

## TEACHERS' PERCEPTIONS OF THE SEVEN DOMAINS OF TECHNOLOGICAL PEDAGOGICAL CONTENT KNOWLEDGE

Renu Singh

Department of English Education, TU, Thakur Ram Multiple Campus, Birgunj, Nepal

Email: singhrtrmc@gmail.com

### Abstract

*This study investigated teachers' perceptions of the seven domains of TPACK. Based on the design of case study, 20 university teachers from different disciplines were purposively selected to participate in the study. Semi-structured interview was used to collect the data. The thematic analysis of the findings revealed that almost all teachers had higher level of primary knowledge domains related to content knowledge (CK), pedagogical knowledge (PK), and pedagogical content knowledge (PCK) in comparison to the domain knowledge with technological knowledge; technological knowledge (TK), technological content knowledge (TCK), technological pedagogical knowledge (TPK), and technological pedagogical content knowledge (TPACK). Thus, they are unable to practice the framework of TPACK for technology integrated interventions into their pedagogy. The study contributes for the better understanding of the teachers' perceptions of TPACK that will be useful for teacher educators, researchers, practitioners, and curriculum designers.*

### Key words

*Seven TPACK Domains; Case Study; Teachers' Perception; technology; pedagogy*

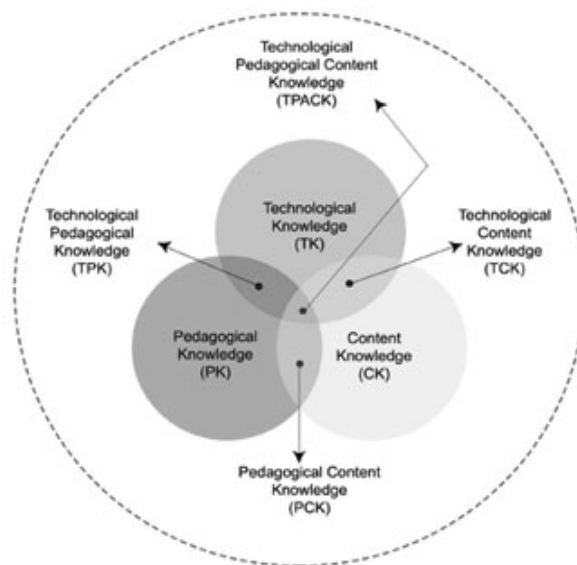
### Introduction

The use of technology in teaching and learning has increased drastically in the arena of 21<sup>st</sup> century. It is now a dire need to have the knowledge and skills of technology based instructional practices.

There is a long history of technology use in pedagogy. Several studies show that technology has been one of the essential parts of teaching and learning (Koehler & Mishra, 2006). Essentially, it highly requires teachers to understand how technology connects with pedagogy and

content for effective use of technology in teaching and learning. In this regard, Mishra and Koehler (2006) have proposed a framework of technological pedagogical content Knowledge (TPACK) based on Shulman's pedagogical content knowledge (PCK) that adequately educates teachers understand how

technological knowledge (TK) intersects with content knowledge (CK) and pedagogical knowledge (PK) effectively. It is shown in the figure 1 below how these basic three types of knowledge domain intersect between and among content, pedagogy, and technology (Mishra & Koehler, 2006).



**Figure1. Framework of TPACK [Taken from Mishra and Koehler (2006)]**

The framework of TPACK (Mishra & Koehler 2006) is an impetus for teacher education research in recent times. Voogt, Fisser, ParejaRoblin, Tondeur, & van Braak(2013) reviewed 55 peer-reviewed publications between 2005 and 2011 on the TPACK framework. They found that there were different understandings of TPACK, and that teachers' knowledge of TPACK and teachers' beliefs about pedagogy and technology were main factors for integrating technology in teaching. Additionally, various research

studies have proved the effectiveness and usefulness of TPACK for technology integrated Instructional practices (Mouza, Nandakumar, Yilmaz&Karchmer-Klein 2017; Shih & Chuang, 2013; Archambault& Barnett, 2010; Jang, 2010; Tseng, Lien, & Chen, 2014). However, there is a gap of such research about understanding university teachers' perceptions of TPACK and its impact on their professional development in Nepal.

