TPACK Newsletter, Issue #35: March 2018

Welcome to the thirty-fifth edition of the TPACK Newsletter! TPACK work is continuing worldwide. This document contains recent updates to that work that we hope will be interesting and useful to you, our subscribers.

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

Gratuitous Quote About Knowledge

"The passionate controversies of one era are viewed as sterile preoccupations by another, for knowledge alters what we seek as well as what we find."
- Freda Adler

In This Issue

1. TPACK Newsletter Update

The TPACK Newsletter has been published via the tpack.news email list since January 2009. It has 1215 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: 50 articles, 5 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: tpack.newsletter.editors@wm.edu.

Articles

Abdo Qasem, A. A., & Viswanathappa, G. (2016). Blended learning approach to develop the teachers' TPACK. *Contemporary Educational Technology*, *7*(3), 264–276.

Abstract: "A theoretical framework has emerged recently to guide research in the teachers' use of ICT and it is the technological pedagogical content knowledge (TPACK). Early research indicates that Blended learning is increasingly being adopted at all levels of educational system. It is considered as a way to foster engaging in interactive learning experiences. The purpose of this article was to determine the levels of ICT knowledge on e-course design through blended learning approach among science teachers of secondary schools in Yemen. The study was conducted on the sample of 60 science teacher trainees in Ibb city. The ICT knowledge scale was used based on TPACK. To analyze the data t-test was used. The findings in this study indicated that TPACK has provided a valuable tool for assessing teacher knowledge in the area of technology integration, the teachers' ICT knowledge was above average in two groups, and there is significant difference between experimental and control groups on ICT knowledge scale. Recommendations are made for future research on online collaboration activities to raise awareness of factors related to online group work and to determine the in-service training needs of teachers on ICT use to follow-up support and to ensure successful utilization of new technologies."

Angeli, C., & Ioannou, I. (2015). Developing secondary education computer science teachers' technological pedagogical content knowledge. *European Journal of Educational Sciences*, *2*(2), 9–30. doi:10.19044/ejes.v2no2a2

Abstract: "In the study herein the authors adopted the framework of technological pedagogical content knowledge (TPCK) and the approach of technology mapping in order to teach secondary education computer science teachers how to teach with technology. During a 15-hour teacher professional development program, teachers learned how to think about the educational affordances of different computer tools, and how to use them to make computer science content more understandable to learners. In addition, teachers learned how to think iteratively about technology, content, and pedagogy in order to design learning activities appropriate for learners' conceptual ecology. The study presents good examples of TPCK in practice by demonstrating teachers' actual instructional artifacts as these emerged through their participation in the teacher professional development program, as well as their evaluations of the program."

Apau, S. K. (2017). Technological pedagogical content knowledge preparedness of student-teachers of the department of arts and social sciences education of University of Cape Coast. *Journal of Education and Practice, 8*(10), 167–181.

Abstract: "The proliferation of digital technology in the 21st century in teaching and learning requires that teachers and students constantly interact with instructional technologies. This places a herculean task on the door step of teacher educators to ensure that student-teachers

graduate from their institutions of training with some knowledge domains that would help them to integrate technology, pedagogy and content in their teaching. This study assesses the Technological Pedagogical Content Knowledge (TPACK) preparedness of student-teachers in the Department of Arts and Social Sciences Education (DASSE) of University of Cape Coast (UCC), Ghana. It uses the descriptive survey design. The stratified simple random sampling technique was used to sample 370 student-teachers of DASSE for the study. Questionnaire was adapted for the data collection. Descriptive (frequencies and percentages, mean of means and standard deviations) and inferential statistics (independent t-test) were used to analyse the data. The study reveals that the student-teachers in DASSE, UCC have Technological Knowledge. The study also found that the student-teachers of DASSE, UCC lack Technological Pedagogical Knowledge. In addition, the study has found that the student-teachers of DASSE, UCC lack Technological Content Knowledge. Moreover, the study establishes that the student-teachers of DASSE, UCC lacked Technological Pedagogical Content Knowledge. Lastly, there is no statistically significant difference between the gender of the student-teachers of DASSE, UCC and their TPACK preparedness. Hence, this study recommends that lecturers should continue to model the use of technology so that student-teachers can increasingly update their technological knowledge through observation and learning. Again, the Academic Board of UCC should advice the teaching departments on the need to infuse technology in their courses they offer for student-teachers. Finally, the teacher education programme offered by DASSE, UCC should be reconceptualised to respond to the technological needs of student-teachers."

Ardic, M. A., & Isleyen, T. (2017). High school mathematics teachers' levels of achieving technology integration and in-class reflections: The case of Mathematica. *Universal Journal of Educational Research*, *5*(12B), 1–17. doi:10.13189/ujer.2017.051401

Abstract: "The purpose of this study is to determine the levels of high school mathematics teachers in achieving mathematics instruction via computer algebra systems and the reflections of these practices in the classroom. Three high school mathematics teachers employed at different types of school participated in the study. In the beginning of this qualitative analysis, the researchers provided the teachers with in-service training titled Computer-assisted Mathematics Instruction Workshop regarding the integration of the Mathematica software which is a computer algebra system in learning-teaching environments. The participating teachers then conducted computer-assisted mathematics instruction activities in their classroom via the Mathematica software regarding the graphs of quadratic equations (parabola). Semi-structured interview and observation forms were used as data collection tools in the study. The data were analyzed using the descriptive analysis method. As a result of evaluation, it was found that before the Computer-Assisted Mathematics Instruction Workshop, the participants either never implemented technology integration or implemented it on the elementary level, which is replacement. After the workshop, it was observed that the teachers achieved the technology integration in classroom implementations on the level of transformation and the top level of amplification and showed improvements in this matter. In the observations made after the workshop, it was seen that the teachers generally employed a student-oriented education approach and encouraged students to facilitate their own learning and make their own inferences utilizing computers and worksheets. It was observed that this

situation led to changes in classroom routines and contributed to students' acquisition of deeper comprehension by their own efforts. Additionally, it was understood that the students or the teachers did not have any difficulty in using the computer-assisted mathematics instruction materials prepared in Mathematica."

Arokiasamy, A. R. A. (2017). A qualitative study on the impact of mobile technology among students in private higher education institutions (PHEIs) in peninsular Malaysia. *Journal of Entrepreneurship and Business*, *5*(2), 25–36. doi:10.17687/JEB.0502.03

Abstract: "The introduction of mobile tools into our classroom spaces ought to be a catalyst for remarkable possibility and genuine change in how we engage learners in the work we pursue together. It should be a moment where we look collectively at what is now possible in how we engage and learn alongside our students and where we do some cultivating that allows us to pull out less timely practices or tools and evolve to what our students need now. It should be a vibrant time. Today's knowledge-based economy requires that nations equip their citizens with appropriate skills and a demand for university education has continued to soar. In much of Peninsular Malaysia, the rapid increase in university enrollments has been matched with an expansion of the relevant infrastructure, resulting in among other things, adequate classrooms and libraries. There has also been a robust growth in the technology sector globally. This study examines the impact of mobile technology usage among students in PHEIs in Peninsular Malaysia and its implications on quality as well as possible contributions of mobile technology to learning. Challenges aside, the study concludes that mobile technology could be exploited to supplement learning as it enables the student to access academic and research materials from credible sources that are either on free-access or subscribed-for through their home university. The findings also add new understanding as regard to factors influencing students' intention to use mobile technology in higher education."

Ay, Y., Karadag, E., & Acat, M. B. (2016). ICT integration of Turkish teachers: An analysis within TPACK-practical model. *International Journal of Progressive Education*, *12*(2), 149–165.

Abstract: "The aim of the study is to analyze Information and Communication Technologies (ICT) integration of Turkish teachers using various variables within the context of Technological Pedagogical Content Knowledge (TPACK). These variables were indicated as the gender of teachers, the implementation status of FATIH project at their schools, school types that the teachers were commissioned at, and their years of seniority. The study was conducted using causal-comparative design, one of the nonempirical quantitative research methods. TPACK-Practical Scale was utilized as data collection tool in the study. The data were collected from 296 teachers serving at Ministry of Education state schools. The analysis of the data was conducted using descriptive statistics, independent samples t-test, and Analysis of Variance (ANOVA). Findings of the study demonstrated that teachers scored the highest mean points in Curriculum Design, while the mean scores for Infusing ICT to assess students was the lowest. Furthermore, while there was no significant difference between the total mean scores of females and males, a significant difference was observed between the teachers that serve at schools where FATIH project was implemented and the teachers that serve at schools where

FATIH project was not implemented, and between the teachers that serve in different types of schools."

Balcin, M. D., Ergun, A. (2017). Science teacher candidates' views about technological pedagogical content knowledge (TPACK). *Journal of Theory and Practice in Education*, *13*(4), 570–600.

Abstract: "The aim of this study was to determine the opinions of science teacher candidates on technological pedagogical content knowledge. Study group of the research consists of 29 3rd grade science teacher candidates receiving education in Celal Bayar University Faculty of education. The study was carried out as a qualitative research using semi-structured interview technique. As a qualitative research pattern, phenomenological approach was used as the research pattern. An interview form comprising 7 questions was used by the researchers during the study. Opinions of science teacher candidates on teacher competencies in addition to their perceptions of TPACK were evaluated. Their opinions on technological aids that should be used in science teaching and the problems they are likely to encounter during the use of such aids, were also determined. In addition, teacher candidates were asked their opinions regarding the strategies and methods that could be used in science teaching. In light of the findings of the research, recommendations were made for consideration by researchers and science teachers."

