

Appendix C

Overview of Records in Final Sample (N = 47) Retained for Substantial Coding of XK (Step 3)

#	Authors (year)	Type	Country	N	Level	Subject	Cited source(s) referring to XK in record
1	Angeli, C., Valanides, N., & Christodoulou, A. (2016). Theoretical considerations of technological pedagogical content knowledge. In M. C. Herring, M. Koehler, & P. Mishra (Eds.), <i>Handbook of technological pedagogical content knowledge (TPACK) for educators: Second edition</i> (pp. 11–32). Routledge. https://doi.org/10.4324/9781315771328	T	-	-	-	-	Koehler & Mishra (2008), Porras-Hernandez & Salinas-Amescua (2013)
2	Angeli, C., Voogt, J., Fluck, A., Webb, M., Cox, M., Malyn-Smith, J., & Zagami, J. (2016). A K-6 computational thinking curriculum framework: Implications for teacher knowledge. <i>Journal of Educational Technology & Society</i> , 19(3), 47–57. http://www.jstor.org/stable/jeductechsoci.19.3.47	T	-	-	-	-	Porras-Hernandez & Salinas-Amescua (2013)
3	Aydın Günbatar, S., Boz, Y., & Yerdelen Damar, S. (2017). A closer examination of TPACK-Self-efficacy construct: Modeling elementary pre-service science teachers' TPACK-Self efficacy. <i>İlköğretim Online</i> , 16(3), 917–934. https://doi.org/10.17051/ilkonline.2017.330232	E	Turkey	665 (in)	I	Science	Canbazoglu-Bilici et al. (2013)
4	Bergeson, K., & Beschoner, B. (2020). Modeling and scaffolding the technology integration planning cycle for pre-service teachers: A case study. <i>International Journal of Education in Mathematics, Science and Technology</i> , 8(4), 330. https://doi.org/10.46328/ijemst.v8i4.1031	E	USA	27 (pre)	I	Literacy	Mishra (2019)
5	Bibi, S., & Khan, S. H. (2017). TPACK in action: A study of a teacher educator's thoughts when planning to use ICT. <i>Australasian Journal of Educational Technology</i> , 33(4), 70–87. https://doi.org/10.14742/ajet.3071	E	Australia	1 (in)	III	Education	Markauskeite et al. (2011)
6	Boniface, A. (2020). <i>Breaking the code: A narrative inquiry into creating and implementing computer science curriculum into elementary classrooms</i> (Publication No. 27963661) [Doctoral dissertation, Northern Arizona University]. ProQuest Dissertations Publishing.	E	USA	3 (in)	I	Computer science	Mishra (2019)
7	Bower, M. (2017). <i>Design of technology-enhanced learning: Integrating research and practice</i> . Emerald Publishing. https://doi.org/10.1108/978-1-78714-182-720171004	T	-	-	-	-	Hofer et al. (2015)
8	Chai, C. S., Koh, J. H. L., & Tsai, C.-C. (2016). A review of the quantitative measures of technological pedagogical content knowledge (TPACK). In M. C. Herring, M. Koehler, & P. Mishra (Eds.), <i>Handbook of technological pedagogical content knowledge (TPACK) for educators: Second edition</i> (pp. 87–106). Routledge. https://doi.org/10.4324/9781315771328	T	-	-	-	-	Canbazoglu-Bilici et al. (2013), Jang & Tsai (2012)

