1. Framework title

Technological Pedagogical Content Knowledge

2. Initials

TPACK (initially TPCK)

originally TPCK, now known as TPACK, or technology, pedagogy, and content knowledge (Koehler & Mishra, 2009)

3. Document(s) in which the framework is presented (if there are previous versions, etc.)

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers college record*, *108*(6), 1017-1054. (Mishra & Koehler, 2006) . 12,594 citations in Google Scholar.

Mishra, P., & Koehler, M. J. (2007, March). Technological pedagogical content knowledge (TPCK): Confronting the wicked problems of teaching with technology. In *Society for Information Technology & Teacher Education International Conference* (pp. 2214-2226). Association for the Advancement of Computing in Education (AACE). 268 citations in Google Scholar. I couldn't find it.

Koehler, M. J., & Mishra, P. (2008). Introducing TPCK. AACTE Committee on Innovation and Technology (Ed.), The handbook of technological pedagogical content knowledge (TPCK) for educators (pp. 3-29). *Mah—wah, N]: Lawrence Erlbaum Associates*. 109 citations on Google Scholar, I didn't find it.

Mishra, P., & Koehler, M. J. (2008, March). Introducing technological pedagogical content knowledge. In *annual meeting of the American Educational Research Association* (pp. 1-16). 505 citations. (Mishra & Koehler, 2008)

Koehler, M., & Mishra, P. (2009). What is technological pedagogical content knowledge (TPACK)?. *Contemporary issues in technology and teacher education*, *9*(1), 60-70. Editors' Note: For the benefit of readers who are unfamiliar with the notion of technology, pedagogy, and content knowledge (TPACK), we offer the following condensed and updated depiction by Mishra and Koehler (2007), which was originally presented at the annual conference of the Society for Information Technology and Teacher Education in 2007. 4,733 in Google Scholar. (Koehler & Mishra, 2009)

Koehler, M. J., Mishra, P., & Cain, W. (2013). What is technological pedagogical content knowledge (TPACK)?. *Journal of education*, *193*(3), 13-19. (Koelher et al., 2013). 911 citations

in Google Scholar.

Matthew, J., Koehler, M. J., Mishra, P., & Spector, J. M. (2015). TPACK (technological pedagogical content knowledge). *The SAGE encyclopedia of educational technology. Thousand Oaks, CA: SAGE Publications*, 783-786. 10 quotes on Google Scholar, i didn't even use it.

4. Documents dates

2006
2007 (did not find)
2008 (did not find), 2008
2009
2013

5. Number of pages in the document(s)

Mishra & Koehler, 2006 (38 p)
Mishra & Koehler, 2008 (16 p)
Koehler & Mishra, 2009 (16 p)
(Koelher et al., 2013) 7 p

6. Organizations or authors responsible for developing the framework, context (if applicable)

Mishra, P.,
Koehler, M.J.
william cain after

7. Scope: regional (indicate region) or international

Not focused on any country or region

8. Synthesis

our framework emphasizes the connections, interactions, affordances, and constraints between and between content, pedagogy, and technology (Mishra & Koehler, 2006)

a change in any one of the factors has to be "compensated" by changes in the other two (Mishra & Koehler, 2006)

The addition of a new technology is not the same as adding another module to a course. It often raises fundamental questions about content and pedagogy that can overwhelm even experienced instructors. (Mishra & Koehler, 2006)

9. Purpose(s) of the framework

a conceptual framework for educational technology (Mishra & Koehler, 2006)

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. (Mishra & Koehler, 2006)

10. Focus of the framework: citizens, workers, teachers, students, managers, parents, organizations, etc.

teachers (Mishra & Koehler, 2006)

11. Methodology for the elaboration of the framework

design experiment (Mishra & Koehler, 2006)

