InFo TED International Forum for Teacher Educator Development

ICT and Technological Change - Further Reading

Contents

What is Technological Pedagogical Content Knowledge (TPACK)

Koehler, M.J., Mishra, P., & Cain, W. (2013). What is Technological Pedagogical Content Knowledge (TPACK)? *Contemporary Issues in Technology and Teacher Education, 9*(1),
https://www.learntechlib.org/p/29544/ or https://www.citejournal.org/volume-9/issue-1-09/general/what-is-technological-pedagogicalcontent-knowledge/

This paper describes a teacher knowledge framework for technology integration called technological pedagogical content knowledge (originally TPCK, now known as TPACK, or technology, pedagogy, and content knowledge). This framework builds on Lee Shulman's (1986, 1987) construct of pedagogical content knowledge (PCK) to include technology knowledge. The development of TPACK by teachers is critical to effective teaching with technology. The paper begins with a brief introduction to the complex, ill structured nature of teaching. The nature of technologies (both analog and digital) is considered, as well as how the inclusion of technology in pedagogy further complicates teaching. The TPACK framework for teacher knowledge is described in detail as a complex interaction among three bodies of knowledge: content, pedagogy, and technology. The interaction of these bodies of knowledge, both theoretically and in practice, produces the types of flexible knowledge needed to successfully integrate technology use into teaching.

Lund, A., Furberg, A, Bakken, J., & Engelien, K.L. (2014). What Does Professional Digital Competence Mean in Teacher Education? *Nordic Journal of Digital Literacy, 9*(4), 281–299.
https://www.idunn.no/dk/2014/04/what_does_professional_digital_competence_mean_inteacher_e

The focus of this position paper is on the conceptualization of professional digital competence (PDC) in the teaching profession and its consequences for teacher education. The aim is to establish a concept that captures, challenges, and possibilities related to teaching and learning in technology-rich settings. By using three school subjects as cases, we argue the necessity of viewing PDC as comprising a deep understanding of technology, knowledge of students' learning processes, and an understanding of the specific disciplinary practices and features characterizing individual school subjects.
Keywords professional digital competence, teacher education, integration of technologies, didactics

Mishra, P. & Koehler, M.J. (2006). Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge. *Teachers College Record, 108*(6), 1017–1054.
https://www.learntechlib.org/p/99246/?nl=1

Research in the area of educational technology has often been critiqued for a lack of theoretical grounding. In this article we propose a conceptual framework for educational technology by building on Shulman's formulation of ''pedagogical content knowledge'' and extend it to the phenomenon of teachers integrating technology into their pedagogy. This framework is the result of 5 years of work on a program of research focused on teacher professional development and faculty development in higher education. It attempts to capture some of the essential qualities of teacher knowledge required for technology integration in teaching, while addressing the complex, multifaceted, and situated nature of this knowledge. We argue, briefly, that thoughtful pedagogical uses of technology require the development of a complex, situated form of knowledge that we call Technological Pedagogical Content Knowledge (TPCK). In doing so, we posit the complex roles of, and interplay among, three main components of learning environments: content, pedagogy, and technology. We

argue that this model has much to offer to discussions of technology integration at multiple levels: theoretical, pedagogical, and methodological. In this article, we describe the theory behind our framework, provide examples of our teaching approach based upon the framework, and illustrate the methodological contributions that have resulted from this work.

Teaching TPACK in Initial Teacher Education

Admiraal, W., Vugt, F. van, Kranenburg, F., Koster, B., Smit, B., Weijers, S., & Lockhorst, D. (2017). Preparing pre-service teachers to integrate technology into K–12 instruction: evaluation of a technology-infused approach. *Technology, Pedagogy and Education, 26*(1), 105–120.
http://dx.doi.org/10.1080/1475939X.2016.1163283

The quality of how technology is addressed in teacher education programmes is conditional for how student teachers apply technology in secondary schools after their graduation. Two technology-infused courses of one teacher education programme were evaluated. In line with studies on the development of pre-service teachers' technological, pedagogical and content knowledge, two important enablers were distinguished: (1) teaching practice to enact what was learned in teacher education institution as well as to receive feedback from students on this enactment, and (2) modelling of teacher educators and teachers in school. Both enablers might require further development of knowledge and skills of both teacher educators and cooperating school teachers.
Keywords: teacher education; technology use; pre-service teachers

Alayyar, G.M., Fisser, P., & Voogt, J. (2012). Developing technological pedagogical content knowledge in pre-service science teachers: Support from blended learning. *Australasian Journal of Educational Technology, 28*(8), 1298-1316.
https://doi.org/10.14742/ajet.827

The Technological Pedagogical Content Knowledge (TPACK) framework has been used to prepare pre-service science teachers at the Public Authority of Applied Education and Training in Kuwait for ICT integration in education. Pre-service teachers worked in teams to design an ICT solution for an authentic problem they faced during in-school training. Pre-service teachers were separated into two groups. The first group was coached by ICT, pedagogy, and content experts. The second group was offered a blended condition, by which they had access to an online portal with different tutorials and examples, with opportunities to meet with different experts whenever they wanted. Pre-test and post-test design data were collected for attitudes toward ICT, ICT skills, and TPACK. The findings show that the self-reported TPACK, the score of attitudes toward ICT, and ICT skills increased in both groups. However, the blended support condition reported a higher increase in the participants' technological knowledge (TK), technological pedagogical knowledge (TPK), their attitude toward ICT as a tool for instruction and productivity, and ICT enjoyment. This indicated that students perceived the blended condition for supporting design teams as a more desirable method for enhancing their development of TPACK.

Barak, M. (2017). Science Teacher Education in the Twenty-First Century: a Pedagogical Framework for Technology-Integrated Social Constructivism. *Research in Science Education, 47*(2), 283–303.
https://doi.org/10.1007/s11165-015-9501-y

Changes in our global world have shifted the skill demands from acquisition of structured knowledge to mastery of skills, often referred to as twenty-first century competencies. Given these changes, a sequential explanatory mixed methods study was undertaken to (a) examine predominant instructional methods and technologies used by teacher educators, (b) identify attributes for learning and teaching in the twenty-first century, and (c) develop a pedagogical framework for promoting meaningful usage of advanced technologies. Quantitative and qualitative data were collected via an online survey, personal interviews, and written reflections with science teacher educators and student teachers. Findings indicated that teacher educators do not provide sufficient models for the promotion of reform-based practice via web 2.0 environments, such as Wikis, blogs, social networks, or other cloud technologies. Findings also indicated four attributes for teaching and learning in the twenty-first century: (a) adapting to frequent changes and uncertain situations, (b) collaborating and communicating in decentralized environments, (c) generating data and managing information, and (d) releasing control by encouraging exploration. Guided by social constructivist paradigms and twenty-first century teaching attributes, this study suggests a pedagogical framework for fostering meaningful usage of advanced technologies in science teacher education courses.
Keywords Twenty-first century competencies. Cloud applications. Social constructivism . Science teacher education . Technology-integrated learning

Bibi, S., & Khan, S.J. (2017). TPACK in action: A study of a teacher educator's thoughts when planning to use ICT. *Australasian Journal of Educational Technology, 33*(4), 70-87.
https://doi.org/10.14742/ajet.3071

In this paper, we discuss how a university lecturer (pseudonym: James) drew on his technological pedagogical and content knowledge (TPACK) when planning to integrate technology in teaching. The main purpose of the study was to use real-life planning observations to understand James's TPACK. The data were obtained through think-aloud sessions in which James planned a course that is offered to undergraduate initial teacher education (ITE) students in a research-intensive Australian university. Chi's (1997) verbal analysis method was used to analyse verbal qualitative data. The results indicate that a different set of knowledge domains underpinned James's decisions in each different episode of his planning sessions giving his TPACK a dynamic and context-sensitive nature. We suggest observations of teachers when making actual planning decisions as one of the preferred methods to understand the nature of their TPACK. The study introduces a new approach in understanding how this teacher's TPACK looks when he drew on various domains of knowledge, by visually presenting the combinations made among knowledge domains.

