptical about this learning when schools did not have technological resources available. This paper argues that teacher education courses should include technological skills that match those available in schools, as well as introduce new technologies to support a change in the culture of using technology in schools."

Finger, G., Romeo, G., Lloyd, M., Heck, D., Sweeney, T., Albion, P., & Jamieson-Proctor, R. (2015). Developing graduate TPACK capabilities in initial teacher education programs: Insights from the Teaching Teachers for the Future Project (TTF). *Asia-Pacific Education Researcher*. Advance online publication. doi:10.1007/s40299-014-0226-x

Abstract:
"There is increased accountability of initial teacher education (ITE) programs in Australia to develop Graduate teachers who are better prepared. Most ITE programs have been designed using Pedagogical Content Knowledge. Informed by the growing Technological Pedagogical Content Knowledge (TPACK) research, this journal article suggests that ITE programs need to develop Graduate teachers who have the TPACK capabilities to use technologies to support teaching and student learning. Insights from the research and evaluation of the Teaching Teachers for the Future (TTF) Project, which was guided by the TPACK conceptualisation, are provided. The TTF Project, which involved all Higher Education Institutions providing ITE

programs in Australia, drew upon the TPACK conceptualisation. The TTF Project research and evaluation included the development and administration of a TTF TPACK Survey and the implementation of the Most Significant Change Methodology. Key findings resulting from the employment of these methodologies are summarised to provide guidance to inform the improvement of ITE programs to develop Graduate TPACK capabilities."

Giannakos, M. N., Doukakis, S., Pappas, I. O., Adamopoulos, N., & Giannopoulou, P. (2014). Investigating teachers' confidence on technological pedagogical and content knowledge: An initial validation of TPACK scales in K-12 computing education context. *Journal of Computers in Education*. Advance online publication. doi:10.1007/s40692-014-0024-8

Abstract:
"Computer science (CS) teachers' training and profile is crucial to ensure students have access to quality computer science education (CSE). The aim of this study is to examine the profile of CS teachers in Greece and map it using the technique of persona. This study examines a national sample of 636 CS teachers who teach algorithms and programing in upper secondary education. The building of the persona is based on teachers' abilities and needs regarding the central aspects of their knowledge with respect to three key domains as described by the technological, pedagogical, and content knowledge (TPACK) framework. According to the results, teachers attain relatively high scores on the TPACK subscales, however they state that there is an area for improvement in their Technology Knowledge and the intersection between content, pedagogical, and technological knowledge. In addition, teachers feel that they need further training on how to incorporate technology in their teaching as well as how to teach algorithms; which are two areas that relate to pedagogical content knowledge and TPACK. By mapping the knowledge, abilities, and needs of CS teachers, we will be able to recognize the challenges they face during teaching and consider strategies and policies for addressing these challenges."

Gluck, L., Dillihunt, M., & Gilmore, M. W. (2014). Advantages of using innovative technological pedagogy to teach chemistry in secondary schools. *Modern Chemistry Applications, 2*(3). Retrieved from http://esciencecentral.org/journals/advantages-of-using-innovative-technological-pedagogy-to-teach-chemistry-in-secondary-schools-2329-6798.1000e119.pdf

Abstract:
"Science and technology have become the leading foundation of global development. Both subjects continue to improve the quality of life as new findings, inventions, and creations emerge from the basis of science. Chemistry, a physical science, provides a strong foundation in the advancement of science and technology. Chemistry, or the central science as it is sometimes called, bridges other natural sciences together. Although chemistry plays a vital role in the world of science and technology, students and teachers in secondary education alike have always found difficulty with this particular subject. As students in secondary education lose interest in studying chemistry, it is crucial that researchers create innovative technology to increase and enhance pedagogical approaches."

Habowski, T. & Mouza, C. (2014). Pre-service teachers' development of technological pedagogical content knowledge (TPACK) in the context of a secondary science teacher education program. *Journal of Technology and Teacher Education, 22*(4), 471-495.

Abstract:
"This study investigates pre-service teachers' TPACK development in a secondary science teacher education program that combined a content-specific technology integration course with extensive field experience. Both quantitative and qualitative data were collected. Quantitative data were collected through a pre-post administration of the Survey of Preservice Teachers' Knowledge of Teaching and Technology. Qualitative data were collected through open-ended survey responses, a focus group and a conference involving teacher educators, practicing teachers and pre-service teachers. Findings indicated that a content-specific technology integration course offered simultaneously with extensive field experience through careful instructional design can improve pre-service teachers' understanding of combining technology with science content and pedagogy. Further, the content-specific nature of the course encouraged pre-service teachers to consider the interactions among technology and content (TCK) more frequently compared to technology and pedagogy (TPK). Findings have implications for teacher education programs and for researchers interested in the development of pre-service teacher knowledge of teaching with technology."

Hammett, R. F. & Phillips, P. (2014). Teaching with digital technologies in university and school contexts: Research and professional development using TPACK. *The Morning Watch: Educational and Social Analysis, 42*(1-2). Retrieved from http://www.mun.ca/educ/faculty/mwatch/vol42/fall2014/Phillips_Hammett.pdf

Abstract:
"This article will discuss what undergraduate students (preservice teachers), graduate students (in-service teachers) and university instructors say about their experiences with and knowledge of digital technologies for teaching and learning. The research data come from a version of the Technological, Pedagogical and Content Knowledge (TPACK) survey (Schmidt et al. 2009-10) administered to university instructors and Education students. TPACK, as a framework for both research and teaching with technology, looks at three domains of knowledge - content, pedagogy and technology - and their interconnectedness. Our research was intended to document the experiences of technology integration for students and instructors in our university and local schools and should thus inform university teaching and professional development activities, particularly in Education."

Hechter, R. & Vermette, L. A. (2014). Tech-savvy science education? Understanding teacher pedagogical practices for integrating technology in K-12 classrooms. *Journal of Computers in Mathematics and Science Teaching, 33*(1), 27-47.

Abstract:

"This paper examines the technology integration practices of Manitoban K-12 inservice science educators based on the Technological, Pedagogical, and Content knowledge (TPACK) framework. Science teachers (n= 433) completed a 10-item online survey regarding pedagogical beliefs about technology integration, types of technology used, and how often each of these technologies was utilized in pedagogical practices. Results indicate that technology is integrated to promote student engagement, teach 21st century skills, as best teaching practice, to stay current, and for hands-on interactive learning. Through quantitative descriptive statistics, results identified that interactive whiteboards and digital communication programs are frequently integrated; while podcasting, digital hand-held data collection sources, online discussion boards, and simulation software are almost never integrated in Manitoban science classrooms. In addition, data indicates that teachers over-report how often classroom technology is actually placed in student hands. Implications of this study inform school division technology purchases, preservice teacher education, and professional development opportunities."

Horzum, M. B., Akgun, O. E., & Ozturk, E. (2014). The psychometric properties of the technological pedagogical content knowledge scale. *International Online Journal of Educational Sciences, 6*(3), 544-557.

Abstract:
"The aim of this study is to develop a scale based on Technological Pedagogical Content Knowledge (TPACK) model with giving more importance to learner centered education and teachers' facilitator role in constructivist learning comparing by previous TPACK scales. In order to prepare item-pool, first we examined previous research and scales and we add additional and novel items to include constructivist view of learning. The new scale developed within this study applied on 724 pre-service teachers, who were selected with stratified sampling. We used confirmatory factor analysis to examine construct validity. Additionally we also performed a criterion validity study to confirm validity of the scale. We calculated Cronbach alpha coefficients, and corrected item-total correlations for reliability. According to validity analyzes we concluded that the scale has a construction with 51 items under 7 factors. Internal consistency coefficients and test-retest reliability coefficients showed that the reliability of the scale is at an acceptable level."

Hsu, C. Y., Liang, J. C., & Su, Y. C. (2014). The role of the TPACK in game-based teaching: Does instructional sequence matter? *Asia-Pacific Education Researcher*. Advance online publication. doi:10.1007/s40299-014-0221-2.

Abstract:
"Previous studies have suggested that understanding the relationships and developmental paths among TPACK constructs plays a crucial role in teachers' TPACK development process. Researchers (Chai et al., Edu Technol Soc 13(4):63–73, 2010) have found that technological knowledge, pedagogical knowledge, and content knowledge are all significant predictors of pre-service teachers' TPACK. Thus, one of the major concerns that educators may have is, which type of knowledge should come first in an educational technology course in order to enhance

the participants' TPACK. This study was conducted to examine the effects of the technology- and pedagogy-oriented course design on improving in-service preschool teachers' technological pedagogical content knowledge-Games (TPACK-G) as well as their acceptance of digital game-based learning. The participants were 49 in-service preschool teachers. They were assigned into a technology- and a pedagogy-oriented group. The results show that when integrating the TPACK-G framework into the preschool context, teachers who were taught with game knowledge first tended to have higher competencies in game knowledge and game pedagogical content knowledge than those who were first instructed with game pedagogical knowledge."

Hunter, J. (2014, November 6). High possibility classrooms: A new model for technology integration in schools. *Education HQ*. Retrieved from http://www.educationhq.com.au/news/11653/high-possibility-classrooms-a-new-model-for-technology-integration-in-schools/

Excerpt:
"What do 'exemplary' teachers focus on when they integrate technology in the classroom? Are there particular aspects of their practices that all teachers could learn from?"

Editors' note: This article is an introduction to a new TPACK-based book that is listed in the *Books* section below.

Kenar, I., Sekerci, A. R., & Bayture, S. (2014). Science and technology teachers' self-confidence in their technological pedagogical content knowledge: An example of Van Province. *European Journal of Educational Studies, 6*(3), 99-110. Retrieved from http://ozelacademy.com/ejes.v6.i3-2%20corrected.pdf

Abstract:
"Today, technological integration, which is seen necessary to improve the quality of education, has been a subject to various studies. In recent years, TPACK (Technological Pedagogical Content Knowledge) has become the principal focus concerning this subject matter. This study has aimed at examining science and technology teachers' level of self-confidence in their TPACK. It has also aimed at studying whether science and technology teachers' level of self-confidence in their TPACK vary according to several variable (gender, seniority, whether they have received in-service training on the use of technology, whether they consider their level of technology utilization sufficient, and access to technology). Scanning method was used in the study which was conducted with 105 science and technology teachers working in a province (Van) in Eastern part of Turkey. Research data was collected through "Demographic Data Form" developed by researchers, and through "Technological Pedagogical Content Knowledge Self-Confidence Scale (TPACKSCS)", which was originally developed by Graham, Burgoyne, Cantrell, Smith, and Harris (2009), and adapted into Turkish by Timur and Tasar (2011). Independent samples t test, Mann-Whitney U test and Kruskal-Wallis H test were used to analyze data in addition to the descriptive statistical analysis. According to the results of the study, science and technology teachers' level of self-confidence in their TPACK was found to be high. However, it was identified that there was no statistically significant difference with respect to science and

technology teachers' level of self-confidence in their TPACK based on gender, seniority, having received in-service training on the use of technology and their capability to access technology."

Koh, J. H. L., Chai, C. S., Hong, H. Y., & Tsai, C. C. (2014). A survey to examine teachers' perceptions of design dispositions, lesson design practices, and their relationships with technological pedagogical content knowledge (TPACK). *Asia-Pacific Journal of Teacher Education*. Advance online publication. doi:10.1080/1359866X.2014.941280

Abstract:
"This study investigates 201 Singaporean teachers' perceptions of their technological pedagogical content knowledge (TPACK), lesson design practices, and design dispositions through a survey instrument. Investigation of these constructs reveal important variables influencing teachers' perceptions of TPACK which have not yet been explored. The confirmatory factor analysis and reliability analysis confirm the validity and reliability of the instrument. The structural equation model shows that the teachers' perceptions of design dispositions (orientations towards design) and lesson design practices (approaches used for lesson design) have direct relationships with the teachers' perceptions of TPACK. The results of this study show that to enhance teachers' TPACK perceptions, teacher educators need to help teachers develop lesson design practices that support ideation and iteration. They also need to develop teachers' design dispositions that are amenable to exploring and resolving conflicting lesson design ideas. Going beyond TPACK, understandings of teachers' lesson design practices and design dispositions are important for teacher educators to better design professional development for integration of information and communications technology."

Kontkanen, S., Dillon, P., Valtonene, T., Renkola, S., Vesisenaho, M., & Vaisanen, P. (2014). Pre-service teachers' experiences of ICT in daily life and in educational contexts and their proto-technological pedagogical knowledge. *Education and Information Technologies.* Advance online publication. doi:10.1007/s10639-014-9361-5

Abstract:
"Many pre-service teachers are members of the net generation and are expected to be familiar with different ICTs, yet several studies have indicated that they are not necessarily able to use them for teaching and learning. The notion of teachers' technological pedagogical knowledge (TPK) is central to this concern. In this study we use the responses of 146 pre-service teachers to open-ended questions about the experiences and knowledge of ICT and pedagogy they brought with them when they entered university teacher training. The data were analysed qualitatively with content analysis based on an integrative framework generated from a number of theoretical perspectives. Derived categories and subcategories were used to construct a framework for 'proto-TPK' as a basis for establishing a starting point for the coordinated development of TPK with students in their university training and early careers."