12. Framework structure

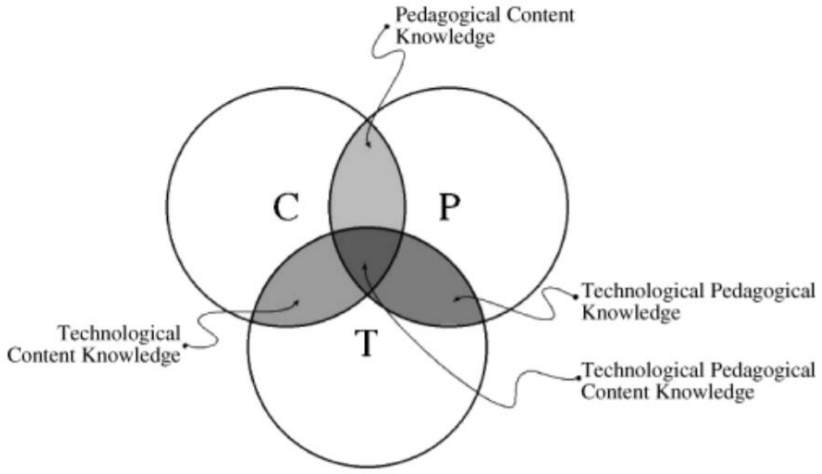


Figure 4. Pedagogical Technological Content Knowledge. The Three Circles, Content, Pedagogy, and Technology, Overlap to Lead to Four More Kinds of Interrelated Knowledge.

(Mishra & Koehler, 2006)

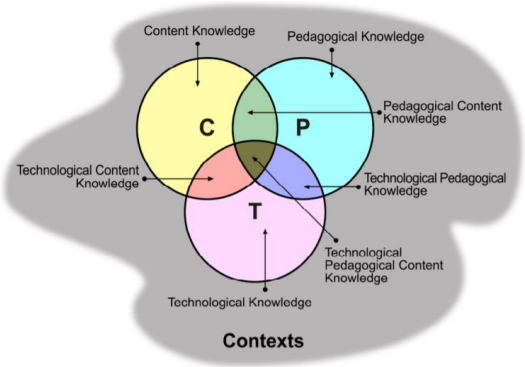


Figure 1. The TPCK framework and its knowledge components (Koehler & Mishra, 2008)

(Mishra & Koehler, 2008)

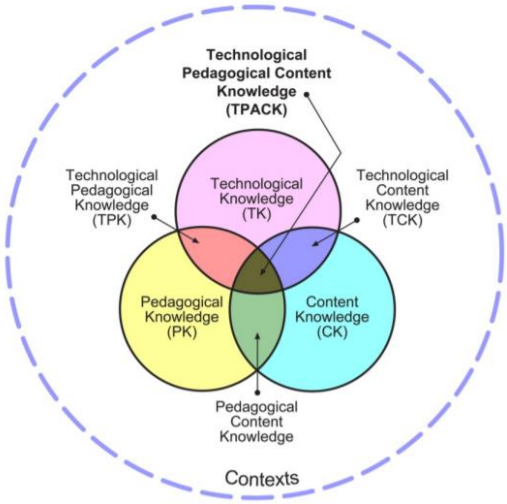
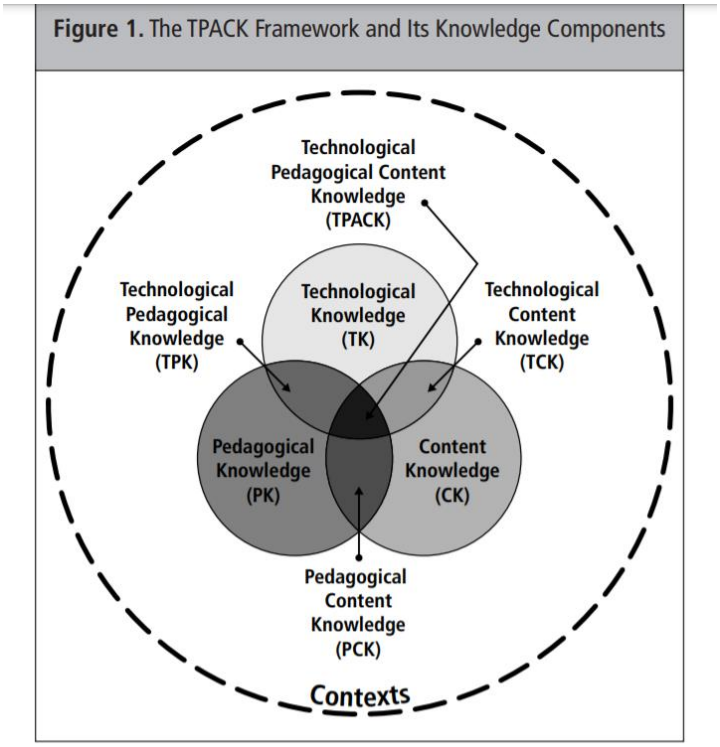


Figure 1. ***The TPACK framework and its knowledge components.***

(Koehler & Mishra, 2009)



(Koelher et al., 2013)

13. Definition of digital competence, digital literacy etc. proposed by the framework

knowledge of technology (Mishra & Koehler, 2006)

learning how to apply new, primarily digital technologies to teaching (Mishra & Koehler, 2006)