Burden, K., Aubusson, P., Brindley, S. & Schuck, S. (2016). Changing knowledge, changing technology: implications for teacher education futures. *Journal of Education for Teaching, 42*(1), 4-16.
https://doi.org/10.1080/02607476.2015.1125432

Recent research in teacher education futures has identified two themes that require further study: the changing nature of knowledge and the changing capabilities of technologies. This article examines the intersection of these two themes and their implications for teacher education. The research employed futures methodologies based on scenario creation. With a focus on the above themes or dimensions, a panel of experts was interviewed to draw on its collective wisdom to explore alternative teacher education futures. Data from these interviews were analysed to stimulate the construction of four future teacher education scenarios. Feedback on the scenarios was obtained from teacher educators in Europe and Australia. The scenarios were then revised based on this

feedback. The final scenarios are presented here as a way of provoking discussion among teacher educators about teacher education futures.
Keywords: knowledge; technology; education futures; scenarios; teacher education

Instefjord, E.J., & Munthe, E. (2017). Educating digitally competent teachers: A study of integration of professional digital competence in teacher education. *Teaching and Teacher Education, 67*(2017), 37-45.
http://dx.doi.org/10.1016/j.tate.2017.05.016

The present study focuses on the integration of professional digital competence in initial teacher education programmes. Data analysed are from three national questionnaire surveys conducted among teacher educators, mentor teachers and pre-service teachers in Norway. The study shows that there are weak positive correlations between positive management, management's development support, and teacher educators' digital competence, but stronger positive correlations between teacher educators' self-reported efficacy and digital competence. Results are discussed in relation to teacher education's role in qualifying for professional work in digital classrooms.
Keywords: Teacher education Technology Digital competence Pre-service teachers Efficacy

Kalonde, G., & Mousa, R. (2016). Technology Familiarization to Preservice Teachers: Factors that Influence Teacher Educators' Technology Decisions. *Journal of Educational Technology Systems, 45*(2), 236–255.
http://dx.doi.org/10.1177/0047239515616965

The purpose of this study was to investigate factors that influence teacher educators' technology decisions in methods courses. Research has shown various reasons why teachers use different types of technologies and not able to integrate certain technologies. However, this study focused on the source of teachers' instructional technology foundations, knowledge, and preparation for teaching. A total of 90 teacher educators were surveyed and stated that content, ease of use, availability, experiences, students' interest, and obstacles influence decisions on technologies modeled to preservice teachers in the methods courses. This study provides a different perspective on understanding teachers' dilemma on technology integration in K-12 classrooms. The findings provide information to understand teacher educators' technology decisions and modeling influence on K-12 teachers' technology integration in the classroom.
Keywords familiarization, technology influences, technology obstacles, teacher educators, integration

Ottenbreit-Leftwich, A.T., Brush, T.A., Strycker, J., Gronseth, S., Roman, T., Abaci, S., VanLeusen, P., Shin, S., Easterling, W., & Plucker, J. (2012). Preparation versus practice: How do teacher education programs and practicing teachers align in their use of technology to support teaching and learning? *Computers & Education, 59*(2012), 399–411.
http://dx.doi.org/10.1016/j.compedu.2012.01.014

Researchers have called for renewed efforts in exploring both what knowledge should be taught in preservice teacher education programs with regard to technology, and how to best prepare teachers to effectively use that knowledge to support teaching and learning. This study compared the importance of technology topics from teacher educators and teachers' perspectives. A two-phase mixed-methods research design utilized surveys and multiple case studies (interviews, documents) to collect data from both teacher educators and practicing teachers. Findings indicate that teachers and teacher educators demonstrated similarities in their views regarding the use of technology for

personal productivity, information presentation, and the access and use of electronic resources to support teaching and learning. Teacher educators and teachers differed with regard to their use of technology for communication, analysis of student data, documenting professional growth, and facilitating higher-order thinking skills. Recommendations for how teacher education programs can incorporate and address technology topics in order to increase relevance for teachers are discussed. *Keywords: Preservice teacher education Technology use Technology integration Teacher technology use*

Rienties, B., Brouwer, N., Bohle Carbonell, K., Townsend, D., Rozendal, A-P., & van der Loo, J. (2013). Online training of TPACK skills of higher education scholars: a cross-institutional impact study. *European Journal of Teacher Education, 36*(4), 480-495.
http://dx.doi.org/10.1080/02619768.2013.801073

Higher education institutions should provide adequate training for teachers in order to increase their awareness of the complex interplay between technology, pedagogy and the cognitive knowledge in their disciplines. However, research has shown that providing effective staff development from teacher educators to support these teachers' skills is not straightforward. An online teacher training programme created and implemented by a team of 14 teacher educators in a cross-institutional programme in the Netherlands was followed by 67 teachers. Data were gathered using a TPACK (Technological, Pedagogical, Content Knowledge) instrument in a pre-posttest design. Furthermore, (perceived) learning satisfaction was measured in order to determine whether the design was appropriate. The results indicate that the teachers' TPACK skills increased substantially. Furthermore, most participants were positive about the design and implementation of the online professionalisation programme. Nonetheless, not all teachers were able to effectively learn in this context, requiring further fine-tuning and research

Røkenes, F. M., & Krumsvik, R. J. (2014). Development of student teachers' digital competence in teacher education: A literature review. *Nordic Journal of Digital Literacy, 9(*4), 250-280.
https://www.idunn.no/dk/2014/04/development_of_student_teachers_digital_competence_in_teac

This article is a literature review of online peer-reviewed empirical studies from 2000 to 2013 regarding the development of digital competence of student teachers in teacher education qualified to teach in the secondary school grade level. The purpose of the review is to showcase and establish knowledge about empirical research on ICT-training in teacher education, and contribute with an overview of approaches for researchers, teacher educators, and policymakers on how teacher education develop student teachers' digital competence for the secondary school grade level. A total of 42 studies met the inclusion criteria and were included in the review. Based on a thematic analysis of the studies, including coding and categorization strategies, eight approaches were identified: collaboration, metacognition, blending, modeling, authentic learning, student-active learning, assessment, and bridging theory/practice gap. The approaches consider ways that teacher education programs promote student teachers' digital competence, and educate them in professionally using ICT for their future use in school and classroom teaching in secondary education.

Røkenes, F.M., & Krumsvik, R.J. (2016). Prepared to teach ESL with ICT? A study of digital competence in Norwegian teacher education. *Computers & Education 97*, 1–20.
http://dx.doi.org/10.1016/j.compedu.2016.02.014

The purpose of this study is to examine how secondary student teachers are educated to teach with ICT through an English as a Second Language (ESL) didactics course offered at a teacher education program in Norway. Using a case study methodology, four cohorts of postgraduate student teachers were examined over 4 academic semesters. The students were qualifying to teach ESL in secondary school. Data were collected through surveys, participant observations, and semi-structured interviews. A theoretical model for digital competence development was used as an analytical lens in the data analysis. Findings indicate that the mastery and appropriation of teaching ESL with ICT varies amongst student teachers. Through their studies, the overall digital competence development is both enabled and inhibited by a number of factors such as modeling, scaffolding learning experiences, linking theory and practice, reflection, access to resources and support, innovative assessment practices, and collaborative learning. The implications that these findings have for teacher education are discussed.