Kurt, G., Akyel, A., Kocoglu, Z., & Mishra, P. (2014). TPACK in practice: A qualitative study on technology integrated lesson planning and implementation of Turkish pre-service

teachers of English. *International Association of Research in Foreign Language Education and Applied Linguistics, 3*(3), 153-166.

Abstract:
"The issue of what teachers need to know about technology for effective teaching has been the centre of intense debate in the recent past. Technological Pedagogical Content Knowledge (TPACK) has been proposed as a conceptual framework to describe the knowledge base teachers need for effective technology integration. The present study aimed to investigate whether and/or how Turkish pre-service teachers of English reflected their TPACK, as developed in a design study integrating coursework and field experiences, on their lesson plans and implementation. Analysis of the data coming from the lesson plans and classroom observations of three cases revealed that pre-service teachers considered the relationship among content, pedagogy and technology while planning and implementing their lessons."

Lee, C. J., & Kim, C. (2014). The second prototype of the development of a technological pedagogical content knowledge based instructional design model: An implementation study in a technology integration course. *Contemporary Issues in Technology and Teacher Education, 14*(3), 297-326. Retrieved from http://www.citejournal.org/vol14/iss3/general/article2.cfm

Abstract:
"This study presents a refined technological pedagogical content knowledge (also known as TPACK) based instructional design model, which was revised using findings from the implementation study of a prior model. The refined model was applied in a technology integration course with 38 preservice teachers. A case study approach was used in this implementation study. Data were collected from the participants' discussion worksheets and lesson plans, along with associated artifacts and the researchers' field observation notes. Data analysis results revealed that (a) preservice teachers' had an entry-level understanding of TPACK through discussions on the meaning of TPACK and evaluations of technology-integrated teaching examples; (b) designing several technology-integrated lesson plans improved preservice teachers' teaching-related knowledge and facilitated their TPACK learning; and (c) preservice teachers' use of technology was more teacher centered than student centered. Findings, suggestions, and future research possibilities are also discussed."

Lee, K. S., Smith, S., & Bos, B. (2014). Pre-service teachers' technological pedagogical knowledge: A continuum of views on effective technology integration. *International Journal of E-Learning and Distance Education, 29*(2). Retrieved from http://www.ijede.ca/index.php/jde/article/view/887/1540

Abstract:
"This article reports a heuristic case study that explored how components of Technological Pedagogical Knowledge (TPK) manifested in the artifacts of post-Baccalaureate pre-service teachers. Self-reported perceptions of their technology integration competencies were high. End-of-semester presentations reflected three distinct views of technology integration: trendy,

pragmatic, and pedagogical. The quality of TPK connections in lesson plans was mixed. Higher TPK scores were apparent in lesson plans associated with models of teaching with which they had the most familiarity as learners themselves. The appropriateness of their choice of technology to enhance student learning was related to the depth of their conceptual understanding of the pedagogy. This article concludes by echoing Shulman's (1987) advice that teacher education courses and programs need to be structured in a way that explicitly address pedagogical reasoning."

Liang, J. C. (2014). Exploring the relationships between in-service preschool teachers' perceptions of classroom authority and their TPACK. *Asia-Pacific Education Researcher*. Advance online publication. doi:10.1007/s40299-014-0217-y

Abstract:
"Contemporary preschool teachers should be considered to have the abilities required to integrate technology into their teaching. Hence, how to integrate technology into preschool teachers' pedagogical content knowledge is an important issue. The current study hypothesizes that preschool teachers' perceptions of classroom authority could be one of the important factors affecting their technological pedagogical content knowledge (TPACK). The purpose of this study was to explore the relationships between preschool teachers' perceptions of classroom authority and their TPACK. Two questionnaires, the Preschool Teacher Authority Scale (PTAS) and the TPACK survey, were administered to 303 in-service preschool teachers in Taiwan. The cluster analyses revealed that the preschool teachers were characterized into four distinct clusters of teacher authority according to their responses on the PTAS, which were labelled as the clusters of Low engagement, Surface constructivist, Teacher dominance and High commitment. The ANOVA analyses showed that the preschool teachers in the Teacher dominance and High commitment clusters had greater agreement than other teachers with teachers' pedagogical content knowledge. In addition, for all the technological related knowledge (TCK, TPK and TPACK), the preschool teachers in the High commitment cluster perceived technology-related knowledge as having greater importance than did other teachers."

Liu, S., Liu, H., Yu, Y., Li, Y., & Wen, T. (2014). TPACK: A new dimension to EFL teachers' PCK. *Journal of Education and Human Development, 3*(2), 681-693.

Abstract:
"This paper focuses on the technological pedagogical content knowledge (TPACK) of English as a foreign language (EFL) teachers. The paper first addresses how technology is connected with EFL teachers' professional knowledge and the importance of TPACK in EFL teaching. In the second section, the paper discusses four points concerning EFL teachers' challenge in developing TPACK. These points include integration of technology into teachers' present knowledge system, the relationship between new and old knowledge, teachers' willingness to accept new technology and teachers' weaker position in using new technology. The last section covers the support to develop EFL teachers' TPACK and suggests what specific measurements should be taken. The paper concludes that the development of TPACK for EFL teachers is a

connection of two sources of knowledge, i.e. the formal knowledge and skills provided and supported by schools and teaching community and the practical knowledge in using technology."

Matherson, L. H., Wilson, E. K., & Wright, V. H. (2014). Need TPACK? Embrace sustained professional development. *The Delta Kappa Gamma Bulletin: International Journal for Professional Educators, 81*(1), 45-52.

Abstract:
"Technology is ever present in the classrooms of today, and today's students are consistently engaged in its use. However, a recognized gap exists related to what teachers are expected to know and do in a real classroom with technology. To instruct students in the best way with technology, teachers should have knowledge of the TPACK framework—Technology, Pedagogy, and Content Knowledge—and how to integrate its use in lesson planning and classroom instruction. The authors provide a description of TPACK and relate how the gap in instruction with TPACK can be alleviated by providing teachers with authentic and sustained professional development."

Na, J. Y. & Song, J. W. (2014). Technology adoption for science education and scientific research analyzes trends in the utilization of technology teacher pedagogical content knowledge (TPCK). *Teacher Education, 53*(3), 511-524.

Abstract (Korean to English translation):
"The purpose of this study is to identify the trends of research in science education research provides implications for technology adoption and utilization of technology pedagogical content knowledge of science teachers based on it. In 1978-2014 field representative national science education journal article 68 section 2 of the introduction of technology from research papers were published where the status and characteristics of the technology used in this study. In addition, we discuss the knowledge required of teachers in utilizing technology education. The results of this study are as follows. First, the study mainly technology in science education research CAI, Web, MBL, VR, and the like multimedia, information and communication technology Web, MBL, Technology emergence percentage was moved to Mobile from CAI in order to evolve. Second, most of the target paper developed a training method that utilized technology and research was to examine the educational effects. Third, whereas early studies focused on the development of teaching methods and development outcomes, since the mid-1990s, this paper to verify the effectiveness of the training method was developed by a majority, 2000s Beginning teaching methods developed strategy papers for the input they emerged. Fourth, the study of the subject and ability required for recognition as a teacher or teacher's teacher about the introduction of technology in the science classroom was lacking. Therefore, this study proposed a debate focused on science teachers in utilizing technology for education requires investigated utilizing technology pedagogical content knowledge of science teachers. Finally, suggestions for science teachers of TPCK growth represents the growth of pedagogical content knowledge, technology utilization, based on

teaching experience (TPCKgwth) model based on these discussions and their implications were discussed."

Ndongfack, M. (2015). Mastery of active and shared learning processes for techno-pedagogy (MASLEPT): A model for teacher professional development on technology integration. *Creative Education, 6*, 32-45. Advance online publication. doi:10.4236/ce.2015.61003

Abstract:
"As schools increasingly adopt new technologies in enhancing teaching and learning, models of teacher professional development are also evolving. To ensure that teacher development programmes effectively assist them in integrating technology in instructional processes, a study was conducted to determine a more acceptable model of teacher professional development. This study employed a quantitative survey methodology in the collection of data towards the development of a model on technology integration in classrooms and the identification of training needs for teachers. A total of 400 teachers were selected to participate in this study using the stratified random sampling technique from primary schools in 10 Regions of Cameroon to identify their preferences in a professional development model. The data was analysed using percentages, frequency counts, mean and standard deviation. The results indicated that teacher-participants showed a strong preference for an on-going school-based professional development model that supports collaborative learning, problem solving and involves classroom follow-up. A review of the weaknesses in current models as well as literature on best practices in in-service teacher training led to the proposed Mastery of Active and Shared Learning Processes for Techno-pedagogy (MASLEPT) model."

Sang, G., Tondeur, J., Chai, C. S., & Dong, Y. (2014). Validation and profile of Chinese pre-service teachers' technological pedagogical content knowledge scale. *Asia-Pacific Journal of Teacher Education*. Advance online publication. doi:10.1080/1359866X.2014.960800

Abstract:
"Researchers state that teachers in different contexts reported different technological pedagogical content knowledge (TPACK). This phenomenon may partially be explained by cultural differences. Based on this consideration, the development and validation of the Chinese pre-service teachers' technological pedagogical content knowledge (CTPCK) scale is described in this article. The sample was split into two subsamples on random basis ($n1 = 229$, $n2 = 207$) for the purpose of conducting (1) exploratory factor analysis (EFA) and (2) confirmatory factor analysis (CFA), respectively. After the EFA, the CTPCK scale excluded six items and included eight factors with 42 items. Reliability and correlations were discussed. The findings revealed that the CTPCK scale was a valid and reliable instrument for measuring the TPACK of Chinese pre-service teachers' knowledge with or without linking educational technology."

Saudelli, M. G. & Ciampa, K. (2014). Exploring the role of TPACK and teacher self-efficacy: An ethnographic case study of three iPad language arts classes. *Technology, Pedagogy, and Education*. Advance online publication. doi: 10.1080/1475939X.2014.979865

Abstract:
"This ethnographic research study investigated three elementary teachers' perceived self-efficacy beliefs and their attitudes toward mobile technology-enhanced instruction. Using technological pedagogical content knowledge (TPACK) as a guiding theory, the authors sought to determine whether and how the three knowledge components that form the foundation of the TPACK framework– technological, pedagogical or content knowledge – have similar levels of influence on teachers' language arts teaching practices. They also examined how each teacher incorporated iPad technologically enhanced pedagogical practices and made connections to their beliefs about the role of technology and education. Data collection consisted of classroom observation field notes, teacher interviews and teacher blogs. Findings reveal that the teachers' attitudes toward the integration of iPad technology formed a basis for how they approached their pedagogy. Compared to their technological and content knowledge, teachers' pedagogical knowledge and years of teaching experience strongly influenced their decisions regarding mobile technology integration. By the end of the study, all teachers identified stronger connections and awareness in relation to the components of TPACK. The implications of these findings will provide insight relevant to the development of professional development opportunities for teachers regarding TPACK that could ultimately lead to more successful technology integration by teachers."

Scharber, C., Henrickson, J., Koseoglu, S., Lanegran, D., & Doering, A. (2014). Technology integration in K-12 geography education using TPACK as a conceptual model. *Journal of Geography, 113*(6), 223-237.

Abstract:
"There is a need for quality professional development programs and instructional models addressing the needs and challenges of K-12 technology integration in the geography classroom. This study used a mixed-methods design employing surveys and observations to evaluate teacher experiences within a professional development program focused on developing in-service geography teachers' technological, pedagogical, and content knowledge (TPACK) through content-specific learning tools and resources. Results indicate that instructional scaffolding plays an important role in improving teachers' ability to integrate technology in pedagogically meaningful ways geared toward enhancing students' geographic inquiry skills."

Sharma, H. L. & Sharma, L. (2014). TPACK. *Paripex-Indian Journal of Research, 3*(12), 67-69. Retrieved from http://theglobaljournals.com/tgj/index.php/pijr/article/view/261/262

Abstract:
"This paper explores the development of Technological Pedagogical Content Knowledge (TPACK). Nowadays, technology application and integration has become a necessity in teaching and learning processes which demanded high technological knowledge. To describe teachers' integration of ICTs in their classroom practices, Mishra & Koehler(2006) proposed TPACK model (Technological Pedagogical Content Knowledge) has become known as a useful overarching conceptual framework that builds on Shulman's formulation of Pedagogical Content

Knowledge. The intention of this paper is to run an in-depth analysis of TPACK to contribute to a profound theoretical conceptualization of pre service teachers' knowledge base that embeds ICT knowledge and serve to guide structuring teacher education programs."

Sheffield, R. S. & McIlveny, L. (2014). Design and implementation of scientific inquiry using technology in a teacher education program. *International Journal of Innovation in Science and Mathematics Education, 22*(6), 46-60.

Abstract:
"Two hundred and fifteen pre-service teachers engaged in a scientific inquiry unit in the newly created Bachelor of Primary and Early Childhood Education course at an Australian university This paper discusses how the Technological, Pedagogical and Content Knowledge (TPACK) model provided the conceptual framework to design an online inquiry unit. The unit enabled students to research an authentic problem focusing on environmental sustainability using an inquiry framework and an array of information and communication technology (ICT) tools. The survey data collected at the conclusion of the unit indicated that 90 % of students thought the unit improved their understanding of the inquiry process and 88% reported more confidence in their understanding of science concepts. Ninety four percent of students reported an increase in their knowledge and confidence of Web 2.0 tools in supporting scientific inquiry in science. The research determined that the online scaffolded inquiry improved students' knowledge and confidence in the skills and processes associated with inquiry and in science concepts. It will, however, not replace more traditional hands-on investigative approaches but provides a complementary valuable tool to teach interesting and engaging science."