Teachers will have to do more than simply learn to use currently available tools; they will also have to learn new techniques and skills as current technologies become obsolete. (Mishra & Koehler, 2006)

in this context, it is the technology that drives the kinds of decisions that we make about content and pedagogy. (Mishra & Koehler, 2006)

Technology knowledge (T or TK) is knowledge about standard technologies such as books and chalk and blackboard, as well as more advanced technologies such as the Internet and digital video. This would involve the skills required to operate particular technologies. In the case of digital technologies this would include knowledge of operating systems and computer hardware, as well as the ability to use standard software tools including web-browsers, email

programs, and word-processors. It includes basic knowledge about installing and upgrading hardware and software, maintaining data archives, and staying up to date about ever-changing technologies. (Mishra & Koehler, 2008)

Beyond traditional notions of technical literacy, teachers should also understand information technology broadly enough to apply it productively at work and in their everyday lives, recognize when information technology can assist or prevent the achievement of a goal, and to continually adapt to changes in information technology. This, obviously, requires a deeper, more essential understanding and mastery of information technology for information processing, communication, and problem solving than does the traditional definition of computer literacy. (Mishra & Koehler, 2008)

The TPACK framework suggests that the kinds of knowledge teachers need to develop can almost be seen as a new form of literacy - as a development of skills, competencies and knowledge in practice that goes beyond specific knowledge of particular disciplines, technologies and pedagogical techniques. This new form of literacy, however, emphasizes integration of these knowledge bases, going beyond standard definitions of literacy that often focus on instrumental competencies. We build on a definition of literacy suggested by Myers (1995) where he suggested that literacy is "the ability to consciously subvert signs." We argue that such an approach implies that knowledge required for teaching is "more than just the ability to use sign systems to communicate some conventional meaning, because... literacy should be reserved for some state of agency in which one can control, even manipulate, how signs are used." (Myers, p. 582). (Mishra & Koehler, 2008)

The definition of TK used in the TPACK framework is close to that of Fluency of Information Technology (FITness), as proposed by the Committee of Information Technology Literacy of the National Research Council (NRC, 1999). They argue that FITness goes beyond traditional notions of computer literacy to require that people understand information technology broadly enough to apply it productively at work and in their everyday lives, to recognize when information technology can assist or prevent the achievement of a goal, and to continually adapt to changes in information technology. FITness, therefore, requires a deeper, more essential understanding and mastery of information technology for information processing, communication, and problem solving than does the

traditional definition of computer literacy. Acquiring TK in this manner enables a person to accomplish a variety of different tasks using information technology and to develop different ways of accomplishing a given task. This conceptualization of TK does not posit an "end state," but rather sees it developmentally, as andvolving over a lifetime of generative, open-ended interaction with technology. (Koehler & Mishra, 2009)

14. Competences proposed by the framework (areas, dimensions, competences, knowledge, skills and attitudes, levels of proficiency, etc.)

apart from looking at each of these components in isolation, we also need to look at them in pairs: pedagogical content knowledge (PCK), technological content knowledge (TCK), technological pedagogical knowledge (TPK), and all three taken together as technological pedagogical content knowledge (TPCK). (Mishra & Koehler, 2006)

The ability to learn and adapt to new technologies (regardless of what the specific technologies are) will still be important. (Mishra & Koehler, 2006)

TECHNOLOGICAL CONTENT KNOWLEDGE (Mishra & Koehler, 2006)

Technological content knowledge (TCK) is knowledge about the manner in which technology and content are reciprocally related. (Mishra & Koehler, 2006)

Teachers need to know not just the subject matter they teach but also the manner in which the subject matter can be changed by the application of technology. (Mishra & Koehler, 2006)

TECHNOLOGICAL PEDAGOGICAL KNOWLEDGE (Mishra & Koehler, 2006)

Technological pedagogical knowledge (TPK) is knowledge of the existence, components, and capabilities of various technologies as they are used in teaching and learning settings, and conversely, knowing how teaching might change as the result of using particular Technologies (Mishra & Koehler, 2006)

TECHNOLOGICAL PEDAGOGICAL CONTENT KNOWLEDGE (Mishra & Koehler, 2006)

Technological pedagogical content knowledge (TPCK) is an emergent form of knowledge that goes beyond all three components (content, pedagogy,

and technology). (Mishra & Koehler, 2006)

TPCK is the basis of good teaching with technology and requires an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes difficult concepts or easy to learn and how technology can help redress some of the problems that students face; knowledge of students' prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge and to develop new epistemologies or strengthen old ones. (Mishra & Koehler, 2006)