Tondeur, J., Braak, J. van, Sang, G., Voogt, J., Fisser, P., & Ottenbreit-Leftwich, A. (2012). Preparing pre-service teachers to integrate technology in education - A synthesis of qualitative evidence. *Computers & Education,* 59(2012), 134–144.
http://dx.doi.org/10.1016/j.compedu.2011.10.009

This study reviewed qualitative studies that focused on strategies to prepare pre-service teachers to integrate technology into their lessons. A meta-ethnography approach was utilized to locate, critically appraise, and synthesize the results of these studies. Based on an extensive search in the Web of Science, 19 articles were included in this synthesis. The results were divided into two parts: (1) key themes explicitly related to the preparation of pre-service teachers (e.g., using teacher educators as role models, learning technology by design, scaffolding authentic technology experiences), and (2) conditions necessary at the institutional level (e.g., technology planning and leadership, co-operation within and between institutions, training staff). To present how these key themes related to each other, an overarching model was developed. By interpreting the results of the review, recommendations were discussed for pre-service teacher technology training and future research.
Keywords: Systematic review Synthesis of qualitative evidence Educational technology Pre-service training Teacher education

Tondeur, J., van Braak, J., Siddiq, F., & Scherer, R. (2016).Time for a new approach to prepare future teachers for educational technology use: Its meaning and measurement. *Computers & Education, 94*, 134–150.
http://dx.doi.org/10.1016/j.compedu.2015.11.009

The main objective of this study is to develop a self-report instrument to measure preservice teachers' perceptions of the extent to which they experience the necessary support and training in order to integrate technology into classroom activities. The questionnaire items of this instrument were drawn up on the basis of a synthesis of 19 qualitative studies and were reviewed by experts in the field. In order to study its reliability and aspects of validity, data were collected and analysed consisting of a sample of 688 pre-service teachers in Flanders (Belgium). The resulting scale showed highly satisfactory psychometric properties. Item response theory revealed a good fit of the measurement to a Rating Scale Model for 22 out of 24 items. The results also indicate that the items differ in their degree of difficulty. It seems that helping pre-service teachers to design ICT-rich lessons and providing adequate feedback can be considered more challenging for teacher training institutions. Recommendations are given regarding how the new scale can be useful for both teacher

training institutions and schools in developing approaches to equip pre-service teachers with the competencies needed to integrate technology in teaching and learning processes.

Tondeur, J., Pynoo, B., & Placklé, I. (2019). Toekomstige leraren opleiden tot educatief ICT-gebruik: Van theorie tot praktijk (Educating future teachers in using educational ICT: from theory to practice)**. In: G. Geerdink & I. Pauw (eds.).** ***Kennisbasis Lerarenopleiders - Katern 7: Opleidingsdidactiek: Hoe leiden we leraren op?*** **Pp 149-158. Eindhoven: VELON.**
https://registratiesite.brlo.nl/CMS/RPP/Organizations/1/Shops/1/Media%20Libraries/2/Toekomstige%20leraren%20opleiden%20tot...%20(KB-2019-7-09).pdf?mode=normal

Wereldwijd worstelen lerarenopleidingen met de vraag welke strategieën ze kunnen inzetten om toekomstige leraren op te leiden om ICT op een adequate wijze te integreren in hun onderwijspraktijk (zie bv. Elen, Pynoo, Goeman, & Van Braak, 2014; Tondeur, Aesaert, Prestridge, & Consuegra, 2018). Er bestaat reeds heel wat onderzoek om deze vraag te beantwoorden, maar de kennisbasis is gefragmenteerd. In dit hoofdstuk synthetiseren we het onderzoek naar effectieve strategieën om studentleraren op te leiden voor educatief ICT-gebruik. Naast het synthetiseren van de kennisbasis in een conceptueel model is een tweede doel van onze bijdrage om na te gaan op welke wijze de strategieën uit het conceptuele model (theorie) geïntegreerd kunnen worden in het curriculum van een lerarenopleiding (praktijk). We focussen daarbij op 'teacher design teams' (Becuwe, Tondeur, Pareja Roblin, Van Braak, Castelein, & Thys, 2015; Handelsatz, 2009; Pynoo, 2018). Door samen te ontwerpen komen systematisch alle strategieën aan bod uit het conceptueel model. Een derde doel is om het geheel te kaderen binnen de traditie van 'Technological Pedagogical Content Knowledge' (TPACK). De kern van TPACK bestaat immers uit de integratie van technologische, didactische en vakinhoudelijke kennis. In het hoofdstuk beschrijven we ook praktijkvoorbeelden gekoppeld aan empirisch onderzoek over het potentieel en de beperkingen van 'teacher design teams' om tot TPACK te komen. Dat brengt ons tot de aanbevelingen om studentleraren in staat te stellen om tot succesvol ICT-gebruik in hun onderwijspraktijk te komen.

Voogt, J., & McKenney, S. (2017). TPACK in teacher education: are we preparing teachers to use technology for early literacy? ***Technology, Pedagogy and Education, 26*****(1), 69-83.**
http://dx.doi.org/10.1080/1475939X.2016.1174730

This study examines if and how five teacher education institutes are helping students to develop the technological pedagogical content knowledge needed to effectively use technology for early literacy. Focus group discussions were held with teacher educators in which their responses to expert recommendations were probed. Findings indicate that, currently, very little attention is specifically given to the knowledge that teachers need to foster early literacy through the use of technology. This is due to multiple factors, including the conviction that many new technologies (e.g. tablets) are not used much in schools. Additionally, teacher educators themselves struggle with effective use of technology in their own courses. And although technological and early literacy specialists are available in teacher training colleges, pre-service educators note a distinct lack of integrated expertise in their institutions. Based on these findings, recommendations are given for research, policy and practice. *Keywords: TPACK; pre-service education; early literacy*

Use of Media Technology in Initial Teacher Education

Admiraal, W., Lockhorst, D., Smit, B., & Weijers, S. (2013). The Integrative Model of Behavior Prediction to Explain Technology Use in Post-graduate Teacher Education Programs in the

Netherlands. ***International Journal of Higher Education, 2*****(4), 172-178.**
http://dx.doi.org/doi.org/10.5430/ijhe.v2n4p172

This study examined technology in post-graduate teacher training programs in the Netherlands. A questionnaire was completed by 111 teacher educators from 12 Dutch universities with a post-graduate teacher training program. The general view of the use of technology in Dutch post-graduate teacher education was quite conventional. Basic technology such as computers, WiFi, electronic whiteboards, virtual learning environments and presentation software was commonly used, but more advanced or innovative technology was less common. In addition, the psychological Integrative Model of Behavior Prediction of Fishbein and Azjen was applied to explain differences between teacher educators in the use of both hardware and software in teacher education. Teacher educators' positive attitudes toward technology in education were significantly related to the extent to which hardware facilities were used to support teacher training pedagogy. Perceived norm largely explained differences in the extent to which software applications were used. However, both aspects were moderated by teacher educators' gender and teaching experience showing that female teacher educators and experienced teacher eduactors reported to use technology in teacher education more than other teacher educators. Soft- and hardware conditions and self-efficacy in technology did not add much explanatory power. Implications for technology use in post-graduate teacher training are formulated.
Keywords: Technology, Teacher education, Integrative model of behavior prediction