Beschorner, B.& Kruse, J. (2016). Pre-service teachers' use of a technology integration planning cycle: A case study. *International Journal of Education in Mathematics, Science and Technology, 4*(4), 258-271. doi:10.18404/ijemst.73952

Abstract: "This study explored pre-service teachers' use of Hutchison and Woodward's (2014) Technology Integration Planning Cycle for instructional lesson planning in literacy. Ten pre-service teachers enrolled in a course entitled Literacy Assessment and Instruction participated. As part of the course, each pre-service teacher developed and delivered weekly one-on-one instruction for a child in first through fifth grade. The Planning Cycle was used in an effort to increase pre-service teachers' consideration for the use of digital technology tools. The study was conducted as a case study (Yin, 2009). First, all of the data were read and descriptive notes were written (Patton, 1990) using an inductive approach (Miles & Huberman, 1994). Patterns and themes were identified and the coding scheme refined accordingly. Data sources included: pre-service teacher lesson plans, video recordings of pre-service teacher lessons, audio recordings of a mid-term conference with the instructor, and a final reflection paper. Four themes were identified: (1) conscious planning; (2) poorly defined instructional goals; (3) determining an instructional approach; and (4) decisions about digital technology. A nature of technology framework was used to make further meaning of the results and generate implications for pre-service teacher education."

Bostancioglu, A., & Handley, Z. (2018). Developing and validating a questionnaire for evaluating the EFL 'Total PACKage:' Technological pedagogical content knowledge (TPACK) for English as a Foreign Language. *Computer Assisted Language Learning*, *31*, 1–27. doi:10.1080/09588221.2017.1422524

Abstract: "This paper introduces a new self-report questionnaire for the assessment of TPACK for English language teaching which does not prescribe a particular approach to language teaching or the use of particular technologies. Development and validation of the questionnaire involved: (1) creation of an initial item pool based on a review of the literature on Pedagogical Content Knowledge (PCK) and the use of technology in EFL, (2) evaluation of the content validity of the initial items with a panel of 36 international experts in computer-assisted language learning, (3) exploration and validation of the underlying factor structure through the administration of the questionnaire to 542 EFL practitioners and Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). A six-factor solution, comprising PCK, TK, CK, Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK), and Technological Pedagogical Content Knowledge (TPCK), emerged from the EFA and was subsequently confirmed through CFA. The results provide support for approaches to English language teacher education which attempt to integrate TK, PK, and CK, rather than introduce them separately, and which highlight the ways in which emerging and established technologies can be employed to represent language and provide opportunities for communication that are known to promote language acquisition."

Can, B., Erokten, S., & Bahtiyar, A. (2017). An investigation of pre-service science teachers' technological pedagogical content knowledge. *European Journal of Educational Research, 6*, 51–57. doi:10.12973/eu-jer.6.1.51 Retrieved from http://www.eu-jer.com/EU-JER_6_1_51_Bahtiyar_etal.pdf

Abstract: "In order to reflect the integration of the teachers' content knowledge, pedagogical knowledge, and technology usage skills to the class context and to provide the expected outputs for the program's purposes, it is needed to be revealed the different dimensions of Technological Pedagogical Content Knowledge (TPACK). In this study, it was aimed to investigate the teacher training programmes related to pre-service science teachers' TPACK. This study was designed as a cross-sectional study. In the 2015-2016 academic year, a total of 269 pre-service teachers (73 of them from 1st grade, 73 of them from 2nd grade, 87 of them from 3rd and 36 of them from 4th grade students) attending Science Education Department participated in this study. As a data collection tool, 7 subscales of "Technological Pedagogical Content Knowledge Scale of Pre-Service Teachers"; namely, technology knowledge, pedagogical knowledge, content knowledge, technological pedagogical knowledge, technological content knowledge, pedagogical content knowledge, and technological pedagogical content knowledge were used. According to the results, as the class level of preservice teacher increases, their level of technological pedagogical content knowledge increases as well. Moreover, there is a significant difference on behalf of pre-service teachers at the 1st grade in all dimensions of technological pedagogical content knowledge scale."

Canbazoglu Bilici, S., & Baran, E. (2015). The investigation of science teachers' self-efficacy toward technological pedagogical content knowledge: A longitudinal study. *GEFAD/GUJGEF*, *35*(2), 285–306.

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."

Chai, C. S., Koh, J. H. L., & Teo, Y. H. (2018). Enhancing and modeling teachers' design beliefs and efficacy of technological pedagogical content knowledge for 21st century quality learning. *Journal of Educational Computing Research*. Advance online publication. doi:10.1177/0735633117752453

Abstract: "This study proposed a new conceptualization of technological pedagogical content knowledge (TPACK) that focuses exclusively on the intersection of technology, pedagogy, and content specifically for selected dimensions of 21st century learning. In addition, teachers' design beliefs were investigated with the teachers' TPACK. Given the conceptualization, a new instrument was designed and validated. An associated intervention program to enhance the preservice teachers' TPACK was designed and the pre- and post-course surveys were conducted. To unpack the relationships between teachers' design beliefs and their TPACK, structural equation models were constructed and validated. The findings indicate that the instrument possesses good construct, discriminant and convergence validity, and reliabilities. The intervention enhanced the teachers' TPACK efficacies and their design beliefs significantly, and the structural equation models indicate that the teachers' design beliefs are significant predictors of the teachers' TPACK. The implications of this study suggest that TPACK may be conceived differently and this may promote new intervention programs to foster preservice teachers' TPACK and design beliefs."

Constantine, A., Rozowa, P., Szostkowski, A., Ellis, J., & Roehrig, G. (2017). The "T" in STEM: How elementary science teachers' beliefs of technology integration translate to practice during a co-developed STEM unit. *Journal of Computers in Mathematics and Science Training*, *36*(4), 339–349. Retrieved from https://www.learntechlib.org/p/178276/.

Abstract: "In the age of STEM education, teachers consistently struggle to understand the nature of technology and how to integrate it. This multiple-case study uses the TPACK framework to explore the beliefs and practices of three elementary science and engineering teachers from an urban school district with a recently implemented 1:1 iPad policy. All three teachers participated in a professional development opportunity in which they co-developed and implemented a STEM curriculum unit in collaboration with a graduate student coach. Data sources for the study included interviews and classroom observations. Qualitative analysis

revealed that although this was a co-developed unit, three distinct variations in technology integration emerged during implementation of the STEM unit. Findings explore how teacher beliefs regarding technology and iPads (whether as a 'purposeful tool for differentiation' or a potential "distraction" potentially limited by technical difficulties) influence their practices."

Debbagh, M. & Jones, W. M. (2018). Examining English Language Teachers' TPACK in Oral Communication Skills Teaching. *Journal of Educational Multimedia and Hypermedia, 27*(1), 43-62. Retrieved from https://www.learntechlib.org/p/178510/.

Abstract: "This case study utilized the Technological Pedagogical Content Knowledge (TPACK) theoretical framework (Mishra & Koehler, 2006) as a lens to examine the instructional strategies of four English as a second language (ESL) teachers and their rationales for incorporating technology into their instructional practices in teaching oral communication skills. The four teachers taught adult learners at the intermediate and advanced levels of an English Language program at a university in the Southeastern United States in spring of 2015. The survey results reported low mean scores in teachers' technological knowledge but higher mean scores for the constructs of technological content knowledge, technological pedagogical knowledge, and TPACK. The data gathered from class observations and interviews suggested that teachers' pedagogical approaches determined the extent to which technology was used in class."

De Rossi, M., & Trevisan, O. (2018). Technological pedagogical content knowledge in the literature: How TPCK is defined and implemented in initial teacher education. *Italian Journal of Educational Technology.* Advance online publication. doi:10.17471/2499-4324/988

Abstract: "In recent decades, there has been increasing research interest in teachers' competences regarding the growing role of technologies in educational practices. These competences are grounded on a clear base of technological knowledge, along with the recognized dimensions of a broad pedagogical expertise and deep knowledge of the content. This paper analyses the most significant international literature on the topic, reporting the theoretical discussion about teachers' knowledge as described by the Technological Pedagogical Content Knowledge framework (TPCK – Koehler & Mishra, 2005a) based on Shulman's (1986, 1987) PCK. This framework will be analysed in its definition and main components, as well as in the different interpretations given by researchers in recent years. Finally, some of the main strategies documented in the literature to develop this type of teacher knowledge in pre-service education will be presented."

Durdu, L., & Dag, F. (2017). Pre-service teachers' TPACK development and conceptions through a TPACK-based course. *Australian Journal of Teacher Education*, *42*(11), 150–171. doi:10.14221/ajte.2017v42n11.10 Retrieved from http://ro.ecu.au/ajte/vol42/iss11/10

Abstract: "This study examines pre-service teachers' Technological Pedagogical Content Knowledge (TPACK) development and analyses their conceptions of learning and teaching with

technology. With this aim in mind, researchers designed and implemented a computer-based mathematics course based on a TPACK framework. As a research methodology, a parallel mixed method approach was used. The data were collected from 71 pre-service teachers taking the course. The TPACK survey, a semi-structured interview, and evaluation scores of pre-service teachers' microteaching performance, which also included analysis of lesson plans, were used as data collection instruments. The findings indicated that the implemented instructional processes affected pre-service teachers' TPACK development positively. There were significant differences before and after the course implementation concerning Technology Knowledge, Technological Content Knowledge, Technological Pedagogical Knowledge, and TPACK in general. Qualitative findings support and overlap the statistical inferences. There should be more courses which require pre-service teachers to develop computer-based instructional materials and use their materials with microteaching sessions. Instructors of faculties of education should use technology in their instructional environments not only for presentation purposes."