In this sense, this study aims to fill the gap investigating university

teachers' perception of seven domains of TPACK, i.e. Content Knowledge (CK), Pedagogical Knowledge (PK), Pedagogical Content Knowledge (PCK), Technological Knowledge (TK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and Technological Pedagogical and Content Knowledge. The research is significant for two prominent reasons. Firstly, teachers' perceptions of the framework of TPACK influence their use of technology in teaching and secondly, it educates practitioners about the usefulness of TPACK framework for effective integration of technology into pedagogy. Additionally, it contributes to researchers, academicians, and content designers of professional development for better understanding of the seven domains of the framework and their need for teachers.

## Methodology

This study was designed under the methodological framework of case study in which context is specific provided with the richness of data collection methods (Patton, 1990). The study investigated the single case through multiple data sources, i.e., the demographic questionnaire and the semi-structured interview. 20 university teachers' were selected purposively to participate in the study. The measures of trustworthiness and ethical consideration of the qualitative research approach have been strictly followed to ensure confidentiality of the

participants and quality of the research outcomes. The required data collected through demographic questionnaire and semi-structured interviews were analyzed thematically under three stages; data reduction, data presentation, and summary of the findings.

## Results and Discussion

The thematic analysis of the results/findings is theorized and discussed under the seven knowledge domains of TPACK that proposed by Mishra and Koehler (2006). It consists of the knowledge domains of Content Knowledge (CK), Pedagogical Knowledge (PK), Pedagogical Content Knowledge (PCK), Technological Knowledge (TK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK) and Technological Pedagogical and Content Knowledge (TPACK).

### Domain of Content Knowledge (CK)

The first knowledge domain is termed content knowledge (CK) by Mishra and Koehler (2006) that requires teachers to have knowledge about the content to be taught. The contents consist of facts, scientific theories, methods, and mind maps of proofs and evidences. A teacher should know concepts, theories, facts, and procedures of the subject matter (Mishra & Koehler, 2006), and rules of evidence and proof (Shulman, 1986, as cited in Mishra & Koehler, 2006)

to teach appropriately and effectively. Content knowledge varies subject wise e.g. English, Biology, Geography, Maths, business, or social sciences. Teachers of particular subjects should consider the specific issues in regard of the domain of content knowledge.

All of the participants were found to have sound level of CK in their subjects. They displayed the high level of confidence in terms of having sufficient content knowledge for well managed delivery in class. One of the participants stated, “I have got in-depth knowledge in my subject that I acquired in a long span of time” (Interview audio no. 5). Evidently, this revealed that she was well confident and satisfied with the level of her content knowledge. Additionally, P13 who was an English teacher expressed that his CK was in a line with objectives of the course that he realized after delivery of the content materials in the class. Similarly, P17 remarked that essentially a teacher required having sound conceptual knowledge of the related subject so that the delivery of that knowledge would be satisfying for the students. P20 added that the organization of the content knowledge should be according to the level of the students. Likewise, P15 said “she needs additional resources for better understanding of the content knowledge” (interview audio no. 15). In this sense, almost all participants were well confident in their CK of respective disciplines.

## **Domain of Pedagogical Knowledge (PK)**

The domain of pedagogical knowledge refers to the strategies of presenting the CK to the students that consists of teaching process, practices and methods such as lesson plan, classroom management, teaching/learning activities, students’ motivation, teaching techniques, and evaluation (Mishra and Koehler, 2006). Additionally, teachers’ overall PK reflects theories of learning that guide the delivery CK and classroom activities.