Arya, P., Christ, T., & Chiu, M.M. (2016). Video use in teacher education: a survey of teacher-educators' practices across disciplines. ***Journal of Computing in Higher Education, 28*****(2), 261–300.**
https://doi.org/10.1007/s12528-016-9116-y

Video methods utilize tenets of high quality teacher education and support education students' learning and application of learning to teaching practices. However, how frequently video is used in teacher education, and in what ways is unknown. Therefore, this study used survey data to identify the extent to which 94 teacher-educators used video in their teacher education courses along with the specific uses of video. Further, multilevel multivariate analyses identified what factors impacted these uses. Findings included that many teacher-educators underused video in their teacher education courses, and typically used only one type of video in each course. Any type of video use was significantly related to teachereducator, course, and discipline-area factors, and interactions amongst these. Specific types of video use were significantly related to institutional-demographic, teacher-educator, support, course, discipline-area factors, and interactions amongst these. Implications for increasing video use and breadth of types of video uses in teacher education are discussed.
Keywords: Video methods Survey Teacher education Instructional technology

Clark, J.S., Brown, J.S., & Jandildinov, M. (2016). Enriching preservice teachers' critical reflection through an international videoconference discussion. ***Technology, Pedagogy and Education, 25*****(4), 431-450.**
http://dx.doi.org/10.1080/1475939X.2015.1066268

The concepts of reflection and reflective practice have become the core of many teacher education programmes, with critical reflection as the goal for many teacher educators. This study examined the use of a videoconference discussion in an instructional methodology course as a means to enrich the process of reflection and encourage critical reflection. Critical action research methodology was used

by the researchers to evaluate the addition of videoconferencing to a model of scaffolded reflection which was already part of the course. The findings suggest that the introduction of a videoconference discussion to the scaffolded reflection model enriched critical reflection on four topics: technology use, multicultural curriculum and instruction, censorship of web-based resources, and accountability and assessment. The discussion of these topics allowed the preservice teachers to think about their own agency, and the affordances and constraints of their school context. Implications for using videoconferencing for critical reflection are provided for teacher educators.
Keywords: videoconference discussion; critical reflection; agency; teacher education; scaffolded reflection model

Christ, T., Arya, P., Chiu, M.M. (2017). Video use in teacher education: An international survey of practices. *Teaching and Teacher Education, 63*(2017), 22-35.
http://dx.doi.org/10.1016/j.tate.2016.12.005

Video use in teacher education can improve teacher/student learning, but teacher educators' extent/uses of video, or what supports or hinders their uses, have not been documented. This study explores these issues. 208 teacher educators'' survey responses regarding their practices across 977 teacher-education courses during one academic year were analyzed using multilevel, multivariate outcome analyses to identify relations between explanatory variables (institutional supports or barriers, teacher-educator characteristics, course attributes, educator beliefs, and video properties) and types of video uses (selfreflection, peer discussion, professor-led discussion, case studies, and multimedia). Findings show often infrequent/unvaried use of video. Video is used just an average of three times per course in teacher education. Typically just one kind of video method is used per course. Higher than average teaching load is a barrier to multiple kinds of video use. Specific discipline areas and colleagues' support increase video use. More frequent/varies video methods are needed.
Keywords: Video technology Teacher education Teaching method Barrier Support

Estapa, A. & Amador, J. (2016). Wearable Cameras as a Tool to Capture Preservice Teachers' Marked and Recorded Noticing. *Journal of Technology and Teacher Education, 24*(3), 281-307.
https://www.learntechlib.org/p/171269/

Teacher educators use a multitude of technological sources to enhance teachers' learning. More specifically, many teacher educators incorporate video as a tool for supporting preservice teachers to analyze noticing of pivotal classroom interactions; however, this video is often from a perspective distinct from the teachers' view. This study utilized an innovative methodological approach to capture the noticing of preservice teachers using wearable cameras while they were in an introspective position within the elementary classroom context. Findings indicate that differences exist in the ability for preservice teachers to mark noticing as compared to practicing teachers, suggesting the importance of further understanding preservice teacher noticing through technological means such as wearable cameras. In instances when preservice teachers marked in-the-moment noticing while wearing the cameras, they often assumed an analytical stance for noticing that was more advanced than what would be expected from preservice teachers. This evidence shows promise for wearable video technology in supporting teacher educators' understandings of what preservice teachers notice. Implications for practices within teacher education and research methodologies are discussed.

Hassler, B., Hennessy, S., Knight, S., & Connolly, T. (2014). Developing an Open Resource Bank for Interactive Teaching of STEM: Perspecives of School Teachers and Teacher Educators. *Journal of Interactive Media in Education*, Spec Iss 2014.
http://jime.open.ac.uk/2014/09

Much of the current literature related to Open Educational Resource (OER) development and practice concentrates on higher education, although a growing body of work is also emerging for the primary and secondary school sectors. This article examines the user perspectives of teachers and teacher educators, regarding: discovery of teaching resources; what they know about OER; their sharing practices; and their perspectives on resource quality and trust. The research was done in the context of the Open Resource Bank for Interactive Teaching (ORBIT), a JISC-funded Phase III OER project at the University of Cambridge. ORBIT is an OER Resource Bank containing more than 200 science, technology, engineering and mathematics (STEM) focused lesson ideas for primary and secondary teachers as well as serving as a resource bank of OER to be used by teacher educators in a variety of settings.
Keywords: STEM Education, Open Source Technology, Resource Units, Shared Resources and Services, Teacher Attitudes, Teacher Educators, Users (Information), Foreign Countries, Sharing Behavior, Usability, Trust (Psychology), Information Sources, Instructional Materials, Educational Quality, Reputation, Quality Control, Information Seeking, Teacher Surveys, Interviews, Access to Information

Kerr, S. (2016). Integrating geospatial technologies into existing teacher education coursework: Theoretical and practical notes from the field. *Contemporary Issues in Technology and Teacher Education, 16*(3), 328-347.
https://www.learntechlib.org/p/151974/ or https://www.citejournal.org/volume-16/issue-3-16/current-practice/integrating-geospatial-technologies-into-existing-teacher-education-coursework-theoretical-and-practical-notes-from-the-field/

Although instruction related to learning management systems and other educational applications in teacher education programs has increased, the potential of geospatial technologies has yet to be widely explored and considered in the teacher education literature, despite its ability to function as an engaging pedagogical tool with teacher candidates. This practitioner article discusses uses of geospatial technologies in a social studies teacher education program as a way of demonstrating how other teacher educators might use geospatial technologies to prompt teacher candidates to new ways of thinking about pedagogy and the world at large. An overview is provided of the value and relevance of integrating geospatial technologies within teacher education, followed by three examples of how geospatial technologies have been included in existing teacher education courses. In each example the activity and its connection to geospatial technologies are described, as well as the assessment and experience of teacher candidates. Teacher educators, especially those with limited experience in geospatial technology use, are provided with exemplar ways they might integrate geospatial technologies into the courses they teach—whether it be a course on methods, curriculum, a content area, or beyond.