Shively, C. T. & Yerrick, R. (2014). A case for examining pre-service teacher preparation for inquiry teaching science with technology. *Research in Learning Technology*, *22.* Advance online publication. doi:10.3402/rlt.v22.21691

Abstract:
"Inquiry has been the framework for guiding reform-based science instruction. All too often, the role of technology is treated tacitly without contributions to this framework. This case study examines a collection of pre-service teachers enrolling in two educational technology courses and the role these experiences play in promoting inquiry teaching. Interviews, field notes, surveys, reflective digital narratives and student-generated exhibits served as the data informing the analysis of inquiry experiences which shaped the enacted lessons of science teachers. Implications for research and practices are discussed."

Tournaki, N. & Lyublinskaya, I. (2014). Preparing special education teachers for teaching mathematics and science with technology by integrating TPACK framework into the curriculum: A study of teachers' perceptions. *Journal of Technology and Teacher Education, 22*(2), 243-259.

Abstract:

"This study examined the development of Technological Pedagogical and Content Knowledge (TPACK) in mathematics and science of pre-service special education teachers via one course. The course focused on the three domains of knowledge related specifically to integrating instructional technology into mathematics and science teaching and learning namely, Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK) and TPACK. The Survey of Pre-service Teachers' Knowledge of Teaching and Technology developed by Schmidt et al (2009) was used to measure pre-service teachers' perceptions of knowledge. A paired t-test revealed that upon completion of the course requirements, students perceived to have had significant gains in each of the domains of teacher knowledge addressed in the course - effect sizes were large (between .69 and 1.10). Further, significant gains were also found in the area of Pedagogical Content Knowledge (PCK) but with moderate effect size."

Tozkoparan, S. B., & Kilic, M. E. (2015). The effect of instructional technology and material design course to teacher candidates' gaining of technological pedagogical content knowledge compentencies. *Participatory Educational Research, 2*(1), 44-56.

Abstract:
"The aim of this study is to determine Technological Pedagogical Content Knowledge (TPACK) Competencies of teacher candidates in Turkish Teaching department of Mevlana (Rumi) University and the effect of Instructional Technology and Material Design (ITMD) Course on TPACK. The study is a study of quantitative type and single-group pretest-posttest experimental design has been used. The study has been conducted in the spring semester of 2013/2014 academic year, candidates who are studying in 2nd class of Turkish teaching department in Education Faculty of Mevlana (Rumi) University. In this study, Sahin (2011)'s Technological Pedagogical Content Knowledge (TPACK) Survey has been used. The survey is a 5 point Likert type survey and it has 47 items in total. This survey has been applied as pre-test in the classroom to the students who participated in the study. After a period of 10 weeks, the same survey has been applied again to the same students as post-test and thus, pre-test/post-test data has been obtained for the study. According to the findings of the study, TPACK levels of Turkish teacher candidates who participated in the study have been differentiated significantly in terms of all the subscales of the survey. In the light of this study, it can be said that TPACK model plays a leading role on the subject of teachers' needs about technology, pedagogy and content in order to ensure professional development of teachers."

Wahyudi, Winanto, A., & Relmasira, S. C. (2015). Developing teaching and learning model with TPACK framework and blended learning content for science and mathematics in elementary school teacher education program. *Online International Interdisciplinary Research Journal, 5*(1), 36-43.

Abstract:
"The aim of this research is to develop teaching and learning model by using TPACK (Technological Pedagogical and Content Knowledge) framework and blended learning content. It is a teaching and learning model that allows lecturers to combine technological skill, pedagogic skill, and content skill to teach science and mathematics for Elementary School

Teacher Education Program at Satya Wacana Christian University (SWCU) with hybrid instructional delivery method (face to face and online). Six steps of ASSURE model was used to develop this model. Those steps are: 1) analyse learners, 2) state objectives, 3) select method, media, and materials, 4) utilize media and materials, 5) require learner participation, 6) evaluated and revise. The result of the research is that a model and procedures of teaching and learning by using TPACK framework with blended learning content developed in Moodle as a media for hybrid learning. In SWCU, Moodle is recognized as flexible learning. For the research subjects selected for this research are college students of Basic Concept of Mathematics I and Development of Science Teaching and Learning class. The result was this model of teaching and learning can make students active in learning and increase their academic achievement in learning mathematics and science."

Wong, L., Lung-Hsiang, W., Chai, C., Zhang, X., & King, R. (2014). Employing the TPACK framework for researcher-teacher co-design of a mobile-assisted seamless language learning environment. *IEEE Transactions on Learning Technologies.* Advance online publication. doi:10.1109/TLT.2014.2354038

Abstract:
"Integrating technologies into teaching and learning poses a significant challenge for many teachers who lack socio-techno-pedagogical know-how and time to design interventions. A possible solution is to design sound Technology-Enhanced Learning (TEL) environments with relevant content and pedagogical tools to reduce teachers' design efforts. Technological pedagogical content knowledge (TPACK) is a promising framework for understanding how teachers could integrate technologies into classrooms. Scholars have highlighted the "repurposing" of the framework to inform the design of TEL environments. This study employed the TPACK framework to design the learning environment called 'MyCLOUD'. MyCLOUD advances the integration of mobile and cloud technologies for self-directed, collaborative and seamless Chinese Language learning among primary students. In this paper, we unpack how the distributed TPACK resources among the teachers and the researchers have contributed to the design of the learning environment. The analysis is accomplished through researchers' coding and consolidation of 42 meeting minutes throughout the developmental period, thereby outlining the trajectory of the researcher-teacher co-design of the learning environment as a manifestation of newly created TPACK. This is followed by a study of students' perceived usability of the platform, with all three subscales of the user acceptance survey scoring above the mid-point of 3 in their respective mean values. This research contributes to current development of TEL by using the TPACK framework to widen the design considerations that go beyond what is technologically possible to include what is pedagogically desirable for a specific content learning."

Yeh, Y. F., Lin, T. C., Hsu, Y. S., Wu, H. K., & Hwang, F. K. (2014). Science teachers' proficiency levels and patterns of TPACK in a practical context. *Journal of Science Education and Technology*. Advance online publication. doi:10.1007/s10956-014-9523-7

Abstract:

"Technological pedagogical content knowledge-practical (TPACK-P) refers to a unified body of knowledge that teachers develop from and for actual teaching practices with information communication technologies (ICT). This study attempted to unveil the longitudinal and multidimensional development of knowledge that teachers possess by interviewing 40 teachers with various backgrounds in subject content, years of teaching experience, and related award-winning records. An automated cluster analysis was used on the codes given to teachers' responses based on their proficiency levels in different knowledge areas. Three different types of teachers with distinctive features were identified: technology-infusive (TI), technology transitional (TR), and planning and design (PD). TI teachers were more student-centered as compared to TR teachers who were more teacher-centered when asked about possible technology uses. PD teachers were fluent in planning and designing but lacked the balanced development demonstrated by the TI and TR teachers. These science teachers' TPACK were found stayed at the level of "simple adoption." These findings suggest that teachers' TPACK-P needs to be developed with an accumulation of contextualized and dynamic experiences during ICT implementation in actual teaching. Explicit demonstrations regarding how ICTs can be used meaningfully to assist science instruction would be needed in teacher education."

Yeh, Y., Hsu, Y., Wu, H., Hwang, F. & Lin, T. (2014). Developing and validating technological pedagogical content knowledge-practical (TPACK-practical) through the Delphi survey technique. *British Journal of Educational Technology, 45*(4), 707-722.

Abstract:
"Technological pedagogical content knowledge TPACK refers to the knowledge set that teachers currently use to further improve the quality of their teaching and assist their students in learning. Several TPACK models have been proposed, either for discussing TPACK's possible composition or its practical applications. Considering that teachers' practical experiences should also be critical to the development of those teachers' knowledge, this study invited a research panel (six researchers) and an expert panel (54 science-related educators) to propose and validate the framework of TPACK-practical. After two rounds of anonymous communications that followed Delphi survey techniques, a total of eight dimensions of TPACK-practical and corresponding indicators were identified and rated as having high levels of importance. Among these knowledge dimensions, the knowledge of direct information and communication technology uses for enhancing teachers' professionalism and students' conceptual comprehension was rated with a high level of importance. Also, disciplinary differences were found to exist between the different groups of experts. Biology teachers showed significantly higher ratings across all knowledge dimensions, whereas physics teachers' ratings were comparatively low. Such findings suggest that the structure and content of subject matter shapes not only the way they teach with technology but also the thinking logics they build longitudinally from their learning experiences."

Yurdakul, I. K., Odabaşi, H. F., Kiliçer, K., Çoklar, A. N., Birinci, G., & Kurt, A. A. (2014). Constructing technopedagogical education based on teacher competencies in terms of national standards. *Elementary Education Online, 13*(4), 1185-1202. Retrieved from http://ilkogretim-online.org.tr/vol13say4/v13s4m5.doc

Abstract (Turkish to English translation):
"In related literature, there are a number of technology integration models that could be a conceptual framework for effective technology use in the teaching process. One of these models is technopedagogical education (Technological Pedagogical Content Knowledge (TPACK). The technopedagogical education model is an integration model based on teacher competencies. However, although there are various studies conducted on this model in related literature, there is no research carried out to determine teacher competencies based on the technopedagogical education model. Depending on this, the purpose of the present study was to determine teacher competencies based on technopedagogical education. The study was carried out with the qualitative research design. The participants of the study were 24 faculty members. In the study, audio and video records, researcher journals and workshop documents were used as the data collection tools. For the analysis of the research data, the techniques of descriptive analysis and inductive analysis were applied. Based on the views of field experts, the results obtained revealed 20 competencies within the framework of six competency fields and 120 performance indicators defining these competencies. The obtained indicators were discussed in line with the related literature."

Books

Angeli, C. & Valanides, N. (Eds.). (2015). *Technological pedagogical content knowledge*. New York: Springer.

Abstract:
"Technological pedagogical content knowledge (TPCK) reflects a new direction in understanding the complex interactions among content, pedagogy, learners and technology that can result in successful integration of multiple technologies in teaching and learning. The purpose of this edited volume is to introduce TPCK as a conceptual framework for grounding research in the area of teachers' cognitive understanding of the interactions of technology with content, pedagogy and learner conceptions. Accordingly, the contributions will constitute systematic research efforts that use TPCK to develop lines of educational technology research exemplifying current theoretical conceptions of TPCK and methodological and pedagogical approaches of how to develop and assess TPCK."

Editors' note: *Technological Pedagogical Content Knowledge* has just been released (in January 2015). The publisher's purchase page for this book can be found here: http://www.springer.com/education+%26+language/learning+%26+instruction/book/978-1-4899-8079-3. Please note that the list of chapters that appears on this page is **not** correct; the correct chapter list and page numbers are at the URL provided here: http://link.springer.com/book/10.1007/978-1-4899-8080-9. All chapters from this new book are also listed in the *Chapters* section of the newsletter, below.

Hunter, J. (2015). *Technology integration and high possibility classrooms: Building from TPACK.* New York: Routledge.

Abstract:
"Technology Integration and High Possibility Classrooms provides a fresh vision for education in schools based on new research from in-depth studies of technology integration in exemplary teachers' classrooms. This timely book meets the demand for more examples of effective technology integration by providing a new conceptual understanding that builds on the popular and highly influential theoretical framework of technological, pedagogical and content knowledge (TPACK).

Technology Integration and High Possibility Classrooms details four rich cases studies set in different contexts with students ranging from age 6 to 16. Each case study articulates in very practical terms what characterizes exemplary teachers' knowledge of technology integration and how that is applied in classrooms. This highly accessible book clearly demonstrates how theory informs practice and provides new possibilities for learning in twenty-first-century schools."

Young, C., & Kajder, S. (Eds.). (2014). *Research on technology in English education.* Charlotte, NC: Information Age Publishing.

Abstract:
"This book brings together the voices of leading English Education researchers who work to offer views into the changing landscape of English as a result of the use of digital media in classrooms, out of school settings, universities and other contexts in which readers and writers work. But, as in most useful texts, the purpose is more nuanced and far reaching than simply offering a glimpse into where we currently find ourselves as a field. In sum, the collection brings together and interweaves what we are coming to know and understand about teaching English within a shifting digital landscape as well as the implications for teacher education and the discipline of English Education specifically. The intended audience for this particular book is English educators, doctoral candidates in the field of English education, researchers and scholars in the field, and English language arts teachers - especially those interested in the impact digital technologies can have in our field."

Chapters

Angeli, C., Valanides, N., & Mavroudi, A., Christodoulou, A., & Georgiou, K. (2014). Introducing e-TPCK: An adaptive e-learning technology for the development of teachers' technological pedagogical content knowledge. In C. Angeli & N. Valanides (Eds.), *Technological pedagogical content knowledge* (pp. 305-317). New York: Springer.

