TPACK Newsletter, Issue #13: December 2012

Welcome to the thirteenth edition of the (approximately quarterly) TPACK Newsletter! TPACK work is continuing worldwide, and is appearing in an increasing diversity of publication, conference, and professional development venues. This document contains recent updates to that work that we hope will be interesting and useful to you, our subscribers.

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

Gratuitous Quote About Technology

"It is the framework which changes with each new technology and not just the picture within the frame."
- Marshall McLuhan

In This Issue

1. TPACK Newsletter Update

The TPACK newsletter currently has 1215 subscribers. This represents a 2% increase during the last 14 months. Next month, the newsletter will be three years old.

2. Recent TPACK Publications

Below are recent TPACK publications that we know about: 10 articles and 1 book. If you know of others that were published within the past several months, please let us know (tpack.news.editors@wm.edu).

Articles

Abdelaziz, H. A. (2012). D^4S^4: A four dimensions instructional strategy for web-based and blended learning. *Turkish Online Journal of Distance Education (TOJDE)*, *13*(4), 220-235.

Abstract:
"Web-based education is facing a paradigm shift under the rapid development of information and communication technology. The new paradigm of learning requires special techniques of course design, special instructional models, and special methods of evaluation. This paper investigates the effectiveness of an adaptive instructional strategy for teaching and learning through the Web and blended learning environments. The central theme of this strategy is that instructional strategies give instructors and students a conceptual as well as a practical mode of delivery from which to teach and learn. Considering and applying new instructional strategy can help instructors to understand the uses of pedagogical content knowledge, as well as to reflect the role of technological content knowledge that can be adapted and/or adopted in teaching in all educational levels and environments. The main objective of this paper was to develop a holonomic instructional strategy for Web-based and blended learning. This strategy is guided by the non-linear and interactive features of learning environments. The strategy is consisted of four dimensions: designing, developing, delving and distributing. In this new instructional strategy, learning is holonomic and adaptive. Learning occurs in an open learning environment, in which instructors are designing a shared vision, developing a sharable e-learning task, delving students' learning through scaffolding and salvaging students' knowledge. The expected outcome of this instructional strategy is that each learner will develop a cognitive schema to be used to organize and construct knowledge and meaning in similar context of learning which may increase the generalizability, trustworthiness and transferability of learning. The results of applying this new strategy showed that this strategy is effective on developing both achievement and deep learning levels among a sample of graduate students."

An, Y-J., & Reigeluth, C. (2011-2012). Creating technology-enhanced, learner-centered classrooms: K-12 teachers' beliefs, perceptions, barriers, and support needs. *Journal of Digital Learning in Teacher Education, 28*(2), 54-62.

Abstract:
"Although a wealth of literature discusses the factors that affect technology integration in general and how to improve professional development efforts, few studies have examined issues related to learner-centered technology integration. Thus, this study aims to explore K-12 teachers' beliefs, perceptions, barriers, and support needs in the context of creating technology-enhanced, leaner-centered classrooms. The researcher

used an online survey to collect data, and 126 teachers participated in the survey. The findings of this study provide practical insights into how to support teachers in creating technology-enhanced, learner-centered classrooms. This article discusses the implications for professional development and the need for paradigm change."

Bodzin, A., Peffer, T. & Kulo, V. (2012). The efficacy of educative curriculum materials to support geospatial science pedagogical content knowledge. *Journal of Technology and Teacher Education, 20*(4), 361-386. Retrieved from http://www.editlib.org/p/40422.

Abstract:
"Teaching and learning about geospatial aspects of energy resource issues requires that science teachers apply effective science pedagogical approaches to implement geospatial technologies into classroom instruction. To address this need, we designed educative curriculum materials as an integral part of a comprehensive middle school energy resources science curriculum. We examined teachers' perceived impact of the curriculum materials to support their pedagogical content knowledge related to teaching science with geospatial technologies. Results indicated that the educative curriculum materials supported science teachers' professional growth related to their geospatial science pedagogical content knowledge during the curriculum enactment. The role of educative curriculum materials in science curriculum reform efforts is discussed."

Hosseini, Z., & Kamal, A. (2012). Developing an instrument to measure perceived technology integration in teaching. *International Magazine on Advances in Computer Science and Telecommunications, 3*(1), pp. 78-89.

Abstract:
"Many studies have highlighted the huge difference between having technology skills and effectively using technology for teaching. However, evaluating teachers' knowledge for the effective use of technology in their teaching seems a complex task. Accordingly, this paper aims to develop an instrument to aid investigators and educators in measuring and researching the knowledge of teachers for integration of technology in teaching. Based on a review of the literature, TPCK framework was selected as the lens for examining technology integration and a new questionnaire was built upon the work of Schmdit [*sic*] and colleagues (2009). According to their suggestion, the questionnaire was adapted by adding new items and changing some existing items in different areas to strengthen the instrument's validity. Consequently, the initial questionnaire in Persian language included 53 items thought to be important for measuring the perceived knowledge of technology integration. These 53 items were allocated to seven categories corresponding to the components of TPCK. A sample of 236 pre-service teachers containing five groups from different instructional fields rated these items and generated a 50-item final version of the instrument. With regard to the reliability of the instrument, the Cronbach alpha value was found to be .895. The alpha reliability coefficient for each scale ranged from .851 to .906 indicating that the questionnaire had a good internal consistency. In addition, analysis using Pearson's correlation coefficient showed a significant correlation between the components of TPCK. Overall, the findings

provided strong support for the reliability and validity of the TPCK questionnaire for measuring teachers' knowledge for integration of technology in teaching."

Hosseini, Z., & Tee, M. Y. (2012). Conditions influencing development of teachers' knowledge for technology integration in teaching. *International Magazine on Advances in Computer Science and Telecommunications, 3*(1), pp. 91-101.

Abstract:
"In spite of the availability and accessibility of computers in almost every school, college and university, computer technology is still not being utilized to its full potential. It seems that teachers still do not have adequate knowledge about using technologies for instructional purposes. Accordingly, a qualitative case study research was conducted to determine the conditions that influence the development of teachers' knowledge for integrating technology in teaching. For this purpose, 30 pre-service teachers participated in a course to learn integration of technology in teaching; the course was designed and led by a constructivist instructor. In this context, Technological Pedagogical Content Knowledge (TPCK) framework was selected to investigate and evaluate the knowledge of the teacher for integrating technology in teaching. The data were collected through classroom observations, interviews and documents during the course. As a result of the study, the conditions which influenced the development of teachers' knowledge for technology integration were identified and categorized into individual, socio-cultural, and situational conditions. Individual conditions included factors related to the personality of the participants such as their motivation, needs, and also their prior knowledge and experiences in different areas. Socio-cultural conditions included constitution of the group, cultural behavior of the participants which influence the development of participants' TPCK. Situational conditions included quality of the computers and resources in the computer lab which influenced developing teachers TPCK."