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|----|---|---|-------------|----------------|----|---------|---|
| 9 | Chai, C. S., Rahmawati, Y., & Jong, M. S.-Y. (2020). Indonesian science, mathematics, and engineering preservice teachers' experiences in STEM-TPACK design-based learning. <i>Sustainability</i> , 12(21), 9050. https://doi.org/10.3390/su12219050 | E | Indonesia | 37 (pre) | II | STEM | (by authors) |
| 10 | Cherner, T., & Smith, D. (2017). Reconceptualizing TPACK to meet the needs of twenty-first-century education. <i>The New Educator</i> , 13(4), 329–349. https://doi.org/10.1080/1547688X.2015.1063744 | T | - | - | - | - | (by authors, based on Bronfenbrenner, 1994) |
| 11 | Chisholm, S. (2020). <i>Enhancing the EdTech ecosystem in a British Columbia school district</i> (Publication No. 127) [Doctoral dissertation, Western University]. https://ir.lib.uwo.ca/oip/127 | E | Australia | - | - | - | Mishra (2019) |
| 12 | Cirit, D., & Canpolat, E. (2019). A study on the technological pedagogical contextual knowledge of science teacher candidates across different years of study. <i>Education and Information Technologies</i> , 24(4), 2283–2309. https://doi.org/10.1007/s10639-018-9845-9 | E | Turkey | 36 (pre) | II | Science | Porras-Hernandez & Salinas-Amescua (2013), (RE-TPCK) (by authors) |
| 13 | Cohen, D. (2020). <i>Contextual issues of technology integration in teacher practice</i> (Publication No. 9921893312001341) [Doctoral dissertation, RMIT University]. https://researchrepository.rmit.edu.au/esploro/outputs/doctoral/Contextual-issues-of-technology-integration-in-teacher-practice/9921893312001341 | E | Australia | 5 (in) | II | Mix | Porras-Hernandez & Salinas-Amescua (2013) |
| 14 | Espinoza, B. D., & Neal, M. (2018). Incorporating contextual knowledge in faculty professional development for online teaching. <i>Journal on Centers for Teaching and Learning</i> , 10, 24–44. https://openjournal.lib.miamioh.edu/index.php/jct/article/view/196 | T | - | - | - | - | TPACK-ConK (by authors) |
| 15 | Everett, S. A., & Otto, C. A. (2015). A graphic model for designing effective lesson plans incorporating technology. In M. S. Khine (Ed.), <i>New directions in technological pedagogical content knowledge research: Multiple perspectives</i> . Information Age Publishing Inc. | T | - | - | - | - | Otto & Everett (2013) |
| 16 | Forssell, K. (2016). Making meaningful advances. In M. C. Herring, M. Koehler, & P. Mishra (Eds.), <i>Handbook of technological pedagogical content knowledge (TPACK) for educators</i> (2467-257). Routledge. | T | - | - | - | - | (by author) |
| 17 | Grosser, D. A. (2017). <i>A multiple case study of co-teachers' technology integration knowledge: How it is held, built, and shared</i> (Publication No. 1499449939) [Doctoral dissertation, College of William and Mary]. https://doi.org/10.21220/W4KM2K | E | USA | 8 (in) | II | Mix | Porras-Hernandez & Salinas-Amescua (2013) |
| 18 | Harris, J., & Hofer, M. J. (2017). 'TPACK stories': Schools and school districts repurposing a theoretical construct for technology-related professional development. <i>Journal of Research on Technology in Education</i> , 49(1-2), 1–15. https://doi.org/10.1080/15391523.2017.1295408 | E | USA, Canada | 7 ^a | - | - | Porras-Hernandez & Salinas-Amescua (2013), (by authors) |

- 19 Hidayat, A. (2018). *Development of the instrument to measure technological pedagogical content knowledge (TPACK) of pre-service science teacher in Indonesia* [Doctoral dissertation, Hiroshima University]. <https://core.ac.uk/download/pdf/197311290.pdf> E Indonesia 1192 (pre) n.d. - (by author)
- 20 Hj Besar, Dk Hj Siti Norainna Pg. *Engaging higher education students with social media: Mib module case study* (Publication No. 0000 0004 7655 9054) [Doctoral dissertation, University of Manchester]. EThOS. <https://ethos.bl.uk/OrderDetails.do?uin=uk.bl.ethos.764422> E Brunei 6 (in) III MIB^b Angeli & Valanides (2009)
- 21 Hsu, L., & Chen, Y.-J. (2019). Examining teachers' technological pedagogical and content knowledge in the era of cloud pedagogy. *South African Journal of Education*, 39(S2), 1–13. <https://doi.org/10.15700/saje.v39ns2a1572> E Taiwan 301 (in) I-III - [TLPACK] (by authors)
- 22 Irmak, M. (2018). *Developing effective socioscientific issues teaching practices through educational design research* [Doctoral dissertation, Middle East Technical University]. <https://etd.lib.metu.edu.tr/upload/12621776/index.pdf> E Turkey 36 (pre) I Science Koh et al. (2014), Porras-Hernandez & Salinas-Amescua (2013)
- 23 Jin, Y. (2017). *Longitudinal study of pre-service teachers' development of TPACK in a required educational technology course* (Publication No. 17223) [Doctoral dissertation, Iowa State University]. <https://lib.dr.iastate.edu/etd/17223> T - - - - Porras-Hernandez & Salinas-Amescua (2013)
- 24 Kadıjević, D. M., & Madden, S. (2015). Comparing approaches for developing TPCK. In M. S. Khine (Ed.), *New directions in technological pedagogical content knowledge research: Multiple perspectives* (pp. 125–146). Information Age Publishing Inc. T - - - - Angeli & Valanides (2009)
- 25 Kadioğlu-Akbulut, C., Çetin-Dindar, A., Küçük, S., & Acar-Şeşen, B. (2020). Development and validation of the ICT-TPACK-science scale. *Journal of Science Education and Technology*, 29(3), 355–368. <https://doi.org/10.1007/s10956-020-09821-z> E Turkey 332 (pre) - Science Grossman (1990)
- 26 Kapıcı, H. O., & Akçay, H. (2020). Improving student teachers' TPACK self-efficacy through lesson planning practice in the virtual platform. *Educational Studies*, 1–23. <https://doi.org/10.1080/03055698.2020.1835610> E (Turkey) 38 (pre) - Science Canbazoglu-Bilici et al. (2013), Mishra (2019)
- 27 Koh, J. H. L., & Chai, C. S. (2015). Towards a Web 2.0 TPACK lesson design framework: Applications of a Web 2.0 TPACK survey of Singapore preservice teachers. In T.-B. Lin, V. Chen, & C. S. Chai (Eds.), *New Media and Learning in the 21st Century* (pp. 161–180). Springer Singapore. E Singapore 270 (pre) I - Cox & Graham (2009)
- 28 Koh, J. H. L. (2020). Three approaches for supporting faculty technological pedagogical content knowledge (TPACK) creation through instructional consultation. *British Journal of Educational Technology*, 51(6), 2529–2543. <https://doi.org/10.1111/bjet.12930> E New Zealand 18 (in) III Mix Koh et al. (2014)