Abstract:
"In this chapter, the authors discuss the design and implementation of e-TPCK, an adaptive e-learning system that targets the development of teachers' Technological Pedagogical Content Knowledge (TPCK). This adaptive system deploys a technological solution that promotes teachers' on-going TPCK development by engaging them in the design of learner-centered and

ICT-infused scenarios, fostering a self-paced and personalized learning experience, while taking into account teachers' diverse needs, information processing constraints, and preferences. The design and implementation of e-TPCK followed the methodology of design-based research and, thus, the system itself has undergone three cycles of revisions during the last 3 years. The design of the system was informed by different theoretical and methodological frameworks, such as, the framework of TPCK, theories of Self-Regulated Learning (SRL), as well as the necessary affordances of adaptive learning. Empirically, the system was pilot-tested with two cohorts of preservice teachers during the academic years from 2011 to 2013. The chapter concludes with recommendations about how to improve the design of e-TPCK by incorporating built-in features to support adaptive scaffolding and self-regulatory processes in order to provide a complete personalized learning experience to the learner."

Benton-Borghi, B. H. (2014). Intersection and impact of universal design for learning (UDL) and technological, pedagogical, and content knowledge (TPACK) on twenty-first century teacher preparation: UDL-infused TPACK practitioner's model. In C. Angeli & N. Valanides (Eds.), *Technological pedagogical content knowledge* (pp. 287-304). New York: Springer.

Abstract:
"This chapter considers the intersection of two innovative and transformative conceptual frameworks, universal design for learning (UDL), and technological pedagogical and content knowledge (TPACK), and the impact of this new merged model—UDL infused TPACK—on teacher preparation. General and special education teachers should be prepared to graduate with the knowledge, skills, and dispositions to teach all students in the digital age. The TPACK model provides a theoretically sound and coherent conceptual framework to prepare general education teachers to effectively integrate technology, but this model alone cannot enable general education teachers to teach the full spectrum of learners, without an understanding of UDL."

Bos, B., & Lee, K. (2014). Mathematical content, pedagogy, and technology: What it can mean to practicing teachers. In L. Liu & D. Gibson (Eds.), *Research highlights in technology and teacher education 2014* (pp. 27-34). Waynesville, NC: AACE.

Abstract:
"The purpose of this study is to look at how practicing teachers integrate technology-based instruction involving the study of number concepts, geometry, and statistic and probability, during their master's program. Though results show significant improvement, there is a need for district support in the form of one-to-one technology for all students if technology is to become a seamless student tool. The program's courses produced a positive attitude about technology, pedagogy, and content (mathematics) knowledge (TPACK) that lasted a year after the program was completed."

Crompton, H. (2014). Preservice teachers' developing technological pedagogical content knowledge (TPACK) and beliefs on the use of technology in the K-12 mathematics

classroom: A review of the literature. In C. Angeli & N. Valanides (Eds.), *Technological pedagogical content knowledge* (pp. 239-250). New York: Springer.

Abstract:
"In mathematics classrooms, technology allows students to reorganize and re-visualize concepts, yet many teachers are choosing not to use technology in their classrooms. This begs the question as to why technology is not being used: Do teachers lack the ability to use the technology, or do they not believe it is effective in the mathematics classroom? This review of literature examines the development of preservice teachers' (PST's) TPACK and changes in beliefs from PST preparation experiences. The findings of this review indicate that preservice teachers develop TPACK skills as they progress through the teacher education programs, which also lead to a more positive stance toward the use of technology for mathematics."

Gillow-Wiles, H., & Niess, M. (2014). A systems approach for integrating multiple technologies as important pedagogical tools for TPACK. In L. Liu & D. Gibson (Eds.), *Research highlights in technology and teacher education 2014* (pp. 51-58). Waynesville, NC: AACE.

Abstract:
"Teacher preparation programs as well as continuing professional education programs recognize the importance of preparing teachers to teach with technology. However, all too often these programs offer a single course, focusing on manipulating individual technologies. This descriptive research presents a perspective where technology is woven throughout a 3-year online MS program and where participants engage with holistic technology systems approach for integrating technologies as pedagogical tools, supporting a community-of-learners based, collaborative experience. The impact of engaging in such a program on participants' technological pedagogical content knowledge (TPACK) and their thinking about student learning with technologies is described. Data collected from a representative course in the program explains how engaging with systematically integrated multiple technologies supports teachers' development of their TPACK and extends their thinking of how students learn with technology."

Haley-Mize, S., & Bishop, J. (2014). Exploring TPACK model practices: Designing, facilitating, and evaluating effectiveness of technology experiences among preservice teachers. In C. Angeli & N. Valanides (Eds.), *Technological pedagogical content knowledge* (pp. 253-268). New York: Springer.

Abstract:
"The study used Technological, Pedagogical, and Content Area Knowledge (TPACK) as a conceptual framework to evaluate the specific ways by which the preservice teacher educators learn technology integration throughout undergraduate coursework. A mixed methodology combined three overlapping phases of data collection and analysis: (1) preservice teacher surveys reporting perceptions, attitudes, and beliefs surrounding notions of "*technology*," (2) facilitation and evaluation of "*Technology-Enhanced Lessons*" (TELs), and (3) case interview and classroom observation of exemplary use of TPACK practices. Findings indicate that many

candidates did not articulate a transformative understanding of technology, but individual differences emerged. Pre- and post-survey data supported a quantitative correlation of specific preservice course experiences with technology and TPACK participant skill levels."

Harris, J., & Hofer, M. (2014). The construct is in the eye of the beholder: School districts' appropriations and reconceptualizations of TPACK. In L. Liu & D. Gibson (Eds.), *Research highlights in technology and teacher education 2014* (pp. 11-18). Waynesville, NC: AACE.

Abstract:
"Despite debates about the specific parameters of its eight subcomponents, TPACK is generally understood within university-based teacher education communities as the knowledge needed to incorporate technologies—especially digital tools and resources—effectively in teaching and learning. How do professional development providers working within primary and secondary schools and districts conceptualize and operationalize TPACK? Our study of educational technology-related professional development in seven North American schools and districts in seven states/provinces found that educational leaders' discussion and operationalization of the TPACK construct differs from that of university-based researchers in intriguing and important ways. In these organizations, TPACK was both appropriated to reconnect curriculum and pedagogy with educational technology use after prior technocentric professional development was found to be lacking, and reconceptualized to focus more upon practice than knowledge."

Hart, M., & Kumar, S. (2014). Designing an educational technology course for preservice Social Studies teachers based on technological pedagogical content knowledge (TPACK) survey results. In L. Liu & D. Gibson (Eds.), *Research highlights in technology and teacher education 2014* (pp. 35-42). Waynesville, NC: AACE.

Abstract:
"An educational technology course for preservice social studies teachers was created based on technological pedagogical content knowledge (TPACK) (Mishra & Koehler, 2006) and refined based on the results of a TPACK- survey completed by students before the course began. The instructor was able to eliminate aspects correlating with high self-assessed knowledge and focus on areas which showed a perceived lack of knowledge. Results of this survey and this paper provide a snapshot of students' perceived knowledge, according to TPACK components, prior to entering the teaching field while also demonstrating how course design can quickly be modified if the class curriculum has a TPACK foundation connected with a TPACK pre-class survey."

Hervey, L. G. (2014). Between the notion and the act: Veteran teachers' TPACK and practice in 1:1 settings. In C. Angeli & N. Valanides (Eds.), *Technological pedagogical content knowledge* (pp. 165-189). New York: Springer.

Abstract:

"This chapter presents a multiple case study, where six veteran secondary education teachers participated in videotaped lessons, simulated recall, and semi-structured interviews. The findings highlight veteran teachers' desired autonomy in selecting professional development, combined with opportunities to learn and practice with peers, as well as the unique generational challenges they face, while practicing in 1:1 settings. The findings suggest that: (a) veteran teachers will need customized, just-in-time professional development to help them acquire nuanced and critical understanding of how to best use their readily available technologies to enhance student content learning; and (b) intentional leveraging of veteran and novice teachers' skills and talents in tandem, when professional learning communities are developed. Future theory building and description must include research-based strategies to best support secondary veteran teachers' successful development of TPACK."

Ioannou, I., & Angeli, C. (2014). Technological pedagogical content knowledge as a framework for integrating educational technology in the teaching of computer science. In C. Angeli & N. Valanides (Eds.), *Technological pedagogical content knowledge* (225-237). New York: Springer.

Abstract:

"The chapter adopts the framework of Technological Pedagogical Content Knowledge (TPCK) in order to redesign the teaching of three computer science lessons about (a) three basic computer science concepts, namely, data, processing, and information, (b) the representation of data in computer language, and (c) the differences between main and secondary memory. The chapter uses the systematic guidelines of technology mapping to transform the teaching content with the use of educational technologies and in particular spreadsheets. While the framework of TPCK and the guidelines of technology mapping proved to be adequate methodological frameworks for the teaching of computer science, it is pointed out that the focus herein has been on the cognitive domain of learning, and that the frameworks have to be also tried out within the context of other subject-matter areas where the emphasis is also on the affective domain of learning."

Jaipal-Jamani, K., & Figg, C. (2014*).* The framework of TPACK-in-practice: Designing content-centric technology professional learning contexts to develop teacher knowledge of technology-enhanced teaching (TPACK). In C. Angeli & N. Valanides (Eds.), *Technological pedagogical content knowledge* (pp. 137-163). New York: Springer.

Abstract:

"This chapter presents the *Framework of TPACK-in-Practice,* a framework of identified characteristics and actions demonstrated by teachers in practice, when they effectively teach with technology. This framework emerged from findings of longitudinal studies of preservice and in-service teachers as they taught with technology in elementary classrooms.
This *Framework* specifically highlights the TPACK knowledge that elementary teachers use in practice, associated with the knowledge intersections, namely, TPCK, TCK, and TPK. Further findings indicate that teacher knowledge of technology-enhanced teaching can be developed from the explicit teaching of these specific characteristics and actions. An illustrative example of

the *Framework's* usefulness in designing technology professional learning, for a variety of professional learning contexts (i.e., teacher education technology courses, in-service workshops), is discussed. Four stages to design professional learning workshops for teacher development of TPACK knowledge are presented. These four stages are: (a) modeling a technology-enhanced activity type (learning with the tool) to set the context and purpose for tool use, (b) integrating "pedagogical dialog" in a modeled lesson, (c) developing activity-specific technical skills through short tool demonstrations, and (d) applying TPACK-in-Practice to design their own task. The four stages provide guidelines for designing content-centric professional learning contexts for teacher development of TPACK knowledge."

Johnson, L. (2014). Impact of design team on preservice teachers' TPACK, attitudes, & skills. In L. Liu & D. Gibson (Eds.), *Research highlights in technology and teacher education 2014* (pp. 43-50). Waynesville, NC: AACE.

Abstract:
"This study examined the effect of a specific instructional approach called design teams on preservice teachers' attitudes toward technology, their technology skills, and their Technological Pedagogical Content Knowledge (TPACK). In a design teams approach, participants work in collaborative teams to design solutions to solve real-world problems. This quasi-experimental study explored the efficacy of an educational technology course implemented with a design teams approach compared to the same course that utilized a standard instructional approach. The sample included 53 preservice teachers from one university majoring in either Early Childhood Inclusive or Elementary Inclusive Education. Preservice teachers in the treatment condition worked in design teams to plan technology integrated lessons to solve authentic instructional problems. In the comparison condition, preservice teachers completed instructor-designed assignments in class and planned a technology integrated lesson independently. In comparing the participating preservice teachers' attitudes toward technology, skills, and TPACK, it was found that there were significant differences between the two groups on TPACK when measured with evidence from lesson plans. There were no significant differences when survey data on attitudes toward technology, technology skills, and TPACK were compared; further exploration indicated that both groups significantly improved on these measures over the course of the semester. These results suggested that the design teams approach was appropriate for use in preservice teacher technology education, but additional research is necessary to determine in which contexts and with what specific learning outcomes it is most effective."

Kramarski, B., & Michalsky, T. (2014). Effect of a TPACK-SRL model on teachers' pedagogical beliefs, self-efficacy, and technology-based lesson design. In C. Angeli & N. Valanides (Eds.), *Technological pedagogical content knowledge* (pp. 89-112). New York: Springer.

Abstract:
"The study examined whether enabling preservice science teachers to use the TPCK-SRL model for integrating SRL (Self-Regulated Learning) into TPCK (Technology Pedagogical Content Knowledge) influenced (a) beliefs about teaching and learning pedagogy, (b) self-efficacy beliefs

in the context of using technology in the classroom, and (c) the extent to which these beliefs are connected to teachers' TPCK-based lesson design. Two groups of teachers were compared (*n* = 96). One group practiced the TPCK-SRL model in a hypermedia environment, and the other practiced TPCK only in the same hypermedia environment. The findings indicated that after exposure to the TPCK-SRL training model, preservice teachers' pedagogical beliefs tended more to favor student-centered learning (self-constructing knowledge) than the TPCK group. TPCK-SRL teachers also showed the strongest beliefs in their own technological self-efficacy, which influenced their ability to develop TPCK-based lesson designs in a constructivist way."

Krauskopf, K., Zahn, C., & Hesse, F. (2014). Cognitive processes underlying TPCK: Mental models, cognitive transformation, and meta-conceptual awareness. In C. Angeli & N. Valanides (Eds.), *Technological pedagogical content knowledge* (pp. 41-61). New York: Springer.