Linton, J. N. (2012). TPACK as a framework for collaborative inquiry in the learning commons. *Teacher Librarian*, *39*(6), 25-29.

Abstract:
"The roles of library and teacher librarian are evolving as schools are faced with new technology and the challenges that accompany attempts to integrate technology effectively. This article explores the changing library and the unique role of the teacher librarian, who is in a position to support both students and teachers in new ways. I propose the TPACK (technological, pedagogical, and content knowledge) model as a framework to guide librarians and teachers in this new work and describe implications for schools and libraries based on the TPACK framework as a model for collaborative inquiry."

Lu, L., & Lei, J. (2012). Using live dual modeling to help preservice teachers develop TPACK. *Journal of Digital Learning in Teacher Education*, *29*(1), 14-22.

Abstract:
“To help preservice teachers learn about teaching with technology – specifically, technological pedagogical content knowledge (TPACK) – the researchers designed and implemented a Live Dual Modeling strategy involving both live behavior modeling and cognitive modeling in this study. Using qualitative research methods, the researchers investigated whether Live Dual Modeling was effective in helping preservice teachers develop TPACK in a technology integration course. The findings showed that the preservice teachers demonstrated the initial ability to transfer what they learned in the modeling to classroom teaching. When Live Dual Modeling is used, attention should be paid to the conditions that influence the effectiveness of the strategy due to the preservice teachers’ limitation in their overall knowledge base, practical experience, and ability to transfer learning to other contexts.”

Magana, A. J., Brophy, S. P., & Bodner, G. M. (2012). Student views of engineering professors’ technological pedagogical content knowledge for integrating computational simulation tools in nanoscale science and engineering. *International Journal of Engineering Education*, *28*(5), 1033-1045.

Abstract:
“The ability to explore the physical world at the nanoscale has opened up an affluence of technological advances with the potential to improve human life. Further, it has been complemented with significant advances in simulation-based engineering and science (SBE&S). Having become a crucial part of the present infrastructure, SBE&S is central to the application of advances in the conductance of scientific research and engineering practices. These facts clearly signify the need to integrate the use of computational simulation' tools in 21st century engineering education curricula as one way to bridge the gap between school engineering and work engineering. The guiding research questions for this study are: (a) What technological pedagogical content knowledge do professors have for incorporating computational simulation tools to convey nanoscale science and engineering-related concepts and practices? and (b) How do students react to an instructor's technological pedagogical content knowledge with computational simulation tools? This study coupled the methodological framework of a case study with the theoretical framework of TPCK. Open-ended interviews, classroom observations, and document analyses were conducted with six engineering professors teaching undergraduate and graduate courses related to nanoscale science and engineering. Thirty-three students of these courses were also interviewed. Analyses present detailed descriptions of how instructors integrated computational simulation tools to support the learning of nanoscale-related concepts. Findings revealed that computational simulations were perceived by students as effective learning tools. Also revealed was that students continued to confront difficulties when interacting with these tools. Implications for education and educational research in engineering relate to the development, the research and implementation scaffolds, and the transparency at the physical/conceptual, mathematical, and computational levels to understand and then overcome student difficulties in learning with computational simulation tools.”

Schmidt-Crawford, D. A., Thompson, A. D., & Lindstrom, D. (2012). Mobile technology: Challenges and opportunities for teacher education. *Journal of Digital Learning in Teacher Education*, *29*(1), 3.

Abstract:
"It is evident that mobile technology is gaining speed in education and is something that we, as teacher educators, should be addressing in our own preparation programs. Specifically, how are we using these devices in teacher education to inform and shape the preparation of a new generation of teachers?"

Young, J. R., Young, J. L., & Shaker, Z. (2012). Technological pedagogical content knowledge (TPACK) literature using confidence intervals. *Techtrends: Linking Research & Practice to Improve Learning*, *56*(5), 25-33. doi:10.1007/s11528-012-0600-6

Abstract:
"The validity and reliability of Technological Pedagogical Content Knowledge (TPACK) as a framework to measure the extent to which teachers can teach with technology hinges on the ability to aggregate results across empirical studies. The results of data collected using the survey of pre-service teacher knowledge of teaching with technology (TKTT) were synthesized using confidence intervals (CIs). Mean pre-service teacher TPACK point estimates were characterized by graphing CIs across studies from 2009 until 2011. The results present approximations of TPACK population parameters and implications for researchers and teacher educators."

Book

Law, N., Yuen, A., & Fox, R. (2011). *Educational innovations beyond technology: Nurturing leadership and establishing learning organizations.* New York, NY: Springer Science + Business Media.

Review:
Somekh, B. (2012, October 29). Educational innovations beyond technology: nurturing leadership and establishing learning organizations. [Review of the book *Educational innovations beyond technology: Nurturing leadership and establishing learning organizations,* by N. Law, A. Yuen, & R. Fox]*. Journal of Computer Assisted Learning, 28*(6), 585-586. Retrieved from http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2729.2011.00471.x/abstract

"The analysis also shows, in terms of Koehler and Mishra's (2005) adaptation of Shulman's categories, that to accommodate the changes in students' roles and their own roles, teachers needed to develop not just technology content knowledge and technology pedagogic content knowledge (TKC and TPKC) [*sic*] but also new pedagogical knowledge (PK), new content knowledge (CK) and new pedagogical content knowledge (PCK). ICT-using pedagogical innovation is a complex and demanding process and more work is needed by other researchers to deepen our understanding of the knowledge demands it places on teachers."

3. Recent TPACK Presentations

Bunyamin, M. A. H., & Phang, F. A. (2012). Technological pedagogical and content knowledge among undergraduate education degree students at Universiti Teknologi Malaysia. In Y. M. Yusof, & F. A. Phang (Eds.), *Procedia – Social and Behavioral Sciences: Vol. 56. International Conference on Teaching and Learning in Higher Education in conjunction with Regional Conference on Engineering Education and Research in Higher Education* (pp. 432-440). doi: 10.1016/j.sbspro.2012.09.673

Abstract:
"This study aims to identify technological pedagogical and content knowledge (TPACK) among undergraduate physics education degree students at Universiti Teknologi Malaysia (UTM). A paper-and-pencil test was used to collect data on their conceptual understanding of Archimedes' principle. They were also requested to write a teaching lesson plan for the topic of Archimedes' principle. The data gathered was analyzed qualitatively using content analysis. The finding indicates that, these respondents possessed many alternative conceptions in the buoyancy concept and more interestingly, those who have not undergone the Teaching Practice (TP) demonstrated more alternative conceptions compared to those who have. Moreover, those who have undergone TP tended to use question-and-answer method to deliver this topic."