- | | | | | | | | |
|----|---|---|-----------|------------------------|------|-----------------|---|
| 29 | Lachner, A., Backfisch, I., & Stürmer, K. (2019). A test-based approach of modeling and measuring technological pedagogical knowledge. <i>Computers & Education, 142</i> , 103645. https://doi.org/10.1016/j.compedu.2019.103645 | E | Germany | 240 (in),
120 (pre) | - | - | De Jong & Ferguson-Hessler (1996) |
| 30 | Lewthwaite, B. E., Knight, C., & Lenoy, M. (2015). Epistemological considerations for approaching teaching in an on-line environment Aboriginal and Torres Strait Islander teacher education program: Reconsidering TPACK. <i>Australian Journal of Teacher Education, 40</i> (9), 63–85. https://eric.ed.gov/?id=ej1076435 | E | Australia | 8 (in) | III | Mix | Porras-Hernandez & Salinas-Amescua (2013), (by authors) |
| 31 | Lim, S. H. (2016). <i>Teacher knowledge, information and communication technology and the teaching of Chinese-as-a-second-language in Singapore</i> [Doctoral dissertation, University of Western Australia]. https://doi.org/10.4225/23/59cdf9df5d6cd | E | Singapore | 12 (in) ^c | II | Chinese | Hsueh (2008) |
| 32 | Maloney, J. (2018). <i>Fulbright FLTA CALL knowledge development and enactment: The role of context</i> (Publication No. 10812437) [Doctoral dissertation, Michigan State University]. ProQuest Dissertations Publishing. | E | USA | 5 (in) | Mix | EFL | Porras-Hernandez & Salinas-Amescua (2013) |
| 33 | Mills, K. (2019). <i>Illuminating children's scientific funds of knowledge through social media sharing</i> [Doctoral dissertation, University of Maryland]. https://doi.org/10.13016/MBYA-JWKQ | E | USA | 3 (in) | II | Science | Mishra (2019), Rosenberg & Koehler (2015) |
| 34 | Mishra, P. (2019). Considering contextual knowledge: The TPACK diagram gets an upgrade. <i>Journal of Digital Learning in Teacher Education, 35</i> (2), 76–78. https://doi.org/10.1080/21532974.2019.1588611 | T | - | - | - | - | (by author) |
| 35 | Njiku, J., Mutarutinya, V., & Maniraho, J. F. (2020). Developing technological pedagogical content knowledge survey items: A review of literature. <i>Journal of Digital Learning in Teacher Education, 36</i> (3), 150–165. https://doi.org/10.1080/21532974.2020.1724840 | T | - | - | - | - | Canbazoglu-Bilici et al. (2013), Mishra (2019), Önal (2016) |
| 36 | Ogan-Bekiroglu, F., & Karabuz, O. (2017). Pre-service teachers' technology integration and their technological pedagogical content knowledge. In M. Pehlivan & W. Wu (Eds.), <i>Research highlights in education and science 2017</i> (pp. 156–165). ISRES Publishing. | E | - | 10 (pre) | I-II | Physics | Burry-Stock & Oxford (1994) |
| 37 | Önal, N. (2016). Development, validity and reliability of TPACK scale with pre-service mathematics Teachers. <i>International Online Journal of Educational Sciences, 8</i> (2), 97–103. https://doi.org/10.15345/iojes.2016.02.009 | E | Turkey | 316 (pre) | n.d. | Math | (by author) |
| 38 | Ortega-Sánchez, D., & Gómez-Trigueros, I. M. (2019). Didactics of historical-cultural heritage QR codes and the TPACK model: An analytic revision of three classroom experiences in Spanish higher education contexts. <i>Education Sciences, 9</i> (2), 1–10. https://doi.org/10.3390/educsci9020117 | E | Spain | - | I | Social sciences | Mishra (2019) |

