TPACK Newsletter, Issue #25: October 2015 (Updated)

Welcome to the twenty-fifth 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.

[Editors' note: This document is an update to a previously distributed version of issue #25. Please delete the earlier document and accept our apologies for the second distribution.]

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

Gratuitous Quote About Technology

"Technology is a word that describes something that doesn't work yet."
–Douglas Adams

In This Issue

1. TPACK Newsletter Update

The TPACK Newsletter has been published via the tpack.news email list since January 2009. It has 1190 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: 22 articles, 35 chapters, 1 book, and 6 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

Alhashem, F., & Al-Jafar, A. (2015). Assessing teachers' integration of technology and literacy in elementary science classrooms in Kuwait. *Asian Social Science, 11*(18), 71-81. doi:10.5539/ass.v11n18p71

Abstract: "The purpose of this study was to investigate experienced science teachers' perceptions regard integrating literacy and technology while teaching science at an elementary level. A concept map and rubric were developed based on the TPACK model to assess teachers' understanding and an in-depth interview technique was used to collect more data from the teachers. For the analysis, the concept map was graded based on the rubric and in-depth interviews were thematically analyzed. The data indicated that teachers have a negative perception about integrating technology and literacy in their classes, due to several barriers. This paper concludes with recommendations to facilitate the use of technology and literacy when teaching science in the elementary schools in Kuwait."

Bilici, S. C. & Baran, E. (2015). The investigation of science teachers' self-efficacy toward technological pedagogical content knowledge: A longitudinal study. *Gazi University Faculty of Education Journal, 35*(2), 285-306. Retrieved from http://dergipark.ulakbim.gov.tr/gefad/article/view/5000119866/5000130697

Abstract: "The purpose of this study was to investigate the impact of in-service teacher training program, designed with technological pedagogical content knowledge (TPACK) framework, on science teachers' self-efficacy. This is a longitudinal study in nature. The TPACK training was implemented between 18-25 August 2013 with 24 science teachers from 18 different cities of Turkey. The program included 19 hands-on TPACK activities. Teachers' efficacy of TPACK was measured with TPACK-efficacy Scale (TPACK-SeS) on the first and last day of the training, also six months and one year after the training. Data was analysed using one-way ANOVA for repeated measures. The analysis revealed that teachers' technological content knowledge, technological pedagogical knowledge, context knowledge, and TPACK knowledge was increased the most as a result of attending the training program. However, teachers' TPACK-SeS scores did not show a significant change six months and one year after the training."

Buss, R. R., Wetzel, K., Foulger, T. S., & Lindsey, L. (2015). Preparing teachers to integrate technology into K–12 instruction: Comparing a stand-alone technology course with a technology-infused approach. *Journal of Digital Learning in Teacher Education, 31*(4), 160-172. doi: 10.1080/21532974.2015.1055012

Abstract: "We compared the effectiveness of learning technological, pedagogical, and content knowledge (TPACK) domain knowledge in a new technology-infused approach for teaching technology to teacher candidates with a more traditional, stand-alone course. In the new

approach, learning to use technology is infused into program methods courses. Candidates all improved their TPACK domain scores. Interestingly, there were interactions of cohort × time of testing on the TPACK measures. Candidates' scores from the stand-alone course increased more rapidly for TK and TPK, whereas candidates' pre- to posttest scores from the technology-infused courses increased faster for CK and PK. Qualitative data also supported the quantitative results. In the discussion, we account for the differences, connect the results to the literature, and pose questions for consideration in future research."

Chang, Y., Jang, S.-J., & Chen, Y.-H. (2015). Assessing university students' perceptions of their physics instructors' TPACK development in two contexts. *British Journal of Educational Technology, 46*(6), 1236–1249. doi: 10.1111/bjet.12192

Abstract: "Technological Pedagogical and Content Knowledge (TPACK) has been gaining traction among educational researchers; however, studies documenting university students' perceptions of their teachers' TPACK remain limited. This study intends to investigate the professional development of two physics instructors through the lens of the TPACK framework. Moreover, this study spans an 18-week semester within both the contexts of Taiwan and China. Multiple data were collected and analyzed, including the pretest and posttest TPACK surveys, instructor interviews, in-class observations and students' feedback and opinions. The results revealed that John's instructional representations and strategies and technology integration and application scores increased significantly, as well as Mike's knowledge of students' understanding score showing a significant increase from the middle to the end of semester. John (Taiwan) emphasized life examples and the use of multimedia while Mike (China) chose to emphasize students' knowledge and evaluation. Such results showed different teaching characteristics in the two contexts. Implications and suggestions are put forward based on the results of this study."

Chen, Y., Jang, S., & Chen, P. (2015). Using wikis and collaborative learning for science teachers' professional development. *Journal of Computer Assisted Learning, 31*(4), 330-344. doi:10.1111/jcal.12095

Abstract: "Wiki bears great potential to transform learning and instruction by scaffolding personal and social constructivism. Past studies have shown that proper application of wiki benefits both students and teachers; however, few studies have integrated wiki and collaborative learning to examine the growth of science teachers' Technological, Pedagogical and Content Knowledge (TPACK). This study introduced a wiki-based TPACK growth model and examined nine elementary and middle science teachers' knowledge growth in a graduate-level course. Data sources included reflective journals, wiki data and interviews. Results showed that with wiki, science teachers learned to design more understandable and lively science teaching content, and they collaboratively generated creative instructional strategies. Furthermore, wiki and collaborative learning helped in-service teachers exchange and elaborate ideas related to the development of TPACK. Implications, suggestions and future research directions were put forward regarding wiki, TPACK and in-service teachers' professional development."

Crompton, H. (2015). Preparing teachers to use technology effectively using the technological, pedagogical, content knowledge (TPACK) framework. *GLOKALde, 1*(2), 82-92. Retrieved from http://dergipark.ulakbim.gov.tr/glokalde/article/view/5000135241

Abstract: "Although technology is on the rise in society and schools, many teachers are not effectively incorporating technology into their teaching and learning. The lack of use can be attributed to teachers' negative beliefs and feelings about technology. Effective teaching requires not only mastery of the subject content, pedagogical techniques, and technological affordances, but also how to achieve a successful dynamic interaction between those three factors. In this paper, the author has elucidated how these teacher beliefs and feelings are generate and the Technological, Pedagogical, Content knowledge framework (TPACK) framework is presented as a method of ameliorating these negative teacher impressions to work towards the effective use of technology in teaching and learning."

Feride, K. R. C. (2015). An investigation of preservice teachers' technological pedagogical content knowledge based on a variety of characteristics. *International Journal of Higher Education, 4*(4), 128-136. doi:10.5430/ijhe.v4n4p128

Abstract: "A survey research was conducted to examine pre-service teachers' Technological Pedagogical Content Knowledge (TPACK) and how it differs based on a variety of characteristics (i.e. gender, grade level, type of high school graduated, possession of different technologies etc.). The participants of the study included 142 preservice teachers from Computer Education and Instructional Technologies Department at Marmara University, Istanbul Turkey. The study results indicated that preservice teachers' TPACK scores differed based on gender, their reasons for choosing their profession, their perceptions of the value of school experience courses and their possession of tablet computers. Understanding the characteristics that would have an influence on preservice teachers' TPACK level provides valuable insights to the development of teacher preparation activities that would lead to more efficient use of technologies in their future professions. As pre-service education has a good potential to influence prospective teachers' use of technologies in their future career, the study results will provide valuable insights about how to improve teachers' technology integration starting from their undergraduate degrees."

Foulger, T. S., Buss, R. R., Wetzel, K., & Lindsey, L. (2015). Instructors' growth in TPACK: Teaching technology-infused methods courses to preservice teachers. *Journal of Digital Learning in Teacher Education, 31*(4), 134–147. doi:10.1080/21532974.2015.1055010

Abstract: "We were concerned about teaching a stand-alone technology integration course while advocating that teachers employ full integration. Our college moved to a tech-infusion model whereby our educational technology curriculum would be incorporated in methods courses. Using a qualitative approach, we documented experiences of teacher educators who were content experts and were asked to teach a tech-infused course. In comparison to their first time teaching their course, during their third experience they demonstrated that

knowledge in teaching teacher candidates how to integrate technology was highly developmental in nature and supported by advancements in instructors' expertise. We found evidence that small changes in their practice were creating larger consequences within our college; it appears our professional development model is creating a positive cultural shift."

Jaikaran-Doe, S., & Jaikaran-Doe, P.E. (2015). Synthesis of survey questions that accurately discriminate the elements of the TPACK framework. *Australian Educational Computing, 30*(1). Retrieved from http://journal.acce.edu.au/index.php/AEC/article/view/50

Abstract: "A number of validated survey instruments for assessing technological pedagogical content knowledge (TPACK) do not accurately discriminate between the seven elements of the TPACK framework, particularly technological content knowledge (TCK) and technological pedagogical knowledge (TPK). By posing simple questions that assess technological, pedagogical, and content knowledge (TK, PK and CK) the logical associations forming the TPACK framework can be used to synthesise TPK [and] TCK survey items that are inherently valid. This process can further be applied to constructing TPACK survey questions that agree closely with those from validated surveys."

Kafyulilo, A., Fisser, P., Pieters, J., & Voogt, J. (2015). ICT use in science and mathematics teacher education in Tanzania: Developing technological pedagogical content knowledge. *Australasian Journal of Educational Technology, 31*(4). 381-399. Retrieved from http://ajet.org.au/index.php/AJET/article/viewFile/1240/1288

Abstract: "Currently, teacher education colleges in Tanzania are being equipped with computers to prepare teachers who can integrate technology in teaching. Despite these efforts, teachers are not embracing the use of technology in their teaching. This study adopted Technological Pedagogical Content Knowledge (TPACK) as a framework for describing the knowledge and skills that pre-service teachers need to develop in order to effectively integrate technology in science and mathematics teaching. Pre-service teachers (N=22) participated in microteaching, hands-on training, collaborative lesson design in design teams, and reflection with peers. Pre- and post-assessment results of the pre-service teachers' perceived knowledge and skills of integrating technology in teaching, showed significant changes in technology-related components of TPACK. We conclude that opportunities for pre-service teachers to participate in professional development programs that involve lesson design, teaching, evaluation and redesign, can be effective for the development of the knowledge and skills of integrating technology in science and mathematics teaching."