Jamieson-Proctor, R., Finger, G., Albion, P., Bond, T., Cavanagh, R., Fitzgerald, R….Heck, D. (2012, October). *Teaching teachers for the future (TTF) project: Development of the TTF TPACK survey instrument.* Paper presented at the meeting of the Australian Computers in Education Conference, South Perth, Australia. Abstract retrieved from http://acec2012.acce.edu.au/teaching-teachers-future-ttf-project-development-ttf-tpack-survey-instrument

Abstract:
"A major outcome of the national Teaching Teachers for the Future (TTF) Project was the development of a survey instrument to evaluate the Technological Pedagogical Content Knowledge (TPACK) of pre-service teachers. The TTF Project aimed to enhance preservice teachers' TPACK across all Australian Higher Education Institutions (HEI) which provide initial teacher education programs, with specific focus on four Australian Curriculum areas (Mathematics, Science, English and History) and positioned within the context of the emerging implementation of National Professional Standards for Teachers (AITSL, 2011). The TTF TPACK Survey developed for the TTF Project was informed by TPACK instruments developed elsewhere and earlier work on the measurement of ICT integration in classrooms (Albion, Jamieson-Proctor & Finger, 2010; Jamieson-Proctor & Finger, 2009; Jamieson-Proctor, Watson, Finger, Grimbeek & Burnett, 2007). Guided by the TTF Research and Evaluation Working Group, the TTF TPACK Survey incorporated additional items to extend the precursor TPACK Confidence Survey (TCS) to meet the needs of the TTF project. The data collected were subject to a battery of complementary analysis techniques using both the pre

(N=12881) and post (N=5809) data sets. Four scales were investigated and confirmed as reliable: (1) Confidence - teacher items; (2) Usefulness - teacher items; (3) Confidence - student items; and (4) Usefulness - student items. This paper describes the conceptual development and psychometric properties of the TTF TPACK Survey administered in 2011."

Myers, O., & Wilson, J. N. (2012, October). *Collaborative planning through a TPACK lens.* Conference presentation at the meeting of the North Carolina School Library Media Association, Winston-Salem, NC.

Abstract:
"Technology integration has been an instructional goal since the placement of personal computers in schools. Collaborative planning is an essential component of the IMPACT Model that facilitates integration of information and technology in to instruction. Collaborative planning includes teachers, school library media professionals and instructional technology facilitators." (Additional resources available from http://ites.ncdpi.wikispaces.net/Collaborative+Planning+with+TPack)

Vroom, J.J. (Producer). (2012, November 20). *Masterclass TPACK* [Online slideshow]. Retrieved from http://prezi.com/vzhft5c1scen/masterclass-tpack/?auth_key=d31f88b9fc966a09d32973059548160e6e4cdd64

Abstract:
(This is a Dutch language Prezi presentation created to explain TPACK.)

4. Recent TPACK-Related Dissertations

WOW – Fifteen new TPACK-based dissertations published in just three months!

Alshehri, K. A. (2012). The influence of mathematics teachers' knowledge in technology, pedagogy and content (TPACK) on their teaching effectiveness in Saudi public schools. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 74*(02), 3541570.

Abstract:
"Many researchers including (Hill et al., 2008; McCray & Chen, 2012) have found that teachers' understanding of the mathematics content knowledge and their expertise in teaching methods "pedagogy" are largely responsible for how effective they are as teachers. More recent research (Lyublinskaya & Tournaki, 2012; Polly, 2011) suggests that teachers' ability to integrate technology into their teaching is also critical to their mathematics teaching effectiveness. This study investigated the validity of these assumptions for 7-12 grade mathematics teachers in Saudi Arabia and how their expertise in Technological Pedagogical And Content Knowledge (TPACK) influences their teaching effectiveness.

The central question for grade 7-12 Saudi Arabian mathematics teachers is: Does expertise in technology integration, pedagogy and content relate to teaching effectiveness? The TPACK expertise of 347 secondary male mathematics teachers in Riyadh public schools was measured by self-evaluation questionnaires. Principals from 109 schools rated their teachers by using a 14 item "Teacher Effectiveness" survey. Descriptive statistics, bivariate correlations, ANOVA, Paired-Samples t-test and MANOVA were used to evaluate the relationship between the teachers' TPACK knowledge and teaching effectiveness. Results showed that teachers evaluated their TPACK at a high level. On the TPACK 1-5 Likert scale survey (5 = highly competent), the teachers rated their general mathematics content knowledge (CK) at M=3.7 (SD=.67), their general pedagogy knowledge (PK) at M=4.1 (SD =.55), their general technology knowledge (TK) at M=3.6 (SD=.70), their pedagogical knowledge within mathematics content (PCK) at M=4 (SD =.60), their technological knowledge within mathematics content (TCK) at M=3.7 (SD=.69), their technological knowledge within pedagogical knowledge (TPK) at M=3.6 (SD=.74), their technological pedagogical and content knowledge at M=3.7 (SD=.71), and their cumulative knowledge of technology, pedagogy and content at M=3.8 (SD=.52). The teachers also rated their professional preparation to integrate technology. They reported that their university courses prepared them to integrate digital technologies (M=3.51, SD=.88) better than professional development workshop and training (M=3.07, SD=1.7); t(346)= 8.17, p<.01. Principals rated the overall effectiveness of their teachers at M=3.11 (SD=.59) on the 14 item scale and their usage of technology at M=2.84 (SD=1.06).

Correlations between mathematics teachers' 7 TPACK self-efficacy and the principals' rating of teacher effectiveness were not significantly different. Negative correlations were found between principals' ratings of teaching effectiveness and the teachers' evaluation of their professional preparedness in university courses (r=-.125, p<.05) and professional development training programs (r=-.129, p<.05). This discrepancy may point to differences between the way these principals and the higher education institutions value teacher preparation curriculum. Further studies may consider comparing teachers' TPACK self-efficacy to student achievement."

Anderson, B. A. (2012). Testing the effectiveness of professional development for integrating technology in an urban Iowa middle school. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 74*(03), 3532953.