The findings based on the PK domain of the participants revealed that almost all were highly familiar with the student-centered mode of classroom activities. As they all were teachers of faculty of education, their PK was found excellent. Their strategies of teaching content were well planned that were primarily designed being directed towards students’ understanding, learning outcomes and active participation. P1 stated, “I put my effort in making my class motivating that could only trigger students’ involvement in my class”. Similarly, P7 expressed, “my attention primarily goes to arouse interest in students that makes me feel comfortable in the class”. Another participant, P4 gave priority on making students attentive in class by hooking up their interest. Additionally, some of the participants were focused on creating a sense of kindness and humbleness in the class for facilitating the process of

learning for the students. Thus, all of them were found to have followed well-planned strategies of delivering content knowledge of various subjects. Their first priority was to create a highly supportive and co-operative classroom environment for students to trigger their attention and participation in learning. Additionally, they revealed that their PK should be according to time that highly required professional development opportunities, additional planning and preparations.

### **Domain of Pedagogical Content Knowledge (PCK)**

This domain is combination of two types of knowledge i.e. pedagogy and content that is required to be mastered by teachers for effective presentation of content materials in the class (Shulman, 1986). Based on the notion of Shulman (1986), Mishra and Koehler (2006) have defined PCK as “Knowing what teaching approaches fit the content, and likewise, knowing how elements of the content can be arranged for better teaching” (p. 1027) including the knowledge about learners and their characteristics. In this sense, it provides teachers with the understanding of contents to be taught and also helps to locate the areas of complexities for better preparation. Additionally, it requires teachers to be familiar with different learning capacities of students and their features of constructing knowledge (Mishra & Koehler, 2006).

The findings revealed that almost all the participants had a considerable

level of PCK. They expressed that their lesson planning consisted of all the required components of content to be taught and the ways of effective delivering of it to students. One of the participants said, “Teacher’s PCK covers overall teaching/learning activities that are oriented towards objectives of the teaching item” (P5, interview audio). Likewise, P7 expressed, “My PCK is combination of sufficient teaching materials and activities such as group/Pair work, project work that facilitate my students for better understanding” (audio interview, P7). Additionally, they used to incorporate educational puzzles and games into their teaching activities to make students bring their creativity in learning.

### **Domain of Technological Knowledge (TK)**

The domain of technological knowledge is an added knowledge domain to the Shulman’s (1986) model of PCK by Mishra and Koehler (2006). It requires teachers to operate technologies for their teaching activities. Teachers’ TK can be defined as “skills to operate technologies such as installing or removing devices/software programs, or creating and archiving documents ...abilities to learn and adapt to new technology” (Mishra and Koehler, 2006, pp. 1027-1028). Thus, it is based on teachers’ knowledge and skills of using innovative educational technological applications related to various subjects, solving basic technical problems, and

being updated for using new technologies to facilitate their teaching. The findings on this domain revealed that majority of the participants could use basic applications of technologies such as computer hardware; input device, the processing device, and the output device. Some of them were found to use some software with technological devices such as Microsoft word office, Excel, PowerPoint, YouTube, social media, and email which were limited to basic usage. Very few were familiar with online learning applications like learning management system (LMS). In this sense, the frequent user of PowerPoint slides, P3 expressed, “I could do PowerPoint presentations incorporating downloaded audio/video materials from YouTube. P6 said, “My skill of using technology is very limited and I don’t feel comfortable”. However, some participants are frequent users of social media like Facebook, Whatsapp for sharing information, learning materials and giving assignments to the groups of students. P1 stated “my students want me to share teaching/learning resources and having group chats on Facebook and Whatsapp” (Interview audio P1). Overall, it showed that TK of the majority of teachers was limited to the basic usage of technology in teaching various subjects.