Abstract:
"In this chapter, the authors aim at theoretically developing the TPCK framework toward a process-oriented model of teachers' pedagogical reasoning about technology. To address this issue, they elaborate on the transformative view of TPCK, introducing the notion of mental models, as analogue and continuous knowledge representations (Johnson-Laird PN, Cogn Sci 4:71–115, 1980). Based on this, they propose two levels of cognitive transformation. First, they claim that the cognitive transformation of knowledge in the basic sub-domains (TK, PK, CK) into knowledge in the intersecting sub-domains (PCK, TPK, TCK) can be defined as the construction of mental models. Second, regarding TPCK as a construct, namely, the construction of knowledge supposedly integrating all sub-domains, they claim that TPCK can be conceptualized as meta-conceptual awareness of the demands of the teaching task, the teachers' knowledge in the sub-domains and the respective context. These claims are discussed in terms of the background of coherent versus fragmented theories, based on the conceptual change literature."

Kushner Benson, S. N., Ward, C. L. & Liang, X. (2014). The essential role of pedagogical knowledge in technology integration for transformative teaching and learning. In C. Angeli & N. Valanides (Eds.), *Technological pedagogical content knowledge* (pp. 3-18). New York: Springer.

Abstract:
"In this chapter, the authors contend that in an era in which technology *applications* and *usage* have exploded; *technology integration* has not been fully realized. They begin the chapter by providing a brief description of a critical time period from the 1980s to 1990s, when computer technology use exploded in classrooms and educational settings. They explain that during this time, the quest for technology integration got side-tracked, taking the path toward technology skills professional development rather than a more essential route toward student learning. They then present some of the research from the 1990s that examined the impact of technology on learning, eventually serving as a catalyst for the development of the TPACK framework. Finally, they summarize their own work, in which pedagogical knowledge has

emerged as the key factor in promoting technology integration that supports transformative learning and teaching practices, and conclude with recommendations for professional practice."

Lyublinskaya, I., & Tournaki, N. (2014). Preparing special education teachers to teach mathematics and science with technology: A study of teachers' surveys and lesson plans. In L. Liu & D. Gibson (Eds.), *Research highlights in technology and teacher education 2014* (pp. 19-26). Waynesville, NC: AACE.

Abstract:
"This study focuses on the development of Technological Pedagogical And Content Knowledge (TPACK) in mathematics and science of pre-service special education teachers via one course. TPACK development is measured through a survey (teachers' perceptions of knowledge) and lesson plans (teachers' artifacts). Paired samples t-test revealed that upon completion of the course requirements, the participants' TPACK scores increased significantly in regards to their perceptions as well as their lesson plans. Correlations between the two measures were not significant leading to a discussion about assessing constructs through measures of self–perception and teaching artifacts. Factor analysis of the survey raises questions about the domains of knowledge of the TPACK framework. Implications for teacher education programs are discussed."

Mouza, C., & Karchmer-Klein, R. (2014). Designing effective technology preparation opportunities for preservice teachers. In C. Angeli & N. Valanides (Eds.), *Technological pedagogical content knowledge* (pp. 115-136). New York: Springer.

Abstract:
"In this chapter, we present one approach to the design of standalone educational technology courses that is aligned with research-based principles for the preparation of preservice teachers, while utilizing the framework of technological pedagogical content knowledge (TPACK) as an instructional guide. We also present insights from preservice teachers' reflections on the TPACK framework, and their anticipated uses of technology in their student teaching placement and future classrooms. Preservice teachers' reflections indicated that key components of the course were beneficial in fostering a greater appreciation of technology in the context of content and pedagogy. Further, all preservice teachers expect to use technology in their future classrooms although their descriptions did not provide detailed information on how they would do so, while considering issues of content and pedagogy. We conclude with a discussion and implications for future practice."

Niess, M. L. (2014). Transforming teachers' knowledge: Learning trajectories for advancing teacher education for teaching with technology. In C. Angeli & N. Valanides (Eds.), *Technological pedagogical content knowledge* (pp. 19-37). New York: Springer.

Abstract:

"Technological pedagogical content knowledge (identified by TPCK and/or TPACK) describes teachers' knowledge for teaching with technologies. Four components illuminate teachers' TPACK as the: (1) overarching conceptions of teaching content with technologies; (2) knowledge of students' understanding, thinking and learning with technologies; (3) knowledge of curriculum and curriculum materials; (4) knowledge of instruction and instructional representations. Five levels of acceptance for teaching with technologies (*recognizing, accepting, adapting, exploring*, and *expanding*) describe teachers' knowledge transformation for teaching with technology. These acceptance levels are examined by the four TPACK components to clarify the development of the knowledge, skills, and dispositions comprising teachers' knowledge. Analysis of the four TPACK components in multiple research projects advocates learning trajectories for transforming teachers' knowledge for teaching with technologies. Recommendations for the design of future educational programs highlight the importance of continued experiences for enhancing the habits of mind that support teachers in teaching with technologies."

Otrel-Cass, K. (2014). Theorizing technological pedagogical content knowledge to support networked inquiry learning in science: Looking back and moving forward. In C. Angeli & N. Valanides (Eds.), *Technological pedagogical content knowledge* (pp. 193-207). New York: Springer.

Abstract:
"The notion that teachers and students can incorporate digital technology to support science investigations and enhance learning experiences has received considerable interest from researchers, practitioners, and policymakers (Loveless & Ellis, 2001; New Zealand Ministry of Education, 2007; Somekh, 2007). For instance, the World Wide Web offers easy access to multimodal and up-to-date information and opportunities to interact with people and information, compared to facilitating face-to-face meetings or using standard texts (Cowie, Moreland, Jones, & Otrel-Cass, 2008; Slotta & Linn, 2000). Careful orchestration of digital technology in classrooms has the potential to enhance understanding of science ideas, promote learners' independence, motivation and engagement in science, and support visualizing investigations and science learning. However, this requires that teachers and students have *sandpit time*, which means time to practice, and reflect for, the use of digital technology (Otrel-Cass, Cowie, & Khoo, 2011). It has been argued that if teachers want their students to learn about what it means to think and work as a scientist, then they should be involved in activities that are authentic and meaningful. This means that students should get opportunities to apply their growing scientific literacy, practice decision making (Roth, van Eijck, Reis, & Hsu, 2008), and learn about social practices and discourses that contribute to the way scientists generate knowledge (Kovalainen & Kumpulainen, 2009). This demand for authenticity is challenging the traditional school environment, because activities that involve students as self-directed learners, who investigate, interpret, and assess the trustworthiness of information from a variety of sources, for the purpose of answering their own questions, are not easily achieved (Duschl, 2008; Otrel-Cass et al., 2011). Although Information and Communication Technology (ICT) has been identified to provide a suite of tools that support such endeavors, digital technology alone will not change teacher practices in science classrooms. If digital

technology is to contribute to transforming science learning, those involved with shaping teacher pedagogy, including researchers and teacher educators, need to explore how teachers can use the creative, collaborative, experimental, and evaluative possibilities ICT may have to offer (Somekh, 2007). It is also not enough to assume that twenty-first century students may be digitally literate in using technology for recreational purposes, such as social networking, and to then believe that they can, or want, to automatically transfer those skills into educational settings (Kennedy, Judd, Churchward, Gray, & Krause, 2008). Such oversimplifications of digital technology use and practices in science, or other subjects, may lead to less productive teaching and learning outcomes, and alienate both teachers and students from using digital technology in class."

Tee, M. Y., & Lee, S. S. (2014). Making tacit knowledge and practices more explicit for the development of TPACK. In C. Angeli & N. Valanides (Eds.), *Technological pedagogical content knowledge* (pp. 269-283). New York: Springer.

Abstract:
"This action research study explored an approach to better facilitate the development of teachers' technological pedagogical and content knowledge (TPACK). The approach combined problem-based learning (PBL) with Nonaka's SECI framework (socialization, externalization, combination, internalization). Based on the survey data, teachers believed that their TPACK had improved. Qualitative data derived from one of the groups also demonstrated TPACK improvement. The teachers' initial understanding toward teaching tended to put the blame on students, but this changed through a cycle of action and feedback. Throughout these cycles, teachers began to focus more on what could be done to improve learning, and, as a result, began to realize that technology in itself is not likely to improve ineffective teaching practices. Consequently, their use of technology for teaching and learning became more purposeful."

Terpstra, M. (2014). TPACKtivity: An activity-theory lens for examining TPACK development. In C. Angeli & N. Valanides (Eds.), *Technological pedagogical content knowledge* (pp. 63-88). New York: Springer.

Abstract:
"TPACKtivity is discussed as a means to examine preservice teachers' TPACK development. TPACKtivity employs activity theory to identify objectives, mediating tools, rules and community, as part of activity settings that contribute to, or detract from, TPACK development. The lens is described and applied in examining seven preservice teachers' experiences and perceptions of various activity settings' impacts on their learning to teach disciplinary content with technology. The TPACKtivity lens identified mediating tools for developing TPACK, made explicit the roles of the community members in contributing toward subjects' TPACK development, and brought to light rules about technology use in classrooms that impact TPACK development. The findings illustrate the effectiveness of the TPACKtivity lens in sorting through the complexities of TPACK development across multiple settings."

Tzavara, A., & Komis, V. (2014). Design and implementation of educational scenarios with the integration of TDCK: A case study at a department of early childhood education. In C. Angeli & N. Valanides (Eds.), *Technological pedagogical content knowledge* (pp. 209-224). New York: Springer.

Abstract:
"Studies worldwide indicate that while the question of whether or not to introduce the use of Information and Communications Technologies (ICT) in the educational process has received a positive response, a new and equally important question arises: How to prepare teachers in the best possible way, so that they can reconstruct, with the use of ICT, the educational process? In this context, several researchers, based on the theoretical framework of Pedagogical Content Knowledge (PCK) have created a new theoretical framework: the Technological Pedagogical Content Knowledge (TPCK). Given the conceptual constructs of the above-mentioned framework, this chapter aims to propose a new, enriched one: the Technological Didactical Content Knowledge (TDCK), which emerges from the need to take into account the teaching particularities of each subject area (mathematics, language, science, etc.). The purpose of the study is not to examine pedagogical principles, but to focus on individual teaching problems that arise within each subject area. The authors first describe the three main conceptual areas of the proposed model—Technology, Content, and Didactics, and their interrelations, and they then present a case study of students of an Early Childhood Education Department integrating the TDCK in the development of their educational scenarios."

3. Recent TPACK-Related Dissertations

Fernholz, L. D. (2014). *Theory into practice: Preparing pre-service teachers for effective literacy instruction using new literacies and technologies* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3642749)

Abstract:
"Teacher preparation programs have an obligation to facilitate authentic learning opportunities for increasing pre-service teachers' TPACK understandings during their methods courses. Additionally, these courses must be supported by curriculum goals and not simply for technical integration or as instructional add-on (Harris & Hofer, 2009; Hutchison et al., 2012).

Therefore, this study examined how pre-service teachers integrated the iPad and iPad "apps" to support the emergence of new literacies and technologies during the implementation of a one-to-one iPad tablet project within the context of a pre-service teacher literacy preparation course practicum. Research questions used to guide this study included: (1) to what extent did pre-service teachers themselves become familiar with and knowledgeable about how to best exploit the affordances unique to the iPad and the iPad Apps, (2) how did pre-service teachers use their understanding of new literacies to build on these affordances and, (3) how did pre-service teachers incorporate (or not incorporate) a critical literacy perspective when planning their literacy activities?

In an effort to advance literacy research and practices that encompass new literacies and technologies for teacher preparation programs, a Technological, Pedagogical, and Content Knowledge (TPACK) framework (Koehler & Mishra, 2007; Mishra & Koehler, 2006) was used as a lens through which to observe the development of TPACK in these ten pre-service teachers. Participant surveys, pre and post interviews, collected assignments and researcher observations were analyzed using TPACK tools (Harris, Grandgenett & Hofer 2012). The data were analyzed to examine the participants' beliefs about the affordances of the iPad and iPad "apps" for literacy lessons designed for authentic tutoring sessions. The results indicate that participants' TPACK understandings improved as their confidence to incorporate the device into literacy lessons increased. Collected data supported the notion that pre-service teacherTPACK development is closely related to a shift in identity from learners of literacy to teachers of literacy. Good teaching using technology required that the pre-service teachers understood the interrelationships among content, pedagogy, and technology."

Fox, T. B. (2014). *Examining health professional educators' adoption of learning-centered pedagogy and instructional technologies* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3624479)

Abstract:
"This mixed-methods study explored the extent to which health professions educators use instructional technologies and learning-centered pedagogical methods. Within the health professions, there is a lack of data on the pedagogical methods used by health professions educators within the classroom. The purpose of this study was to examine and explore the use of learner centered pedagogical methods and the use and acceptance of instructional technologies in a health sciences university in order to plan and implement appropriate professional development. Questionnaires based on Technological, Pedagogical Content Knowledge (TPACK) and Unified Theory of Use and Acceptance of Technology (UTAUT) were sent to educators at a health professions' school at a large medical university. The quantitative data was comprised of 46 responses. Following the questionnaires, requests for interviews were sent out to the same population. Pearson's correlation coefficient and multiple linear regression were used to analyze the quantitative data. Five participants were interviewed for the qualitative part of the study, and the data were hand-coded by the researcher and auto-coded by NVivo analyzing software. Results revealed that most educators incorporate some degree of a learning-centered pedagogy and some degree of instructional technology in their classrooms, although to varying levels. PowerPoint was the most often used technology, followed by Internet web pages. Instructional technology that was compatible with current practices and that increased instructor productivity was more likely to lead to behavioral intention to use technology. In this study, intention to use technology did not equate to actual technology use, although more refinement of measuring "actual use" would benefit future studies. When TPACKresults were compared to UTAUT results, there were statistically significant correlations between many of the constructs. A larger, multiple-center study would add more information regarding the pedagogical practices and use of instructional technologies by health professions' educators, but this study adds to a limited body of knowledge on this topic. The use of ongoing professional development and increased focus on pedagogy and

instructional technologies by the university might improve the learning environment in a body of students that are headed into the world of patient care."