Abstract:
"The purpose of this quantitative one-group pretest-posttest design study was to test the effectiveness of professional development for integrating technology in the curriculum of an urban Iowa middle school. Iowa middle school teachers are expected to integrate technology, to comply with Iowa Core Curriculum standards, by 2014. The participants were 30 teachers who had not been assigned to other mandatory professional development during the time allotted for the professional development for this study. Participants completed the Technological Pedagogical and Content Knowledge (TPACK) survey as a pretest and posttest to assess their technological knowledge (TK), technological and pedagogical knowledge (TPK), technological and content knowledge

(TCK), and technological pedagogical and content knowledge (TPACK). A one-tailed paired t-test indicated significant differences between the means of the pretest and posttest responses for all the TPACK constructs as indicated by the following: a) TK p =.0001; b) TCK p =.0001; TPK p =.0002; and TPACK p =.0001. The effect size, as determined by Cohen's d, ranged from high (.84) for TPACK to medium (.42) for TK. The TPACK framework was the basis for the professional development sessions designed to help teachers in determining best practices for integrating technology in the curriculum. Each participant created a technology-enhanced lesson as a part of their professional development. The open-ended TPACK survey question was used to ascertain if teachers or students were the primary users of technology and whether it was being used for general purposes or for learning the content. Answers were sorted in categories of general/student usage, general/instructor usage, content-specific/student usage, and content-specific/instructor usage. A McNemar's chi square test revealed a significant increase in reported content-specific/student usage on the posttest (p =.016). Data gathered using the International Society for Technology in Education's (ISTE) classroom observation tool (icot) substantiated these findings. A Wilcoxon signed ranks test indicated overall student technology use (mdn =30) was greater than overall teacher technology use during the 50 minute classroom observations (mdn =6.0, z =2.37, p <.05, r =.60. A second Wilcoxon test showed student technology for learning content (mdn =24) was greater than teacher technology use for learning content during the classroom observations (mdn =6.0, z =2.01, p <.05, r =.61. Critical reflection about the implemented technology-enhanced lessons, as indicated by responses of a majority of interviewed teachers, shows an application of TPACK framework constructs. The quantitative data suggests significant increases in all TPACK constructs following the intervention. The observation and interview presented converging data for the self-reported TPACK survey data. However no pretest data were gathered for the observations or interviews. A larger random sample of teachers in all subject areas and adding the observation and interview data as pretests would strengthen the findings."

Benson, T. K. (2012). A post-intentional phenomenological case study of pedagogical awareness of technology integration into secondary science teaching. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 74*(02), 3540869.

Abstract:
"Pre-service teachers continue to matriculate through content and methods courses without sufficient attention to how these disciplines merge in the practice of teaching with technology. Consequently, a disconnect exists between learning what to teach and the act of teaching with technology. In order to develop this proficiency, Niess (2005) and others (Beck and Wynn, 1998; Becker, 2001; Duhaney, 2001; Flick and Bell, 2000) suggest investigating the pedagogical decisions that teachers make and how technology integration must inform those decisions. Using Vagle's (2010) post-intentional phenomenological approach, this study examined the practice of two pre-service science teachers and the tentative manifestations of their pedagogical awareness of technology integration in secondary science student teaching. This study

investigated the what, how and why surrounding the pedagogical decisions with technology and how these pre-service teachers came to understand the impacts to their teaching. Additionally, this study examined the challenges that existed in identifying the participants' pedagogical awareness of technology integration into teaching. Utilizing Mishra & Koehler's (2006) framework of technological pedagogical content knowledge (TCPK), the participants provided insight into their perception of how their TPCK changed throughout student teaching through observed lessons, interviews and the reflexive phenomenological practice of bridling. Single-case and cross-case analysis indicated that the participants perceived a deeper understanding in their TPCK, greater student engagement through student-centered technology integration and greater comfort levels with technology integration in their teaching. This study also indicated existent challenges in how pre-service teachers decipher their own pedagogical awareness from that of their cooperating teachers. These results have implications for science teacher preparation, cooperating teachers and student teaching supervisors as these constituents conglomerate into more effective science teacher preparation. Situating pre-service teachers in the reflexive practice of bridling provides both time and space to investigate their pedagogical understandings that inform the practice of teaching."

Bilici, S. C. (2012). *The pre-service science teachers' technological pedagogical content knowledge and their self-efficacy* (Doctoral dissertation, Aksaray University, Aksaray, Turkey). Retrieved from http://www.esera.org/phd-studies/turkey/sedef-canbazoglu-bilici/

Abstract:
"The main purpose of this study was to evaluate pre-service science teachers' technological pedagogical content knowledge (TPACK) and the self-efficacy toward TPACK throughout one academic year. Using a mixed-methods research design, this study was carried out with senior pre-service science teachers within the 2010-2011 academic year. The TPACK model used in this research was adapted from Magnusson, Krajcik and Borko's (1999) PCK model. At the beginning of the fall semester, 27 pre-service science teachers participated in a 5-week training program that was designed in accordance with the TPACK components. For the following eight weeks, pre-service science teachers prepared technology enriched lesson plans related to various science topics, and completed microteaching. In the spring semester, six pre-service teachers were selected from a pool of 27 pre-service science teachers and observed in the middle school. The quantitative data were collected via TPACK survey, and three-tier heat and temperature test. The qualitative data were collected via pre-service teacher information form, interview form, focus group interview form, methods of teaching science II course practices evaluation form, school experience performance self-evaluation form, TPACK evaluation form toward heat-temperature concepts, TPACK and classroom images evaluation form, videotape records, blog comments, lesson plans and materials. Using the Statistical Package for the Social Sciences (SPSS) 11.5, the data was analyzed by descriptive statistics obtained from the quantitative data. Qualitative data was analyzed by the NVivo 9.0 package program employing descriptive analysis, content analysis, and constant comparison method. When the findings

obtained from fall semester are examined within the TPACK components, it was shown that pre-service science teachers' knowledge of technology integrated science and technology curriculum were completely adequate, and their knowledge of orientations toward science teaching with technology are somewhat adequate. Through two semesters, six pre-service science teachers' TPACK level was compared in terms of TPACK components. These results showed that pre-service teachers' knowledge of using technological tools for helping students to learn a specific science topic increased during the spring semester. When 27 pre-service science teachers' self-efficacy level toward TPACK was evaluated, it was found that their level increased at the end of fall semester (when compared to the beginning of that semester). On the contrary, a statistically significant difference was not found between the self-efficacy level at the end of the fall semester and at the end of the spring semester."