Gokdas, I., & Torun, F. (2017). Examining the impact of instructional technology and material design courses on technopedagogical education competency acquisition according to different variables. *Educational Sciences: Theory & Practice*, *17*(5), 1733–1758. doi:10.12738/estp.2017.5.0322

Abstract: "The need to integrate technology into education has made necessary a thorough examination of teachers' technopedagogical competencies. While training preservice teachers, it is of particular importance that they acquire technopedagogical education competences during their preservice education. Practical and theoretical course content and Instructional Technology and Material Design (ITMD) courses are thought to be essential for preservice teachers' technopedagogical education competency acquisition. However, the role of ITMD courses in preservice teachers' technopedagogical education competency acquisition has remained obscure in the literature. As such, the study aims to describe the effect that ITMD courses have on technopedagogical education competency acquisition. The research was conducted with a total of 186 preservice teachers studying in the departments of classroom teaching and preschool teaching in a Faculty of Education in Turkey. The research data were gathered using the Technopedagogical Education Competency Scale (TPACK-deep), developed by Kabakci Yurdakul, Odabasi, Kilicer, Coklar, Birinci, and Kurt. This five-point Likert type scale consists of a total of four factors, i.e. design, proficiency, ethics, and exertion. The internal reliability coefficient of the 33-item scale was .95. The scale was applied by faculty members in-line with the course description designated by the Council of Higher Education (YÖK) as a pre- and post-test at the beginning and end of the semester that the course was given. A paired samples t-test and CHAID (Chi-squared Automatic Interaction Detection) analysis were incorporatedly employed to analyze the data. The research showed that ITMD courses influenced preservice teachers' acquisition of technopedagogical education competencies. The following were observed to be critical predictor variables in technopedagogical education competency acquisition: having received computer training prior to taking the ITMD courses and the average time one spends using a computer per day."

Hannaway, D. M., & Steyn, M. G. (2017). Teachers' experiences of technology-based teaching and learning in the foundation phase. *Early Child Development & Care*, *187*(11), 1745–1759. doi:10.1080/03004430.2016.1186669

Abstract: "This paper presents one aspect of a larger scale doctoral study, namely the teachers' experiences of technology-based teaching and learning in the foundation phase. Technology is a huge driver of change and South African education has to change regularly to meet the requirements set out by the Department of Education, including the development of learning outcomes for the 21st century. This study therefore explored teachers' experiences of technology-based teaching and learning in the foundation phase. Qualitative case study research methods such as photo voice, semi-structured interviews and field notes were conducted within two cases of technology-rich schools and examined through the Technological Pedagogical and Content Knowledge framework. Data yielded results that correlated with the theoretical framework namely: technological knowledge; pedagogical knowledge; and content knowledge, as well elements such as technological tools, 21st century skills and technology-based teaching and learning in the foundation phase. Finally, the significance of this study was that the data gathered proved worthwhile in producing a framework in order to understand foundation phase teachers in context as well as provide a robust contribution to the way in which technology-based teaching and learning occurs."

Hayati, Y. M., Jantan, H., & Abdullah, N. K. (2017). Pre-development of potential educational technology competency standard based on TPCK in UITM (Terengganu). In J. Othman, N. S. Foong, S. B. Mahlan, S. N. Warris, M. S. A. Bakar, & C. P. Eng (Eds.), *Proceedings of 6th International Conferences on Science & Technology* (pp. 26 - 32). Retrieved from https://www.researchgate.net/profile/Sufri_Muhammad/publication/322714648_ICTS-eyes_ICT_Services_Mobile_Reporting_Application/links/5a6aafadaca2725b1c1bd639/ICTS-eyes-ICT-Services-Mobile-Reporting-Application.pdf#page=30

Abstract: "Various researchers have found that the value of educational technology directly linked to the educators' capability; the more knowledgeable the educators are on technology, the more the students are able to understand them. Technology in education is purposely designed to help both educators and students in knowledge transfer and knowledge gain simultaneously. In many aspects, technology in education is supposed to prove that education can be delivered effectively and efficiently. However, there are cases in which technology in education can be frustrating and annoying for both parties. The outcome of this study proposes an Educational Technology standard to be applied in university setting using Technological Pedagogical Content Knowledge (TPCK) as the basic framework. It is hoped to allow university management to review and regulate the educational technology efforts prepared to uplift the standards of teaching and learning to be in compliance with the Malaysia Education Blueprint 2015-2025 (Higher Education)."

Howrey, S. Preparing pre-service teachers for TPCK in the reading content area: Insights from an action research study. *Literacy Practice & Research*, 13–21.

Abstract: "This mixed methods action research study had the researcher examining pre-service teachers' attitudes and dispositions toward technology pedagogical and content knowledge (TPCK) as they developed lesson plans for teaching early readers. Qualitative analysis of the lesson plans and technology therein, a panel interview and a project/presentation were augmented by quantitative data gathered from a survey and checklist. Results revealed ways in which the pre-service teachers used Internet technology, the sources from whom or which they learned about the technology, the criteria they used when choosing technology, and their perceptions of how technology training for early reading instruction could be improved. Themes were noted within and across the data sets with implications for teacher educators as they design teacher technology learning experiences in the literacy content areas."

Incik, E. Y., & Akay, C. (2017). A comprehensive analysis on technopedagogical education competency and technology perception of pre-service teachers: Relation, levels, and views. *Contemporary Educational Technology*, *8*(3), 232–248.

Abstract: "The main purpose of this research is to identify the competency and the perceptions of pre-service teachers on technopedagogical education. While study group of quantitative dimension is composed of 626 pre-service teachers; study group of qualitative extent is composed of 67 pre-service teachers. The sample represents 35% of the population of 1778 students. The quantitative data were collected through Technopedagogical Education Competency (TPACK-deep) Scale and Technology Perception Scale and the qualitative data were collected with an open ended-question form. It was concluded that pre-service teachers generally regard themselves at a moderate level in the sense of technopedogogical education competency, have positive perception towards tech nology and there is a positive correlation between pre-service teachers' technopedogogical educational competency and perception towards technology. According to results of qualitative analysis of the study, pre-service teachers think that educational technologies have contributions to preparing information-communication technologies based upon presentations, developing technology-based materials, preparing homework, doing research, raising awareness about the importance of educational technology use in the learning and teaching process, acquiring information about their department, developing skill of using technology based on information-communication technologies and having positive attitude."

Isler, C., & Yildrim, O. (2018). Perceptions of Turkish pre-service EFL teachers on their technological pedagogical content knowledge. *Journal of Education and Future*, *13*, 145–160. Retrieved from http://dergipark.gov.tr/jef/issue/35229/390947

Abstract: "The purpose of this study is to investigate perceptions of Turkish pre-service EFL (English as a Foreign Language) teachers related to their level of Technological Pedagogical Content Knowledge (TPACK), the factors affecting their perceptions of TPACK, and their beliefs related to technology integration into EFL classrooms. The study employs both quantitative and qualitative data collection and analysis procedures. A total of 94 Turkish pre-service EFL teachers answered two questionnaires designed to gather information about their combining technology, pedagogy, and content knowledge in the ways of both learning and teaching

processes. Six of the participants were also interviewed about their perceptions on TPACK competences and their beliefs related to technology use in language teaching. Quantitative data were analyzed by calculating descriptive statistics (frequency, percentage, mean score, standard deviation), and qualitative data were analyzed by using content analysis. The findings related to quantitative data revealed high levels of perceptions on TPACK competences, and the findings related to qualitative data supported the high level of perceived TPACK competences and further revealed that participants emphasized the place of personal interest, experience, knowledge and access while singling out educational support by their own instructors on the development of TPACK. In the light of the findings of the study, it has been suggested that courses offered to pre-service teachers should include how to combine technology, content and pedagogy together for effective instruction in their subject field; and teacher education programs should provide pre-service teachers with the opportunities of becoming the designers of technologically mediated materials."

Jaipal-Jamani, K., Figg, C., Collier, D., Gallagher, T., Winters, K., & Ciampa, K. (2018). Developing TPACK of university faculty through technology leadership roles. *Italian Journal of Educational Technology*. Advance online publication. doi:10.17471/2499-4324/984

Abstract: "This paper reports on a study that explored how faculty to take on technology leadership roles developed TPACK knowledge and built capacity for technology-enhanced teaching. The study was the second phase of a professional development initiative, called the Digital Pedagogies Collaboration, in a Faculty of Education. Four faculty, who had participated in technology workshops, volunteered to conduct workshops on technologies they had integrated into their own instruction. A qualitative case study design was used and data included pre-and-post-interviews, videotaped technology workshops, and workshop artifacts. Findings show that taking on a leadership role as a workshop facilitator improved faculty members' knowledge and skills around teaching with technology (TPACK). Moreover, the TPACK-based Professional Learning Design Model (TPLDM) was useful for designing content-centric workshops and the Faculty as Technology Leaders was a component that extended the TPACK Leadership Theory of Action Model (Thomas, Herring, Redmond, & Smaldino, 2013)."