Karaca, F. (2015). An investigation of preservice teachers' technological pedagogical content knowledge based on a variety of characteristics. *International Journal of Higher Education, 4*(4), 128-136. doi:10.5430/ijhe.v4n4p128

Abstract: "A survey research was conducted to examine pre-service teachers' Technological Pedagogical Content Knowledge (TPACK) and how it differs based on a variety of characteristics (i.e. gender, grade level, type of high school graduated, possession of different technologies etc.). The participants of the study included 142 preservice teachers from Computer Education

and Instructional Technologies Department at Marmara University, Istanbul Turkey. The study results indicated that preservice teachers' TPACK scores differed based on gender, their reasons for choosing their profession, their perceptions of the value of school experience courses and their possession of tablet computers. Understanding the characteristics that would have an influence on preservice teachers' TPACK level provides valuable insights to the development of teacher preparation activities that would lead to more efficient use of technologies in their future professions. As pre-service education has a good potential to influence prospective teachers' use of technologies in their future career, the study results will provide valuable insights about how to improve teachers' technology integration starting from their undergraduate degrees."

Lehiste, P. (2015). The impact of a professional development program on in-service teachers' TPACK: A study from Estonia. *Problems of Education in the 21st Century, 66*, 18-28. Retrieved from http://oaji.net/articles/2015/457-1441441936.pdf

Abstract: "Recently there has been a considerable interest in the Technological Pedagogical Content Knowledge (TPACK) framework for effective technology integration (Koehler et al., 2013). Researchers have been measuring how effective their professional development efforts have been for the development of teachers' TPACK (Graham et al., 2009; Guzey & Roehrig, 2009). So far research is based only on short-term courses, so longitudinal studies are needed to examine the TPACK development of teachers across time (Hoffer & Grandgenett, 2012; Koh & Sing, 2011). A two-year in-service training program of educational technology (60 ECTS), based on the TPACK framework, was developed at Tallinn University Haapsalu College to support in-service teachers to effectively embed ICT into their classroom teaching. The first group of teachers (n=20) enrolled in the program in January 2014. This paper reports some preliminary findings of a longitudinal action research, the main aim of which is to evaluate the impact of the in-service training program of educational technology on teachers' TPACK. The key questions for this research were: how do teachers' perceptions of their TPACK levels change after participating in the training program for a year; which of the seven knowledge domains of the TPACK framework develop more than others; what is the impact of different knowledge domains on teachers' TPACK perceptions. The TPACK questionnaire developed by Schmidt et al. (2009) was used to measure in-service teachers' self-assessments of their TPACK during the first meeting of the training program and at the end of the first academic year. The research results revealed increase in all the domains of the TPACK framework. There was significant development of the teachers' TK and TPACK, but only limited growth in CK and PK. Strong positive correlations were found between TCK, TPK and TPACK in the post-course survey."

Lewthwaite, B. E., Knight, C., & Lenoy, M. (2015). Epistemological considerations for approaching teaching in an on-line environment Aboriginal and Torres Strait Islander teacher education program: Reconsidering TPACK. *Australian Journal of Teacher Education, 40*(9), 63-85. doi:10.14221/ajte.2015v40n9.4

Abstract: "This research inquiry explores teacher educator knowledge, understandings and beliefs informing their teaching in a web-based Australian teacher education program for Aboriginal and Torres Strait Islander students. Through the use of a phenomenologically aligned interview process, the study investigates instructors' consideration of practice for teaching in an on-line environment. Using the TPACK framework (Mishra & Koehler, 2006) as a lens for analysis, what emerges from the data is how lecturers' knowledge and beliefs about students influences the roles they adopt as educators, and how this influences, in turn, what and how technology is used to support student learning. The study ends by critiquing and re-conceptualizing TPACK and providing insights that program developers and teacher educators need to consider in the conceptualization and enrichment of web-based learning, especially those which engage with minority students, such as Aboriginal and Torres Strait Islander learners."

Lin, C.Y., Kuo, Y.C., & Ko, Y.Y. (2015). A study of pre-service teachers' perception of technological pedagogical content knowledge on algebra. *Journal of Computers in Mathematics and Science Teaching, 34*(3), 327-344. Abstract retrieved from http://www.editlib.org/p/148706/

Abstract: "The purpose of this study was to investigate elementary pre-service teachers' content knowledge in algebra (Linear Equation, Quadratic Equation, Functions, System Equations and Polynomials) as well as their technological pedagogical content knowledge (TPACK) in teaching algebra. Participants were 79 undergraduate pre-service teachers who were enrolled into the university core program and the teacher education program where the former offered a content course and the latter the methods course. A paper-based survey was distributed to the students to collect data. Quantitative analysis was utilized to analyze the collect data. Results indicated that there were no significant differences in content knowledge for algebra between the pre-service teachers from two programs. Pre-service teachers in the teacher education program had better pedagogical knowledge than those in the university core program. The five sub-scales of the algebra content were significantly correlated with each other. Content knowledge and pedagogical knowledge significantly predicted TPACK. Levels of technology skills among the pre-service teachers had a significant impact on their technology knowledge, technological content knowledge and TPACK."

Mahdum, M. (2015). Technological pedagogical and content knowledge (TPACK) of English teachers in Pekanbaru, Riau, Indonesia. *Mediterranean Journal of Social Sciences, 6*(5), 168-176. doi:10.5901/mjss.2015.v6n5s1p168

Abstract: "This study discusses Technological Pedagogical Content Knowledge (TPACK) of senior high school English teachers in Pekanbaru. This research is aimed at examining how in-service teachers develop and apply TPACK throughout their teaching. The data were taken from 74 in-service English teachers of senior high school in Pekanbaru who were selected through simple random sampling. The instrument consists of 45 items for measuring in-service English teachers' self-assessment of the 7 TPACK sub-domains. The result of validity test through Pearson Correlation showed that all items are valid. To test the questionnaire reliability using

Alpha Cronbach's test showed 0.975, which can be interpreted that the TPACK of English teachers of senior high school in Pekanbaru was in 'good' category. It implies that the teachers have been able to develop and apply their TPACK well."

Ndongfack, M. N. (2015). TPACK constructs: A sustainable pathway for teachers professional development on technology adoption. *Creative Education*, *6*(16), 1697-1709. doi:10.4236/ce.2015.616171.

Abstract: "As numerous Information and Communication Technologies (ICTs) penetrate various facets of life, teachers are underutilising it in the teaching and learning process. With the introduction of ICTs in the Cameroon primary school curriculum, teachers have been receiving training on computer skill-base courses and yet many are unable to adopt the tool in instructional processes. To ensure that teacher training programmes effectively assist them in integrating technology in instructional processes, a study was initiated to determine additional set of skills that they need to adopt the tool in their classrooms. This study employed a quantitative survey methodology in the collection of data towards the determination of additional skills needed by primary school teachers. A total of 400 teachers were selected using the stratified random sampling technique from primary schools across all the 10 Regions of Cameroon. The data were analysed using mean and standard deviation. The findings of the survey indicated that teacher-participants reported a better mastery of content knowledge (CK), pedagogy knowledge (PK), pedagogical content knowledge (PCK) and technological content knowledge (TCK). On the other hand, they reported weaknesses in three other constructs notably: technology knowledge (TK), technological pedagogical knowledge (TPK), and technological pedagogical content knowledge (TPACK). The researcher concluded that teacher-participants performed better in the CK, PK and PCK because these constructs constitute the basis for teacher education in Cameroon. Similarly, they performed well in the TCK construct because their professional development programme is focused on fostering their computer knowledge as a standalone skill. Their poor performance in the TK, TPK and TPACK stems from the fact that the training programmes do not lay emphasis on these constructs. To provide a sustainable teacher professional development programme on technology adoption, it was therefore recommended that stakeholders involved in the sector design training packages that focus on the TPACK constructs. This will foster teachers' adoption of the tool for instructional purposes."

Ozturk, E. (2013). Prospective classroom teachers' technological pedagogical content knowledge assessment in terms of some variables (TPCK). *Usak University Journal of Social Sciences, 6*(2), 223-228. Retrieved from http://www.researchgate.net/publication/274369878_Sinif_gretmeni_Adaylarinin_Teknolojik_Pedagojik_Alan_Bilgilerinin_Bazi_Degisken

Abstract: "The aim of this study is to determine classroom teacher candidates' technological pedagogical content knowledge. The research was based on the survey model and consists of 293 students in 2nd, 3rd, and 4th years of the department of classroom teaching, Faculty of Education, Sakarya University. Technological Pedagogical Content Knowledge Scale developed

by Schmidt and others (2009) and adapted into Turkish by Öztürk and Horzum (2011) has been used to collect data for the study. T-test for independent groups has been applied in order to test whether there is a difference between prospective classroom teachers' gender, type of education, technology training they have received or not, how competent they see themselves in the use of technology and their TPCK. It has been tested whether TPCK differs according to classroom teachers' gender, type of education, technology training they have received or not. According to the findings, it has been seen that there is not a statistically significant difference between technological knowledge (TK), content knowledge (CK), pedagogical content knowledge (PCK), technological content knowledge (TCK), technological pedagogical knowledge (TPK) and TPCK. As a last part of research, whether there is a difference between how competent prospective teachers see themselves in the use of technology and TPCK has been observed in this study. Accordingly, a statistically significant difference has been found between how competent they see themselves in the use of technology and TK, CK, PCK, TCK, TPK, TPCK."