Corey, R. C. (2012). Digital immigrants teaching digital natives: A phenomenological study of higher education faculty perspectives on technology integration with English core content. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 73*(08), 3505264.

Abstract:
"In the last two decades, technology use has escalated and educators grapple with its advances and integration into the classroom. Issues surrounding what constitutes a literate society, the clarion calls for educational reform emanating from US presidents to parent teacher organizations, and educators' ability to cope with advances in technology in the classroom demand attention. Therefore, the purpose of this qualitative study was to explore and understand the professional and educational experiences of six English faculty members teaching undergraduate courses at Midwest universities. Using the framework of Technological Pedagogical Content Knowledge - TPACK (Koehler and Mishra 2008), the major focus of the study was to determine how faculty members understood what characterized the nature of teaching with technology in undergraduate classrooms.

Results of this study revealed five themes showing how the participants were introduced to technology, how they assimilated it into their pedagogy, and how they integrated it into teaching practice. This study has the potential to impact the nature of illustrating the methods and techniques used by the six participants as they merge technology, pedagogy, and content knowledge and set in motion classroom practices that assist faculty at all levels to develop and teach technology skills necessary for the 21 st century and to better prepare students for thinking critically about how to use digital advances."

Easter, T. N. (2012). Preparing pre-service teachers and technology literacy. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 74*(02), 3541207.

Abstract:
“Over the last thirty years, policy makers and education reformers have expressed the need for integrating technology into K-12 education. Policies developed by current legislation and accreditation organizations dictate that pre-service teachers need to be technology literate. However, there is no conclusive research on the most effective method of providing technology literacy skills. This study used a descriptive case study design to take an in depth look at how an exemplary teacher education program teaches technology literacy using Mishra and Koehler's TPACK framework for incorporating technology instruction into teacher education programs (2006). The Educating Teachers Report: Educating School Teachers (Levine, 2006) has identified the top teacher preparation programs in the United States. Of these exemplary institutions, one School of Education was noted as an exemplary institution in the preparation of pre-service teachers in technology literacy. The data was gathered from interviews of faculty and graduate instructors, observations of content and technology courses, and document analysis of course syllabi. The data gathered was reviewed under the lens of the Technological Pedagogical Content Knowledge framework and compared and analyzed to determine if the program covered the ISTE National Education Technology Standards. The results of this study showed that technology is integrated throughout the program and is guided by the TPACK theoretical model. While methods of technology integration varied as to individual faculty, the underlying conclusion of the data is that the Teacher Preparation Program uses the TPACK framework and the ISTE NETS-T to prepare their pre-service teachers to effectively integrate and use technology. The findings of this study further the research for institutions to use as a model to act as a guide with recommendations for the pieces necessary to promote technology literacy in pre-service teachers.”

Gillow-Wiles, H. (2012). Engagement in a community of learners as a mediating agent toward the construction of Technological Pedagogical Content Knowledge (TPACK) in an online master's program. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 73*(05), 3493202.

Abstract:
“This study investigates how teachers develop and extend their understanding and knowledge of teaching and learning with digital technologies in a primarily online Master of Science program. The investigation focuses on exploring the relationship between developing an online community of learners and the construction of technological pedagogical and content knowledge (TPACK) during the online Master's program in mathematics education and science education. The purpose of this study was to explore rural elementary and middle school in-service teacher's perceptions of the relationship between their development of and participation in an online community of learners and the construction and extension of their TPACK. With a focus on engagement in an online community of learners, this study used a social-constructivist perspective transitioned to an online context as a framework for supporting the research. To shed light on the relationship in question, a general question was posed: How do teachers develop and extend their understanding and knowledge of teaching and learning with digital technologies (TPACK) in an online education experience? Three questions were used to guide this research: (1) What is the mediating effect of

engaging in an online community of practice during the program on the participants' perspectives of teaching and learning with integrating digital technologies? (2) How do the instructional strategies used in the program mediate the development and support of an online community of learners? (3) What are the participants' perspectives of the development of their understanding of teaching and learning with digital technologies as a result of their participation in the online educational experience?

Through a case-study analysis of interviews, classroom observation narratives, and online course artifacts, this study identified two primary mediating effects resulting from engagement in an online community of learners. The first effect was in providing the participants with tools and support for developing personal relationships where they were able to feel part of a meaningful community of learners. This learning community proved to be an essential environment and structure in which the participants shared aspects of themselves in ways that helped others connect with them as people, more than text on a screen.

The second effect was to provide an avenue for extended sense making discourse resulting in participants' individually building their TPACK. The online community of learners provided an environment and structure in which the participants were able to share ideas and understandings of the content and concepts presented in the online courses. These academically focused interactions were a necessary component in facilitating individual TPACK building.

An essential underlying element in both these effects was the importance of instructor monitoring and mediating of participant engagement in facilitating the formation and continued development of the online community of learners. Having the instructor act as a "vision keeper" throughout the entire program, where they monitored participant engagement and mediated these interactions to maintain an appropriate focus, was an essential component in initiating and continuing both socially and academically focused engagement behaviors. The findings identify the critical nature of developing and engaging in an online community of learners, facilitated through continued support by instructors, in developing TPACK in an inline educational experience."

Habowski, T. A. (2012). Improving technological pedagogical content knowledge development among pre-service science teachers. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 74*(02), 3540683.

Abstract:
"Many teacher education programs provide pre-service teachers with a limited field experience during the professional block semester prior to student teaching. These programs require few hours in the classroom, mainly composed of observations. Many teacher education programs contain a technology-integration methods course that is not subject-specific and mainly focuses on the use of various technologies, in the absence of content and pedagogy.

The purpose of this EPP was to examine a Professional Development School (PDS) Program with respect to technology integration among pre-service science teachers. This examination set out to measure differences in pre-service teachers' Technological Pedagogical Content Knowledge (TPACK) before and after the first-semester internship in the program, and utilized various data collection instruments in the process. The primary instrument used was a survey which provided quantitative data for measuring changes in TPACK among the interns throughout the first-semester internship. A set of open-ended questions on the survey provided descriptive details concerning models of TPACK observed and co-taught by the interns. Additionally, a focus group and a PDS conference provided descriptive data concerning observed models of technology, the impact of a subject-specific technology integration course, comparisons between the PDS and traditional teacher education programs, and insight into the comfort and success levels with using technology in the science classroom.

The survey responses, the focus group responses, and the PDS conference data all suggested that the increased time requirement, in conjunction with the required technology integration course, and the mentorship provided by a co-teaching model led to exposure to valuable models of technology, an increase in self-assessed TPACK, and a feeling of increased confidence as reported by the interns during the first-semester internship of the PDS Program."