Van Es, E.A., Tunney, J., Goldsmith, L.T., & Seago, N. (2014). A Framework for the Facilitation of Teachers' Analysis of Video. *Journal of Teacher Education, 65*, 340-56.
http://dx.doi.org/10.1177/0022487114534266

Video is being used more widely in professional development to help teachers learn to notice and systematically analyze teaching practice. Video captures the authenticity and complexity of teaching and can promote the examination of classroom interactions in a deliberate and focused way. However, simply viewing video does not ensure teacher learning. An important question concerns how to facilitate substantive analysis of teaching practice with video so that it becomes a productive learning tool for teachers. In this study, we examine the in-the-moment moves facilitators make in two different video-based professional development programs to offer a framework for facilitation with video. We then examine patterns in facilitation across both contexts and identify practices that are unique to the goals of each setting. The findings from this study have implications for the design of video-based professional development and for developing a knowledge base for professional education.

Digital Learning Environments in Initial Teacher Education

Fletcher, T., & Bullock, S.M. (2015). Reframing pedagogy while teaching about teaching online: a collaborative self-study. *Professional Development in Education, 41*(4), 690-706.
http://dx.doi.org/10.1080/19415257.2014.938357

The purpose of this paper is to use collaborative self-study to analyze and describe our experiences of teaching about teaching in a digital, online environment. Data were gathered from reflective journal entries, emails and monthly Skype calls. Our findings indicate that the perceived disembodiment of teaching and learning online affected how we fostered relationships with students and responded to problems of practice. Further, we felt that a particular approach to teaching online risked teaching becoming reduced to providing feedback to students in the form of assessment, which had implications for our identities as teacher educators. By discussing our experiences of teaching online we began to develop a critical understanding of the challenges of teaching online, and questioned how our online practices shaped our developing pedagogies of teacher education.

Wang, F. & Hannafin, M.J. (2005). Design-Based Research and Technology-Enhanced Learning Environments. *Educational Technology Research and Development, 53(4*) 5-23.
https://doi.org/10.1007/BF02504682

During the past decade, design-based research has demonstrated its potential as a methodology suitable to both research and design of technology-enhanced learning environments (TELEs). In this paper, we define and identify characteristics of design-based research, describe the importance of design-based research for the development of TELEs, propose principles for implementing design-based research with TELEs, and discuss future challenges of using this methodology

TPACK Competencies of Teacher Educators

Foulger, T.D., Graziano, K.J., Schmidt-Crawford, D., & Slykhuis, D. (2017). Teacher Educator Technology Competencies. *Journal of Technology and Teacher Education, 25*(4), 413-448.
https://www.learntechlib.org/p/181966/

The U.S. National Educational Technology Plan recommends the need to have a common set of technology competencies specifically for teacher educators who prepare teacher candidates to teach with technology (U.S. Department of Education, Office of Educational Technology, 2017). This study facilitated the co-creation of the Teacher Educator Technology Competencies (TETCs). The TETCs

define the competencies (knowledge, skills, and attitudes) all teacher educators need in order to support teacher candidates as they prepare to become technology-using teachers. The TETCs shed light on the roles and responsibilities of teacher educators who address technology within their courses. A highly collaborative research approach was used to develop the TETCs which involved the crowdsourcing of technology-related literature, a Delphi method for expert feedback, and an open call for public comment. As a result, 12 competencies with related criteria were identified. The TETCs should be viewed as a first step in a larger reform effort to better address technology integration in teacher preparation programs. The release of the TETCs provides future research opportunities including, but not limited to, implications for course design, relevant faculty development for teacher educators, and policy implications.

Foulger, T.S., Graziano, K.J., Slykhuis, D., Schmidt-Crawford, D. & Trust, T. (2016). Invited Commentary: The Time is Now! Creating Technology Competencies for Teacher Educators. *Journal of Technology and Teacher Education, 24*(3), 249-256.
https://www.learntechlib.org/p/174099/

The way preservice teachers learn to use technology within their practice varies widely depending on the learning opportunities available (e.g., technology-infused teacher preparation program vs. standalone education technology course), and the knowledge, skills, and attitudes of the teacher educators within their teacher preparation programs. Curriculum, as well as teacher educators' use of technology for teaching and learning, impacts preservice teachers' use of technology in their practice. Yet, there is no cohesive set of technology competencies to guide teacher educators in teacher preparation programs. This commentary advocates for the need to develop a common set of technology competencies for teacher educators to help guide their work in helping preservice students develop their ability to teach with technology.
Keywords: technology competencies, teacher preparation, teacher educators, preservice teachers, teaching with technology, TPACK

Kosnik, C., Dharamshi, P., & Menna, L. (2019). From Tinkering Around the Edges to Reconceptualizing Courses: Literacy/ English Teacher Educators' Views and Use of Digital Technology. In: In: J. Murray et al. (eds.), *International Research, Policy and Practice in Teacher Education.* pp. 63-78. Switzerland: Springer Nature.
https://doi.org/10.1007/978-3-030-01612-8_5

This chapter reports on a study of 28 literacy/English teacher educators in 4 countries (Canada, the USA, Australia, and England) with a focus on their use of digital technology. For analyzing the data, we used Ottenbreit-Leftwich et al.'s (2010) six different ways to incorporate technology into teacher education: information delivery, hands-on skill-building activities, practice in the field, observations and modeling, authentic experiences, and reflections (p. 20). Although most felt using digital technology in teacher education is very important, there were huge differences in how they used it. A few reconceptualized their courses to teach about, with, and through it, while others only used it mainly for information delivery. Two major challenges identified by most were that their university only provided limited support and mostly for technical problems (not pedagogical support) and that student teachers were not necessarily discerning users of resources on the web.

Slykhuis, D., Foulger, T.S., Graziano, K.J., & Schmidt-Crawford, D.A. (2017). *The Big Reveal: Teacher Educator Technology Competencies.* Paper presented at: SITE 2017 - Austin, TX, United States, March 5-9, 2017.

https://www.learntechlib.org/p/177543/

Teacher Educator Technology Competencies (TETCs) were developed via a highly collaborative process involving many teacher educators, professional associations, and experts in the field. The research team conducted this study using the Delphi methodology with 17 participants who were tasked with identifying a comprehensive list of TETCs and related criteria. The participants were involved in a 6-round iterative Delphi process with the end goal being that of agreement and consensus. The final Teacher Educator Technology Competencies are available via the project web site at http://teacheredtechcompetencies.net

Uerz, D., & Kral, M. (2014). De lerarenopleider als rolmodel voor leren en lesgeven met ICT: nog een weg te gaan. (The teacher educator as a role model for learning and teaching with ICT: still a way to go). *Tijdschrift voor Lerarenopleiders, 35(*4), 29-42.
https://registratiesite.brlo.nl/CMS/RPP/Organizations/1/Shops/1/Media%20Libraries/2/De%20lerarenopleider%20als%20rolmodel%20voor...%20(TVL-2014-35-4-04).pdf?mode=normal

Onder invloed van technologische ontwikkelingen veranderen de eisen die worden gesteld aan zittende en toekomstige leraren. De vraag is of lerarenopleiders klaar zijn voor het opleiden van leraren voor de 21ste eeuw en in staat zijn om als rolmodel leren en lesgeven met ICT te integreren in hun onderwijs. In dit artikel presenteren we de uitkomsten van een onderzoek onder lerarenopleiders van de Hogeschool van Arnhem en Nijmegen en beantwoorden we de vraag in hoeverre lerarenopleiders van de HAN in staat zijn om ICT in te zetten voor leren en lesgeven en welke factoren hierop van invloed zijn. Op dit moment blijken de lerarenopleiders nog nauwelijks een rolmodel voor hun studenten als het gaat om lesgeven met ICT. Maar weinig opleiders zetten ICT structureel in in het eigen onderwijs of besteden aandacht aan leren en lesgeven met ICT in hun curriculum. Vooral de ICT-geletterdheid en didactische ICT-vaardigheden lijken daarvoor nog tekort te schieten. De onderzoeksresultaten bieden concrete handreikingen voor het professionaliseringsaanbod voor lerarenopleiders.