Prodromou, T. (2015). Teaching statistics with technology. *Australian Mathematics Teacher, 71*(3), pp. 32-40. Abstract retrieved from http://search.informit.com.au/documentSummary;dn=492268598086117;res=IELHSS

Abstract: "The most recent Australian Curriculum: Mathematics document (ACARA, 2013) calls for students to develop the ability to use technology in their mathematical and statistical studies. Due to this increasing importance of integrating digital technologies in mathematics education, the national professional standards for teachers in Australia (AITSL, 2014) expect teacher education graduates to demonstrate technological, pedagogical and content knowledge (TPACK) in mathematics teaching and learning. The Technological Pedagogical Content Knowledge (TPACK) conceptual framework for teaching mathematics, developed by Mishra and Koehler (2006), emphasises the importance of developing integrated and interdependent understanding of three primary forms of knowledge: technology, pedagogy, and content. ... The purpose of this article is to discuss the TPACK required for teaching Statistics, and to assist Australian teachers to make sense of the TPACK required for the effective integration of technology in statistics instruction."

Rosenberg, J. M., & Koehler, M. J. (2015). Context and technological pedagogical content knowledge (TPACK): A Systematic Review. *Journal of Research on Technology in Education, 47*(3), 186–210. doi:10.1080/15391523.2015.1052663

Abstract: "Context is an important aspect of educational research and the technological pedagogical content knowledge (TPACK) framework, but is often missing from TPACK research, or its specific meaning is not clear. To provide a systematic and comprehensive view of the extent to which context is included in such research, and to understand the meaning of context when it is included, we conducted a systematic review of publications about TPACK. Context was included in descriptions, explanations, or operationalizations of TPACK among 36% of the 193 empirical journal articles we examined. When context was included, classroom and school factors and those related to teachers were more likely to be included than those related to students and society. The grounds for context being included among around one-third of the

articles and why some contextual factors are examined more than others are discussed. Implications for practice and recommendations for future research focus on investigating the complexity of practice, the development of measures that include context, and aligning TPACK and educational technology research with other disciplines through greater attention to context."

Sheffield, R., Dobozy, E., Gibson, D., Mullaney, J., & Campbell, C. (2015). Teacher education students using TPACK in science: A case study. *Educational Media International.* Advance online publication. doi: 10.1080/09523987.2015.1075104

Abstract: "Teacher education is in the grip of change. Due to the new Australian Curriculum, no longer is it possible to plan and implement lessons without considering the inclusion of Information and Communication Technologies. Simply knowing about the latest technology gadgets is not enough. Information literacy is essential in today's information-rich learning and working environment. Students and teachers must be able to engage with diverse learning technologies efficiently and effectively in the search for the "right information" at the "right time" for the "right purpose". Key information literacy and inquiry skills have been recognised as vital learning goals by the Australian Curriculum Assessment and Reporting Authority and the International Society for Technology in Education and are thus critical in science teacher education. This paper examines the overlap of technology, pedagogy and science content in the Technological Pedagogical and Content Knowledge (TPACK) framework and its affordances for science educators, at the intersection between technology knowledge, science pedagogy (information literacy and inquiry) and science content knowledge. Following an introduction of the TPACK framework for science education, the paper reports the research findings, which illustrate that 90% of pre-service teachers thought the experimental unit improved their understanding of the inquiry process, 88% reported more confidence in their understanding of science concepts and 94% of students reported an increase in their knowledge and confidence of Web 2.0 tools in supporting scientific inquiry in science. The implications of this study are that the online inquiry improved students' knowledge and confidence in the skills and processes associated with inquiry and in science concepts."

Wong, L.-H., Chai, C. S., Zhang, X., & King, R. B. (2015). Employing the TPACK framework for researcher-teacher co-design of a mobile-assisted seamless language learning environment. *IEEE Transactions on Learning Technologies, 8*(1), 31-42. Abstract retrieved from http://repository.lib.ied.edu.hk/jspui/handle/2260.2/17203

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."

Zhang, M., Parker, J., Koehler, M. J., & Eberhardt, J. (2015). Understanding inservice science teachers' needs for professional development. *Journal of Science Teacher Education, 26*(5), 471-496. doi:10.1007/s10972-015-9433-4

Abstract: "Prior research has mainly focused on what makes professional development effective from the program design perspective. However, there is a lack of understanding about what teachers need for improvement in the context of educational reforms and curricular changes. This study used the pedagogical content knowledge framework to examine teachers' needs for professional development situated in specific science topics. Data were drawn from a total of 118 science teachers who participated in a professional development program over 3 years. First, this study identified a list of common science topics that teachers needed to improve in life science, physics science, and earth science. Also, teachers perceived the needs to improve teaching of certain topics for different reasons: themselves, students, and curricular changes. Moreover, data analysis showed that teachers needed improvement in multiple areas of pedagogical content knowledge: learners, instructional strategies, curriculum, and assessment. In particular, inquiry teaching was one of the greatest challenges for most teachers."

Book

Hofer, M., Bell, L. & Bull, G. (Eds.). (2015). *Practitioner's guide to technology pedagogy and content knowledge (TPACK): Rich media cases of teacher knowledge*. Waynesville, NC: Association for the Advancement of Computing in Education (AACE). Retrieved from http://www.editlib.org/j/TPACKPRACT/ [Editors' note: The book will be available via this link soon.]

Abstract: "This book is designed to complement the AACTE's Handbook of TPCK for Educators. Rather than focusing on the teacher educator/research audience, this book is designed to support preservice and novice teachers in developing their TPACK. We envision this text being used in teaching methods and educational technology courses or in professional development workshops to help preservice and novice teachers develop their own integrated knowledge for technology integration. We have structured the book around rich media cases of actual

classroom practice in each of the four primary content areas in American schools: reading/language arts/English, mathematics, science, and social studies. In each content area, we offer one case at the elementary (K-5) level and one case at the secondary level (6-12), with an extra language arts case at the middle school level."

Chapters

Adegbenro, J. B., Gumbo, M. T., & Olugbara, O. O. (2015). Exploring technological knowledge of office data processing teachers: Using factor analytic methods. In M. L. Niess & H. Gillow-Wiles (Eds.), *Handbook of research on teacher education in the digital age* (pp. 548-576). Hershey, PA: Information Science Reference. doi:10.4018/978-1-4666-8403-4.ch021

Abstract: "This study applied factor analysis for exploring technological knowledge of beginner and veteran Office Data Processing (ODP) teachers at Further Education and Training (FET) or Technical and Vocational Education and Training (TVET) colleges in South Africa. These ODP teachers use Information Communication Technology (ICT) in the technology-enhanced classrooms. The Mishra & Koehler (2006) Technological Pedagogical Content Knowledge (TPACK) framework was extended by replacing Technological Knowledge with Procedural Functional Knowledge (PrFK) to realise the PrFPACK theoretical framework that enabled the researchers to holistically explore the contextual technological knowledge of teachers in the digital classroom environment. We developed an inventory of 65 comprehensive measures based on the PrFPACK framework and validated the inventory on a dataset of responses from 107 ODP teachers. The findings of this study generally revealed that Procedural Functional Content Knowledge is the most important factor in explaining the technological knowledge of ODP teachers."

Chai, C., Lim, C., & Tan, C. (2016). Introduction: Co-creating technological pedagogical content knowledge (TPACK) for the transformation of Nan Chiau Primary School. In C. S. Chai, C. P. Lim, & C. M. Tan (Eds.), *Future learning in primary schools* (pp. 1–7). Singapore: Springer. doi: 10.1007/978-981-287-579-2

Abstract: "The advancements of information and communications technology (ICT) have brought irreversible changes to how we work, live, play and connect. To cope and thrive amidst these changes, it is imperative for students to leverage upon emerging technologies for epistemologically generative work. Such work contrasts the traditional classroom practices where knowledge as true beliefs and verified by experts is transmitted to the students through various pedagogical representations. Bereiter and Scardamalia (2006) characterize such knowledge work as idea improvement. It is initiated by students' authentic quest to understand the world they live in. Students are encouraged to articulate their ideas about what they are inquiring and to subsequently work on these ideas to achieve deeper understanding, employing not just true/false criteria but also criteria related to the usefulness of the ideas. Adopting such a constructivist approach, students are engaged in knowledge work directly. This formed the foundation for them to become knowledge workers for the twenty-first century."

Cohen, J., George, M., & Riddle, D. (2015). Secondary English. In M. Hofer, L. Bell, & G. Bull (Eds.), *Practitioner's guide to technology pedagogy and content knowledge (TPACK): Rich media cases of teacher knowledge* (pp. 3-31-3-44). Waynesville, NC: Association for the Advancement of Computing in Education (AACE).

Abstract: Please see *Practitioner's Guide to Technology Pedagogy and Content Knowledge (TPACK): Rich Media Cases of Teacher Knowledge* in the Books section.

Daniel, E. G. S. (2015). Be it elementary or tertiary level of biology that we teach, we need TPACK. In E. G. S. Daniel (Ed.), *Biology education and research in a changing planet* (pp. 215–225). Singapore: Springer. doi:10.1007/978-981-287-524-2

Abstract: "Whether one is teaching elementary science or genome biology, the ability to create innovative biology lessons requires Technological Pedagogical and Content Knowledge (TPACK). We have come a long way since the early twentieth century … the world is changing. The laptop in the classroom has become commonplace and new technological tools can be integrated in the biology classroom. Today when we hear about the technology in the teaching–learning environment, we think of word-processing software, presentation software, animation software, multimedia, online learning (including interactive features such as chat rooms, forum, etc.), distance learning, laptops, tablet PCs, handhelds and such. Related to the technology-supported learning environments (for biology and other subjects) and the learning experiences, Brown (Why students still need teachers in the internet age. Keynote address presented at the 'International educational conference: Education and ICT in the new millennium', University Putra Malaysia June 30 2000) purported that five key components were necessary in learning which are motivation, structure, knowledge, guidance and evaluation. Educators and technical developers need to rethink their roles in the light of new fast evolving technologies."