Garrett, K. N. (2014). *A quantitative study of higher education faculty self-assessments of technological, pedagogical, and content knowledge (TPaCK) and technology training* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3639104)

Abstract:
"Growing use of technology in the 21st century, the age of the millennial learners, has introduced instructional challenges for higher education faculty. Technology deficiency is prevalent among the Baby Boomers and Generation X population. Yet, at a growing rate for the millennial population, technology tools are at the forefront of extracurricular and educational activities. This abundance of technology requires faculty to hone their skills in multifaceted approaches to combat technology skill deficiencies within higher education institutions. As a result, it is projected that faculty across all disciplines will become lifelong learners, not only within their specialization, but also with instructional technology tools geared toward enhancing learning (Wetzel, Foulger, & Williams, 2009). However, this is also an indication that higher education administrators need to provide support initiatives that will encourage faculty to enhance their existing pedagogy through the integration of technology (Lye, 2013).

This study assessed the perception of the technological, pedagogical, and content knowledge (TPaCK) of faculty at a southeastern research university using the researcher-developed HE-TPACK instrument (*n* = 128). HE-TPACK is a valid and reliable revision of the original TPACK instrument that allows the measurement of higher education facultyTPACK. The research described faculty perceptions on each of the eight HE-TPACK domains and determined whether there was a difference in HE-TPACK based on discipline type, gender and academic ranking of the faculty. Descriptive statistics revealed that a majority of all participating faculty agreed with the statements in six domains (technology training, pedagogy knowledge (PK), pedagogy content knowledge (PCK), technological pedagogical knowledge (TPK), technological content knowledge (TCK), and technological, pedagogical, and content knowledge (TPaCK)) and strongly agreed with statements in two domains (technology knowledge (TK) and content knowledge domains (CK)). This finding indicates that faculty perceive they are knowledgeable in seven HE-TPACK domains and that they believe technology training is important.

A multiple linear regression analysis was conducted to identify differences in HE-TPACK due to educational discipline types, gender and academic rank. Based on academic rank, results revealed significant differences in the pedagogical knowledge (PK), content knowledge (CK), pedagogical content knowledge (PCK), and the technological, pedagogical, content knowledge (TPaCK) domains. There were no differences based on gender and educational discipline types.

The findings suggest that future practice should validate the HE-TPaCK scoring through observations and evaluations. Additional validation would strengthen the understanding of technology integration used by faculty. In addition, the findings suggest that future research

evaluate the HE-TPaCK differences between tenured and non-tenured faculty. To improve response rate, future research should seek to reduce the number of items on the HE-TPACK survey by removing items from select domains."

Hallissy, M.P. (2014). *Building teacher professionalism in teaching-learning interactions between online tutors and learners during synchronous tutorials –a case study from Hibernia College*. (Doctoral dissertation, University of London). Retrieved from http://bit.ly/MichaelHallissyThesis

Abstract:

"This case-study is set within the context of a new online Masters Programme for teachers within Hibernia College, the Masters of Arts in Teaching and Learning (MATL). It explores how tutors and students interact using synchronous computer mediated conferencing (SCMC) technologies during live tutorial sessions. The study found that students and tutors did not have an agreed set of ground rules for these online events and thus there was a need for a signature pedagogy to clarify this. It was observed, using the Flanders Interaction Analysis Categories (FIAC) and tutor interviews, that the level of interaction during these tutorials was predominantly teacher led with little evidence of student voice. Further analysis found that there was also limited evidence of critical discussion. The study has developed a toolkit comprising an expanded FIAC framework and an adapted version of Brookfield and Preskill's Dispositions for Critical Discussion. The toolkit is designed to enable tutors to reflect on their tutorial practice. Using a cyclical process tutors can capture, codify and analyse their existing knowledge with a view to developing critical discussion as the signature pedagogy for their online tutorials. In this way Hibernia College can assist tutors in building their own professional practice knowledge with the ultimate goal of enhancing student learning on the programme. The study is set against a backdrop where higher education institutions are placing greater significance on online interactions and this is placing new demands on the pedagogical repertoire of their faculty."

Hunter, J. (2013). *Exploring technology integration in teachers' classrooms in NSW public schools* (Doctoral dissertation, University of Western Sydney). Retrieved from http://researchdirect.uws.edu.au/islandora/object/uws:18801

Abstract:

"This thesis took the TPACK framework (Mishra & Koehler, 2006) as its theoretical starting point and posed the question: how do a group of exemplary teachers conceptualise their knowledge of technology integration in education contexts? The research was a series of purposeful, intensive case studies of four teachers in Stages 1-5 classrooms (approximate ages 6-16 years) in different school sites. The study found that the teachers‟ knowledge of technology integration is constructed on theory (T), creativity (C), public learning (P), lifepreparation (L) and contextual accommodations (C). These five main conceptions are underpinned by particular pedagogical themes. In the first conception, T, is underpinned by construction of learning, purposeful teaching, focused planning, enriched subject matter, promotion of reflective learning, shifts in conversations and thinking and authentic student engagement. The second

conception, C, is underpinned by boosting creative learning, creating opportunities for production, unleashing playful moments, supporting values and differentiating learning. The third conception, P, is underpinned by scaffolding performance by making learning public and enhancing outcomes. Life preparation, or L, is underpinned by operationalising the real world, giving voice, ownership and responsibility, and the revelation of effectiveness in terms of self-regulation and self-efficacy. The final conception, contextual accommodations, C, is underpinned by the personal and professional, changes to time, nurturing community and defining the game. Each initial of the conceptions cometogether to form a fresh equation, T+C+P+L+C = high possibility classrooms (HPC). The study findings add to what is known about the TPACK framework by deriving five new conceptions out of exemplary teachers‟ knowledge of technology integration. Recent moves in some futures literature (Chen, 2010; Craft, 2011, Gardner, 2012; Mishra & Koehler, 2012a; Pink, 2009; Robinson, 2012; Zhao, 2012) reflect the study findings about where education must go if young people are to be involved in high possibility classrooms where they are given opportunities to learn well, be creative, productive and thinking citizens who 2can help solve some of the world‟s most significant problems. New knowledge generated by this study forms a useful and practical conduit to ensuring all children have an experience of learning that is important and relevant. The study findings are both theoretical and practical in their approach to graduate and experienced teachers‟ knowledge of technology integration and will be of critical significance to leaders in teacher professional learning in education jurisdictions."

Knolton, D.V. (2014). *Technological, pedagogical, content knowledge (TPACK): An exploratory study of adjunct faculty technology proficiency* (Doctoral dissertation, Kansas State University). Retrieved from http://krex.k-state.edu/dspace/bitstream/handle/2097/18695/DavinKnolton2014.pdf?sequence=5

Abstract:
"In an era of increasing demand for a limited budget, more universities are turning to adjunct faculty to fill the need and to address the student load. Adjunct faculty members are hired for their content knowledge and close association to the business world and industry. This study was conducted to investigate whether a relationship exists between (a) technological pedagogical content knowledge (TPACK); (b) pedagogical training; and (c) personal technology; and to determine which variables have the greatest influence in the willingness of adjunct faculty at a Midwestern higher education institution to choose and integrate digital technology into curriculum and expand to the discussion of TPACK into graduate level education.
TPACK is both a framework and an instrument to measure the level of integration of the primary components of the TPACK framework. TPACK is a term that describes what a teacher must know to integrate technology effectively into curriculum or teacher practices and represents the combination of teacher content knowledge, pedagogical knowledge and technology knowledge as interrelated. TPACK allows educators to consider what knowledge is required to integrate technology into teaching and how they might develop that knowledge within themselves.

The study was conducted with a sample (*n*=30) of adjunct faculty members from two extension campuses from a Midwestern, Tier 1 university. The data revealed significant relationships between pedagogical training and selection of appropriate technology, and between personal technology use and selection of appropriate technology. The data also revealed that TPACK was a significant predictor; however, the subdomains of TPACK masked the true impact because of the high presence of covariance."

Lehman, A. (2014). *Engineering, teaching, and technology: A nationwide assessment of instructional internet use by engineering faculty* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3581651)

Abstract:
"There has been an explosion of internet use among college students over the last decade for at least two important reasons: the proliferation of available resources and the arrival of a digital native generation to university campuses. Not surprisingly, engineering students are entering undergraduate programs possessing a much different skill set than previous generations, which has led to a decline in the popularity of traditional engineering pedagogy. Numerous conceptual models have been developed in the field of instructional technology, as researchers have attempted to classify and effectively integrate new technology practices into 21 st century educational contexts. One of the most prominent models is Technology, Pedagogy and Content Knowledge (TPACK), which separates instructors' knowledge into the three listed categories and describes their instructional strategies based on the presence and level of integration of the three knowledge categories. A newer, engineering-specific model separates engineering faculty into three archetypes based on their instructional internet use: internet adopters, internet users, and internet resisters.

This study quantitatively assesses the instructional internet use by a sample of 1126 tenured and tenure-track engineering faculty in the United States. Factor analysis revealed three significant factors: use of internet resources for content delivery, guiding students' internet research, and faculty beliefs on the usefulness of internet resources. The distribution of these factors was used to attempt to identify each of the three archetypes, and to discretely measure the presence and level of integration of the technology component of the TPACK model. While exceptional cases could be identified as internet adopters or resisters, the results do not support the existence of three unique archetypes. Similarly, the presence and degree of technology integration does not fit any categorical model, but rather a broad spectrum of internet technology usage and beliefs. Finally, regression analyses show that demographic and institutional variables are only minimally predictive of faculty beliefs and practices regarding instructional internet use.

This study contributes to the understanding of instructional internet use in undergraduate engineering education, and provides insight into the applicability of two instructional technology models. Findings from the study may also inform institutional policy and practice regarding professional development initiatives."

McGlothlin, C. D. (2014). *Evaluation of HQT online courses: Growth of participants' technology, pedagogy and content knowledge (TPACK)* (Doctoral dissertation). Retrieved from https://etd.ohiolink.edu/ap/10?0::NO:10:P10_ACCESSION_NUM:ohiou1411132394

Abstract:
"This research project examined the pre and post survey scores of the seven constructs of TPACK to determine the impact of participation in an online course in regards to the constructs outlined with the TPACK instrument. Three online courses were used in the study with a total of 36 participants (math 6, science 17, and social studies 13). The intent of this concurrent mixed methods study was to determine whether online courses taken by teachers can help address the lack of technological integration in the classroom through a learn by doing model. The first phase, quantitative research addressed the relationship of the constructs of TPACK with teachers who participated in an online course not specifically aligned to the TPACK model by using t-test, ANOVA, and multiple regression analysis. In the second phase, the comment area of the pre and post survey and discussion forums within the online course were examined, to give voice to the participants. The responses within the comments sections of the pre and post survey and the discussion forums were analyzed inductively using thematic content analysis, a common approach of grounded theory (Burnard et al., 2008). And finally as part of the course requirement, participants created a lesson plan using a template. The Technology Integration Assessment Rubric (TIAR) was used to score the lesson plans. The four overarching themes used in the TIAR instrument are 1) ways in which technology was used with specific curriculum, 2) was the technology used by the teacher and/or by the student, 3) was technology used in a way that support the teaching strategies outline, 4) does the technology use alignment to curriculum goals and strategies, and content, pedagogy and technology fit."

Nakashima, R. (2014). *The dialectic of technological pedagogical content knowledge and their contributions to teaching action and to learning process supported by virtual environment.* (Doctoral dissertation, Faculdade de Educação). Retrieved from http://www.teses.usp.br/teses/disponiveis/48/48134/tde-01102014-134609/en.php

Abstract:
"This research investigated the contributions of technological pedagogical content knowledge for teaching skills and the learning process supported by virtual environment. It is characterized as a qualitative research, descriptive and exploratory nature, in an educational context, with participant observation and ethnographic approach. It was conducted in the discipline Supported and Cooperative Learning Environments in Internet Technologies: New Challenges, New Skills" (EDM 5053), belonging to the hall of disciplines of the graduate field "Didactic, Teaching Theories and School Practices, from Education Faculty at USP. Qualitative techniques of data collection (logbook, procedural review forms, chats records, discussion forums, interviews and focal group) were used. Data were analyzed from the perspective of the autopoiesis categories, metacognition and interaction, all related to the interpretative scope of teaching and learning process that dialogued with the explanatory model of the teaching action "Technological Pedagogical Content Knowledge" (TPACK). Among the contributions the highlight was the understanding that educational purposes are achieved in the inter-

relationship with the students and in the dialectical relationship between theory and practice, and not solely by the presence of technological infrastructure available in classroom. The pedagogical proposals must be open to dialogue, creativity and negotiation of meanings for the cooperative construction of autonomous thinking and exercise of freedom. The experient teaching action represented a variable that reiterated the requirement of methodologies and strategies also represented by the TPACK model, namely, the articulation of different knowledge, highlighting the technological pedagogical content knowledge. This constituted a guiding issue for reflections required to formulate pedagogical proposals supported by Digital Technologies for Information and Communication (DTIC), i.e., it underlies the importance of teacher knowledge in dialogue with the student knowledge in the selection of technologies, in the study of their best methodological strategies, which is its educational intentionality, in order to meet the learning expectations and demands of specific knowledge articulated to the technological content. Additional research in this area can lead to deeper understanding of the topic and boost pedagogy supported by DTIC in order to enhance teaching and student experiences."

