



A Study on TPACK Structural Characteristics and the Effects of Community of Practice for College English Teachers

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Abstract. Through the rapid development of internet communication technology, big data, cloud computing and a series of information technology, the field of education is also undergoing profound changes. The research is based on the theoretical framework of Niess's TPACK (Technological Pedagogical and Content Knowledge). It takes five college English teachers in college as the research objects. The study takes a qualitative case study approach adopted semi-structured interviews, reflective journals and observations as qualitative research instruments. The present study shows that the TPACK ability of college English teachers is weak. They generally have problems such as backward professional development concept, unbalanced knowledge structure, low information searching quality, weak professional development motivation, and single professional development path. To improve the TPACK ability of college English teachers, we propose the community of practice to serve as TPACK development strategies for college English teachers.

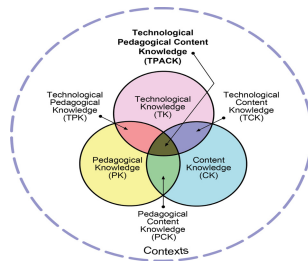
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1 Introduction

In the movement of teacher professionalization, which began in the 1980s, Shulman (1986) put forward the concept of Pedagogical Content Knowledge (PCK) and claimed that teacher professionalization is mainly characterized with teachers' capability to integrate subject knowledge and pedagogical knowledge [1].

In the 21st century featured by the increasingly close connection between information technology and education, the traditional PCK framework failed to clearly explain the professional knowledge and literacy that teachers should acquire to use effective teaching under the information education environment. Therefore, TPACK proposed by Koehler and Mishra (2006) was quickly put into force in education [2]. They accept the view that technical knowledge and subject knowledge are fairly of significance, obviously, technical knowledge in teaching should be attached great importance while TPACK is an outcome of interaction among six types of knowledge. Application studies of TPACK are extremely conspicuous in teacher education, mostly are reflected in three

Table 1. The TPACK framework and its knowledge components (source: <http://tpack.org>, 2012, reproduced by permission of the publisher)



items: the assessment of teachers' TPACK levels, the practice of teachers' TPACK, the combination of pre-service teacher education classes and TPACK. Niess (2008) further puts forward a five-level theory of theory of TPACK development of cognition, acceptance, adaptation, exploration and promotion for the process of technology integration of mathematics teachers in teaching, which enriches the research on the advancement of teachers' TPACK [3] (Table 1).

A total of 755 related articles are extracted when searched from CNKI database in an accurate way until October 2021, including 177 master and doctoral theses. Furthermore, the total number of the articles entitled "TPACK and English" is ninety-five, in which involve twenty-five master and doctoral dissertations.

As the blooming of TPACK, there are some studies that have explored the teaching model framed by TPACK. Besides, the development of sociocultural theory highlights the increasingly crucial contribution of teachers' learning and growth.

Boyer (1995) first proposed the concept of "learning community". For school education, the establishment of a learning community was essential to boost the efficiency of education (Boyer, 1995) [4]. The teacher community of practice was a new type of social group, which combined teachers' professional wisdom, teaching practice and shared knowledge. The characteristics of community of practice are mutual engagement, joint enterprise and shared repertoires. And most of the empirical studies have been conducted mainly from two perspectives: the constructions of teacher community of practice and its positive effects on teachers. To sum up, community of practice has brought a new perspective to college English teachers' professional development. It is helpful for them to enhance their efficiency and identification, thus improving their structural quality. Through the studies, a positive community of practice can serve as an essential part of the development of teachers' professional skills. It is an inevitable trend that college English teachers pay more attention to their professional skills, especially their TPACK. However, as for the amount of published literature, the limited empirical studies indicate that little focus of college English teachers' TPACK development in the community of practice. The present study, therefore, places college English teachers in a context of teacher community of practice and explore their TPACK development in it.

Table 2. The Basic Information of the Participants

Name	Gender	Age	Degree	Teaching Experience
Wang	Male	46	Master's degree	24 years
Guo	Female	42	Master's degree	20 years
Hu	Female	39	Master's degree	17years
Pang	Female	44	Master's degree	17years
Li	Female	27	Master's degree	1 year

2 Research Methodology

The present study examines college English teachers' TPACK development by addressing the following questions:

- 1) What are the characteristics of college English teachers' TPACK structure?
- 2) What changes do college English teachers experience in their TPACK through the community of practice?
- 3) What problems exist within college English teachers' TPACK development?