Technological Content Knowledge (TC or TCK) Teachers need to master more than the subject matter they teach, they must also have a deep understanding of the manner in which the subject matter (or the kinds of representations that can be constructed) can be changed by the application of technology. Teachers need to understand which specific technologies are best suited for addressing subject-matter learning in their domains and how the content dictates or perhaps even changes the technology—or vice versa. (Mishra & Koehler, 2008)

Technological pedagogical knowledge (TP or TPK), then, is an understanding of how teaching and learning changes when particular technologies are used. This includes knowing the pedagogical affordances and constraints of a range of technological tools as they report to disciplinarily and developmentally appropriate pedagogical designs and strategies. This requires getting a deeper understanding of the constraints and affordances of technologies and the disciplinary contexts within which they function. (Mishra & Koehler, 2008)

15. Examples of use

there are hypothetical examples in the article (Mishra & Koehler, 2006)

teacher training not focused so only on the neutral use of technologies (Mishra & Koehler, 2006)

teacher education programs that implement instructional technology in ways that encourage integration (Mishra & Koehler, 2006)

framework to guide the design of curriculum (Mishra & Koehler, 2006)

learning-technology-by-design approach (in fact, it is tb placed as the basis for the elaboration of the framework) (Mishra & Koehler, 2006)

Example 1: Making Movies (Mishra & Koehler, 2006)

Example 2: Redesigning Educational Web Sites (Mishra & Koehler, 2006)

Example 3: Faculty Development and Online Course Design (Mishra & Koehler, 2006)

TPCK AS A FRAMEWORK FOR RESEARCH (Mishra & Koehler, 2006)

CASE STUDIES OF DESIGN TEAMS (Mishra & Koehler, 2006)

USING TPCK AS AN ANALYTICAL FRAMEWORK (Mishra & Koehler, 2006)

DISCUSSION: WHAT DOES THE TPCK FRAMEWORK BUY US? (long reflection on the uses of a framework, and specifically of TPCK) (Mishra & Koehler, 2006)

TPCK framework allows us to make sense of the complex web of relationships that exist when teachers attempt to apply technology to the teaching of subject matter. (Mishra & Koehler, 2006)

There are two aspects to the application of the TPCK framework. First, the TPCK framework allows us to critique approaches toward developing teacher knowledge. Further, it assists us in developing better learning environments. In particular, it argues against teaching technology skills in isolation and supports integrated and design-based approaches as being appropriate techniques for teaching teachers to use technology. It argues that learning environments that allow students and teachers to explore technologies in relationship to subject matter in authentic contexts are often most useful. Additionally, the TPCK framework can also help us in conducting scholarship and research into the nature and development of teacher knowledge. It provides an analytic framework and categorization schemes for the analysis of teacher knowledge and its evolution. (Mishra & Koehler, 2006)

We believe that the TPCK framework can guide further research and curriculum development work in the area of teacher education and teacher professional development around technology. The framework allows us to view the entire process of technology integration as being amenable to analysis and development work. Most important, the TPCK framework allows us to identify what is important and what is not in any discussions of teacher knowledge

surrounding using technology for teaching subject matter (Mishra & Koehler, 2006)

Table 2. Approaches for Developing TPACK

Approaches for Developing TPACK	Description
From PCK to TPACK	Teachers draw upon their existing pedagogical content knowledge (PCK) to form insights into which technologies might work well for specific learning goals (see Harris & Hofer, 2009; Doering, Scharber, Miller, & Veletsianos, 2009).
From TPK to TPACK	Teachers build on their knowledge of technology in general to develop expertise in using technology in learning contexts; they then use that knowledge to identify and develop specific content that benefits from teaching with technology strategies (see Angeli & Valanides, 2009).
Developing PCK and TPACK simultaneously	Teachers gain experience and knowledge through projects that require them to define, design, and refine solutions for learning problems and scenarios. The design process serves as the locus for activities that produce insights into the ways technology, pedagogy, and content interact to create specialized forms of knowledge (see Mishra & Koehler, 2006; Brush & Saye, 2009).