Nordin, H. (2014). *Pre-service teachers' TPACK and experience of ICT integration in schools in Malaysia and New Zealand*. (Doctoral dissertation, University of Canterbury). Retrieved from http://ir.canterbury.ac.nz/bitstream/10092/9856/1/thesis_fulltext.pdf

Abstract:
"Information and communication technologies (ICT) are common in schools worldwide in the 21st century, in both developed and developing countries. A number of initiatives have been made in the development of ICT related training in Initial Teacher Education (ITE) programmes. These initiatives aim to develop future teachers' ability to teach and deliver the school curriculum, including using ICT in the classroom. Sufficient field experience is essential since the process of undergoing such placements would prepare them in creating new ideas and implementing strategic ways as to how they can effectively incorporate the use of ICT in their lesson plan, class management, and in teaching.

The key research question in this study is "Do pre-service teachers in a New Zealand and a Malaysian ITE programme use their field experience to develop their potential to integrate ICT in schools and, what are the similarities and differences between these case studies?" Effective use of ICT in teaching and learning requires the teacher to understand how ICT weaves with pedagogy and content. The Technological, Pedagogical Content Knowledge (TPACK) theoretical framework introduced by Mishra and Koehler (2006) clarifies the need to understand and develop TPACK to inform integration of ICT in teaching.

This research provides two case studies of ICT in ITE in the Asia Pacific region, one in a developed country, New Zealand, and the other in a developing country, namely Malaysia. Both case studies are of ICT in an ITE programme with a particular focus on field experience in secondary schools, within which there are embedded cases of ITE students. This study illustrates how pre-service teachers' experience and development of ICT knowledge and skill and their understanding of TPACK can support an increase in their teaching competencies. This

research provides evidence that field experience is important to support pre-service teachers to develop their teaching competencies with ICT and understanding of TPACK in ways that are transferable into their own practice. This study has also contributed to increased reliability and validity of TPACK instrumentation. The comparative findings of the New Zealand and Malaysian case studies indicate the importance of a range of contextual factors, which suggest that the Initial Teacher Education programme, school curriculum and ICT availability as well as student maturity contribute to the development of TPACK."

Phillips, M.D. (2014). *Teachers' TPACK enactment in a community of practice.* (Doctoral dissertation, Monash University). Retrieved from http://newmediaresearch.educ.monash.edu.au/lnmrg/sites/default/files/Teachers'%20TPACK%20enactment%20in%20a%20Community%20of%20Practice.pdf

Abstract:
"This study sought to understand secondary school teachers' pedagogical adoption of digital technology. The literature review indicated that, while numerous adoption-diffusion models had been used as the basis to understand technology adoption in different populations, the particular contexts in which secondary school teachers work means that adoption-diffusion models do not adequately address the complexity of teachers' workplaces. A popular way of exploring teachers' use of digital technologies has been the technological, pedagogical and content knowledge (TPACK) framework (Mishra & Koehler, 2006). While TPACK has been often used as a framework to measure teachers' knowledge and to explain teachers' use and non-use of digital technologies, little attention had been paid to the ways in which in-service teachers develop their TPACK.

This research focusses on the contextual influences that shape teachers' TPACK development and enactment in their workplace settings by examining teachers' TPACK enactment through a situated learning (Lave & Wenger, 1991) lens, in particular, Wenger's (1998) conceptualisation of Communities of Practice. To understand the relationship between Communities of Practice and TPACK, this research was driven by a single research question: *How are teachers' TPACK enactments influenced in a Community of Practice?* A case study methodology generated cases of four teachers in one Australian school around their enactment of TPACK. The cases also drew on data from their colleagues who had been invited by the teachers to participate in the study as their key professional learning colleagues. In total, ten participants contributed to the four cases reported in this investigation. While all the cases were located in the same physical context, the ways in which the participants enacted their TPACK were very different and explorations of participants' practices and identity development helped to explain teachers' TPACK enactment.

The findings from this thesis support six propositions regarding the influence of Communities of Practice on in-service teachers' TPACK enactment: (1) Processes of identity development and practice constitute aspects of context in which an individual enacts their TPACK; (2) Membership of a CoP is more complex than newcomers and old-timers and includes near-peers and liminal members; (3) The enactment of TPACK among teachers in a CoP is not always

consensual or coherent; (4) Challenges to the assumptions of consensus implicit in concepts such as *joint* enterprise, *mutual* engagement and *shared* repertoire, are revealed in communal negotiations involving TPACK enactment and reification. As such, the reification of practice is influenced by professionals' perceptions of power and authority; (5) A CoP can have multiple, simultaneous and context-specific joint enterprises which can challenge the relationships between the forms of knowledge underpinning TPACK enactment; (6) Mutual engagement reveals TPACK as knowledge in the making. The thesis outlines three implications for teachers' TPACK enactment in a CoP along with a number of recommendations for future research."

Ramanair, J. (2014). *Integrating technology in tertiary level English language programmes: Case studies of Moodle learning environments* (Doctoral dissertation). Retrieved from http://researchcommons.waikato.ac.nz/handle/10289/8849

Abstract:
"While the potential of technology to enhance language pedagogy has been realised in some English language learning environments, there are contexts in which its use has failed to achieve its promise. Teachers' use of technology has also often been described as uneven or limited with the tendency of technology to be used on the periphery or on an 'ad hoc' basis. These gaps have provided the basis for this doctoral level study to investigate the integration of Moodle into English language programmes offered at two tertiary institutions in New Zealand. This study adopted the concept of "normalisation" (Bax, 2000, 2003) as the research perspective.

The conceptual framework for the research was developed based on five areas that explored teacher learning and thinking, and how these processes interacted with the complexities in the educational environment. The framework consists of technological pedagogical content knowledge (TPACK), sociocultural theory as applied to teacher learning, Activity Theory, language pedagogy, and the challenges of integrating technology in the context of tertiary-level English language classrooms.

The research followed a qualitative case study design. The English language programme was planned as the boundary for each case. Data collection involved the use of semi-structured interviews, classroom observations, and work-together sessions, which were conducted at the two case study sites. The main participants included teachers, with participation from students and other key informants. Data were collected over a period of twelve weeks in case study site one and eighteen weeks at site two. All data were thematically analysed using an inductive approach.

The findings from each case study were reported based on three categories in the Activity Theory framework: the object of the activity (its purpose), division of labour, and rules. The analysis of the findings in case study site one revealed one purpose (object) for using Moodle in the tertiary level English language programme, which was to use text-based, asynchronous activities to prepare the students to speak in the classroom and develop their speaking skills. However, at case study site two, two purposes (objects) for Moodle use were identified. These were to use text-based, asynchronous activities to prepare the students to speak in the

classroom to develop their speaking skills and to provide them with a bank of text-based resources for language learning. This unanticipated finding challenged the notion of the language programme as the boundary for a case and resulted in each purpose (object) functioning instead as a boundary for a case study. The result was that the single case study at site two was analysed and is reported as two case studies. The findings also revealed how the teachers interacted with their students and the relationships between the teachers (division of labour). The teachers experienced tensions within the existing practices and policies (rules) at each case study site.

Three key themes emerged from the findings. The first was that the teachers lacked a valid and clear conceptualisation of the purpose (object) for using Moodle. This theme illustrates the importance of a language syllabus, teachers' pedagogical content knowledge for effective language pedagogy, and task-based language learning. The second theme concerned the teachers' conceptualisation of the role of technology in realising the purpose (improvement of speaking competence and availability of resources for language learning). The role of Moodle in scaffolding students' learning to realise the object and the misconception that teaching in the online environment is the same as teaching in the face-to-face in the classroom are discussed. The third theme related to the individual teacher in the context of a learning community, especially the teacher's responsiveness to innovation and the uptake of opportunities for professional learning.

This research suggests three important factors that should be explicitly considered when integrating technology into tertiary English language programmes: teacher development, the language syllabus, and the learning community. All of these factors relate, are interconnected, and need to be considered in order for technology to be normalised in English language programmes and for the potential of technology to be realised in practice."

4. Recent TPACK Presentations

Baker, N. (2014, June). *Build it and they will use it: A case study in getting bang for your buck in educational technology choices.* Paper presented at the World Conference on Educational Multimedia, Hypermedia and Telecommunications, Tampere, Finland.

Abstract:
"This paper reports on a case study of the selection and implementation of a synchronous online collaboration and communication tool, Blackboard Collaborate, as a discussion point for an alternative model of facilitating educational culture change in a university setting. The approach draws on the Technology Acceptance Model (TAM) and Technology, Pedagogy and Content Knowledge (TPACK) Framework to identify and implement educational technology likely to have multiple impacts across the institution. The approach taken here is now being applied to other educational technologies at the University of Windsor, Canada, and is meeting with significant success in both driving and supporting pedagogical change."

Baran, E., Uygun, E., Altan, T., Bahcekapili, T. & Cilsalar, H. (2014, June). *Investigating technological pedagogical content knowledge (TPACK) in action: Workshop design cases.*

Paper presented at the World Conference on Educational Multimedia, Hypermedia and Telecommunications, Tampere, Finland.

Abstract:
"Recent research on technological pedagogical content knowledge (TPACK) calls for the investigation of TPACK in action. This study examined how TPACK is put into action in workshops conducted as part of a graduate course that was designed with the TPACK framework. Case study used in this research helped to capture detailed information about the TPACK applications within the workshops. This paper described two cases from the list of workshops delivered by the students: 1) Integrating Technology into Educational Sciences Courses, and 2) Integrating Technology into Computer Education."

Chang, Y. F., Wen, B. S., Lin, F. J., & Hsu, C. Y. (2015, February). *Examining secondary student teachers' perceptions of technological pedagogical content knowledge in Taiwan*. Paper to be presented at the 2nd International Academic Conference on Social Sciences, Istanbul, Turkey. Retrieved from http://www.academicinst.com/admin/editor/uploads/files/IACSS%202014%20PROCEEDINGS%20-%20New.pdf

Abstract:
"This paper examined the profile of Taiwanese secondary student teachers in terms of their technological pedagogical content knowledge (TPACK). A TPACK survey on a 7-point Likert scale was employed for this study. The survey had a total of 38 items consisting of seven constructs: technological knowledge (TK), content knowledge (CK), pedagogical knowledge (PK), pedagogical content knowledge (PCK), technological content knowledge (TCK), technological pedagogical knowledge (TPK), and technological pedagogical content knowledge (TPACK). A total of 586 responses were collected from 25 randomly selected teacher preparation programs in Taiwan during the beginning of 2012 fall semester. The results indicated that the respondents had moderately high perception for each construct, with CK being rated the highest and TK the lowest. In addition, their TPACK perceptions differed significantly due to their gender and hours of technology integration experience. Implications for development of pre-service teachers' technological pedagogical content knowledge were then discussed."

Chui, H. L., Mak, C. N. B., Li, C. X. (2013, May). *Reflective inquiry practice of English language teacher: Blogging as e-portfolios within the TPACK framework.* Paper presented at the 17th Global Chinese Conference on Computers in Education, Beijing, China.

Abstract:
"Our study explores how blogging embedded with Web services can influence the readiness and reflective inquiry practice of English language student-teachers (STs). Drawing upon the Technological Pedagogical Content Knowledge framework (TPACK), we invited 11 English STs to participate in a one-year course through which they learn how to infuse blogging with Web services as a pedagogical tool. They were asked to finish a questionnaire and provide their own blogs at the end of the course. Results demonstrate that engaging English STs in blogging

integrated with versatile Web services can increase their degree of readiness at a perceptual level, and that those who have undergone more hand-on experiences will cultivate a higher degree of reflective inquiry practice."

Handal, B., Ritter, R. & Marcovitz, D. (2014, June). *Implementing large scale mobile learning school programs: To BYOD or not to BYOD.* Paper presented at the World Conference on Educational Multimedia, Hypermedia and Telecommunications, Tampere, Finland.

Abstract:
"This research attempts to explore the mobile learning (ML) implementation models adopted by school systems in Canada and the United States. Within an interpretative approach it will look at the instructional, curricular and organizational issues involved in the implementation of large scale mobile learning programs in order to inform policy in Australia. The two main models for providing mobile technology to students, either 'bring your own device' (BYOD) or organization provided device (OPD) will be used to examine their implications on the three aforementioned issues. The research will be conducted through interviews to teachers, teacher educators and educational leaders. Additionally, the research will be additionally guided by the Technological Pedagogical Content Knowledge (TPACK) model which advocates the integration of technology, pedagogy and content in the use of mobile devices in the school curriculum."

