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An Analysis of TK Integration into Pedagogy within the Framework of TPACK

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Abstract

This paper intends to explore some more satisfactory ways to integrate technology into curriculum development, as it concludes that technology plays an important role in the process of the technological integration within the framework of TPACK. Therefore, this paper starts with defining where technology operates within the framework of TPACK. Then it will discuss the availability of technology and the underlying reasons for the preference and constraints of some technology in pedagogical practice. This paper finds out that technology is an integral part of pedagogical activities but the integration of technology into curriculum is a complex domain highly dependent on context, because the technological integration into curriculum involves the change of part or the whole of teaching context but the consequent changes are difficult to be evaluated as positive or negative only in terms of technology, even though technology is an essential ingredient for factors within the framework of TPACK and pedagogical practice. Moreover, this paper comes to the conclusion that technological integration is subjected to the constraints of technology itself and teaching contexts, especially teachers' attitudes. Since technology as a tool is beneficial to improve the quality of teaching or transform teaching activities into new forms, it would be helpful if we take into consideration from a holistic view the context of the integration of technology into pedagogical practice.

Keywords: TAPCK; technological Knowledge; pedagogical practice; technological preference; constraints of technology

The term TPACK began to gain widespread popularity in 2006 after Mishra and Koehler's seminal work outlining the model and describing each of the central constructs. TPACK was called "TPCK" in the literature until 2008, when some in the research community proposed using the more easily spoken term TPACK (Thompson, 2008). The TPACK framework builds on Shulman's (1986, 1987) conception of pedagogical content knowledge (PCK) by explicitly integrating the component of technological knowledge (TK) into the model. Technology includes analog and digital, as well as new and old, technologies. "As a matter of practical significance, however, most of the technologies under consideration in current literature..." (Mishra and Koehler, 2009) are newer and digital. How can teachers integrate technology into their teaching? According to Mishra and Koehler (2009), "an approach is needed that treats teaching as an interaction between what teachers know and how they apply what they know in the unique circumstances or contexts within their classrooms. There is no "one best way" to integrate technology into curriculum. Rather, integration efforts should be creatively designed or structured for particular subject matter ideas in specific classroom contexts." No" one best way" has two meanings. One is that technological integration could bring good outcomes. Many studies have proven that technology can enhance teachers' pedagogy and improve student content understanding. For example, Niess (2008) performed a pooled data analysis of multiple in-service teacher education programs that emphasized mathematics teachers' development of TPACK. Researchers reported that teachers considered using technology to be beneficial in a number of ways, which included enabling graphical representations, allowing concepts to be applied to a real problem-solving environment, making assessment easier, promoting enjoyment, and improving efficiency. The other meaning is that the issue of technological integration is involved with many factors, whose relationship will determine the final efficiency of the integration. This paper assumes that it will help find some more satisfactory ways to

integrate technology into pedagogical practice if it is possible to work out what role technology play in the process of integration. When the function of technology in the technological integration is discussed, we should first define where technology operates within the framework of TPACK. Then, we should answer where technology comes, the reasons why we choose some technology, and the constraints of using it in our teaching. This paper will begin with an analysis of the first question.

1. Where Technology Is Used

Within the framework of TPACK, technology is closely connected with the concept of TPACK. According to Mishra and Koehler (2006), TPACK "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 concepts difficult 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." In short, technology is used for four fields: the representation of concepts, constructive ways to teach content, students learning and the formation of new experience of using new technology. Obviously, the use of technology depends on teachers, whose understanding of the teaching context will impact their choices and application of technology in the teaching practice. It is common to find that, even if teachers teach the same course, they will choose different ways of using technology because of their different comprehension of teaching aims. In Manfra and Hammond's (2008) qualitative case study of two social studies teachers, although both of them used digital storytelling to teach similar content, because of the different pedagogical aims of the two, one teacher used technology to present information for his students to absorb and reproduce while the other used technology as a way to help students construct content knowledge and develop critical thinking skills.

From this case study, we see that teachers use technology on the basis of teaching context, but what should be noted is that there is no common rationale for the judgment of teachers' choices: are their choices appropriate? Are there better alternatives? There are so many uncertainties about the answers to these questions because the use of technology in teachers' classroom performance is usually made individually and serves only as one component of teaching practice. It means that, when using one technology, whether it is right or whether there is a better choice, it is

hard to judge because we can not assess for sure the effect of the technology use on the spot. So it is understandable that it is difficult for us to do technological integration in teaching because in which field technology is used is highly context-based and often just an individual choice.