Doukakis, S., Koilias, C., Adamopoulos, N., & Giannopoulou, P. (2013). Computer science teachers' in-service training needs and their technological pedagogical content knowledge. In M. D. Lytras, D. Ruan, R. D. Tennyson, P. O. De Pablos, F. J. G. Penalvo, & L. Rusu (Eds.), *Information systems, e-learning, and knowledge management research (communications in computer and information science)* (pp. 311–316). Berlin: Springer Berlin Heidelberg. doi: 10.1007/978-3-642-35879-1_36

Abstract: "This study examines a national sample of 1127 computer science teachers who teach algorithms and programming in upper secondary education; it measures their knowledge with respect to three key domains as described by the TPACK framework: technology, pedagogy, content, and the combination of these areas. According to the results in the TPACK subscales, teachers state that their knowledge is between the values 4.38 (Content Knowledge) and 3.51 (Pedagogical Content Knowledge). Furthermore, according to the same study, teachers feel that they need further training in how to incorporate technology in their teaching as well as how to teach algorithms, two areas that relate to Pedagogical Content Knowledge and TPACK."

Figg, C. & Jaipal-Jamani, K. (2015). Developing teacher knowledge about gamification as an instructional strategy. In M. L. Niess & H. Gillow-Wiles (Eds.), *Handbook of research on teacher education in the digital age* (pp. 663-690). Hershey, PA: Information Science Reference. doi:10.4018/978-1-4666-8403-4.ch025

Abstract: "There is a need for teachers and higher education faculty to develop knowledge about instructional strategies that engage digital learners and accommodate digital learning preferences in order to deliver instruction that digital learners perceive as relevant. This chapter discusses how gamification can be used in higher education as an instructional strategy to meet the needs of the digital learner. Findings from a design-based research study of how gamification was used in a Teacher Education technology methods course, to engage pre-service teachers in activities that develop Technological Pedagogical Content Knowledge (TPACK) (knowledge about teaching with technology) (Mishra & Koehler, 2006), are discussed. The findings provide guidance for teachers and technology educators on how to design courses incorporating gamification as an instructional strategy appropriate for meeting the needs of digital learners. Issues concerning design and implementation as it influenced student engagement and learning are highlighted, and recommendations are made for course development."

Garcia, N., & Strutchens, M. (2015). Secondary math (geometry). In M. Hofer, L. Bell, & G. Bull (Eds.), *Practitioner's guide to technology pedagogy and content knowledge (TPACK): Rich media cases of teacher knowledge* (pp. 4-15-4-32). Waynesville, NC: Association for the Advancement of Computing in Education (AACE).

Abstract: Please see *Practitioner's Guide to Technology Pedagogy and Content Knowledge (TPACK): Rich Media Cases of Teacher Knowledge* in the Books section.

Gillow-Wiles, H. & Niess, M. L. (2015). Engaging Google docs to support collaboration and reflection in online teacher education. In M. L. Niess & H. Gillow-Wiles (Eds.), *Handbook of research on teacher education in the digital age* (pp. 635-662). Hershey, PA: Information Science Reference. doi:10.4018/978-1-4666-8403-4.ch024

Abstract: "The purpose of this chapter is to describe the impact engaging collaborative software has on technological pedagogical content knowledge (TPACK) development through collaboration and reflection. Situating teaching and learning in an online teacher education environment creates challenges for developing learning communities supporting reflection and collaboration. This cross case analysis reveals the impact of Google Docs to facilitate reflection and collaboration in an online integrated mathematics, science, and technology education graduate program has on developing in-service teachers' TPACK. Using a social metacognitive constructivist lens to focus the course design, this study collected student learning products, including essays, Blackboard forum transcripts, and Google Docs editing histories to understand how participants' TPACK thinking matured through their collaboration and reflections. Results suggest Google Docs provided a rich online environment where participants were able to engage in and reflect on a community that developed both individual and shared knowledge."

Greenhalgh, S. P., & Koehler, M. J. (2015). Pretty good practices for the design of teacher portfolio courses. In M. L. Niess & H. Gillow-Wiles (Eds.), *Handbook of research on teacher education in the digital age* (pp. 256-280). Hershey, PA: IGI Global. doi:10.4018/978-1-4666-8403-4.ch010

Abstract: "In this chapter, the authors argue that although portfolios are a popular means of teacher evaluation, they, like any other assessment, must be properly implemented if they are to realize their full potential. Accordingly, they offer seven "pretty good practices" (Mishra, 2008) for designing portfolio courses: peer feedback, authentic audience, diverse resources, learning by doing, open access, confidential spaces, and self-pacing. These practices were developed from the authors' extensive work helping teachers to develop portfolios that demonstrate their learning in their graduate studies, and they help students create portfolios that have value as both summative assessments and places for formative growth. In the spirit of "pretty good practices," however, the authors invite others to modify these practices for other contexts or to carry out research that would help refine and improve them."

Hennessey, S., Olofson, M. W., Swallow, M. J., & Downes, J. M. (2015). Evolving pedagogy and practice: The 1:1 mathematics classroom through a TPACK lens. In M. Niess & H. Gillow-Wiles (Eds.) *Handbook of research on teacher education in the digital age* (pp. 577-603). Hershey, PA: Information Science Reference. doi:10.4018/978-1-4666-8403-4.ch022

Abstract: "This chapter presents qualitative research describing the pedagogy of middle grades mathematics teachers who participated in professional development in conjunction with classroom integration of 1:1 technology. Through a multiple-case study design, the expression and development of teacher pedagogy that occurred as teachers created self-designed action research projects grounded in pedagogical goals is illustrated. The use of action research in these four case studies as a vehicle for professional growth and as a reflective evaluation tool is discussed. When viewed through the lens of the TPACK framework (Mishra & Koehler, 2006), data suggest a technology-mediated shift in pedagogy in the area of differentiation in instruction and assessment in mathematics classrooms. Future implications regarding technology integration, professional development programs, and the use of the TPACK as a descriptive tool are considered."

Hofer, M. & Bell, L. (2015). Introduction. In M. Hofer, L. Bell, & G. Bull (Eds.), *Practitioner's guide to technology pedagogy and content knowledge (TPACK): Rich media cases of teacher knowledge* (pp. 1-1-1-7). Waynesville, NC: Association for the Advancement of Computing in Education (AACE).

Abstract: Please see *Practitioner's Guide to Technology Pedagogy and Content Knowledge (TPACK): Rich Media Cases of Teacher Knowledge* in the Books section.

Hofer, M. & Harris, J. (2015). Developing TPACK with learning activity types. In M. Hofer, L. Bell, & G. Bull (Eds.), *Practitioner's guide to technology pedagogy and content knowledge*

(TPACK): Rich media cases of teacher knowledge (pp. 7-1-7-14). Waynesville, NC: Association for the Advancement of Computing in Education (AACE).

Abstract: Please see *Practitioner's Guide to Technology Pedagogy and Content Knowledge (TPACK): Rich Media Cases of Teacher Knowledge* in the Books section.

Hunter, J. L. (2015). High possibility classrooms: A new model for technology integration. In M. Niess & H. Gillow-Wiles (Eds.), *Handbook of research on teacher education in the digital age* (pp. 466-492). Hershey, PA: Information Science Reference. doi:10.4018/978-1-4666-8403-4.ch018

Abstract: "This chapter reports on a case study of a high school teacher from a larger study of 'exemplary' teachers and how they conceptualized their knowledge of technology integration in education contexts (Hunter, 2013). The research was a series of purposeful case studies of teachers in classrooms in Australia. The study found that theory, creativity, public learning, life preparation and contextual accommodations are crucial. Each conception of the teachers' knowledge is underpinned by particular pedagogical themes that together form a fresh vision for technology integration known as High Possibility Classrooms or HPC. Kitty, the teacher featured in this chapter, conceptualized her knowledge of technology integration based on flexibility, experiential learning and creativity, preparation of learning, and whole school culture. This case study builds on the TPACK framework (Mishra & Koehler, 2006) and provides an important theoretical and practical exemplar of technology integration in practice for teacher education in a digital age."

Jacoby, A., Shoffner, M., George, M., & Wright, J. G. (2015). Middle school language arts. In M. Hofer, L. Bell, & G. Bull (Eds.), *Practitioner's guide to technology pedagogy and content knowledge (TPACK): Rich media cases of teacher knowledge* (pp. 3-17-3-30). Waynesville, NC: Association for the Advancement of Computing in Education (AACE).

Abstract: Please see *Practitioner's Guide to Technology Pedagogy and Content Knowledge (TPACK): Rich Media Cases of Teacher Knowledge* in the Books section.

Jones, D., Heffernan, A., & Albion, P. R. (2015). TPACK as shared practice: Toward a research agenda. In L. Liu & D. C. Gibson (Eds.), *Research highlights in technology and teacher education 2015* (pp. 13-20). Waynesville, NC: Society for Information Technology & Teacher Education (SITE).

Abstract: "The task of using Information and Communication Technologies (ICT) to effectively teach hundreds of pre-service educators, many of whom never attend campus, is a significant challenge, which is amplified by the need to do so in ways that model how they might use ICT in their own classrooms once they graduate. This paper analyses a collection of posts written across a teaching year on a group blog by three teacher educators as they explored their practice and attempted to learn how to meet this challenge. The analysis uses a distributed view of knowledge and learning to identify the barriers and enablers encountered, and how the

teacher educators developed their distributed TPACK throughout the year. The paper argues that a distributed view of TPACK offers some interesting insights that can inform practitioners, researchers and policymaker as they explore practice and learn how to meet the technology integration challenge."