Kabakci Yurdakul, I. (2017). Modeling the relationship between pre-service teachers' TPACK and digital nativity. *Education Technology Research and Development*. Advance online publication. doi:10.1007/s11423-017-9546-x

Abstract: "The purpose of this study is to build a structural equation model that predicts the relationship between Technological Pedagogical Content Knowledge (TPACK) competencies and digital nativity. The data was collected from 1493 Turkish pre-service teachers. Two instruments were used in the data collection; a TPACK-deep scale and a Turkish adaptation of the Digital Native Assessment Scale (DNAS). Structural equation modeling (SEM) was conducted to investigate the assumption that digital nativity was a predictor of TPACK competency. It was found that pre-service teachers considered themselves to have high-level ability in both digital nativity and TPACK competency. The most prominent finding of the study was that digital

nativity is a significant predictor of TPACK competency. Based on the research findings, implications for practice and suggestions for future studies are also provided."

Kennedy-Clark, S., Kearney, S., & Galstaun, V. (2017). Using a collaborative assessment design to support student learning. *Education Sciences*, *7*(4), 80. doi:10.3390/educsci7040080

Abstract: "The purpose of the study was to try to develop an understanding of how groups of pre-service teachers organised, planned and built two information and communication technologies (ICT) resources using a learn-technology-by-design framework. The benefits for students in using a learn-by-design approach have been well researched, and the research has covered a broad range of research streams. A design-based research approach underpins the research. This paper presents the observational data, which was collected in an ICT in the Education unit of study. The collaborative design assessment provided pre-service teachers with the opportunity to collaboratively build an Interactive Whiteboard (IWB) resources and a web-based teaching (website) resource. In this study, seven groups were observed while they engaged in a long-term collaboration and completed two group assessment tasks. The results suggest that students needed both guidance and time to develop their skills in collaboration. While there were variations in the collaborative patterns, these variations did not impact the success of the groups in the development of their ICT resources."

Kim, M. K., Xie, K., & Cheng, S. (2017). Building teacher competency for digital content evaluation. *Teaching & Teacher Education*, *66,* 309–324. doi:10.1016/j.tate.2017.05.006

Abstract: "The purpose of the current study is to investigate teachers' digital content evaluation (DCE) competency as a combined set of teachers' intellectual ability and affect-motivation in evaluating digital content. To this end, this study employed an exploratory sequential mixed-methods design to examine 102 in-service teachers' experiences in a one-year DCE professional development program. Qualitative thematic analysis followed by quantitative K -means cluster analysis identified and validated four levels of teacher competency in DCE: familiarization, utilization, integration, and reorientation. In addition, this study also proposed design guidelines to scaffold DCE competency development tailored to the needs of teachers at various competency levels."

Kimmons, R., & Hall, C. (2018). How useful are our models? Pre-service and practicing teacher evaluations of technology integration models. *Tech Trends*, *62*, 29–36. doi:10.1007/s11528-017-0227-8

Abstract: "We report on a survey of K-12 teachers and teacher candidates wherein participants evaluated known models (e.g., TPACK, SAMR, RAT, TIP) and provided insight on what makes a model valuable for them in the classroom. Results indicated that: (1) technology integration should be coupled with good theory to be effective, (2) classroom experience did not generally influence teacher values and beliefs related to technology integration, (3) some models may be more useful to teachers than others, (4) the widespread use of a model does not necessarily reflect usefulness, (5) useful models for teachers should engender real-world, concrete

application, and (6) visual appeal of a model is largely subjective, but some visual representations might convey notions of practicality. Conclusions should be used to help researchers and practitioners understand the practical application value of technology integration models in real-world settings."

Lee, C. J., & Kim, C. (2017). A technological pedagogical content knowledge based instructional design model: A third version implementation study in a technology integration course. *Educational Technology Research and Development*, *65*(6), 1627–1654. doi:10.1007/s11423-017-9544-z

Abstract: "This paper presents the third version of a technological pedagogical content knowledge (TPACK) based instructional design model that incorporates the distinctive, transformative, and integrative views of TPACK into a comprehensive actionable framework. Strategies of relating TPACK domains to real-life learning experiences, role-playing, and teachers as designers were developed based on the three views and integrated into the third version of the model. The model was then applied in a teacher education undergraduate course on technology integration. A case study approach was used. Data were collected from the participants' discussion worksheets, lesson designs, and the researchers' field observation notes. Data analysis results suggest that the strategies integrated into the model helped the participants deepen their understanding of student-centered technology applications and practice TPACK. Findings, implications, and future research possibilities are discussed."

Lisenbee, P. S., & Ford, C. M. (2017). Engaging students in traditional and digital storytelling to make connections between pedagogy and children's experiences. *Early Childhood Education Journal.* Advance online publication. doi:10.1007/s10643-017-0846-x

Abstract: "Traditional and digital storytelling is a powerful literacy tool which engage students in making connections between pedagogy and academic content. Definitions of traditional and digital storytelling, pedagogical methods aligned with curriculum standards, and examples of literacy centers associated with storytelling in early childhood classrooms are shared. The theoretical framework, Technological Pedagogical Content Knowledge (TPACK), is included to illustrate how pedagogy, storytelling, and technology interact to teach content knowledge and 21st-century skills. The five literary elements and additional elements of stories identified from research which enhance students' engagement in stories are provided. A checklist for selecting stories, book lists and storytelling websites offer resources that will support teachers in using both digital and traditional storytelling with their students."

Makkawi, F. (2017). Integrating technology in teachers' profession. *International Journal for Infonomics*, *10*(2), 1325-1332. Retrieved from http://infonomics-society.org/wp-content/uploads/iji/published-papers/volume-10-2017/Integrating-Technology-in-Teachers-Profession.pdf

Abstract: "The continuous fast developing field of Information and Communications Technology (ICT) is affecting every aspect of our life including education. The purpose of this

research is to show the importance of ICT knowledge in Teachers' education journey (preservice and inservice). The first part of this paper discusses the teacher's professional knowledge. The second part discusses ICT in Education. Section three explains and discusses the TPACK (Technological Pedagogical Content Knowledge) model. Part four and five discuss preservice teachers education and inservice teachers' training respectively. Last part sheds the lights on the benefits of teachers' networks. Finally, in the digital world we are living, teachers need to be digitally knowledgeable to be able to lead the students to be critically engaged active members."

Marcelo, C., & Yot-Dominguez, C. (2018). From chalk to keyboard in higher education classrooms: Changes and coherence when integrating technological knowledge into pedagogical content knowledge. *Journal of Further and Higher Education*, Advance online publication. doi:10.1080/0309877X.2018.1429584

Abstract: "The European Higher Education Area has promoted reconsidering the role played by teachers at universities. Faculties are expected to design learning activities that promote the acquisition of competencies among students. In this context, technologies have garnered prominence as they contribute to creating student-centred learning environments. This study answers these research questions: (1) To what extent has university teaching changed with the implementation of digital technologies in university classrooms? What technology-based learning activities are incorporated in instructional designs by the teachers? (2) How does the faculty describe the integration of technological knowledge into pedagogical content knowledge when designing and developing technology-based learning activities? (3) According to university teachers, which other factors (intrinsic or extrinsic) determine the use of digital technologies in their learning designs? To answer these questions, we have collected data from two differentiated samples of university teachers using the Inventory of Learning Activities with Technology at the University and semi-structured interviews. First, the results reveal that teachers use technologies to carry out learning activities focusing on the content and the teacher. Student-centred learning activities are only timidly being incorporated. Second, the extent to which such activities are implemented is linked to the teachers' techno-pedagogical content knowledge. Third, the factors that facilitate or inhibit teachers from using technologies in the teaching–learning process respond to intrinsic aspects, such as teachers' knowledge and beliefs, but also to extrinsic and contextual issues, such as the discipline taught or institutional policy at the university regarding the use of educational technologies."

Mouza, C., Nandakumar, R., Ozden, S. Y., & Karchmer-Klein, R. (2017). A longitudinal examination of preservice teachers' technological pedagogical content knowledge in the context of undergraduate teacher education. *Action in Teacher Education*, *39*(2), 153—171. doi:10.1080/01626620.2016.1248301

Abstract: "This study used longitudinal data to investigate the development of preservice teachers' Technological Pedagogical Content Knowledge (TPACK) throughout their initial teacher education program in the United States. Quantitative and qualitative data were collected at four different points in time. Findings indicated that teacher preparation

experiences collectively provided preservice teachers' with opportunities to develop their knowledge of teaching with technology from their freshman to their junior/senior year. Opportunities to develop and retain knowledge gains over time, however, were limited in the absence of intentional educational technology coursework. Findings have implications for the design of teacher education programs on the use of technology."

Muhtadi, D., Wahyudin, Kartasasmita, B. G., & Prahmana, R. C. I. (2017). The integration of technology in teaching mathematics. *Journal of Physics: Conference Series, 943*(2017). doi:10.1088/1742-6596/943/1/012020

Abstract: "This paper presents the Transformation of Technological Pedagogical and Content Knowledge (TPACK) of three pre-service math teacher. They participate in technology-based learning modules aligned with teaching practice taught school and became characteristic of teaching method by using the mathematical software. ICT-based learning environment has been the demands in practice learning to build a more effective approach to the learning process of students. Also, this paper presents the results of research on learning mathematics in middle school that shows the influence of design teaching on knowledge of math content specifically."