Uerz, D., Volman, M., & Kral, M. (2018). Teacher educators' competences in fostering student teachers' proficiency in teaching and learning with technology: An overview of relevant research literature. *Teaching and Teacher Education, 70*(2018), 12-23.
https://doi.org/10.1016/j.tate.2017.11.005

Teacher educators play an important role in preparing student teachers to integrate technology into their classrooms. This article presents an overview of research literature on teacher educators' competences in preparing their students to teach with technology. A literature search yielded 26 relevant research articles. Four domains of competence were identified: technology competences, competences for pedagogical and educational technology use, beliefs about teaching and learning and competences in professional learning. The literature focuses on teacher educators' competences in using technology for teaching. Research on the competences that teacher educators need and have as second-order teachers is lacking. Recommendations for future research are discussed.
Keywords: Teacher educators Teaching and learning with technology/ technology integration Technological competences Second-order teacher/role model/modelling Professional development Systematic review

Voithofer, R., Nelson, M.J., Han, G., & Caines, A. (2019). Factors that influence TPACK adoption by teacher educators in the US. *Educational Technology Research and Development.*
https://doi.org/10.1007/s11423-019-09652-9

This study presents the results of a survey of 842 teacher educators at 541 different institutions across the 50 US states that examined the state and direction of technology integration preparation in accredited teacher education programs. Using both descriptive statistics and regression analysis the study provides a general description of the characteristics of these teacher educators, their Technological, Pedagogical, and Content Knowledge (TPACK) adoption, and the relationships between individual and institutional factors and their TPACK adoption. The results of the research show that TPACK adoption is generally low among these teacher educators and that there are multiple personal and institutional factors that influence TPACK adoption. The participants had a significant amount of both K12 and teacher education experience and had high levels of comfort with their technological knowledge. Factors that were shown to influence TPACK adoption included the highest degree offered at their institution, their self-rated TPACK score, and their individual adoption of the International Society for Teaching and Education (ISTE) standards. The results address implications for teacher educator professional development and program accreditation.
Keywords Teacher educators · TPACK · Technology integration · Teacher education

TPACK Development of Teacher Educators

Becuwe, H., Roblin, N.P., Tondeur, J. Thys, J., Castelein, E. , & Voogt, J. (2017). Conditions for the successful implementation of teacher educator design teams for ICT integration: A Delphi study. *Australasian Journal of Educational Technology, 33*(2), 159-172.
https://doi.org/10.14742/ajet.2789

Teacher educators often struggle to model effective integration of technology. Several studies suggest that the involvement of teacher educators in collaborative design is effective in developing the competences necessary for integrating information and communication technology (ICT) in teaching. In a teacher educator design team (TeDT), two or more teacher educators (re-)design curriculum materials together. For the successful implementation of TeDTs, conditions at both team and institutional levels have to be taken into account. However, there is little consensus among stakeholders about which of these conditions are of highest priority. Most studies present priority or critical conditions from the viewpoint of just one group (e.g., school leaders). A Delphi study was set up aiming at synthesising the knowledge and views of various stakeholders about the conditions for the successful implementation of TeDTs for ICT integration. Consensus about the importance of ten conditions was reached in the entire sample after three rounds. These conditions include a long-term vision, trust, ownership, time and supportive institutional policies.

Capobianco, B.M. (2007). A Self-Study of the Role of Technology in Promoting Reflection and Inquiry-Based Science Teaching. *Journal of Science Teacher Education, 18*(2007), 271–295.
https://doi.org/10.1007/s10972-007-9041-z

This self-study examined the 1st-year science teacher educator's integration of instructional technology into a science methods course and modeled the reflective practice of her own teaching. Elementary science methods students participated in a series of inquiry-based activities that utilized various instructional technologies. Data sources included daily reflections, formative assessments, concernbased surveys, and class assignments. Findings from this self-study revealed that the teacher

educator's own reflections and practical inquiry influenced and paralleled her students' development of learning how to teach scientific inquiry using instructional technology. Results suggest that inviting preservice teachers into reflective practice and modeling for them the development of professional practical knowledge allow them to address the uncertainties in their own learning about using technology for inquiry-based science teaching

Gunuc, S. (2015). Implementation and Evaluation of Technology Mentoring Program Developed for Teacher Educators: A 6MFramework. *Qualitative Research in Education, 4*(2), 164-191.
https://doi.org/10.17583/qre.2015.1305

The purpose of this basic research is to determine the problems experienced in the Technology Mentoring Program (TMP), and the study discusses how these problems affect the process in general. The implementation was carried out with teacher educators in the education faculty. 8 doctorate students (mentors) provided technology mentoring implementation for one academic term to 9 teacher educators (mentees) employed in the Education Faculty. The data were collected via the mentee and the mentor interview form, mentor reflections and organization meeting reflections. As a result, the problems based on the mentor, on the mentee and on the organization/institution were determined. In order to carry out TMP more effectively and successfully, a 6M-framework (Modifying, Meeting, Matching, Managing, Mentoring - Monitoring) was suggested within the scope of this study. It could be stated that fewer problems will be encountered and that the process will be carried out more effectively and successfully when the structure in this framework is taken into consideration.
Keywords: technology mentoring, mentor, mentee, teacher educator, technology integration

Kehrwald, B. A., & McCallum, F. (2015). Degrees of Change: Understanding Academics Experiences with a Shift to Flexible Technology-Enhanced Learning in Initial Teacher Education. *Australian Journal of Teacher Education, 40*(7), 43-56.
http://dx.doi.org/10.14221/ajte.2015v40n7.4

The implementation of technology enhanced learning in higher education is often associated with changes to academic work. This article reports on a study of staff experiences with curriculum development and teaching in multiple modes of blended and online learning in a Bachelor of Education degree. The findings indicate that the changes experienced by these teacher educators were significant but not wholesale. More specifically, the findings highlight three particular areas of change that impacted on their role as teacher educators: changed pedagogical practices, particularly in staff-student communication, interaction and relationship building with students; increasing workloads associated with flexible delivery; and changed needs for staff capacity building related to issues of quality in technology enhanced learning.

Maher, D., Schuck, S., & Perry, R. (2017). Investigating Knowledge Exchange amongst School Teachers, University Teacher Educators and Industry Partners. *Australian Journal of Teacher Education, 42*(3).
http://dx.doi.org/10.14221/ajte.2017v42n3.5

This article reports on a study in which teachers, university teacher educators and a software company formed a learning community which provided a mechanism for knowledge exchange regarding pedagogical approaches using mobile technologies. The study employed an interpretivist methodology. The findings indicated that the collaboration promoted reflection on practice and

facilitated development of innovative pedagogies. All partners benefited through this knowledge exchange: the teachers developed new approaches and ways of thinking about teaching; the teacher educators gained insights informing their practice and feedback on theory-practice alignment; and the industry partner derived insights on how to support other schools in technology knowledge exchange.