Kim, R., Lee, J., & Isley, A. (2015). Elementary history. In M. Hofer, L. Bell, & G. Bull (Eds.), *Practitioner's guide to technology pedagogy and content knowledge (TPACK): Rich media cases of teacher knowledge* (pp. 6-1-6-11). Waynesville, NC: Association for the Advancement of Computing in Education (AACE).

Abstract: Please see *Practitioner's Guide to Technology Pedagogy and Content Knowledge (TPACK): Rich Media Cases of Teacher Knowledge* in the Books section.

Kjellstrom, W., Berry, R., & White, P. (2015). Elementary math. In M. Hofer, L. Bell, & G. Bull (Eds.), *Practitioner's guide to technology pedagogy and content knowledge (TPACK): Rich media cases of teacher knowledge* (pp. 4-1-4-14). Waynesville, NC: Association for the Advancement of Computing in Education (AACE).

Abstract: Please see *Practitioner's Guide to Technology Pedagogy and Content Knowledge (TPACK): Rich Media Cases of Teacher Knowledge* in the Books section.

Koehler, M. J., Mishra, P., & Zellner, A. L. (2015). Mind the gap: Why TPACK case studies? In M. Hofer, L. Bell, & G. Bull (Eds.), *Practitioner's guide to technology pedagogy and content knowledge (TPACK): Rich media cases of teacher knowledge* (pp. 2-1-2-8). Waynesville, NC: Association for the Advancement of Computing in Education (AACE).

Abstract: Please see *Practitioner's Guide to Technology Pedagogy and Content Knowledge (TPACK): Rich Media Cases of Teacher Knowledge* in the Books section.

Lee, J. & Rhodes, A. G. (2015). Secondary history. In M. Hofer, L. Bell, & G. Bull (Eds.), *Practitioner's guide to technology pedagogy and content knowledge (TPACK): Rich media cases of teacher knowledge* (pp. 6-12-6-24). Waynesville, NC: Association for the Advancement of Computing in Education (AACE).

Abstract: Please see *Practitioner's Guide to Technology Pedagogy and Content Knowledge (TPACK): Rich Media Cases of Teacher Knowledge* in the Books section.

Lim, G., Ang, P., & Koh, J. (2016). Developing teachers' technological pedagogical mathematics knowledge (TPMK) to build students' capacity to think and communicate in mathematics classrooms. In C. S. Chai, C. P. Lim, & C. M. Tan (Eds.), *Future learning in primary schools* (pp. 129–145). Singapore: Springer. doi:10.1007/978-981-287-579-2_9

Abstract: "This chapter documents the Mathematics teachers' creation of technological pedagogical mathematics knowledge (TPMK) for the infusion of an inquiry-based approach to

support students' communication of mathematical reasoning. The 5E (Engage, Explore, Explain, Elaborate, and Evaluate) approach was originally used in the school's Science curriculum. This design project was initiated to explore the cross-disciplinary infusion of the 5E pedagogical approach into the school's Mathematics curriculum. The goal is to address students' weaknesses in articulating their mathematical reasoning and understanding. By documenting the teachers' design processes, this chapter provides insights for educators and researchers on how usable TPMK can be created within a school-based context to address the specific learning challenges of students with relevant ICT tools. It also provides findings on how such kinds of pedagogy influences student learning."

Lyublinskaya, I. (2015). Evolution of a course for special education teachers on integrating technology into math and science. In M. L. Niess & H. Gillow-Wiles (Eds.), *Handbook of research on teacher education in the digital age* (pp. 521-547). Hershey, PA: Information Science Reference. doi:10.4018/978-1-4666-8403-4.ch020

Abstract: "This chapter describes a two-year development of a graduate pedagogy course for pre-service special education teachers to integrate technology into teaching mathematics and science. The Technological Pedagogical Content Knowledge (TPACK) framework was used for the course design. The chapter discusses the modifications made to the course from semester to semester based on the analysis of lesson plan TPACK scores and information drawn from pre-service teachers' written feedback. The challenge was to determine an optimal balance between theory and practice and between guided and independent learning that leads to higher TPACK gains. Data analysis showed that in a semester when the instructor provided extensive instructional support coupled with a large amount of work required of the pre-service teachers, they achieved the highest TPACK level; however, this design resulted in unreasonable workload. Reducing the amount of work to a reasonable level produced lower TPACK; nevertheless, the gain in TPACK was still significant."

Lyublinskaya, I. & Tournaki, N. (2015). Examining the relationship between self and external assessment of TPACK of pre-service special education teachers. In L. Liu & D. C. Gibson (Eds.), *Research highlights in technology and teacher education 2015* (pp. 29-36). Waynesville, NC: Society for Information Technology & Teacher Education (SITE).

Abstract: "This study examined the relationship between TPACK scores of lesson plans (external scores) developed by 150 pre-service special education teachers and TPACK scores of self-reflections (self-scores) about teaching these lessons. The TPACK Levels Rubric (Lyublinskaya & Tournaki, 2012) was used to assess both types of TPACK. Results indicated that a) both, self and external TPACK scores significantly improved, and b) there was no significant difference between external and self TPACK scores for each lesson plan. In order to examine relationships between self and external scores, the participants were divided into three groups: close-estimators (self and external scores are within one standard deviation), over- and under-estimators (self-scores are respectively higher or lower than external by more than a standard deviation) Correlational analysis conducted on self and external scores of TPACK revealed significant moderate to strong positive correlation between self and external scores."

Mann, L. & Ardon, E. (2015). Elementary literacy (reading). In M. Hofer, L. Bell, & G. Bull (Eds.), *Practitioner's guide to technology pedagogy and content knowledge (TPACK): Rich media cases of teacher knowledge* (pp. 3-1-3-16). Waynesville, NC: Association for the Advancement of Computing in Education (AACE).

Abstract: Please see *Practitioner's Guide to Technology Pedagogy and Content Knowledge (TPACK): Rich Media Cases of Teacher Knowledge* in the Books section.

Marcelo, C. & Yot, C. (2015). Pedagogies of working with technology in Spain. In L. Orland-Barak & C. J. Craig (Eds.), *International teacher education: Promising pedagogies, part B* (pp. 329-357). Bingley, UK: Emerald Insight.

Abstract: "In recent years, we have seen a paradox. No matter how much the government strives to incorporate technology into classrooms as a learning resource for students, both national and international reports prove that this is a difficult aim to achieve purpose. Training both preservice and in-service teachers is vitally important for technology to become part of everyday school life. But to achieve this, we must move away from the techno-centric focus of technology. This chapter analyzes the importance of focusing on implementing technologies in the learning activities that teacher-trainers design to prepare preservice teachers. We describe seven types of activities: assimilative, informative management, applicative, communicative, productive, experiential, and evaluation. All of these technology-based learning activities, organized in learning sequences, potentially help teachers to come to terms with technological knowledge in their pedagogical content area."

Owusu, K. A., Conner, L., & Astall, C. (2015). Contextual influences on science teachers' TPACK levels. In M. Niess & H. Gillow-Wiles (Eds.), *Handbook of research on teacher education in the digital age* (pp. 307-333). Hershey, PA: Information Science Reference. doi:10.4018/978-1-4666-8403-4.ch012

Abstract: "The contextual factors influencing teachers' use of technology as well as teachers' Technological Pedagogical Content Knowledge (TPACK) levels were investigated through multiple embedded case studies of five science teachers who were regular users of technology in their teaching. The case studies reported in this chapter revealed that teachers used technology to support inquiry learning through a wide range of ways in lower levels of high school but mostly to clarify concepts and theories for senior level students. This chapter identified that teachers demonstrated different TPACK levels of expertise and engagement in the use of technology when transferring different types of knowledge from one teaching and learning context to another and for addressing differences amongst learners. The context of assessment driven teaching influences science teachers' TPACK for integrating technology in instruction. The chapter noted that having teachers actively evaluate the effectiveness of the technology on students' learning may help increase teachers' TPACK levels."

Patel, Y., Slykhuis, D., & Wayne, T. (2015). Secondary science (physics). In M. Hofer, L. Bell, & G. Bull (Eds.), *Practitioner's guide to technology pedagogy and content knowledge (TPACK): Rich media cases of teacher knowledge* (pp. 5-1-5-14). Waynesville, NC: Association for the Advancement of Computing in Education (AACE).

Abstract: Please see *Practitioner's Guide to Technology Pedagogy and Content Knowledge (TPACK): Rich Media Cases of Teacher Knowledge* in the Books section.

Peled, Y. & Oster-Levinz, A. (2015). The impact of modeling and mentoring on pre-service teachers to use technological pedagogical content knowledge. In L. Liu & D. C. Gibson (Eds.), *Research highlights in technology and teacher education 2015* (pp. 21-28). Waynesville, NC: Society for Information Technology & Teacher Education (SITE).

Abstract: "The present study examines the ability of pre-service teachers from a large college located in the center of Israel and a small college in the northern part of Israel to integrate technological knowledge and pedagogical content knowledge (TPACK) into their teaching and compares the colleges. Significant differences were found between the two colleges concerning TPACK knowledge. The influence of lecturer and mentor teacher modeling on ICT integration is discussed, as well as the level of training components for technology integrated teaching and the pre-service teachers' attitudes towards ICT and TPACK."

Phillips, M. (2015). Digital technology integration. In M. Henderson & G. Romeo (Eds.). *Teaching and digital technologies: Big issues and critical questions* (pp. 318-331). New York: Cambridge University Press.