(Koelher et al., 2013)

16. Indications for the elaboration of instruments based on the framework

first-person accounts by the participants of their lived experience in these seminars (Mishra & Koehler, 2006)

DEVELOPING A SURVEY INSTRUMENT TO TRACK THE EVOLUTION OF TPCK (Mishra & Koehler, 2006)

surveys (Mishra & Koehler, 2006)

In particular, we are concerned that although qualitative (or mixed-method) studies, such as the ones described above, offer rich and detailed information about the phenomena (teacher knowledge around technology), they are time consuming and difficult to replicate. In this study, we developed and administered a survey instrument to assess the development of TPCK by student and faculty participants in the learning technology by design seminar. (Mishra & Koehler, 2006)

The survey instrument consisted of 35 items—33 Likert scale items and 2 short-answer questions—attempting to determine the level of TPCK knowledge both at the individual and group levels. For example, we asked participants the

following questions: (1) Our group has been thinking and talking about course pedagogy [to address pedagogical knowledge—PK]; (2) Our group has been thinking and talking about technology [to address technological knowledge—TK]; and (3) Our group has been considering how pedagogy and technology influence one another [to address technological pedagogical knowledge—TPK]. Similar items were created for each component of the framework, including TPCK. (Mishra & Koehler, 2006)

Our data clearly show that participants in our design teams moved from considering technology, pedagogy, and content as independent constructs toward a more transactional and codependent construction that indicated a sensitivity to the nuances of technology integration. In other words, they showed a significant shift toward developing TPCK, involving the development of deeper understandings of the complex web of relationships between content, pedagogy, and technology and the contexts within which they function. (Mishra & Koehler, 2006)

A snapshot of the field in 2011 (Koehler, Shin, & Mishra, 2011) documented 141 separate instances of measurement research and application. Despite the varied attempts to measureTPACK, five main categories emerged from the analysis, with varying degrees of usage by the TPACK community. Table 1 shows the results of this analysis. (Koelher et al., 2013)

Table 1. Categories of TPACK Measurement and Assessment Instruments

Type of Measurement	Number of Uses	Description
Self-reports	31	Asking participants to rate the degree to which they agree to a given statement regarding the use of technology in teaching
Open-ended questionnaires	20	Surveys that prompt participants to expand on their experiences with educational technology
Performance assessments	31	Directly evaluating performance on specific tasks to assess TPACK
Interviews	30	Using a set of pre-determined questions to uncover evidence of participants' TPACK
Observations	29	Observing participants in classrooms or similar settings for evidence of TPACK

(Koelher et al., 2013)

Cavanagh, R. F., & Koehler, M. J. (2013). A turn toward specifying validity criteria in the measurement of technological pedagogical content knowledge (TPACK). *Journal of Research on Technology in Education*, *46*(2), 129-148. More recently, Cavanaugh & Koehler (in press) have argued that researchers use a seven-criterion framework to guide empirical investigations using the TPACK framework to help develop a more rigorous approach to research involvingTPACK measurements. (Koelher et al., 2013)

Koehler, M. J., Shin, T. S., & Mishra, P. (2011). How do we measure TPACK? Let me count the ways. In R. N.Ronau, C. R.Rakes, & M. L.Niess (Eds.), Educational technology, teacher knowledge, and classroom impact: A research handbook on frameworks and approaches (pp. 16–31). Hershey, PA: Global IGI (Koelher et al., 2013)

17. Miscellaneous

conceptual framework for educational technology (Mishra & Koehler, 2006)

teachers integrating technology into their pedagogy (Mishra & Koehler, 2006)

More recent standards, such as those of the International Society for

Technology (ISTE) and the National Council for Accreditation of Teacher Education (NCATE, 1997, revised in 2001), have moved away from an emphasis on just basic skills and have enumerated a series of higher order goals that are essential for effective pedagogy with technology (Glenn, 2002a, 2002b; Handler & Strudler, 1997; Wise, 2001). (Mishra & Koehler, 2006)

teaching is an example of an illstructured discipline (Koehler & Mishra, 2009)

Digital technologies—such as computers, handheld devices, and software applications—by contrast, are protean (usable in many different ways; Papert, 1980); unstable (rapidly changing); and opaque (the inner workings are hidden from users; Turkle, 1995). (Koehler & Mishra, 2009)

http://tpack.org/ site

The TPACK community is now an international one, with scholars from around the globe studying theoretical issues and practical applications of the framework

The TPACK framework itself has prompted the creation of a professional guide, The Handbook of Technological Pedagogical and Content Knowledge for Educators (2008), in recognition of its rapidly developing network of scholarship and research. Herring, M. C., Koehler, M. J., & Mishra, P. (Eds.). Handbook *of technological pedagogical content knowledge (TPACK) for educators*. Mr. Routledge. 2 ed. 338 pages. (Koelher et al., 2013)

TPACK user community