Handal, B., Campbell, C., Cavanagh, M., Dave, K. (2014, September). *Appraising mobile maths apps: The TPACK model*. Paper presented at the 2014 ACEC Conference, Adelaide, Australia. Retrieved from http://www.academia.edu/8754156/appraising_mobile_maths_apps_the_tpack_model

Abstract:
"The purpose of this study was to develop an instrument for appraising educational apps in mathematics education. The instrument allows mathematics related apps to be analysed based on the three aspects of the TPACK (technological pedagogical content knowledge) model, namely, content, technology and pedagogy. Four sub-scales were created with the first one examining the app role according to the type of task promoted: explorative, productivity and/or instructive. The second sub-scale appraises the degree of cognitive involvement when a learner interacts with the app. The third and fourth sub-scale deals with general pedagogical and operational affordance. The instrument framework was piloted and subsequently trialled with ten school teachers and mathematics educators to ensure content validity. It was further endorsed with examples of educational apps currently available in the context of the secondary curriculum."

Juniu, S. (2014, June). *Innovative pedagogy: Integration of technology in a Physical Education context using the TPACK framework.* Paper presented at the World Conference on Educational Multimedia, Hypermedia and Telecommunications, Tampere, Finland.

Abstract:

"This presentation examines the TPACK framework as a way to prepare physical educators to integrate technology in the teaching and learning process and to understand how to represent subject matters with technology in pedagogically ways. The TPACK approach is to reflect on the pedagogical actions and on the subject matter when designing successful, technology integrated projects in physical education. In order to teach in a given discipline, the teacher must have the knowledge on the subject, the understanding of the teaching strategies to represent this content, and the knowledge of the learners' characteristics and of the educational context (i.e. gymnasium)."

Jwaid, A. E., Clark, S., Ireson, G. (2014, March). *Understanding best practices in control engineering education using the concept of TPACK.* Paper presented at the 2014 Integrated STEM Education Conference, Nottingham, UK.

Abstract:
"This study aimed to design an integrated pedagogical approach to advance introductory Process Control Engineering Education through the application of the Technological Pedagogical Content Knowledge (TPACK) framework, and evaluating its impact on student learning. The research is initially being undertaken at Nottingham Trent University, UK but we will next adapt it to a case study in Libya. This paper aims to strengthen the teaching of introductory Process Control by using appropriate approaches in universities to improve the learning outcomes for students. From this work a new schematic for teaching Process Control has been developed and, moreover, a thoughtful best practice in introducing Process Control in engineering education can be developed."

Law, N., Yuen, J., & Lee, Y. (2014). Supporting teacher learning for pedagogical innovation through collaborative co-design: Issues and challenges. In J. L. Polman, E. A. Kyza, K. O'Neill, I. Tabak, W. R. Penuel, A. S. Jurow . . . L. D'Amico (Eds.), *Learning and becoming in practice: The international conference of the learning sciences (ICLS) 2014* (Vol. 1, pp. 777-784). Boulder, CO: ISLS. Retrieved from http://www.isls.org/icls2014/Proceedings.html

Abstract:
"This study reports on an in-depth analysis of two teachers' implementation of one collaboratively designed curriculum unit in the context of the school's participation in an e-learning initiative to integrate ICT use in the grade 5 General Studies curriculum. The analysis reveals significant differences in the actual implementation as well as in the students' learning outcomes achieved. While both teachers ventured beyond their comfort zone to provide more opportunities for student interactions and explorations, the enacted implementations reflect differences in the learning goals they targeted and their knowledge for practice. Presentation of preliminary learning analytics results did not trigger further exploration among teachers, though the researchers' analyses reveal strong links between learning outcomes and the enacted curriculum. Findings raise questions about collaborative instructional design as a model for organizing teacher learning for pedagogical innovation, and the paper proposes design

principles and further research to better facilitate innovation-focused professional development."

McCann, K. (2014, June). *Using technological-pedagogical-and-content knowledge (TPACK) to support universal design for learning (UDL): A case study.* Paper presented at the World Conference on Educational Multimedia, Hypermedia and Telecommunications, Tampere, Finland.

Abstract:
"This poster session is a report on the design and implementation of a case study based upon series of observations, interviews, and the analyses of materials were utilized to discover how a Hawaii Department of Education (HDOE) teacher utilizes TPACK to support UDL in an inclusive instructional environment. An ethnographic analysis of data, paired with peer review, expert review, and member checking were also utilized to ensure validity and minimize researcher bias. Findings reveal that both TPACK and UDL play a complex and series of interconnected roles in supporting inclusion for practitioners in the field and for policymakers who define professional guidelines and supports."

Mourlam, D. (2014, October). *Developing teacher technological, pedagogical content knowledge*. Presented at the 2014 ITEC Conference, Des Moines, IA.

Abstract:
"This session focuses on how to create professional development opportunities that develop teacher knowledge of technologies, pedagogy, and content, and their ability to leverage that integrated knowledge effectively in the lesson development process."

Ndlovu, M. (2014, April). *Modeling the derivative in Sketchpad: An instrumental and TPACK approach*. Paper presented at the First International Congress and Exhibition on Current Trends on Science and Technology Education, Istanbul, Turkey. Retrieved from http://www.academia.edu/8936524/Modelling_the_derivative_in_Sketchpad_an_instrumental_and_TPACK_approach

Abstract:
"In this paper I illustrate the representational capabilities of Sketchpad that have the potential to enhance a deeper understanding of the derivative concept in introductory calculus if appropriate learning trajectories are designed. Sketchpad is dynamic mathematics software with Trouche's instrumental theory affordances that can support multiple representations of mathematical concepts. The proliferation of digital technologies, under which dynamic mathematics software falls, challenges mathematics educators and teacher educators to accelerate the integration of these new tools into the classroom. To this end I present a hypothesized learning trajectory of the derivative for the instrumental geneses of the derivative as an instantaneous rate of change and as a rate of change function. Six forms of representation of the derivative emerge as a potential part of the mathematics teacher's Technological Pedagogical Content Knowledge (TPACK). A recommendation is made to

vigorously equip and capacitate pre-service and in-service mathematics teachers or risk them becoming an impediment."

Ntsekhe, M., Terzoli, A., Thinyane, M. (2014, November). *Towards building an indigenous knowledge platform to enable culturally-sensitive education underpinned by technological pedagogical and content knowledge (TPACK)*. Paper presented at the 2014 e-Skills for Knowledge Production and Innovation Conference in Cape Town, South Africa. Paper retrieved from http://proceedings.e-skillsconference.org/2014/e-skills275-284Ntsekhe821.pdf

Abstract:
"The everyday use of Information and Communication Technologies (ICTs) is ingrained to the fabric of today's society. A question open for debate is whether this use is or can be optimized to engender authentic solutions, which are aligned to the natural environment of the people? In this paper, we examine at the question from the vantage point of educating the rural African child. We engage with the sub-question: can ICTs facilitate education grounded in people's own realities, especially those of the marginalized rural poor? We believe this is possible under specific conditions, which include making Indigenous Knowledge (IK) readily available. We propose building an ICT platform that allows injection of IK into the education process: develop a solution that valorizes IK, but also supports efforts to use ICTs in education driven by Technology, Pedagogy, and Content Knowledge (TPACK) framework. The main goal of this framework is to facilitate effective teaching with technology. TPACK partially embeds IK within pedagogical knowledge and 'contexts' of learning; we argue for explicit inclusion of IK within the framework to complement the other knowledges."

Piotrowski, A. & Witte, S. (2014, October). *Preservice English teachers learn to flip classroom instruction.* Paper presented at the World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education, New Orleans, LA.

Abstract:
"The presenters will share the results of a qualitative case study examining the perceptions and beliefs of preservice secondary English Language Arts teachers who learned about the flipped classroom in a teacher education course at a university in the Southeast United States. The participants in this study were four undergraduate English Education preservice teachers who shared their experiences learning about the flipped classroom, discussed how they created their own series of flipped lessons, and described possible benefits and drawbacks to using this pedagogical strategy. We will discuss how this course built preservice teachers' Technological Pedagogical Content Knowledge (TPACK)."

Tseng, J. (2014, August). *Investigating EFL teachers' technological pedagogical content knowledge: Students' perceptions*. Paper presented at the 2014 EUROCALL Conference, University of Groningen, Netherlands.

Abstract:

"Technological pedagogical content knowledge (TPACK) has received much attention recently, serving as a lens to examine the ways in which teachers integrate technology into teaching. Questionnaire instruments have been developed to examine teachers' TPACK. However, teacher-perceived TPACK may not fully reflect their real practices in classrooms. To address this problem, students' perspectives could be incorporated to achieve a balanced assessment of TPACK. Thus, the present study was to assess English as a foreign language (EFL) students' perceptions of their teachers' TPACK through a validated student-based TPACK instrument."

Whitehouse, P., McIntyre, C. J. (2014, October). *Pre-service teacher video case analysis: Using guided self-assessment to build TPACK.* Paper presented at the 2014 Association for the Advancement of Computing in Education Conference, New Orleans, LA.

Abstract:
"How and to what extent does guided self-assessment of teaching help pre-service teachers build Technological Pedagogical Content Knowledge (TPACK)? This study examined nascent pedagogical knowledge of teacher education students through video, using VoiceThread, a video annotation software tool. Students were video-recorded teaching their first practice lesson and the final of three lessons taught in a public high school. Students were asked to answer questions structured to assess their technological pedagogical content knowledge for the practice lesson and the final lesson. Students selected sections of their teaching video they deemed evidentiary in supporting their responses and they were uploaded into VoiceThread. The video clips and discussions were then analyzed using a constant comparative method; early findings indicate this type of video analysis can be of great value in improving TPACK and individualizing learning activities for pre-service teachers."

5. Call for TPACK-Related Manuscripts

From Maggie Niess (niessm@onid.oregonstate.edu), Shannon Driskell (sdriskell1@udayton.edu), and Karen Hollebrands (karen_hollebrands@ncsu.edu):

We invite you to submit a chapter proposal for the **Handbook of Research on Transforming Mathematics Teacher Education in the Digital Age.** The primary objective for this book is to gather research evidence that guides the redesign of programs and educational opportunities towards transforming and supporting mathematics teachers' knowledge development for integrating technologies in their classroom instruction. The TPACK framework provides one framework that recognizes the significant shifts in teaching and learning toward a social, metacognitive, and constructivist learning perspective. The TPACK framework was introduced in the early 2000s, and since that time, extensive research has been undertaken that is dramatically changing the nature of teacher preparation programs. Additional frameworks provide important lenses with which to think about and investigate teaching with technologies. This book is designed to document this research evidence that is guiding changes that are influential in the transformation of teachers' knowledge for teaching mathematics with technology. What research evidence is driving the dynamic shift in teacher knowledge

development, as current and emerging technologies are being developed and promoted as potential mathematics learning tools?

For a more complete description of this **Handbook of Research on Transforming Mathematics Teacher Education in the Digital Age** as well as information about submission details and deadlines, go to: http://www.igi-global.com/publish/call-for-papers/call-details/1660.

Proposals are due on February 28, 2015.

6. TPACK Newsletter Suggested Citation

Our thanks to Lisa Winebrenner, who wrote to suggest that *we* suggest a citation format for you 'academic types' who might want to cite something that appears in this humble virtual publication. Our reading of the most recent (6th edition) of the *Publication Manual of the American Psychological Association* suggests that the citation should look like this:

Harris, J., & Rodriguez, K. (Eds.). (2015, February 7). TPACK newsletter issue #22: February 2015 [Electronic mailing list message]. Retrieved from http://www.matt-koehler.com/tpack/tpack-newsletters/

7. Learning and Doing More with TPACK

Interested in learning more about TPACK or getting more involved in the TPACK community? Here are a few ideas:

- Visit the TPACK wiki at: http://tpack.org/
- Join the TPACK SIG at: http://site.aace.org/sigs/tpack-sig.htm
- Subscribe to the tpack.research, tpack.teaching, tpack.grants and/or tpack.future discussion lists at: http://site.aace.org/sigs/tpack-sig.htm
- Access the TPACK Learning Activity Types taxonomies at: http://activitytypes.wm.edu/
- Access three tested TPACK assessment instruments at http://activitytypes.wm.edu/Assessments

Please feel free to forward this newsletter to anyone who might be interested in its contents. Even better, have them subscribe to the TPACK newsletter by sending a blank email to sympa@lists.wm.edu, with the following text in the subject line: subscribe tpack.news FirstName LastName (of course, substituting their own first and last names for 'FirstName' and 'LastName' — unless their name happens to be FirstName LastName, in which case they can just leave it as is).

If you have a news item that you would like to contribute to the newsletter, send it along to: tpack.news.editors@wm.edu.

Standard End-Matter

If you have questions, suggestions, or comments about the newsletter, please send those to tpack.news.editors@wm.edu. If you are subscribed to the tpack.news email list, and — even after reviewing this impressive publication — you prefer not to continue to receive the fruits of our labors, please send a blank email message to sympa@lists.wm.edu, with the following text in the subject line: unsubscribe tpack.news

- Judi & Kim

…for the SITE TPACK SIG leadership:

Petra Fisser,	Co-Chair, SLO Expertise Center, National Curriculum Development
Josh Rosenberg,	Co-Chair, Michigan State University
Candace Figg,	Rocking Chair, Brock University
Mark Hofer,	Sedan Chair, College of William & Mary
Judi Harris,	Wing Chair, College of William & Mary
Mario Kelly,	Futon, City University of New York
Matt Koehler,	Chaise Lounge, Michigan State University
Punya Mishra,	Recliner, Michigan State University