Excerpt: "There are a wide variety of approaches that have been developed by researchers in an attempt to understand the ways in which second order barriers can be overcome and digital technologies integrated in school classrooms. These include learning theories such as constructivism, behaviourism, cognitivism or connectivism which have all been used to explain effective use of digital technology; however, the following section will provide you with a critical understanding of three different perspectives that are often used, sometimes erroneously, to examine teachers' technology integration: Diffusion of Innovations, TPACK and SAMR. These three perspectives have been chosen not only because they are commonly used in schools and professional development settings, but also because they provide you with three different ways to consider effective technology use: Diffusion of Innovations provides you with the opportunity to examine effective digital technology use across social systems. TPACK draws your attention to the forms of knowledge individual teachers need to effectively integrate digital technologies into their practice while SAMR is a framework that allows you to consider the effectiveness of digital technology use in different classroom activities."

Polly, D., Binns, I. C., Putman, S. M., Rock, T. C., & Good, A. J. (2015). Developing technological pedagogical content knowledge in elementary education programs. In M. Niess & H. Gillow-Wiles (Eds.) *Handbook of research on teacher education in the digital age* (pp.

493-520). Hershey, PA: Information Science Reference. doi:10.4018/978-1-4666-8403-4.ch019

Abstract: "The digital age requires teacher education programs to constantly evaluate and revise their programs and courses, particularly with reference to guiding teacher candidates towards integrating current and emerging technologies. This designed-based research study demonstrates how state-wide mandates to revise teacher education programs were used in promoting subsequent revisions influencing the course components and teacher candidates' development of Technological Pedagogical Content Knowledge (TPACK). Cases of four undergraduate elementary education courses and the advanced licensure elementary education program are described. The cross case analysis reveals the subsequent influence on the program for improving the TPACK preparation of the teacher candidates. The chapter concludes with implications for teacher educators and leaders of teacher education programs."

Rosenberg, J. M., Greenhalgh, S. P., & Koehler, M. J. (2015). Performance assessment of teachers' TPACK using artifacts from digital portfolios. In L. Liu & D. C. Gibson (Eds.), *Research highlights in technology and teacher education 2015* (pp. 189-196). Waynesville, NC: Society for Information Technology & Teacher Education (SITE).

Abstract: "Researchers have employed many different methods of measuring teachers' Technological Pedagogical Content Knowledge (TPACK). Existing measures of TPACK have typically focused on teachers' self-report of their understanding, and relatively few approaches directly measure teacher performances. Moreover, to date, no performance assessments of teachers' TPACK have used teachers' digital portfolios or the work samples (or artifacts) included in teachers' portfolios. In this paper, we build on our initial attempt (Koehler, Rosenberg, Greenhalgh, Zellner, & Mishra, 2014) to test the reliability of a performance assessment of the TPACK present in teachers' portfolio artifacts by focusing on two specific types of artifacts: Dream IT (a type of grant proposal) and a sustainable technology initiative. We report the reliability of our attempts to code levels of TPACK evident in these artifacts and discuss the development of more robust performance measures of teachers' TPACK."

Rosenberg, J. M., & Koehler, M. J. (2015). Context and teaching with technology in the digital age. In M. L. Niess & H. Gillow-Wiles (Eds.), *Handbook of research on teacher education in the digital age* (pp. 440-465). Hershey, PA: Information Science Reference. doi:10.4018/978-1-4666-8403-4.ch017

Abstract: "Context is an essential aspect of educational research. In this chapter, the authors discuss how context has been avoided or has referred to different constructs among educational technology research, especially among educational technology research, especially among research on the Technological Pedagogical Content Knowledge (TPACK) framework. The authors discuss the descriptive, inferential, and practical implications of framework for the context of teachers' TPACK advanced by Porras-Hernandez and Salinas-Amescua (2013). Then, they exemplify the power of this framework by using it to guide a descriptive study conducted to determine the extent to which the publications included context. They also describe what

researchers meant by context as understood through the framework for context. The authors found that context was important but often missing from research about TPACK and that the meaning of context has differed widely. They discuss these findings in relation to the TPACK literature as well as for educational technology research."

Sprague, D. & Katradis, M. (2015). The transference between elementary preservice teachers' courses and technology use in teaching. In M. L. Niess & H. Gillow-Wiles (Eds.), *Handbook of research on teacher education in the digital age* (pp. 108-134. Hershey, PA: Information Science Reference. doi:10.4018/978-1-4666-8403-4.ch005

Abstract: "This mixed-method study explored a cohort of 18 preservice elementary teachers' perceptions of technology and their abilities to integrate technology in their teaching. Data sources included blog postings, a confidence survey, lessons plans and observations. Results showed a disconnect between the blog postings and confidence survey (their perceptions) and their lessons plans and observations (their abilities). Five case studies were examined, using the TPACK framework, to determine where the disconnect was occurring. Although Technical Knowledge seemed to be an issue for some, the majority of the preservice teachers struggled with Pedagogical Knowledge. Suggestions for how to address this issue are included. Implications for teacher education are discussed."

Tournaki, N., & Lyublinskaya, I. (2015). TPACK for teaching mathematics and science and differentiation of instruction: Case study with pre-service special educators. In L. Liu & D. C. Gibson (Eds.), *Research highlights in technology and teacher education 2015* (pp. 37-44). Waynesville, NC: Society for Information Technology & Teacher Education (SITE).

Abstract: "In this paper, we argue that the Technological Pedagogical Content Knowledge framework (TPACK, Mishra & Koehler, 2006) can be used to develop excellence in teaching in a variety of classrooms that include differentiation of instruction. In order to examine how the quality of differentiation changes as TPACK improves, 150 lesson plans of pre-service special educators were assessed using the TPACK Levels Rubric (Lyublinskaya & Tournaki, 2012). Two lesson plans were randomly selected at each level of TPACK (with total of eight) and examined for evidence of differentiation of instruction. The study describes how strategies used for differentiation parallel the levels of TPACK that were achieved by each participant."

Vasinda, S., Kander, F., & Redmond-Sanogo, A. (2015). University reading and mathematics clinics in the digital age: Opportunities and challenges with iPad integration. In M. L. Niess & H. Gillow-Wiles (Eds.), *Handbook of research on teacher education in the digital age* (pp. 135-163). Hershey, PA: Information Science Reference. doi:10.4018/978-1-4666-8403-4.ch006

Abstract: "This chapter discusses the findings of an exploration to integrate iPads in a university reading and mathematics clinic impacting three groups of learners: preservice teachers enrolled in reading and mathematics practicums, the K-8 community students served by the clinic, and the teacher educators. The TPACK model was used as a conceptual framework for teacher

educators to engage and support preservice teachers in a technology rich learning environment designed to enhance their literacy and mathematics content knowledge, pedagogical knowledge, and technology knowledge, and the complex intersections between each. The teacher educators expected their mostly digital native preservice teachers to recognize technology affordances and technology integration opportunities when provided content knowledge and pedagogical support. Although the K-8 tutees were engaged at high-levels, faculty's assumption of the digital native preservice teacher was disrupted. Teacher educators discovered that digital natives still need support in developing technological knowledge in an educational setting."

Yarnall, L. & Fusco, J. (2015). A framework for supporting in-service teachers to use domain-specific technologies for instruction. In M. L. Niess & H. Gillow-Wiles (Eds.), *Handbook of research on teacher education in the digital age* (pp. 604-634). Hershey, PA: Information Science Reference. doi:10.4018/978-1-4666-8403-4.ch023

Abstract: "Domain-specific technologies, which are used for analysis, representation, and production in real-world contexts, differ from basic technologies, such as word processing software and Internet search tools. They cannot be used effectively without adequate command of fundamental domain-specific content knowledge. They can be used to deepen students' understanding of content, but these technologies bring distinct classroom-integration challenges. This chapter presents a framework for supporting in-service teachers to integrate these technologies. The research team derived this framework from data collected during an extended TPACK-style (Technological Pedagogical Content Knowledge) workshop that engaged 13 life science community college instructors in integrating bioinformatics technologies into courses. This chapter presents a case study about the challenges community college teachers faced in implementing these tools—and the strategies they used to address them. Challenges included activity translation, problem definition, implementation, and assessment."

3. Recent TPACK-Related Dissertations and Theses

Curtis, M. D. (2015). *Analyzing the diffusion of geospatial technologies as instructional tools in high school geography education* (Doctoral dissertation). Available from ProQuest Dissertations and Theses Global database. (UMI No. 3725322)

Abstract: "Twenty-first century education demands that students engage in innovative technologies in authentic learning environments. With a focus on keeping geographic learning current, the geography education community strives to diffuse geospatial technologies (GST) into secondary geography education. However, these tools remain largely unused. This national study examined the current patterns of GST and decisions to use geospatial technologies as pedagogic enhancements by a sample of high school geography educators. Rogers' (2003) Innovation-Decision Process and Mishra and Koehler's (2006) Technological Pedagogical Content Knowledge (TPCK) research provided the two lenses for this study. These frameworks illustrate one model for the GST adoption process and provide insight into challenges to implementation beyond commonly known barriers to technology integration. Rogers' (2003)

process model is helpful in understanding the phases involved in accepting innovation and informing possible actions and decisions by secondary geography educators. The findings of this research suggest that the phases may not be a sequential progression as identified in earlier innovation diffusion studies. According to Mishra and Koehler (2006), teachers exhibit sustained, integrative technology use when they develop a combination of three knowledge sets: Technological Pedagogical Content Knowledge (TPCK). The current investigation revealed significant associations among the data with an emphasis on the importance of teachers' geospatial TPCK (G-TPCK) and its influence on the diffusion of GST in high school geography classrooms."