Hineman, J. M. (2011). Double standards: Using teachers' perceptions to develop a standards-based technology integration method for social studies. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 74*(01), 3528366.

Abstract:
"This qualitative collective case study with an action research design identified teachers' perceptions of the use of technology in standards-based social studies education. Data were collected from semi-structured, one-on-one interviews conducted with a purposive sample of ten in-service social studies teachers from southwestern Pennsylvania. Study results indicated that participants believed state academic standards were necessary, used technology in the teaching of social studies, felt technology training needed to be improved, and believed that the use of technology is beneficial to students' learning of social studies content. The results of the study supported the development of a technology integration planning model and standards-based lesson template designed to support teachers participating in an interorganizational community of practice integrating technology into social studies pedagogy guided by state academic and national technology standards. As part of the development of this technology integration method, the researcher used the Technological Pedagogical Content Knowledge (TPACK) conceptual framework developed by Mishra and Koehler (2006). Use of the technology integration method proposed as a result of this action research recognizes and supports teachers' need to balance technology, pedagogy, and content in 21st century teaching and teacher professional development."

Matherson, L. H. (2012). A case study of how and if a professional development program builds teachers' TPACK model of instruction. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 74*(02), 3539995.

Abstract:
"The purpose of this case study was to examine the technology professional development experiences of three teachers, to explore their decisions regarding the classroom integration of technology, and to determine if the technology integration met the TPACK model of instruction. The case study design utilized guided interviews, observations, documents, and fieldnotes. From this process, the researcher was able to gain a greater understanding of the decisions made by the teachers regarding technology integration into their classroom curriculum and lessons. The findings of the study indicated that two of the three teachers integrated technology into their classroom lessons meeting a TPACK model of instruction. The discussion reveals the decisions the study participants made regarding the inclusion of technology, their perceptions of professional development, and why they did or did not meet the TPACK model of instruction."

McBroom, E. S. (2012). Teaching with dynamic geometry software: A multiple case study of teachers' technological pedagogical content knowledge. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 73*(12), 3524587.

Abstract:
"This qualitative case study investigated how four high school teachers developed and used their knowledge in teaching geometry with technology. In particular, this study focused on teachers' technological pedagogical content knowledge (TPACK) and their integration of dynamic geometry in the classroom instruction. The sources of data included: an initial interview, observations, documents, a closing interview, a survey, implementation questionnaires, professional development attendance records and the researcher's log. Data analysis utilized the TPACK Development Model to describe participants' dynamic geometry integration and to identify their TPACK development levels.

All participants displayed good knowledge of geometry content, although they did not always know how to connect it with their pedagogical and technological knowledge. TPACK development levels were identified through the descriptions of participants' TPACK development and enactment. The levels varied within the themes and their descriptors for each participant; however, overall TPACK development levels were identified for three participants--two at the adapting level and one at the exploring level. The TPACK levels for the fourth participant were consistent only for the teaching theme descriptors and were at the exploring level.

Three unexpected findings surfaced. First, the participant with least teaching experience displayed the highest levels of TPACK. Second, the participant with most teaching experience with dynamic geometry showed the most inconsistency among the TPACK

development levels, ranging from recognizing to exploring. Third, ongoing professional development and easy access to computers did not translate to frequent incorporation of dynamic geometry in teaching and learning. The participants claimed the curriculum and standardized testing to be the main barriers to increased technology use. Findings suggested that participants developed their TPACK through attending professional development workshops and implementing what they learned in the classroom instruction. Based on those findings, this study proposed a professional development model designed for teachers interested in integrating dynamic geometry in the classroom instruction."

Mishne, J. (2012). An investigation of the relationships between technology use and teachers' self-efficacy, knowledge and experience. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 73*(08), 3503821.

Abstract:
"Dramatic changes have occurred in the area of technology development and society's use of technology in daily life and the workplace. Yet in many classrooms, technology integration remains a significant challenge for educators, creating a digital disconnect that threatens to handicap students as they graduate and compete for jobs in the 21st century.

The purpose of this study was to examine whether teacher self-efficacy, teacher knowledge, and teaching experience influence levels of technology integration in the classroom. The research question asked was: How well do measures of self-efficacy, teacher knowledge and teaching experience predict teachers' scores on a state measure of classroom technology use? More specifically: (1) What is the relationship among self-reported teachers' self-efficacy, teacher knowledge, and teaching experience? (2) How well do they predict technology integration?

Based on the existing literature on the topic of teacher integration of technology into classroom instruction, the study hypothesized that these factors would play a significant role in predicting technology use. Research was conducted using four knowledge subscales in the form of surveys to quantify the existence and extent of these relationships.

The data were analyzed using descriptive statistics, a correlational matrix, and hierarchical regression. There were 44 usable surveys (N=44). This study yielded mixed results. While technology knowledge was proven to be a significant predictor of overall technology proficiency, teacher self-efficacy and teaching experience were not. Technological Pedagogical Content Knowledge (TPACK) variables were consistently a statistically significant predictor of all three dependent variables (Using Technology in the Classroom, Using Technology to Support Learning, and Overall Proficiency). The higher the teachers' TPACK scores, the more technology use and proficiency they reported."

Mudzimiri, R. (2012). A study of the development of Technological Pedagogical Content Knowledge (TPACK) in pre-service secondary mathematics teachers. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 74*(01), 3523442.

Abstract:
"The Technological Pedagogical Content Knowledge (TPACK) framework is a relatively new construct that offers a useful perspective from which to understand the development of pre-service teachers' abilities in teaching with technology. It is grounded in the understanding that if teachers are to effectively integrate technology into their instruction, they need to integrate their knowledge of content, pedagogy and technology, instead of viewing these components as separate entities. Current efforts to develop TPACK in pre-service teachers have tended to focus on experiences in either a methods course or an educational technology course. It is admittedly difficult to adequately address technology, pedagogy and content in a single college course. Therefore, this study proposes using three courses that are offered in collaboration, a mathematics teaching methods course, a technology-intensive content-rich mathematical modeling course, and a practicum course, to study the development of connections between technology, content and pedagogy. For this multiple case study, TPACK changes in five pre-service teachers were tracked during a period of about 15 weeks. Data were collected using a TPACK survey, teaching philosophy statements, lesson plans, student teaching episodes, and weekly instructor meeting notes. A detailed analysis of the results demonstrates that the development of pre-service teachers' mathematics TPACK is complex, and there are a number of factors that are at play, such as the pre-service teachers' prior experiences with technology, their mathematical backgrounds and their beliefs about the use of technology in mathematics instruction. Assessing the development of TPACK in pre-service teachers is complicated by the fact that the available model for mathematics teachers' TPACK was developed using observations of in-service mathematics teachers."