2. The Availability of Technology

Harris, Mishra, and Koehler (2009) recommended that technology integration be consistent with the planning process of teachers. Thus teachers would first determine the curriculum to be taught, then select activities to support student learning, and last identify technology to support the chosen activities. The recommendation sounds reasonable, but it is problematic. As we know, every technology is made by its maker for some purposes in specific context. But we should also recognize that every technology also work for some other purposes from the perspective of users. Wechat, a popular Smart phone App, is a case in point. Most users use it for communicating with friends, which is designed by its designers. Yet, users often find some new ways of using the App, for example, teachers calling rolls or group discussion platform in classroom, which are user's innovative use of the App. Therefore, in terms of teaching, we are facing a difficult situation, that is, we often find some new functions of a common technology or some possible applications of new or strange technologies. It is very hard for us to choose whether to follow the above recommendation and use the common functions of technologies or to try something new. If not trying, Internet would not have changed the form of Distant Education or MOOC would have not change the nature of classroom teaching. If trying, it is more of an innovation matter because it involves the new use of technology in the teaching context, which should stand the test of practice and time before it gain recognition, besides the restraints of school regulations. In addition, trying new ways of using technology is subjected to teachers' knowledge. It would be impossible for teachers to use a new technology if they do not know its existence.When teachers try some new technology in teaching, they are facing uncertainties and have to shoulder the risk of failing, which may invite damage to their careers., From the above, we could see that the availability of technology is no simple matter of choice, although we will see in the next section choice is also troublesome.

3. The Choice of Technology

The choice of technology is a complicated issue in two senses. On the one hand, technology could be used in all fields of teaching. No matter in which field technology is used with new functions or some new technology is applied for the first time, it will change the status quo, leading to unpredictable direction of further

development. For example, whiteboard is usually placed at the front of the classroom and is controlled by the teacher. If we use it for a brainstorming group work in the course of business negotiation, the whiteboard is not under the purview of a single individual. It can be used by anybody in the group, and it becomes the focal point around which discussion and the negotiation/construction of meaning occurs. Therefore, the new use not only expands the application range of white board, but also change the structure of teaching form and classroom setting. On the other hand, choice means comparison but there is no definite standard for the assessment of comparison, which means that choice is a matter more of personal preference than of better quality. For example, when teaching reading, we could not say which way is better, through online course or through a blended way of online plus face to face learning, because technology is not the sole factor influencing the learning results, just as we have mentioned in the above section. To make things worse, we are inclined to use the old technology because we could perform better in teaching with experience of using it. Here comes the dilemma: if we stick to the old technology and the routine practice, how could we make a better choice? If we use a new technology, no matter we succeed or fail, how could we decide for sure the improvement of teaching is the result of using it?

4. Constraints of Using Technology

Technology does not exist in a vacuum environment. Rather, particular technologies have their own propensities, potentials, affordances, and constraints that make them more suitable for certain tasks than others. Generally speaking, there are two kinds of constraints of using technology. One is the limitations of technology itself. The other is the context. For example, there are three common ways of establishing business relationship with technologies in the course of business writing. Using email to communicate affords (makes possible and supports) asynchronous communication and easy storage of exchanges. Email does not afford synchronous communication in the way that a phone call, or instant messaging does. Nor does email afford the conveyance of subtleties of tone, intent, or mood possible with an online face-to-face conversation. Understanding how these affordances and constraints of specific technologies influence what teachers do in their classrooms is not straightforward. That is to say, the constraints of technology do not directly correspond to whether they would be put into actual applications in teaching.

As far as context is concerned, budget and teacher are most influential factors. Since money is usually a problem, I will discuss the factor of teacher only. Just as the above analysis mentioned, the incorporation of a new technology or new medium for teaching often leads to the reconstruction of the dynamic equilibrium among the TPACK elements. For instance, consider faculty members developing online courses

for the first time. The relative newness of the online technologies forces these faculty members to deal with all the TPACK elements, and the relationships between them, often leading them to ask questions of their pedagogy, something that they may not have done for a long time (Peruski &Mishra, 2004). 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.

Besides, teachers often have inadequate (or inappropriate) experience with using digital technologies for teaching and learning. Many teachers earned degrees at a time when educational technology was at a very different stage of development than it is today. Thus, it is not surprising that they do not consider themselves sufficiently prepared to use technology in the classroom and often do not appreciate its value or relevance to teaching and learning. Acquiring a new knowledge base and skill set can be challenging, particularly if it is a time-intensive activity that must fit into a busy schedule. Moreover, this knowledge is unlikely to be used unless teachers can conceive of technology uses that are consistent with their existing pedagogical beliefs (Ertmer, 2005). In a word, the willingness, readiness, and competence of teachers will join together to shape the quality of using technology in teaching.

Conclusion

From the above analysis, we could see that the integration of technology into curriculum is a complex domain highly dependent on context. On the one hand, technology is an underlying component for factors within the framework of TPACK and teaching practice. To integrate technology into curriculum means the change of part or the whole of teaching context but it is hard to assess the consequent changes only in terms of technology. On the other hand, technology is an integral part of pedagogical activities, technological integration will be subjected to the constraints of technology itself and teaching context, especially teachers' attitude. Since technology as a tool is able to improve the quality of teaching or transform teaching activities into new forms, it would be helpful if we take into consideration from a holistic view the context of the integration of technology into pedagogical practice.

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