McCann, K. (2015). *Using technological, pedagogical, and content knowledge (TPACK) to support universal design for learning (UDL): A case study* (Doctoral dissertation). Available from ProQuest Dissertations and Theses Global database. (UMI No. 3717200)

Abstract: "Research indicates that technology can play a vital role in supporting universal design for learning (UDL); however, little research currently exists to detail specific practices of educators in the field. This qualitative case study was designed to explore and describe the efforts to prepare and deliver instruction with a combined knowledge of technology-content-and-pedagogy (TPACK) to support UDL in an inclusive setting, at a Title 1 school. The justification for this study stemmed from the researcher's passion to help practitioners in the field understand the strategies and materials utilized by an exemplary educator. It was this researcher's intuition that an awareness of a unique practice may help broaden the research base for both UDL and TPACK, and possibly impact both policy and practice.

The purposefully selected participant was an experienced general education teacher at a Title 1 school in central Oahu, a part of the Hawai'i Department of Education (HDOE). Data were collected across the duration of an entire, official HDOE instructional quarter, and included a series of observations followed by in-depth interviews, and the analyses of materials and instructional resources that were designed and utilized to support instruction. The data were coded and analyzed to address the specific research questions of this study. The analysis and interpretation of the findings were organized with respect to the frameworks of this particular study: TPACK and UDL.

This research revealed that a teacher's TPACK provides important support in preparing for and delivering UDL-based instruction and expands the range of strategies and materials available for the teacher to use. Recommendations included the ongoing integration of 21st century technologies and TPACK in the delivery of professional development for educators related to UDL. Additionally there is a call for administrative policies that support the ongoing development of TPACK for practitioners in the field, as well as broadening opportunities for research that examine the connections between TPACK and UDL."

Mourlam, D. J. (2015). *The ongoing faculty development system: A case study exploring content methods teacher education faculty technological, pedagogical, content knowledge*

development (Doctoral dissertation). Retrieved from http://scholarworks.uni.edu/cgi/viewcontent.cgi?article=1191&context=etd

Abstract: "Society has changed from manufacturing to information-based, resulting in an emphasis in different knowledge and skills. When entering the profession, new teachers will be expected prepare learners for key 21st century skills using digital technologies. At a time when near technological ubiquity exists, development of these skills using digital tools has become an expectation. As teacher education programs have responded to the demands for more new teachers that can leverage technologies to develop 21st century skills, much of this preparation has occurred in instructional technology focused courses. However, in recent years attention has shifted to developing these skills in content methods courses, which have the potential to more deeply contextualize the use of digital technologies within individual disciplines. As faculty have requested more faculty development support, often decontextualized technology-focused workshops have been the misguided response. This has resulted in faculty disenchantment with development offerings due to a lack of applicability within their courses.

The purpose of this study was to explore a different approach to faculty development grounded in Technological, Pedagogical, Content Knowledge (TPACK), social constructivism, adult learning theory, and systems theory. An embedded mixed method exploratory case study was used to examine a cohort- and design-based faculty development experience, how faculty implemented TPACK-based instruction, and changes to faculty and preservice teacher TPACK. Data was collected using faculty interviews, participant observation, and a candidate survey and was analyzed using Grounded Theory and Constant Comparison, as well as descriptive and inferential statistics. Results indicated the emergence of an ongoing faculty development system where faculty progressed through the entire instructional design process while engaging in development activities throughout the study. Key themes identified were the differences faculty described between "one shot" and ongoing faculty development, as well as the value of faculty developer support as being both personalized and dispositional in nature, allowing for more faculty comfort and risk taking. There were also increases in faculty TPACK, as well as statistically significant increases in some candidate TPACK domains. Given the ongoing nature of faculty development that emerged in this study, attention is given to the implications of this phenomenon within higher education."

Park, E. (2015). *A case study exploring TPACK framework within the context of early childhood education* (Doctoral dissertation). Available from ProQuest Dissertations and Theses Global database. (UMI No. 3717210)

Abstract: "The purpose of this exploratory single-case study was to investigate the affordances of iPads and how these affordances transpired within a technological, pedagogical content knowledge (TPACK) framework by four early childhood educators at a low-income family preschool in Honolulu, Hawaii. Early childhood education (ECE) will be defined as education from birth to age eight although this study focused primarily on educators for preschool age group that is from age three to five. The targeted participants included four preschool teachers with varying technological skills and knowledge.

Methods of data collection were pre-survey, post-survey, follow-up survey, group interviews, follow-up interviews, classroom observations, and documentation of iPad workshops and other email correspondences. The data included existing data from a grant project completed at the end of 2013 and new data from follow-up interviews collected in May 2014. The data were analyzed using coding methods in two cycles.

The three major findings were 1) the exploration of affordances provided by iPads showed common themes of efficiency and effectiveness in assessing, teaching, and learning. In addition, there were some affordances particular to teaching and learning; 2) the exploration in how participating teachers discovered the affordances of iPad over time indicated parallel progression in technological knowledge and change in their value system about the affordances of iPad; and 3) the exploration in the progression of technological knowledge and change in their value system about the affordances of iPad within the TPACK framework suggested that there was a close relationship between progression of technological knowledge (TK) towards TPACK and progression of affective-valuing (AV) towards affective-characterization by value system (AC)."

Prince, J. (2014). *A case study of English language learners in a digital classroom: Exploring the experiences of students and teachers using iPads for linguistic development and content knowledge acquisition* (Doctoral dissertation). Available from ProQuest Dissertations and Theses Global database. (UMI No. 3581321)

Abstract: "English Language Learners (ELLs) must develop a full range of language skills to participate in the academic discourse of school. This population is a growing demographic in the United States and abroad; and meeting the linguistic needs of ELL students in the mainstream classroom is relevant to teachers across the globe. Technology can be a potential support for students and teachers. This thesis presents findings from a qualitative case study about the implementation of a one-to-one iPad program at an international school. The adoption of the iPads into the 4th grade mainstream classroom was guided by both a linguistic goal to integrate English and content knowledge; and by a second goal to explore teachers' experiences using a specific conceptual model for iPad integration. The Technological, Pedagogical, and Content Knowledge (TPACK) framework has been shown as a positive model for teacher practice and student learning (Mishra and Kohler, 2008). Little research on this model had been conducted with ELL teachers at the elementary level, and the current study contributes to the literature as it explores students', teachers', and leaders' experiences with this iPad program. The findings from the case study showed that ELL students were engaged when working with the iPads, and that the functionality of the devices offered unique supports to ELL students and teachers. Participants reported that the iPads were used in ways that contributed to linguistic growth and content knowledge development of students. Teachers and leaders reported that the TPACK model was a helpful conceptual model for technology integration with ELL students. While there were many positive findings, there were concerns about shifting pedagogy and resources required to implement a one-to-one iPad program. The thesis concludes with analysis of the findings, and implications for theory and practice."

Saldana, R. J. (2015). *Mobile professional development: Taxonomic levels of learning on teachers' TPACK perceptions and acquisition of technology competencies* (Doctoral dissertation). Available from ProQuest Dissertations and Theses Global database. (UMI No. 3708564)

Abstract: "As it stands, the integration of technology can be advantageous for teachers, students, administrators, and parents, yet teachers are expected to teach and facilitate learning with new technologies in order to prepare students to succeed in a global economy. As the Part D of the Enhancing Education Through Technology Act of 2001 (Part D - Enhancing Education Through Technology, n.d.) states, one of its purposes is to "enhance ongoing professional development of teachers, principals, and administrators by providing constant access to training and updated research in teaching and learning through electronic means," one of its goals is to "encourage effective integration of technology resources and systems with teacher training and curriculum development." Additionally, with the number of mobile devices continuing to increase, schools employing initiatives such as Bring Your Own Device (BYOD) that encourage the use of mobile devices in teaching and learning, and the benefits of technology integration on student learning, to provide a 21st century education using technology remains a problem across American schools. At the frontline of preparing and equipping teachers with the training and support needed to increase knowledge and skills, and their impact on attitudes and beliefs (Bandura, 1977, 1994, 1997) is professional development (PD). However, PD often lacks any form of assessment making it difficult to understand what participants really learned. The purpose of this study was to examine and report the impact of mobile professional development (MPD) taxonomic rigor on in-service teachers' attitudes and beliefs towards technology and technology integration and performance on a standardized knowledge and skills assessment on Technology Applications. This study developed a MPD course and designed 3 taxonomic treatment conditions to examine how question-rigor impacts Technological, Pedagogical, and Content Knowledge attitudes and beliefs, and performance on a Technology Applications and Competencies assessment. The rationale for this study is the need to understand how a new mode of PD (i.e., MPD) and taxonomic rigor influences teachers' attitudes and beliefs towards technology and performance on a knowledge and skill performance assessment. This quantitative study used a modified experimental design to randomly assign 40 in-service teachers to one of three taxonomic treatment conditions. 29 participants yielded complete data. Participants began with a pretest measuring TPACK attitudes and beliefs and knowledge and skills on technology applications, completed the MPD, and completed with taking a posttest. Using an analysis of covariance, this research found increased mild gains in competency and dispositional scores. However, there was no statistical significance in participant gains across the three treatment conditions. Furthermore, the participants contributed to several additional items in their assigned conditions and admitted to the acquired skills in being able to integrate technology into their lessons as a way to express their creativity and heighten their interest in the subject matter. This research contributes to the literature on assessing PD, design issues in MPD, and assessment outcomes of MPD."

4. Recent TPACK Presentations

Graziano, K., & Persiani, K. (2015, January). *Photovoice and TPACK: Using documentary photography and storytelling in teacher education.* Paper presented at the Hawaii International Conference on Education, Honolulu, HI.

Abstract: "This presentation will discuss photovoice, the use of documentary photography and storytelling, as a strategy for developing Technological Pedagogical Content Knowledge (TPACK) in teacher education. The presenters will provide an overview of photovoice and discuss its theoretical underpinnings, including its strengths and weaknesses as a research methodology and teaching strategy. This session will display photographs and stories from two photovoice studies and discuss how photovoice aligns with TPACK. These studies include using photovoice with preservice teachers from Nevada State College and English language learners from an urban elementary school in the Southwest and using photovoice with preservice teachers enrolled in a culture and inclusion course and a social studies methods course from California State University, Los Angeles."