### **Domain of Technological Content Knowledge (TCK)**

Technological content knowledge (TCK) refers to the reciprocal relationship between technology and content (Mishra & Koehler, 2006). It enables teachers to change the delivery mode of contents

using technology. Similarly, teachers of any specific subject could use technology if the domain of their TCK is mastered well. The findings on the perception of this domain of the participants were highly appreciative. Majority of them were well confident in using technology for the delivery of various contents in class. They had good knowledge and skills of using technological devices like computer, laptop, smart phone, Bluetooth, and audio/video devices. Moreover, they frequently used PowerPoint slides, e-library, Microsoft word/excel, YouTube resources for effective teaching/learning activities. P9 stated, “My students want me to deliver lectures through slide presentation along with diagrams, figures, and pictures”. Similarly, P13 expressed, “I feel comfortable delivering contents using technology”. Additionally, P3, P7, P16 and P17 stated that their students like to have regular group discussion on Facebook and Whatsapp.

### **Domain of Technological Pedagogical Knowledge (TPK)**

The domain of technological pedagogical knowledge is combination two types of knowledge. According to Mishra and Koehler (2006) TPK is the knowledge of “the existence, components and capabilities of various technologies as they are used in teaching and learning settings, and knowing how teaching might change as the result of using particular technologies” (p. 1028). This is based on the selection of a particular technology for effective pedagogy. The findings on this domain of knowledge revealed that

as the teachers had the basic knowledge and skills of technology, majority of them were stick to PowerPoint presentation for any type of content. Though they used internet resources, social media, and email, majority of students could not get benefitted due to poor internet services and lack of technological devices. P5 reflected, "I share additional resources and assignments to my students through email but many of them could not download in time that causes delayed response". In similar line, P14 stated, "Group discussion through social media such as Facebook and Whatsapp cannot be effectively done due to restriction in the number of participants" (interview audio, P14). Similar perception was expressed majority of the participants.

### **Domain of Technological Pedagogical and Content Knowledge (TPACK)**

This domain consists of three types of knowledge; technology pedagogy and content. This is the final construct of Mishra and Koehler (2006) which is called TPACK in short. It refers to

...understanding of the representation of concepts using technologies, pedagogical techniques that utilize 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

utilized to build on existing knowledge and to develop new epistemologies or strengthen old ones....(Mishra & Koehler, 2006, p. 1029)

The interplay of three types of knowledge requires teachers use technologies with various pedagogical techniques in constructive ways to teach contents. The effective and constructive practices of TPACK could address many problems related to concepts building, and understanding. It is context specific that makes it fit into various subject-contents and level of students. The findings on this domain of knowledge revealed that majority of the teachers were not well confident in using TPACK in teaching various subject contents. They stated that their limited technological knowledge and skills were restricting them from constructive and effective use of TPACK. Very few were found to have a moderate level of confidence for frequent use of TPACK. Additionally, they mentioned that for the preparation of TPACK based instruction, sufficient time was required that created them extra trouble provided with completion of course in time. P7 started, "I find difficulty to have TPACK based mathematics teaching activities as I'm not well confident in using it". This also revealed that though many of them used technologies for teaching, they were unaware of the framework of TPACK in a systematic way. Moreover, they found their students highly attentive in technology integrated instruction but they could not bring variation in delivery of content due to lack of professional development opportunities

for technology based instruction and adequate resources. Consequently, they could not make the delivery of contents amazing and effective for their students.

## Conclusion

The study investigated teachers' perceptions of the seven domains of TPACK. The major findings on the teachers' perceptions of the seven domain knowledge of TPACK reveal that the teachers of various subjects are more confident in three domains;

CK, PK, and PCK than the domains related to technological knowledge; TK, TCK, TPK, and TPACK. The main reason behind it is the teachers' limited knowledge and skills of technology based instructional practices and being unaware of the framework of TPACK. The study is highly significant for bringing understanding on teachers' perceptions of seven domains of TPACK and also is an addition in the existing literature. It is recommended to have some more in-depth studies in this area.

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