Navarro, L. (2017). Technology integration using outcome based education approach in teaching introductory physics. *PEOPLE: International Journal of Social Sciences*, *3*(2), 1102–1116. doi:10.20319/pijss.2017.32.11021116

Abstract: "The study was focused on determining the effectiveness of an approach in education which is outcome-based and integrated technology in teaching introductory physics among second year BSIT/BSCS students of Cavite State University enrolled in six (6) chosen campuses during the second semester of school year 2014-2015. Through purposive sampling and census method three hundred fifty nine (359) students and eight (8) instructors were used as participants respectively. The researcher used quasi-experimental research design. Seven (7) instruments were employed in the study. At $p<0.05$ level of significance using t-test independent mean, standard deviation, percentage and analysis of co-variance (ANCOVA) hypotheses were tested. The result suggests that the technology integration intervention used for physics instruction utilized by the experimental group was effective in improving the students' test scores. Results revealed the rejection of three null hypotheses tested thus, development of learning plans employing Technology Integrated Strategy (TIS) using outcome-based education approach is highly recommended to actively involve the students in the teaching-learning process. The study conducted was limited in determining the effectiveness of TIS in teaching physics, therefore it is recommended to replicate the study in other discipline and the instrument crafted by the researcher may be used by other institution in promoting technology integrated lesson presentations. Administrators are highly encouraged to initiate the conduct of workshop about the use of TIS on various disciplines through continuing education program."

Nave, R., Ackerman, R., & Dori, Y. J. (2017). Medical community of inquiry: A diagnostic tool for learning, assessment, and research. *Interdisciplinary Journal of E-Learning & Learning Objects*, *13*, 1–17. doi:10.28945/3632

Abstract: "These days educators are expected to integrate technological tools into classes. Although they acquire relevant skills, they are often reluctant to use these tools. Background: We incorporated online forums for generating a Community of Inquiry (CoI) in a faculty development program. Extending the Technology, Pedagogy, and Content Knowledge (TPACK) model with Assessment Knowledge and content analysis of forum discourse and reflection after each CoI, we offer the Diagnostic Tool for Learning, Assessment, and Research (DTLAR). Methodology: This study spanned over two cycles of a development program for medical faculty. Contribution: This study demonstrates how the DTLAR supports in-depth examination of the benefits and challenges of using CoIs for learning and teaching. Findings: Before the program, participants had little experience with, and were reluctant to use, CoIs in classes. At the program completion, many were willing to adopt CoIs and appreciated this method's contribution. Both CoIs discourse and reflections included positive attitudes regarding cognitive and teacher awareness categories. However, negative attitudes regarding affective aspects and timeconsuming aspects of CoIs were exposed. Participants who experienced facilitating a CoI gained additional insights into its usefulness. Recommendations for Practitioners: The DTLAR allows analyzing adaption of online forums for learning and teaching. Impact on Society: While the tool was implemented in the context of medical education, it can be readily applied in other adult learning programs. Future Research: The study includes several design aspects that probably affected the improvement and challenges we found. Future research is called for providing guidelines for identifying boundary conditions and potential for further improvement."

Scherer, R., Tondeur, J., Siddiq, F., & Baran, E. (2018). The importance of attitudes toward technology for pre-service teachers' technological, pedagogical, and content knowledge: Comparing structural equation modeling approaches. *Computers in Human Behavior*, *80*, 67–80. doi:10.1016/j.chb.2017.11.003

Abstract: "A large body of literature suggests that attitudes toward technology and its educational use are important determinants of technology acceptance and integration in classrooms. At the same time, teachers' Technological, Pedagogical, and Content Knowledge (TPACK) facilitates the meaningful use of technology for educational purposes. Overall, attitudes toward technology and TPACK play a critical role for technology integration and have been in the focus of many empirical studies. Albeit the attention that has been paid to these two concepts, their relation has not been fully understood. The present study contributes to the advancement of this understanding by examining the relations between three core technology attitudes (i.e., general attitudes towards ICT, attitudes towards ICT in education, and ease of use) and TPACK self-efficacy beliefs, based on a sample of N = 688 Flemish pre-service teachers in 18 teacher-training institutions. Using a variety of structural equation modeling approaches, we describe the TPACK-attitudes relations from multiple perspectives and present a substantive-methodological synergism. The analyses revealed that the attitudes

toward technology and TPACK self-beliefs were positively related; yet, differences across the attitudes and TPACK dimensions existed, pointing to the delineation of general and educational perspectives on the use of ICT."

Slough, S. W., & Chamblee, G. E. (2017). 21st century pedagogical content knowledge and science teaching and learning. *Journal of Computers in Mathematics & Science Teaching*, *36*(2), 173–187. Retrieved from https://www.learntechlib.org/p/177942/.

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 in an increasingly technological world with specific applications to science teaching and learning."

Spiteri, M., & Chang Rundgren, S. (2017). Maltese primary teachers' digital competence: implications for continuing professional development. *European Journal of Teacher Education*, *40*(4), 521–534. doi:10.1080/02619768.2017.1342242

Abstract: "Learning with technology during primary school years will equip students with dispositions to continue learning with evolving technology throughout their lifetime and it is the responsibility of the teacher to develop this digital competence (DC) in the classroom. The aim of this research was to investigate Maltese primary class teachers' DC and to recommend new training on technology integration in teaching practices. Semi-structured individual interviews with 26 primary teachers (23 females and three males) and the teaching material used in the classroom were the sources of data in this study. Directed content analysis was applied, where a new area in DC,the creation of modes of communication, was revealed. Recommendations for teacher training in the areas of DC are suggested."

Sutton, K. K., & DeSantis, J. (2017). Beyond change blindness: Embracing the technology revolution in higher education. *Innovations in Education & Teaching International*, *54*(3), 223–228. doi:10.1080/14703297.2016.1174592

Abstract: "The pace of education technology innovation outpaces many professors' abilities to thoughtfully integrate new tools in their teaching practice. This poses challenges for higher education faculty as well as those responsible for planning professional development in higher education. This article explores recent trends in education technology and the capabilities that new pedagogical tools make possible. It also introduces readers to three foundational educational technology theories: Rogers' diffusion model, Davis's technology acceptance model and Mishra & Koehler's technological, pedagogical and content knowledge model. Each theory holds important implications for those interested in helping higher education faculty members to make the most of emerging classroom technologies. Higher education leadership can help

their faculties make the most of education technology tools by including the implications of these theories in their professional development designs."

Thomas, G. J., & Munge, B. (2017). Innovative outdoor fieldwork pedagogies in the higher education sector: Optimising the use of technology. *Journal of Outdoor & Environmental Education*, *20*, 7-13.

Abstract: "Outdoor fieldwork has been a long-standing pedagogy in the higher education sector, across a range of disciplines. Based on a review of the literature, this paper explores the use of outdoor fieldwork in the 21st century university with particular reference to the way technology contributes to student learning. Research has indicated that fieldwork enhances student engagement, links theory and practice, and assists students with the development of professional expertise. Many of the challenges for outdoor fieldwork, such as budget cuts, risk management concerns, and workload demands on staff, have been exacerbated by massification pressures in universities, such as the growth in student numbers and a more diverse student cohort. The increased use of technology on outdoor field trips both solves and creates problems, and technology use in outdoor education has been described as a double-edged sword (Cuthbertson, Socha, & Potter, 2004). It can be difficult for teachers to judge whether the benefits to student-learning outcomes created by introducing technology outweigh any negative impacts. Koehler and Mishra's (2009) concept of technological pedagogical content knowledge suggests that teachers need to develop a very specific kind of knowledge to make informed decisions about the use of technology. The substitution, augmentation, modification, redefinition (SAMR) ladder (Puentedura, 2006) can contribute to this teacher knowledge by focusing on how the use of technology can transform student learning rather than just replace, or augment, existing teaching tools and strategies. Some examples of how technology is used at the different levels of the SAMR model in outdoor education are provided."

Turgut, Y. (2017). A comparison of pre-service, in-service and formation program for teachers' perceptions of technological pedagogical content knowledge (TPACK) in English language teaching (ELT). *Educational Research and Reviews*, *12*(22), 1091–1106. doi:10.5897/ERR2017.3311

Abstract: "In view of the rapid advancement of technology, technological pedagogical content knowledge (TPACK) has been extensively studied. However, research on technological pedagogical content knowledge (TPACK) in teaching English appear to be scarce and addressed either pre-service or in-service teachers, but not their comparison. Additionally, although teacher-certificate programs are employed in many countries, none of the existing studies have examined teacher-candidates' TPACK, especially in English language teaching (ELT). To fill the gap, this study aims to compare TPACK among teacher-candidates, pre-service and in-service English as a foreign language (EFL) teachers in Turkey. Quantitative and qualitative data analysis indicated significant differences among them. Based on these findings, suggestions for teacher education and future research were made."