Rathsack, C. (2012). A profile of early 21st century teachers of northwest Ohio: The relationship between teachers' technology integration and leadership practices. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 73*(09), 3510803.

Abstract:
"In 2010, U. S. Secretary of Education, Arne Duncan, encapsulated the national concern and immediate need for educational change in order to prepare our students for the 21st century by stating, "The urgency to improve our children's schools has never been greater." Therefore, in order to develop students with the skills and knowledge needed to thrive in college, careers, and/or citizenship in the 21st century, teachers must be prepared--including, but not limited to, their pedagogical methodologies as well as their technological and leadership knowledge, skills, and practices.

The purpose of this correlational study was to examine the relationship between teachers' leadership practices and their classroom technology integration within the framework of ISTE NETS, Partnership for 21st Century Skills, and TPACK. Teachers (N = 361) from six northwest Ohio suburban school districts participated in the online 21st Century Technology Integration and Teacher Leadership (21-TITL) inventory, made up primarily of the Overall Technology Integration Scale (OTIS) and Teacher Leadership Practices Inventory (T-LPI), a modified version of Kouzes and Posner's Leadership Practices Inventory (LPI).

Numerous significant results were discovered, including: a correlated sixth T-LPI subscale (Refine the Craft); moderately correlated technology and leadership factors (Reflection and Modified Stage of Technology Adoption); a T-LPI subscale (Challenge the Process) that predicts Overall Technology Integration; a two-factor model that predicts Technology Integration, a six-factor model that predicts Teacher Leadership, and various group differences for both Overall Technology Integration (Technology Efficacy, Professional Development, Reflection, Modified Stage of Technology Adoption, Computers in the Classroom, Total Computing Hours Per Week, and Total Leadership Positions) and Leadership Practices (Gender-Female, Technology Efficacy, Social Trait-Extrovert, Professional Development, Reflection, Modified Stage of Technology Adoption, Computers in the Classroom, Total Computing Hours Per Week, and Total Leadership Positions).

Implications and recommendations are presented (relating to Classroom Technology Integration and Teacher Leadership Practices) for 21st century teachers, administrators, schools, and government or legislative leadership in order to preserve institutional knowledge and transform teaching and learning through support and funding for embedded, continual, reflective professional development focused on TPACK + Leadership (or CPTaLK)."

Unger, K. L. (2012). Examining the factors of a technology professional development intervention. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 73*(08), 3503933.

Abstract:
"In response to the ever increasing demand to compete in a global economy, the United States needs to prepare its students with the appropriate technical knowledge and communication skills to be competitive in the 21st century (Watson, 2007). Students must begin utilizing current technology tools during their K-12 educational experience and online learning can assist students with developing these skills. Teachers with online technology skills and equipped with effective pedagogical strategies for teaching in an online environment are the keys to achieving this goal. To ensure teachers are keeping pace with changing teaching and learning environments, and effectively utilizing new technologies, teacher technology professional development (PD) is a major initiative throughout K-12 education (Lawless & Pellegrino, 2007). In turn, it is the responsibility of school districts to prepare our nation's teachers to model and teach the use of these tools. Funding initiatives and federal and state programs have been put in

place to assist school districts with preparing their teachers to teach with new technologies. While there are government mandates requiring teachers to become knowledgeable in online teaching, many teachers and school districts are not meeting these mandates, and often barriers, such as lack of funding, time, and accessibility to experts, impact the quality of PD provided (Reeves & Pedulla, 2011). One way to gain more knowledge for providing quality PD is to examine the factors of a technology professional development intervention (TPDI) to establish best practices for designing quality technology PD for teachers.

The purpose of this qualitative multiple-case research study was to examine secondary education teachers' perceptions of a technology professional development intervention (TPDI). This study was designed to provide a deeper understanding of which factors teachers' perceived to be beneficial to the quality of technology professional development (PD) they received. An extensive review of literature surrounding technology integration within K-12 educational settings, demonstrated important factors to be incorporated into a TPDI to increase its quality and effectiveness. These factors aligned with the TPACK (Technological Pedagogical Content Knowledge) theoretical framework, so it was used to for designing, developing, and implementing the TPDI for this study. The instructional goal of the TPDI was to assist teachers in meeting two Entry-Level Standards for Michigan teachers related to designing and facilitating learning in the online environment. A learning technology by design approach (Koehler & Mishra, 2005; Mishra & Koehler, 2003) was the basis for the TPDI. This hands on approach exposed teachers to Google Applications while designing instruction and instructional materials to use in their teaching practice. The instructional design of the TPDI was evaluated by a panel of subject matter experts to increase content validity, and was modified based on feedback. The TPDI was implemented in an online learning environment.

The quality of PD can be influenced by a variety of factors, but Guskey and Sparks (1996) suggest that the factors with the most direct influence can be grouped into content, processes, and contextual factors. To investigate the complex relationship between the TPDI factors and teacher practice, I used the first piece of the Guskey and Sparks (1996) Model of the Relationship between Professional Development and Improvements on Student Learning, as a conceptual framework for collecting and analyzing data to address the research questions. The data was analyzed using a content analysis methodology to examine the factors of the TPDI that the teachers perceived to be most beneficial for transferring the knowledge and skills taught during the TPDI to teaching practice. Studying teachers' perceptions of these factors during the TPDI provided insight into which factors teachers believed were most beneficial to their learning. Comparing teachers' perceptions of the same factors after they began applying the knowledge and skills from the TPDI with their students, provided insight about which factors were most beneficial for teacher practice.

The results of this study demonstrated seven beneficial factors to narrow the transfer gap between technology PD and practice. These factors include: relevant, learning, access, reactions, interactions, clear and easy, and instructor. This suggest that

instructional designers should incorporate relevant learning by doing activities that are structured to impact learners' perceptions of how their knowledge can be expanded by creating their own learning path in a situated contextual environment. While this study examined a specific TPDI designed for secondary education teachers at a high school in Michigan, the design of the TPDI incorporated factors that are rooted in constructivist design principles, making the implications of the findings from this study relevant to instructional design. These recommendations could be used to guide instructional designers when designing environments for other technology training and adoption initiatives for employees."