Psycharis, G., & Kalogeria, E. (2018). Studying the process of becoming a teacher educator in technology-enhanced mathematics. *Journal of Mathematics in Teacher Education, (2018)*21, 631–660.
https://doi.org/10.1007/s10857-017-9371-5

In this paper, we explore the process of becoming a teacher educator in the pedagogical use of digital tools in mathematics teaching. The study took place in the context of an in-service program during the trainees' engagement in their practicum fieldwork activities including the process observation–reflection–design–implementation– reflection. We explored the features of this context that facilitated the trainees' transition from the level of trainee educator to the level of teacher educator as well as the nature of the trainees' documentation work for teachers. The results showed that observation of other teacher educators' teaching in conjunction with reflection during the program's respective sessions facilitated the trainees' transition to the professional level. The identified operational invariants underlying the trainees' designs concerned the focus of their observation in teacher education classrooms, the importance they attributed to the constraints and opportunities provided by the wider educational context and epistemological issues regarding the teaching and learning of mathematics with technology. The analysis of trainees' designs revealed three kinds of documents (''explanatory,'' ''instructive'' and ''facilitative'') and corresponding roles of trainees during the implementation. These documents targeted different aspects of TPACK depending on the trainees' conceptualizations of teachers' roles either ''as students'' or ''of students.''
Keywords: Teacher educators' education Documentational approach Teacher knowledge and epistemologies Technological-pedagogical-content-knowledge

Vijfeijken, M. van, Neut, I. van der, Uerz, D., & Kral, M. (2015). Samen leren innoveren met ICT Ervaringen met grensoverschrijdende multidisciplinaire leergemeenschappen bestaande uit basisonderwijs, lerarenopleiding en onderzoek (Learning together to innovate with ICT – Experiences with boundary crossing multi-disciplinary learning communities of primary education teachers, pre-service teachers, teacher educators and researchers)**. *Tijdschrift voor Lerarenopleiders, 36*(4), 91-102.**
https://registratiesite.brlo.nl/CMS/RPP/Organizations/1/Shops/1/Media%20Libraries/2/Samen%20leren%20innoveren%20met%20ICT%20(TVL-2015-36-4-09).pdf?mode=normal

Leraren, leraren-in-opleiding, lerarenopleiders, ICT-experts en onderzoekers hebben samen in multidisciplinaire leergemeenschappen, ICT-rijke leerarrangementen ontwikkeld en beproefd voor onderwijs dat recht doet aan verschillen. Beoogd wordt om met deze multidisciplinaire leergemeenschappen bij te dragen aan onderwijsinnovatie met ICT in het basisonderwijs en aan een verbeterde opleiding van toekomstige leraren. In dit artikel presenteren we de uitkomsten van het evaluatieonderzoek naar de vormgeving, de opbrengsten en verbetermogelijkheden van de multidisciplinaire leergemeenschappen. Uit het onderzoek blijkt dat de ontwerpgerichte en onderzoeksmatige aanpak van de multidisciplinaire leergemeenschappen ICT-rijke leerarrangementen opleveren die aansluiten bij de behoefte van de scholen. In de

leergemeenschappen wordt van en met elkaar geleerd. Er zijn effecten op het niveau van individuele professionalisering. De grensoverschrijdende samenwerking leidt vooralsnog niet tot innovatieve leerarrangementen en tot onderwijsinnovatie op de basisscholen en de lerarenopleiding. Het blijkt dat de deelnemers tijd nodig hebben om invulling te geven aan de nieuwe rollen die van hen verwacht worden. Daarnaast is vanuit de betrokken organisaties onvoldoende aandacht geweest voor de leergemeenschappen. De bevindingen hebben geleid tot maatregelen voor de aanscherping van de werkwijze van de multidisciplinaire leergemeenschappen. De twee belangrijkste zijn: (1) meer aandacht voor het ontwerpproces in de leergemeenschappen door toepassing van de methodiek van design thinking, (2) meer aandacht voor de verbinding tussen de multidisciplinaire leergemeenschappen en de scholen door het team al in de beginfase te betrekken bij het formuleren van de praktijkvraag, het uitproberen en evalueren van ontwikkelde prototypes.

Ungar, O. A., & Baruch, A. F. (2016). Perceptions of teacher educators regarding ICT implementation. *Interdisciplinary Journal of e-Skills and Life Long Learning, 12*, 279-296.
http://www.informingscience.org/Publications/3606

ICT (Information and Communication Technologies) in teacher education poses new challenges to faculty and students. This study was carried out to examine factors facilitating and hindering ICT implementation in teacher education institutes in Israel. Findings from our study, administered at two points in time, revealed that providing technological-pedagogical support to teacher educators and their perceptions and beliefs regarding ICT usage were consistent with being either facilitating or hindering factors in the integration process in colleges of education. Professional development of teacher educators in ICT skills and guidance in applying advanced technologies are additional facilitating factors. Resources, mainly time and infrastructure, were mostly a hindering factor with adverse influence on ICT integration. Three levels of successful ICT integration indicated successful implementation: teacher educators' level, students in their practice, and the organization level in terms of policy.
Keywords: teacher educators, ICT Implementation, facilitating factors, hindering factors, colleges of education

Media Technology for the Development of Teacher Educators

Burden, K.J., & Kearney, M. (2017). Investigating and critiquing teacher educators' mobile learning practices*. Interactive Technology and Smart Education, 14*(2), 110-125.
https://doi.org/10.1108/ITSE-05-2017-0027

Purpose This study aims to investigate contemporary mobile learning practices in teacher education, exploring the following research question: how are teacher educators exploiting the pedagogical features of mobile learning?
Design/methodology/approach The study uses data from an online survey that elicited information about how 46 teacher educator participants were using distinctive mobile pedagogical features (Personalisation, Authenticity and Collaboration) in their mobile learning practices. It uses the iPAC theoretical framework to analyse the data collected.
Findings Findings indicated high self-ratings of authenticity, and positive perceptions of collaborative sharing (Collaboration construct), often involving generative tasks that required use of creative, media production mobile applications. There were weaker perceptions of personalisation and online conversation (Collaboration construct). In light of these findings, we discuss implications for teacher education and recommend future directions for research and development.

Research limitations/implications This study underlines our contention that teacher educators struggle to exploit the entire range of mobile pedagogical approaches. The findings suggest that teacher educators are cautiously exploring the potential for online collaboration mediated through mobile devices, but have not yet fully grasped the opportunities to design tasks which exploit (and model) the personalised nature of m-learning. The limitations of the study include the size of the sample (46), its self-selected nature and its bias towards Australian and the UK respondents.
Practical implications In response to the issues raised in this paper, the authors are developing a mobile learning toolkit (www.mobilelearningtoolkit.com) for teacher educators.
Originality/value. There is a scarcity of m-learning studies in teacher education exploring pedagogical insights, and the views of teacher educators themselves are often absent.
Keywords: Collaboration, Mobile learning, Personalization, Authenticity, Teacher educators

Cherner, T., Dix, J., & Lee, C. (2014). Cleaning up that mess: A framework for classifying educational apps. *Contemporary Issues in Technology and Teacher Education, 14*(2), 158-193.
https://www.learntechlib.org/p/129859/ or https://www.citejournal.org/volume-14/issue-2-14/general/cleaning-up-that-mess-a-framework-for-classifying-educational-apps/

As tablet technologies continue to evolve, the emergence of educational applications (apps) is impacting the work of teacher educators. Beyond online lists of best apps for education and recommendations from colleagues, teacher educators have few resources available to support their teaching of how to select educational apps. In response, this article puts forward a framework for choosing educational apps based on their purpose, content, and value. The framework first classifies educational apps into four categories before delineating them into smaller subcategories. A sample of apps that are representative to each category and subcategory are included. This framework provides teacher educators with a much-needed resource to support their instruction of educational apps.