Valtonen, T., Kukkonen, J., Kontkanen, S., Makitalo-Siegl, K., & Sointu, E. (2018). Differences in pre-service teachers' knowledge and readiness to use ICT in education. *Journal of Computer Assisted Learning*. Advance online publication. doi:10.1111/jcal.12225

Abstract: "The aim of this paper is to provide insights into differences between pre-service teachers based on the areas of technological pedagogical content knowledge (TPACK) and the areas of theory of planned behaviour (TPB) in the context of using information and communication technology in education. The target group consisted of 267 first-year pre-service teachers at 3 Finnish universities. Differences between pre-service teachers were outlined using cluster analysis based on their knowledge of different TPACK areas (the respondents' weak and strong areas). To see how the TPB areas aligned with the 4 TPACK clusters, 1-way analysis of variance was used. Statistically significant differences between the 4 clusters were found in all the TPB areas except subjective norms. These results provide insights into the differences among pre-service teachers in the context of TPACK and the TPB. They also suggest that instead of considering pre-service teachers as one homogenous group, we need to understand the variations among their abilities and knowledge in order to be able to provide them with support they need within teacher education."

Van Vaerenewyck, L. M., Shinas, V. H., & Steckel, B. (2017). Sarah's story: One teacher's enactment of TPACK+ in a history classroom. *Literacy Research and Instruction, 56*(2), 158–175. doi:10.1080/19388071.2016.1269267

Abstract: "This article presents a descriptive case study that describes a secondary history teacher's expression of sociocultural-oriented technological pedagogical content knowledge (TPACK) in the classroom, the execution of which we describe as TPACK+. TPACK+ describes sociocultural-oriented teacher knowledge requisite for the dynamic execution of TPACK such that socially situated learning experiences occur in communities of learners within and beyond the classroom. Data were collected from classroom observations and semi-structured interviews. A priori codes were applied to data, which were analyzed using the constant-comparative method. This case presents a narrative of an honors U.S. History II lesson and explication of the teacher's demonstration of TPACK+ in the context of Common Core State Standards-driven history content instruction."

Vasinda, S., Ryter, D. A., Hathcock, S., & Wang, Q. (2017). Access is not enough: A collaborative autoethnographic study of affordances and challenges of teacher educators' iPad integration in elementary education methods courses. *Contemporary Issues in Technology and Teacher Education*, *17*(3), 411–431. Retrieved from https://www.learntechlib.org/p/173508/.

Abstract: "Research indicates that preservice teachers' understandings of how to integrate technology into their classrooms are dependent upon experience in their university methods courses and in their field placements. These findings place a new responsibility on teacher educators for modeling effective integration of technology into methods courses. This study focused on teacher educators' integration of technology using iPads to enhance teaching and

learning in an elementary education teacher preparation program. Four faculty members documented their own technology integration journey through collaborative autoethnography identifying the affordances and challenges of 1:1 iPad integration into their science, social studies and literacy methods courses. The researchers discovered that access to technology alone is not sufficient for faculty members to integrate iPad use in their courses. High quality use of iPads and their applications require time for exploration, experimentation, and practice, as well as professional support and development adding another dimension to the work of teacher educators."

Xie, K., Kim, M., Cheng, S., & Luthy, N. (2017). Teacher professional development through digital content evaluation. *Educational Technology Research & Development*, *65*(4), 1067–1103. doi:10.1007/s11423-017-9519-0

Abstract: "In this study, researchers designed and implemented a 1-year professional development (PD) program that focused on supporting teachers in evaluating and selecting digital learning contents. Participants in this investigation included 109 teachers who consented to the study amongst a total of 171 teachers from five school districts across central Ohio. In addition to their participation in the PD program, they completed surveys, interviews, and self-reflections in this mixed-method study. The results revealed that teachers' perceived TPACK increased over time throughout the PD program, suggesting that training teachers to evaluate digital contents can be an effective PD model to improve teachers' capacity in learning technology integration. The PD program was especially effective for teachers with less prior experience in technology integration or related training. Mathematics teachers, in comparison to teachers from other disciplines, began with low TPACK; however, these initial differences gradually diminished over the course of the PD program. In terms of their motivation in digital content evaluation, teachers' expectancy for success increased significantly while their task values remained medium high. The qualitative analyses provided additional insights and revealed design suggestions for success in future PDs."

Yalley, C. E. (2017). Renaissance of social studies instruction in the senior high schools in Ghana: Technological perspective. *Journal of Education and Practice, 8*(13), 101–107.

Abstract: "The main purpose of this paper is to position Mishra and Koehler (2006) theoretical/conceptual framework 'Technological Pedagogical Content Knowledge (TPACK)' as a contingent solution to the future of Social Studies teaching and learning. This paper is to offer a contingent solution to the Ministry of Education, Ghana, on the challenges of 'ICT in Education' and how to boost teacher's ICT/technological competencies, skills and knowledge to ensure maximum utilization of ICTs in education. This position paper recommend that teacher training institutions in Ghana should adopt the theoretical/conceptual framework 'Technological Pedagogical Content Knowledge' by Mishra and Koehler (2006) as a course design to enable said Social Studies teachers grasp the requisite competencies and skills to effectively integrate the three knowledge domains (technology, content and pedagogy). Furthermore, this position paper recommend that Ministry of Education, the Curriculum Research Development Division (CRDD), Social Studies curriculum Specialists/Experts, Regional, District as well as Heads of

various Second Cycle Institutions should organize periodic technological training and workshops on 21st century teaching and learning methods to enable Social Studies teachers acquire, grasp and possess the needed requisite competencies to effectively integrate technology in education."

Yan, Z., Chai, C. S., & So, H. J. (2018). Creating tools for inquiry-based mathematics learning from technological pedagogical content knowledge perspectives: Collaborative design approach. *Australasian Journal of Educational Technology*. Advance online publication. doi:10.1177/0735633117752453

Abstract: "This study proposed a new conceptualization of technological pedagogical content knowledge (TPACK) that focuses exclusively on the intersection of technology, pedagogy, and content specifically for selected dimensions of 21st century learning. In addition, teachers' design beliefs were investigated with the teachers' TPACK. Given the conceptualization, a new instrument was designed and validated. An associated intervention program to enhance the preservice teachers' TPACK was designed and the pre- and post-course surveys were conducted. To unpack the relationships between teachers' design beliefs and their TPACK, structural equation models were constructed and validated. The findings indicate that the instrument possesses good construct, discriminant and convergence validity, and reliabilities. The intervention enhanced the teachers' TPACK efficacies and their design beliefs significantly, and the structural equation models indicate that the teachers' design beliefs are significant predictors of the teachers' TPACK. The implications of this study suggest that TPACK may be conceived differently and this may promote new intervention programs to foster preservice teachers' TPACK and design beliefs."

Yildiz, A. (2017). The factors affecting techno-pedagogical competencies and critical thinking skills of preservice mathematics teachers. *Malaysian Online Journal of Educational Sciences, 5*(2), 66–81.

Abstract: "Students' high-level thinking skills, like critical thinking, have been developed thanks to the use of technology. When the previous researches in the literature are analyzed, it will be understood that this research is original by providing significant contributions to the literature. This research aims to investigate whether techno-pedagogical competencies and critical thinking skills show statistically significant difference in terms of some variables and whether there is statistically significant relationship between critical thinking skills and techno-pedagogical competencies of pre-service elementary mathematics teachers. At that point, this research is remarkable for presenting an idea in terms of educating more qualified mathematics teachers. This study was designed as a descriptive study. The sample of the research consists of 552 pre-service elementary mathematics teachers. Two types of data collection tools were used in this study: 'TPACK Self-Efficacy Scale' and 'Critical Thinking Scale.' The data of the study were analyzed by using the Statistical Package for Social Science (SPSS) 21.0. The results of the study reveal that the techno-pedagogical competencies and critical thinking skills of pre-service mathematics teachers are midlevel. On the other hand, there is a significant relation between

the pre-service mathematics teachers' critical thinking skills and techno-pedagogical competencies."

Yildiz, A., & Baltaci, S. (2017). Reflections from the lesson study for the development of techno-pedagogical competencies in teaching fractal geometry. *European Journal of Educational Research, 6*, 41–50. doi:10.12973/eu-jer.6.1.41

Abstract: "Technological Pedagogical Content Knowledge (TPACK) is a model that explains how teachers use technology more effectively in the context of technological, pedagogical, and content knowledge. Teachers' TPACK competencies play great importance in this regard. Lesson study has also been playing significant roles in the development of teachers' professional trainings. When the researches on TPACK and lesson study have been analyzed, the research is expected to provide significant contributions to the literature. This study aims to present reflections from a lesson study practice that carried out to urge techno-pedagogical competencies of the secondary school mathematics teachers and to reveal the development of teachers' progress. The study used case study method, and it was conducted with three in-service teachers. The research data were collected through semi-structured interviews, voice recorder, and observation notes. To analyze the collected data, descriptive analysis method was used. The results have revealed that teachers have made much more progress in designing, implementing, and problem solving in terms of TPACK competencies. It has also been determined that teachers' development of openness to the innovations was limited. This limitation appeared to emerge as a result of teachers' time anxiety and insufficient knowledge regarding the use of technology."

Zinger, D., Naranjo, A., Amador, I., Gilbertson, N., & Warschauer, M. (2017). A design-based research approach to improving professional development and teacher knowledge: The case of the Smithsonian Learning Lab. *Contemporary Issues in Technology & Teacher Education*, *17*(3), 388–410. Retrieved from https://www.learntechlib.org/p/178235/.