39	Rosenberg, J. M., & Koehler, M. J. (2015). Context and teaching with technology in the digital age. In J. Keengwe, M. L. Niess, & H. Gillow-Wiles (Eds.), <i>Handbook of research on teacher education in the digital age</i> (pp. 440–465). IGI Global. https://doi.org/10.4018/978-1-4666-8403-4.ch017	T	-	-	-	-	-	Porrás-Hernández & Salinas-Amescua (2013)
40	Sadaf, M., & Tariq, M., Haider, A. (2019). Measuring the impact of technological pedagogical content knowledge on teacher resilience in universities of Pakistan. <i>International Journal of Management Excellence</i> , 12(3), 1872–1881. https://doi.org/10.17722/ijme.v12i3.1084	E	Pakistan	377 (in)	Mix	Mix		Canbazoglu-Bilici et al. (2013)
41	Şen, Ş. (2020). Modelling the relations between Turkish chemistry teachers' sense of efficacy and technological pedagogical content knowledge in context. <i>Interactive Learning Environments</i> , 1–14. https://doi.org/10.1080/10494820.2020.1712430	E	Turkey	201 (in)	-	Chemistry		Jang & Tsai (2012, 2013), Koehler & Mishra (2008), Koh et al. (2014)
42	Slaughter, Y., O'Brien, A., Hajek, J., & Smith, W. (2019). Distance education for languages: The role of technological knowledge. <i>Babel</i> , 54(3), 12–17. https://afmlta.asn.au/babel/	E	Australia	2 (in)	I	Japanese/ Indonesian		Mishra (2019)
43	Ünal Çoban, G., Akpınar, E., Baran, B., Kocagül Sağlam, M., Özcan, E., & Kahyaoglu, Y. (2016). The evaluation of 'technological pedagogical content knowledge based argumentation practices' training for science teachers. <i>TED EĞİTİM VE BİLİM</i> , 41(188). https://doi.org/10.15390/EB.2016.6615	E	Turkey	37 (in)		Science		Canbazoglu-Bilici et al. (2013)
44	Wang, J. G. H. (2020). <i>Developing teachers technological, pedagogical, and content knowledge (TPACK) through design thinking and community of practice</i> [Doctoral dissertation, San Jose State University].	E	USA	18 (in)	I			Mishra (2019), Rosenberg & Koehler (2015)
45	Wright, B., & Akgunduz, D. (2018). The relationship between technological pedagogical content knowledge (TPACK) self-efficacy belief levels and the usage of Web 2.0 applications of pre-service science teachers. <i>World Journal on Educational Technology: Current Issues</i> , 10(1), 52–69. https://doi.org/10.18844/wjet.v10i1.3332	E	Turkey	344 (pre)	-	-		Canbazoglu-Bilici et al. (2013)
46	Xu, X., & Sun, Y. (2019). A technological pedagogical content knowledge (TPACK) framework for ESP teachers in tertiary education in China. <i>The Asian ESP Journal</i> , 15(3), 193–227. https://www.elejournals.com/asian-esp-journal/asian-esp-journal-volume-15-issue-3-december-2019/	E	China	125 (in)	III	English		TPACK-ESP (by authors)
47	Yanış, H., & Yürük, N. (2020). Development, validity, and reliability of an educational robotics based technological pedagogical content knowledge self-efficacy scale. <i>Journal of Research on Technology in Education</i> , 1–29. https://doi.org/10.1080/15391523.2020.1784065	E	Turkey	266 (pre)	I	Science		Mishra (2019)

Note. Type indicates whether the record is of theoretical/conceptual nature ('T') or of empirical nature ('E'). The column *N*, in addition to sample size in parentheses indicates whether this consisted of in-service ('in') or pre-service teachers ('pre'). The Level column presents the educational level being taught or trained for: I = primary level (including early childhood); II = secondary level; III = tertiary level.

^aSchools/districts participating in symposium and presenting their own cases.

^bMalay Islamic Monarchy.

^cIn addition to 12 in-service teachers, study included two teacher educators.