Herring, M., Smaldino, S., Graziano, K., Carpenter, J., & DeBacker, T. (2015, October). *Assessing transformational leadership qualities to develop TPACK-ready teacher candidates.* Paper presented at the American Association of Colleges for Teacher Education (AACTE) 67th Annual Meeting, Atlanta, GA. Abstract retrieved from http://issuu.com/aactehq/docs/aacte-67th-annual-meeting-program-b/95

Abstract: "The AACTE Innovation and Technology committee, in collaboration with college deans, presents a change process, formative assessment tool, and case studies addressing changing school culture and practices to ensure that teacher candidates are ready to grow as TPACK-proficient teachers."

Jordan, K., Dinh, H. & Elsden-Clifton, J. (2015). Measuring TPACK in Vietnam: Issues still remain. In S. Carliner, C. Fulford & N. Ostashewski (Eds.), *Proceedings of EdMedia: World Conference on Educational Media and Technology 2015* (pp. 971-976). Waynesville, NC: Association for the Advancement of Computing in Education (AACE). Abstract retrieved from http://www.editlib.org/p/151493/

Abstract: "In recent times, there has been a lot of research interest in the TPACK framework particularly in the United States and Australia, which seeks to explain the knowledge that teachers need to integrate ICT into practice (Abbitt 2011). Measuring teacher TPACK knowledge has become one of the main areas of interest, however a number of theoretical issues around defining the constructs and how these constructs relate to one another have compounded research. This study seeks to contribute to this research by focusing on English as a Foreign Language (EFL) teachers' self-assessment of their TPACK at Hanoi University Vietnam. It also suggests that there are issues in measurement and that reconceptualization of the framework may be needed."

Ouyang, D. (2015). Exploring an experienced online instructor's applications of TPACK in a graduate-level online course through the online students' perspectives: Design of a qualitative case study. In S. Carliner, C. Fulford & N. Ostashewski (Eds.), *Proceedings of EdMedia: World Conference on Educational Media and Technology 2015* (pp. 504-512). Waynesville, NC: Association for the Advancement of Computing in Education (AACE). Abstract retrieved from http://www.editlib.org/p/151296/

Abstract: "This paper reported the design of a case study using qualitative methods - participant observation and online focus group interview to examine an experienced online instructor's applications of Technological Pedagogical Content Knowledge (TPACK) in a graduate-level online course. Firstly, this paper described the evolvement of TPACK in which this study was grounded, and presented a review of relevant literature focused on addressing practical issues of TPACK measurement and teachers' professional development. In addition, this paper proposed an initial design of a qualitative case study to examine an experienced online instructor's applications of TPACK in an online course. The research design included research questions, rationale for the choice of the setting and participants, research procedure design, data collection design, analysis strategies, and validity and reliability. Finally, the article concluded with limitations, future research, and implications of this case study."

Sheffield, R., Dobozy, E., Gibson, D., Mullaney, J., & Campbell, C. (2014, October). *Teacher education students using TPACK in science: A case study.* Paper presented at the 64th International Council for Educational Media Conference, Eger, Hungary. Abstract retrieved from http://espace.library.curtin.edu.au:80/R?func=dbin-jump-full&local_base=gen01-era02&object_id=228196

Abstract: "Teacher education is in the grip of change. Due to the new Australian Curriculum no longer is it possible to plan and implement lessons without considering the inclusion of Information and Communication Technologies (ICTs). Simply knowing about the latest technology gadgets is not enough. Information literacy is essential in today's information rich learning and working environment. Students and teachers must be able to engage with diverse learning technologies efficiently and effectively in the search for the 'right information' at the 'right time' for the 'right purpose' (Delors, 2010). Key information literacy and inquiry skills have been recognised as vital learning goals by the Australian Curriculum Assessment and Reporting Authority (2011) and the International Society for Technology in Education (ISTE) (2008) and are thus critical in science teacher education. This paper examines the overlap of technology, pedagogy and science content in the TPACK framework (Mishra, Koehler, 2006) and its affordances for science educators, at the intersection between technology knowledge, science pedagogy (information literacy and inquiry) and science content knowledge. Following an introduction of the TPACK framework for science education, the paper reports the research findings, which illustrate that 90% of pre-service teachers thought the experimental unit improved their understanding of the inquiry process, 88% reported more confidence in their understanding of science concepts and 94% of students reported an increase in their knowledge and confidence of Web 2.0 tools in supporting scientific inquiry in science. The

implications of this study are that the online inquiry improved students' knowledge and confidence in the skills and processes associated with inquiry and in science concepts."

Slough, S. & Slough, P. (2015). 21st century pedagogical content knowledge. In S. Carliner, C. Fulford & N. Ostashewski (Eds.), *Proceedings of EdMedia: World Conference on Educational Media and Technology 2015* (pp. 1207-1214). Waynesville, NC: Association for the Advancement of Computing in Education (AACE). Abstract retrieved from http://www.editlib.org/p/151382/

Abstract: "Technological Pedagogical Content Knowledge (TPACK) is a theoretical framework that has enjoyed widespread applications as it applies to the integration of technology in the teaching and learning process. This paper reviews the background for TPACK, discusses some of its limitations, and reviews and introduces a new theoretical framework, 21st Century Pedagogical Content Knowledge (21st Century PCK), to clarify the discourse surrounding teaching and learning with technology."

5. Request for TPACK-Related Research Participation

"The American Association of Colleges for Teacher Education's (AACTE) Innovation & Technology Committee seeks participants to pilot a recently developed formative diagnostic tool designed for self-reflection and guidance for educational leaders as they develop technology rich models for teacher candidates to successfully become 21st century educators. The diagnostic tool serves as an opportunity to examine current practices and help develop realistic goals for program development. The diagnostic tool utilizes the Technological Pedagogical and Content Knowledge (TPACK) framework to further the development of TPACK proficient teacher candidates.

The purpose of the case study is to examine how the diagnostic tool assists educational leaders with a TPACK-based initiative, to examine the educational leaders' perceptions of the use of the diagnostic tool, and to describe future plans for the tool at respective institutions. Your participation in this study should be no more than one hour, which will consist of a telephone interview. If you have a TPACK project or initiative underway and would like to participate in the study, please complete a brief application" that is linked on this Web page: http://edprepmatters.net/2015/09/participants-needed-for-tpack-diagnostic-tool-case-study/."

Kevin Graziano
Professor in the School of Education at Nevada State College
Chair of AACTE's Committee on Innovation and Technology

6. Call for TPACK-related Manuscripts: Special Issue of the *Journal of Computers in Education*
(http://www.springer.com/education+%26+language?SGWID=0-40406-6-1479543-0)

"The emergence of the current technology-driven world has raised many challenges to didactic teaching and learning in traditional classrooms. The notion of 21st century learning can be viewed as an overarching vision of education that many educators are now advocating. Key dimensions of learning practices promoted by various 21st century learning models include collaborative learning, use of ICT as tools for knowledge construction and co-construction, critical and creative thinking and authentic problem solving (Dede, 2010; Howland, Jonassen, & Marra, 2012; Voogt & Roblin, 2012). Beyond these practices, some models are also concerned with citizenship education. Despite the consensus that has developed, schools however have not changed as desired (Voogt, Knezek, Cox, Knezek, & ten Brummelhuis, 2011).

Teacher learning and professional development has always been the key enabling factor for transformation in education to happen. To develop teachers' competencies for 21st century teaching and learning, many aspects have to be looked into. These include teachers' knowledge, beliefs and most recently their design capacities (Tsai & Chai, 2012) for creation of technological pedagogical content knowledge (TPACK) (Chai, Koh, & Tsai, 2013). Teachers' learning and professional development involve teachers in transforming their knowledge into practice for the benefit of their students' growth (Avalos, 2011). It has been advocated that teacher professional learning communities are a viable way for teachers to experience co-constructing knowledge to experience the transformative change needed (Kong & Song, 2013).

This special issue invites interested researchers to submit papers pertaining to teachers' learning and development for 21st century oriented education. The following themes are suggested:

1. Teachers' or educators' understanding and development of TPACK
2. Change in teachers' identity, beliefs and/or practices in association with 21st century education
3. Research effort in teachers' perspective of technology-enhanced 21st century classrooms

Paper Submission

Authors should prepare manuscripts using the instructions for authors on the website of the Journal of Computers in Education (http://www.springer.com/education+%26+language/learning+%26+instruction/journal/40692)

Manuscripts should contain no more than 7000 words. Papers submitted for this special issue must not be submitted or are under consideration for publication anywhere. Manuscripts should be submitted using the online submission system (https://www.editorialmanager.com/jlce/). All papers will be peer reviewed based on quality, originality, organization and clarity of writing, and evidence provided for assertions and conclusions.

Important Dates

- Full paper submission deadline: 31 December 2015
- Review decision: 31 March 2016

• Final version submission: 30 April 2016

Guest Editors

Prof. Kong Siu Cheung – sckong@ied.edu.hk
Professor, Department of Mathematics and Information Technology, Hong Kong Institute of Education, Hong Kong

Dr. Ching Sing Chai – chingsing.chai@nie.edu.sg
Associate Professor, National Institute of Education, Nanyang Technological University, Singapore"

7. 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, October 26). TPACK newsletter issue #25: October 2015 [Electronic mailing list message]. Retrieved from http://www.matt-koehler.com/tpack/tpack-newsletters/

8. 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,	Chair, SLO Expertise Center, National Curriculum Development
Josh Rosenberg,	Associate 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
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Punya Mishra,	Recliner, Michigan State University