Abstract: "Incorporating technology in classrooms to promote student learning is an ongoing instructional challenge. Teacher professional development (PD) is a central component of teacher education to support student use of technology and can improve student learning, but PD has had mixed results. In this study, researchers investigated a PD program designed to prepare a cohort of middle school social studies teachers to teach with an online resource, the Smithsonian Learning Lab. They examined how an iterative, design- based approach used teacher feedback to develop learning opportunities in the PD. Using the technological, pedagogical, and content knowledge framework (TPACK), they found that through four iterations of 1-day PD workshops, PDs afforded teachers increasingly individualized and meaningful opportunities to learn. Teacher feedback emerged as a central component in the changes and development of the PD series. Through the course of the PD, teacher knowledge increased across five of seven TPACK domains."

Chapters

Kaplon-Schilis, A., & Lyublinskaya, I. Exploring independence of five TPACK domains TK, PK, CK math, CK science, and TPACK of pre-service special education teachers. In L. Liu & D. C. Gibson (Eds.), *Research highlights in technology and teacher education 2017* (pp. 29–36). Waynesville, NC: AACE.

Abstract: "This long-term single group study was conducted with pre-service special education elementary teachers taking the graduate level course Integrating Technology in Mathematics and Science Instruction in Special Education and Inclusive Classrooms in a New York City public university. The purpose of this study was a) to explore whether TK, PK, CK (in math and science) and TPACK are independent constructs in TPACK framework, and b) to analyze effect of the TPACK-based course on these domains. Confirmatory factor analysis of the study instruments suggests that TPACK construct is independent from TK, PK, and CK (in math and science). The paired sample t-test showed significant gains in teachers' TK, CK (in math), and TPACK, however, there were no significant changes in PK and CK (in science)."

Phillips, M., Koehler, M. J., Rosenberg, J. M., & Zunica, B. (2017). Revisiting concepts of knowledge as part of the TPACK framework. In L. Liu & D. C. Gibson (Eds.), *Research highlights in technology and teacher education 2017* (pp. 21–27). Waynesville, NC: AACE.

Abstract: "Teacher knowledge has been a research focus for a number of decades and is a core component of the TPACK framework and the PCK framework which preceded it. Despite the centrality of knowledge in both conceptualisations, it is difficult to find a clear and universally accepted understanding of the term knowledge. We believe that, outlining differences in knowledge domains may assist members of the TPACK research community – and indeed those who draw on PCK as a research focus – to develop a more nuanced understanding of the possibilities and limitations that result from these epistemological differences. This paper therefore presents an argument that the knowledge required by teachers should not be thought of as a homogenous term. In contrast, discussion presented in this paper will highlight differences in knowledge domains including justified and true knowledge; skills based knowledge; and actionable, craft knowledge. Discussion of these knowledge domains will challenge the interconnected representations of knowledge presented in frameworks such as PCK and TPACK will be together with three major implications for teacher education."

Valtonen, T., Kontkanen, S., Kukkonen, J., Sointu, E., & Pontinen, S. (2017). Insights into pre-service teachers' TPACK. In L. Liu & D. C. Gibson (Eds.), *Research highlights in technology and teacher education 2017* (pp. 13–20). Waynesville, NC: AACE.

Abstract: "This research focuses on pre-service teachers' Technological Pedagogical Content Knowledge (TPACK). Research data consists of 61 lesson plans written by second-year pre-service teachers in a Finnish teacher education department. The lesson plans were analyzed qualitatively using document and artifact analysis. Results provide insights into the contents of

six areas of pre-service teachers' TPACK. While the results indicate a rather narrow scope in the areas related to pedagogical knowledge, a wide variety of different technologies were used. Based on the analyzed lesson plans, the impact on teacher education is evident. The chosen teaching and learning methods and technologies align closely with methods and technologies used within teacher education. Still, the results indicate that pre-service teachers need more encouragement to design and innovate new ways of using technology in pedagogically sound ways that align with 21st century skills."

Yu, C., & Franz, D. P. (2017). Visiting technological pedagogical and content knowledge (TPACK): Issues and challenges for teachers' professional development. In T. Kidd & L. R. Morris (Eds.), *Handbook of research on instructional systems and educational technology* (pp. 380-391). Hershey, PA: IGI Global. doi:10.4018/978-1-5225-2399-4.ch032

Abstract: "The TPACK framework has been widely discussed for effective technology integration, and the literature has also indicated TPACK has significant implications for teacher education and professional development. The purpose of this chapter is to examine interconnectedness of TPACK and teacher professional development. This chapter reviews the research on TPACK and the extensive literature on quality professional development for teachers. In addition, the chapter highlights how various content areas have addressed pedagogical content knowledge and implications for practice in technology and teacher development. The chapter seeks to contribute knowledge about the structure of professional development initiatives that involve instructional technology and integration into various content knowledge disciplines."

Zinger, D., Tate, T., & Warschauer, M. (2017). Learning and teaching with technology: Technological pedagogy and teacher practice. In D. J. Clandinin & J. Husu (Eds.), *The SAGE handbook of research on teacher education* (pp. 577–593). Thousand Oaks, CA: SAGE.

Abstract: "In this chapter, we examine technology-enhanced pedagogy in the context of teacher learning and classroom practice. We define and discuss technology-rich environments, which encompass a complex combination of tools, curricula, contexts, and teachers. We will point out that technocentrist approaches (see discussion in Papert, 1990) persist in the classroom and note their counterproductive nature. We then conceptualize technological pedagogy within the framework of technological pedagogical content knowledge (TPACK) (Koehler & Mishra, 2009), which presents a useful way to situate technology and teacher knowledge. Finally, we broaden our view to examine technological contexts across a number of settings and the impact of socio-cultural factors on the use of technology and the enactment of technological pedagogy. In exploring varied teaching contexts, we identify emerging characteristics that support or hinder teacher learning of technological pedagogy and implementation of high quality instruction. In particular, we examine barriers that teachers and schools are likely to confront in developing teacher technological pedagogy and practice. We consider both pre-service teacher education programs and in-service teacher professional development (PD), and their roles in promoting teacher technological pedagogy and improved

classroom practice. We look at affordances in existing pre-service and in-service programs, and make recommendations for productive approaches to improve teacher technological pedagogy."

Book

Breen, P. (2018). *Developing educators for the digital age: A framework for capturing knowledge in action*. London: University of Westminster Press. doi:10.16997/book13 Retrieved from https://www.uwestminsterpress.co.uk/site/books/10.16997/book13/

Abstract: "Evaluating skills and knowledge capture lies at the cutting edge of contemporary higher education where there is a drive towards increasing evaluation of classroom performance and use of digital technologies in pedagogy. *Developing Educators for the Digital Age* is a book that provides a narrative account of teacher development geared towards the further usage of technologies (including iPads, MOOCs and whiteboards) in the classroom presented via the histories and observation of a diverse group of teachers engaged in the multiple dimensions of their profession.

Drawing on the insights of a variety of educational theories and approaches (including TPACK) it presents a practical framework for capturing knowledge in action of these English language teachers – in their own voices – indicating how such methods, processes and experiences shed light more widely on related contexts within HE and may be transferable to other situations.

This book will be of interest to the growing body of scholars interested in TPACK theory, or communities of practice theory and more widely anyone concerned with how new pedagogical skills and knowledge with technology may be incorporated in better practice and concrete instances of teaching."

3. Recent TPACK-Related Dissertations and Theses

Carton, R. (2017). *TPACK learning activity types for secondary computer science courses* (Master's thesis). Retrieved from https://scholarworks.uni.edu/cgi/viewcontent.cgi?article=1132&context=grp

Abstract: "Learning activity types for secondary computer science courses support educators in integrating technology and developing their TPACK (technological, pedagogical, and content knowledge) authentically. The taxonomy of computer science activity types presented in this project report provide seven identified activity types and descriptions aligned with the Computer Science Teachers' Association (CSTA) standards and framework. Included in the taxonomy are possible technologies for each activity type. Along with the CSTA standards and framework, ten peer-reviewed studies published between 2009 and 2015 were selected for analysis in the literature review and as research backing the construction of the taxonomy.

Further research and expansion of the computer science learning activity types and technologies was recommended."

Day, V. (2017). *Understanding the relationship between K-12 teachers' perceptions of their levels of teaching innovation and their experiences with technology-driven professional development* (Doctoral dissertation). Available from ProQuest Dissertations and Theses Global. (UMI No. 10285248)

Abstract: "Students today are expected to develop real-world thinking and digital literacy skills to succeed in a globally connected and technology-infused world. Accordingly, teachers are tasked with implementing innovative levels of teaching to meet the needs of today's digital learners. As technology becomes increasingly ubiquitous and accessible in K-12 schools, learning will continue to take place in digital spaces. However, current research suggests that teachers lack the technological proficiencies required to develop the engaging and innovative classroom experiences that students crave. Despite significant investments in professional development in K-12 schools, many teachers are failing to effectively transfer learning from these experiences into innovative levels of teaching.

A rapid influx of technology into K-12 schools presents significant potential for educators to leverage digital resources to pursue professional development opportunities that are relevant to their practice—in any place, at any time. However, it is unclear how teachers' use of innovative, technology-driven pedagogy in their classrooms relates to their perceptions and experiences with technology-driven professional development. The purpose of this study was to examine K-12 teachers' perceptions and experiences with technology-driven professional development and how they relate to their level of innovative teaching. To shed light on the research problem, this mixed-methods study sought to answer the following research questions:

1. What are K-12 teachers' LoTi based on the Levels of Teaching Innovation Digital Age Survey for Teachers? 2. How do K-12 teachers with varying LoTi describe their experiences with technology-driven professional development? Why do teachers choose to participate in professional development? How do teachers feel about technology-driven professional development? Who participates in technology-driven professional development? How is teachers' participation in technology-driven professional development related to their LoTi?