Donelan, H. (2016). Social media for professional development and networking opportunities in academia, J*ournal of Further and Higher Education, 40*(5), 706-729.
https://doi.org/10.1080/0309877X.2015.1014321

The research reported on in this article explores the use of social media for work-related or professional purposes. In particular, it focuses on the perceptions and use of social media by academics in the UK. The purpose of the research was to explore the potential social media has to facilitate the changing landscape of higher education and support the individual academic in their role. Of particular interest is how specific social media tools are being used to enhance networking opportunities and contribute to career progression. The use of social media was explored in detail through interviews and a survey. Typical activities that are currently being undertaken were identified and user group profiles developed that articulate different levels of engagement with these tools and the motivations that each group of users have for using social media. The study found that, with increasing levels of activity, the number of motivations for using social media increase, as does the perceived number of successful outcomes, including contributions towards career progression. The main barriers to using social media were identified as a lack of time and skills to undertake these activities, as well as a negative perception of social media. Recommendations for increasing participation are to provide practical training, including the sharing of good practice, and to initiate dialogues within institutions regarding the potential career progression opportunities that social media may afford.
Keywords: social media; Twitter; blogs; social networking sites; networking; STEM

Li, J. & Greenhow, C. (2015) Scholars and social media: tweeting in the conference backchannel for professional learning. *Educational Media International, 52*(1),1-14.
https://doi.org/10.1080/09523987.2015.1005426

Social media are fundamentally changing core practices in various industries. Although surveys indicate that social media are impacting social scientists, we know little about how education scholars, specifically, use social media for their work or professional learning. This article explores how educational scholars incorporated the social media, Twitter, as a conference backchannel. Using qualitative interview data collected from members of the American Educational Research Association (AERA) and considering previous analysis of AERA conference tweet data, we describe participants' purposes and practices and their perceptions of how using this social media impacts participation in the conference community. We discuss implications for those concerned with research dissemination, faculty professional development, and academic identity.
Keywords: Twitter; social media; conference backchannel; professional learning; community of practice

Digital Learning Environments for the Development of Teacher Educators

Downing, J.J., & Dyment, J.E. (2013). Teacher Educators' Readiness, Preparation, and Perceptions of Preparing Preservice Teachers in a Fully Online Environment: An Exploratory Study. *The Teacher Educator, 48*(2), 96-109.
https://doi.org/10.1080/08878730.2012.760023

With a view to attracting more students and offering flexible learning opportunities, online teaching and learning is becoming increasingly widespread across the higher education sector. It is now found across a wide range of disciplines (e.g., business, health, psychology, accounting, information technology) and program levels (e.g., from associate degrees to doctorate degrees). Online delivery is also strongly represented in the teacher education sector at many universities. Research of online delivery in higher education generally and teacher education specifically has pointed to a range of benefits and challenges associated with this mode of learning. Within the teacher education literature, many aspects of the online preparation of teachers remain poorly understood. More specifically, there is scant literature on the experiences and beliefs of teacher educators in relation to their readiness and preparation for online teaching as well as their beliefs in relation to the appropriateness of online education for preservice teachers. This article responds to this gap in the literature and reports on an exploratory study that worked with academic staff, teaching in a fully online teacher education course, at a mid-size Australian university. Twenty-seven teacher educators completed a 34-item questionnaire that consisted of closed and open-ended questions. With regards to readiness and preparation for teaching online, the majority of teacher educators reported lacking confidence and competence in the technological and pedagogical skills required to teach online. By and large, the study participants were welcoming of individualized ''at-elbow'' support that seemed to abate some of their fears of online teaching. The teacher educators were generally divided on whether the online classroom was an appropriate method for preparing preservice teachers. This article concludes with several recommendations for consideration by teacher educators who work in an online environment and sets the stage for a more ambitious study.

Flessner, R., & Horwitz, J. (2012). Easing Into the Academy: Using Technology to Foster Cross-Institutional Critical Friendships. *The New Educator, 8*(1), 86-103.

https://doi.org/10.1080/1547688X.2012.641879

This article addresses the ways in which early career teacher educators can support each other as they enter the academic community. By utilizing technology as an instrument to engage in a cross-country critical friendship, the authors were able to engage in a dialogue that grew out of mutual interests and concerns. Through critical reflection, they were able to address the question: How can we, two early-career teacher educators, push ourselves and one another to more critically examine our teaching practices? In doing so, each "new educator" grew more confident in claiming one's voice as a sustainable critical friendship emerged.

Fowler, Z., Stanley, G., Murray, J., Jones, M., & McNamara, O. (2013). Research capacity-building with new technologies within new communities of practice: reflections on the first year of the Teacher Education Research Network. *Professional Development in Education, 39*(2), 222-239. http://dx.doi.org/10.1080/19415257.2012.744769

This article focuses on a virtual research environment (VRE) and how it facilitated the networking of teacher educators participating in an Economic and Social Research Councilfunded research capacity-building project. Using the theoretical lenses of situated learning and socio-cultural approaches to literacy, participants' ways of engaging with this technology are described, and the reasons why their existing technical expertise did not unproblematically transfer to the new technology are explored. We argue that three main factors affected the use of the VRE, and in particular its wiki tool: the individual's motivation to learn and to engage with (more) new technologies; the emerging dynamics of each research group as they developed shared working practices; and the institutional climates, which supported or discouraged the individuals' engagement with both the technology and a regional Teacher Education Research Network that used this technology. In conclusion, we suggest that successful engagement with new technologies in future academic communities of practice might well benefit from a shared commitment to agreed working practices across the group and the provision of brokerage and championing of the technology by key individuals who are in the position to inspire, motivate and support others.

Schuck, S., Aubusson, P., Kearney, M., & Burden, K. (2013). Mobilising teacher education: a study of a professional learning community. *Teacher Development, 17*(1), 1-18. http://dx.doi.org/10.1080/13664530.2012.752671

This paper reports on a study of a community of university educators that investigated the introduction of mobile technologies into their learning and teaching. The study was conducted by a subgroup of that community. Given the ubiquity of mobile devices, members of the community felt they needed to develop expertise in mobile learning so that they could incorporate it into their teaching. They studied their own learning, supported by a critical friend who evaluated the community's functioning and activities, providing valuable feedback. Activities of this group were informed by and focused on: development of awareness of the potential of mobile devices for learning; construction of action plans within the community; and implementation of these plans. They also included investigating best-practice approaches by interviewing experts in the field, exploring the literature on mobile learning and then initiating and testing some mobile learning pedagogies in the context of their own teacher education subjects. The community met regularly to discuss emerging issues and applications. The paper shares some of the findings gained from studying the community, and discusses the challenges and constraints that were experienced. The

authors conclude with recommendations for professional learning communities aiming to learn about technology-mediated teaching practices.
Keywords: mobile learning; community of practice; teacher education; higher education; community of learners; teacher learning; professional learning community