5. Recent TPACK-Related Professional Development

Anderson, S. How to use TPACK as a framework for tech integration [Online slideshow]. Retrieved from http://snapguide.com/guides/use-tpack-as-a-framework-for-tech-integration-1/

Abstract:
This slideshow was presented as part of a Nearpod session with Steven Anderson: "This Session will introduce you to TPACK (Technological Pedagogical Content Knowledge) and how it can be used to effectively integrate new technology in a classroom setting. We will examine how three important components (Technology, Pedagogy, and Content) intersect to form a new way of learning. We'll also explore how teachers can create content-rich lessons in a few simple steps and, when appropriate, use technology effectively."

Myers, O., & Wilson, J. N. (2012, October). *Collaborative planning through a TPACK lens.* Conference presentation at the meeting of the North Carolina School Library Media Association, Winston Salem, NC.

Abstract:
"Technology integration has been an instructional goal since the placement of personal computers in schools. Collaborative planning is an essential component of the IMPACT Model that facilitates integration of information and technology in to instruction. Collaborative planning includes teachers, school library media professionals and instructional technology facilitators." (Additional resources available from http://ites.ncdpi.wikispaces.net/Collaborative+Planning+with+TPack)

6. Recent TPACK-Related Videos

21CLearning. (2012, March 26). Punya Mishra – keynote speaker @ 21st Century Learning conference – Hong Kong 2012 [Video file]. Retrieved from http://www.youtube.com/watch?v=9bwXYa91fvQ&feature=youtu.be

Punya Mishra's keynote talk at the 2012 21st Century Learning Conference in Hong Kong.

Svensk, P. (2012, October 25). Connecting TPACK and TEI [Video file]. Retrieved from http://vimeo.com/52133898

A video exploring how TPACK relates to Microsoft's Teacher Education Initiative.

7. Selected TPACK-Related Blog Entries/Podcasts

We found this blog post to be particularly thought-provoking. Thanks to "mooseonskis" for this contribution!

mooseonskis. (2012, November 17). TPACK – An answer to 21st century education or wishful thinking? [Web log post]. Retrieved from http://mooseonskis.wordpress.com/2012/11/17/tpack-an-answer-to-21st-century-education-or-wishful-thinking/

Be sure to listen to this podcast with Mark Hofer and David Carpenter discussing "practical strategies for using technology and various literacies in your classroom" (See: http://lessonslearned.edublogs.org/)

Carpenter, D. (Producer). (2012, November 25). *Show 25: TPACK and the learning activity types (LAT)* [Audio podcast]. Retrieved from http://edtechcoop.posterous.com/show-25-tpack-and-the-learning-activity-types

8. Other TPACK Updates

The tpack.org website has been renovated recently. Matt Koehler reports:

"There have been some big changes to the [tpack.org] website, designed to make tpack.org more community-centered. In the new [tpack.org] website, there are three main sections:

- The Quick Links – The image, the bibliography, and what is TPACK – the things everyone wants quick access to. ...Anyone can access these.

- The Question & Answer Section – A place to ask your questions about TPACK and have them answered by the TPACK community. You will have to create a (free) account for this (to fight the tide of Spammers).
- TPACK Academy – Inspired by Khan Academy, here you will find documents, videos, and even quizzes about a variety of TPACK related material. Anyone can submit an item to add to the TPACK Academy for the community to use." (http://www.tpack.org)"

9. TPACK Work in Progress

Check out tpackcases.org, currently featuring a case study on elementary math. More case studies are on the way.

Site Description:
"The Practitioner's Guide to TPACK is an initiative jointly undertaken by the members of the National Technology Leadership Coalition (NTLC). Technology is rapidly changing how we teach and how we learn. Emergent technologies offer opportunities to understand concepts in deeper, often different, and more meaningful ways. However, this growth in understanding will occur only if teachers learn to use these technologies in effective ways. The NTLC was established to address this challenge."

Joyce Koh is embarking on a new research project: *Understanding and Profiling Teacher's Technological Pedagogical Content Knowledge (TPACK) Development Patterns*. Visit http://acad21.ntu.edu.sg/research-projects/understanding-and-profiling-teachers-technological-pedagogical-content-knowledge-tpack-development-patterns for more information.

Abstract:
"Technological Pedagogical Content Knowledge (TPACK) describes teachers' technology integration expertise as a combination of their technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK). Even though it has been received with much enthusiasm by teacher educators, its practical application as a framework for the planning of information and communication technology (ICT) programmes is limited as there is a dearth of empirical studies explicating the process of teachers' TPACK development. The researchers published a preliminary study where regression analysis of TPACK survey responses from 889 NIE teachers found TK, PK, and CK having different levels of impact on teachers' TPACK formation. Another published qualitative paper of 74 NIE pre-service teachers examined a TPACK-developing ICT instructional model. This project extends these studies to develop a baseline profile of TPACK development patterns for Singapore teachers from pre-service to in-service; in both course-based and school-based contexts. The first objective is to profile course-based TPACK development patterns of 80 pre-service and 30 in-service teachers as they attend semester-long ICT modules at NIE. A mixed methods approach will be used where the change in their perceived and manifested

TPACK will be tracked through pre and post course TPACK surveys, expert evaluation of ICT lesson plans, and coding of their learning reflections. The second objective of this project is to examine the TPACK development patterns of ICT innovation teams in a collaborating Future school, Beacon Primary School. The TPACK development patterns of three ICT project teams throughout a school year will be examined through qualitative analysis of project group meetings transcripts, focused group interview transcripts, and expert rating of ICT lessons they developed. The influences of factors such as teaching experience, subject specialization and project team characteristics on teachers' TPACK development patterns will also be analysed. This study maps the different ways with which Singapore teachers develop technology integration expertise. It informs the design of ICT courses and school-based ICT mentoring, which contributes to the enhancement of the theory-practice linkage for this important theoretical construct in the area of educational technology."

10. 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., Theisinger, D. & Hofer, M. (Eds.). (2012, December 27). TPACK newsletter issue #13: December 2012 [Electronic mailing list message]. Retrieved from http://punya.educ.msu.edu/research/tpck/newsletter-archive/

11. 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 and contribute to 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.wmwikis.net/
- Access two tested TPACK assessment instruments (that use three types of data) at: http://activitytypes.wmwikis.net/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

Happy 2013, everyone!

- Judi, Diana & Mark

…for the SITE TPACK SIG leadership:

Candace Figg, Co-Chair, Brock University
Mark Hofer, Co-Chair, College of William & Mary
Judi Harris, Wing Chair, College of William & Mary
Mario Kelly, Futon, City University of New York
Matt Koehler, Chaise Lounge, Michigan State University
Punya Mishra, Recliner, Michigan State University