This study utilized both the LoTi Digital Age Survey for Teachers to gather quantitative data on teachers' levels of innovative teaching and a qualitative component consisting of semi-structured interviews. Analysis of the quantitative component resulted in a descriptive analysis in the form of categorical variables pertaining to teachers' levels of teaching innovation to explain outcome variance. The qualitative component sought to develop an understanding of K-12 teachers' perceptions and lived experiences with technology, professional development, and levels of teaching innovation. The themes and subthemes that emerged from this study are grouped into two primary categories: (1) Teaching and Learning with Technology, and (2) Professional Development. Furthermore, answers to the study's research questions are

interwoven into a discussion based on reached conclusions. Finally, based on the study's results and conclusions, along with current research in K-12 education, recommendations are made for improving professional development practices toward elevated levels of innovative teaching."

Hume, V. (2018). *The impact of TPACK, SAMR, and teacher effectiveness on student academic growth in eighth grade language arts and mathematics* (Doctoral dissertation). Retrieved from https://etd.ohiolink.edu/!etd.send_file?accession=ysu1516440040583993&disposition=inline

Abstract: "School districts in the United States are investing large sums of money in educational technology. The investment is predicted to continue, with an increase in spending due to the explosion of the 1-to-1 technology implementations such as iPads and Chromebooks. The additional funding available through the Federal E-Rate program significantly contributes to the expansion of classroom technology. However, research has found that singularly examining the impact technology has on student learning shows there is no consistent result. Other research has acknowledged this shortcoming with technology and has focused on teacher technology use skills, how teachers integrate technology in the classroom, teacher evaluation systems, and educational value-added systems. The research results of these factors indicate individually they can influence classroom learning. This study examined the impact of multiple variables on student academic growth. The variables were a teacher's self-efficacy of their Technology, Pedagogy, and Content Knowledge (TPACK) skills (gathered via a survey), the level of Substitution, Augmentation, Modification, and Redefinition (SAMR) obtained in the classroom (reported through principal observation), and teacher effectiveness rating (end of year principal evaluation forms based on the Pennsylvania Teacher Evaluation Model). The study demographic was Northwestern Pennsylvania and the schools were located within the service area of the same educational service agency. Eight eighth grade language arts and mathematics teachers were included in the study. The results indicated two relationships. The first was between TK (Technology Knowledge) and Danielson's Domain Two (Classroom Environment). The second was between Danielson's Domain Three (Instruction) and the 2017 PVAAS PSSA Academic Growth Index."

Knapp, W. (2017). *The impact of TPACK and teacher technology efficacy on social studies teachers' use of technology in the classroom* (Doctoral dissertation). Retrieved from http://hdl.handle.net/11299/193425

Abstract: "Access to classroom technology and professional development does not ensure teachers will use technology in the classroom. According to Kopcha (2012) the availability of technology in classrooms has grown, yet a majority of teachers still report-using technology most frequently for non-instructional tasks such as administrative work and communication with peers. This case study research describes the experience of three teachers who participated in a TPACK focused professional development workshop designed to improve their understanding of how to effectively use technology to teach social studies and whether participation in the workshop influenced teachers' technology efficacy and their TPACK while

looking closely at why some teachers more readily adopt technology than others. The context of this study centered on teacher technology efficacy, as this is a strong indicator of behavior, (Moran & Hoy, 2001; Palak & Walls, 2009; Lee & Tsai, 2010) and the TPACK framework because it serves as a backdrop for discussion related to instructional decisions (Lee, M, & Tsai, C. 2007; Koehler & Mishra, 2009). Findings from this study suggest that participation in the workshop resulted in a positive change in behavior, improved technology self-efficacy, and increased ability to overcome obstacles and barriers associated with classroom technology integration among the participants studied. This information is useful to those engaged in the design of professional development. It further serves to inform social studies teachers on the type of professional development useful for learning how to effectively combine technology, content, and pedagogical strategies in the classroom. The testimony of these cases supports the notion that professional development that is thoughtfully designed, offers content specific materials, while modeling implementation strategies with supported guidance is effective in the influence of teacher's use of technology in the classroom."

Shafer, E. C. (2017). *A qualitative study of how teacher perceptions within a 1:1 iPad® program may contribute to changes in teacher practices* (Doctoral dissertation). Retrieved from https://lib.dr.iastate.edu/cgi/viewcontent.cgi?article=7220&context=etd

Abstract: "*Background*: Schools around the United States are implementing costly school-wide 1:1 iPad programs to support student learning. Technology integration in schools has the potential to influence teachers to include more student-centered approaches. Student-centered approaches can be defined as methods of teaching and learning that place more responsibility on students. Numerous studies suggest that key elements of student-centered approaches incorporate student activity and engagement into the learning process. The increase in access to technology that is afforded students by school-wide 1:1 iPad programs can potentially bring about a change in teacher practices. *Purpose*: The primary purpose of this study was to understand the perceptions of high school teachers regarding their experience with 1:1 iPad programs related to teacher practices. *Setting*: One Midwest high school that implemented a 1:1 iPad program. *Participants*: High school teachers within the school-wide 1:1 iPad program. *Research Design*: Phenomenological interviews and classroom observations. *Data collection and analysis*: Interviews, classroom observations, ongoing data analysis with coding, and document analysis were all used. *Findings*: 1:1 iPad Programs changed teacher practices in the areas of constructivist approaches, improved lesson planning through teacher collaboration and the ability for teachers to formatively assess. Constructivist teaching lead to less lecture based teaching and more student activity and engagement in the learning process. *Conclusions*: The results could provide potential evidence to support a 1:1 iPad program to change teacher practices, among other factors."

Sharp, S. K. (2017). *iPads in the second language classroom: An examination of iPad use by teachers through TPACK and teacher perception lenses* (Doctoral dissertation, University of Maryland, College Park). Retrieved from https://drum.lib.umd.edu/bitstream/handle/1903/20334/Sharp_umd_0117E_18545.pdf?sequence=1&isAllowed=y

Abstract: "Research indicates a need for teacher education programs which include embedded computer assisted language learning (CALL) to support teachers' technological pedagogical and content knowledge (TPACK) of how to employ technology in classroom settings. Researchers also indicate a need to better understand the knowledge-base of language teacher education (LTE), including a teacher's possible 40-year career through ever changing technology. This mixed-method case study examines the use of iPads by four teachers, who represent maximum variation in their teaching and technology experience, in two mostly homogenous schools. The study looks specifically at how teachers' perceptions of 1) teaching, 2) technology, 3) using technology and 4) their students shape the way they use iPads with English language learners. It also examines what supports facilitate the use of iPads for instructional purposes in second language classrooms. I focus on the use of iPads in a one-to-one implementation in a technologically embedded context because iPads are a relatively new innovation in classrooms, with the potential of changing instruction. Such changes may contribute to the challenges and benefits of being an effective teacher in the English language teaching (ELT) classroom. Research on the use of iPads in classrooms has been previously limited to mostly suggestions for use and has given little guidance in how this disruption will assist and challenge teachers. TPACK is used as a powerful construct based in a reconceptualization of the language teacher education (LTE) knowledge-base, indicating influences of context, teachers and their perceptions, identity and agency and activities in the classroom. These factors suggest ways which classroom technology and teacher, student, administrative and contextual influences may mediate the activities of teaching and learning in the classroom.

The data show a correlation between teachers' practices with iPads and their previous experiences using technology in the classroom. Teacher groupings demonstrated differences in teaching based on their experience using technology and teaching. Schools showed differences only in terms of some choices made by the administration. Students' effects on the use of iPads is minimal, except for instances of how student behavior affected the classroom."

4. 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., & Wildman, A. (Eds.). (2018, March 5). TPACK newsletter issue #35: March 2018 [Electronic mailing list message]. Retrieved from http://bit.ly/TPACKNewslettersArchive

5. 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/
- Read past issues of the newsletter at: http://bit.ly/TPACKNewslettersArchive
- Subscribe to the tpack.research, tpack.teaching, tpack.grants and/or tpack.future discussion lists at: http://site.aace.org/sigs/tpack-sig/
- Access the TPACK Learning Activity Types taxonomies at: http://activitytypes.wm.edu/
- Access three tested TPACK assessment instruments at: http://activitytypes.wm.edu/Assessments
- Access and/or adapt TPACK online short courses at: http://activitytypes.wm.edu/shortcourse/

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.newsletter.editors@wm.edu.

Standard End-Matter

If you have questions, suggestions, or comments about the newsletter, please send those to tpack.newsletter.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 & Amelia

…for the SITE TPACK SIG leadership:
Mamta Shah,   Co-Chair, Drexel University
Teresa Foulger,   Co-Chair, Arizona State University
Josh Rosenberg,   Camping Chair, Michigan State University
Petra Fisser,   Red-Blue Chair, SLO Expertise Center, National Curriculum Development
Candace Figg,   Rocking Chair, Brock University

[Mark Hofer](#),   Sedan Chair, College of William & Mary
[Judi Harris](#),   Wing Chair, College of William & Mary
[Mario Kelly](#),   Futon, City University of New York
[Matt Koehler](#),   Chaise Lounge, Michigan State University
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