The participants were five college English teachers engaged in public English teaching from the same university. Three were experienced teachers with an average age of 40 and one was a 27-year-old novice teacher. There were some standards for the choices. The first criterion was that the participants were willing to cooperate with the current study. The second criterion was that they all from the same community of practice. The following Table 2 presents the details of the participants.

The teacher community of practice was established by the department of foreign language in March, 2021 and advocates adopting the flipped classroom teaching mode and different information technology for public English course. According to the arrangements of the teacher community, members of the community prepared the lessons together. They learned some on-line courses which were about the improvement of the teaching skills in the new era.

To get deeper insight into the three research questions, the qualitative research method was adopted in the current study. Multiple data was collected through semi-structured interviews, reflective journals and observations in the classroom.

Semi-structured interviews are a series of predetermined but open questions posed to interviewees by researchers. And the range of answers to each question is not fixed, making the respondents to have more freedom to express themselves freely (Ayres, 2008) [5, 6]. There were two rounds of semi-structured interviews altogether. The first round of semi-structured interview was conducted at the 8th week of the 2021 autumn semester. The second round of semi-structured interview was conducted at the 15th week of the 2021 autumn semester. It consisted of a series of open questions, originating from Koehler & Mishra's (2006) seven elements of TPACK and Baser et al.'s (2016) TPACK_EFL survey. It aimed at investigating the effects in TPACK of these 5 college English teachers in the community of practice [7].

There were two rounds of semi-structured interviews altogether. The first round of semi-structured interview was conducted at the 8th week of the 2021 autumn semester. It consisted of the general picture of the participants' personal background information. The second round of semi-structured interview was conducted at the 15th week of the 2021 autumn semester. It consisted of a series of open questions, originating from Koehler & Mishra's (2006) seven elements of TPACK and Baser et al.'s (2016) TPACK_EFL survey. It aimed at investigating the effects in TPACK of these 5 college English teachers in the community of practice and the sociocultural factors facilitating the changes.

Reflective journals are also adopted in the current study. It serves as a supplement to the semi-structured interviews. It helps to deeply understand the participants. In the current study, the 5 participants were required to accomplish two reflective journals during the semester. The reflective journals helped the participants know their components of the TPACK and the changes of their teaching influenced by the community of practice.

The Coding table of Flanders Interaction Analysis System is deemed as a ground, while technology integration observation tool advanced by Harris and Hofer (2012) correctly has laid a prerequisite for TPACK table [8]. Meanwhile, the encoding outcomes have been scrutinized for several times to ensure the accuracy of the data.

Any technical means is well-planned in every teaching step with explicit attention for achieving teaching optimization. Thus, six components of CK, PK, TCK, TPK, PCK, and TPACK are encoded in the classroom teaching behaviors. In the current study, the qualitative data from the interviews and reflective journals were analyzed qualitatively in order to discover changes in teachers' TPACK, reflect sociocultural factors influencing the process of their TPACK changes and shows the effects through the TPACK coding table on teachers' classroom teaching behaviors.

For the first step, the qualitative data recorded from participants' interviews and the reflective journals were collected. The transcripts were then shown to the five participants to make sure the integrity and authenticity.

For the second step, record some clarifications over classroom teaching contents, and teaching behaviors as well as students' performance. To make the research results accurate, mobile phone APP of iFlytek Yuji is employed to transcribe the videos in the process of video observation and recording. Each consecutive state referring to teaching activities and classroom utterances are recorded.

For the third step, the research encoded the teachers' teaching behaviors and TPACK elements in accordance with TPACK coding table of classroom teaching behavior of college English teachers. Quantitative results will be discussed with respect to the characteristics of the five teachers' classroom teaching behaviors, TPACK components distribution and structural characteristics of the components of TPACK.

3 Results and Discussion

Through the video analysis of the classroom activities for the five teachers, and the coding for their TPACK structure, the present study summarizes the frequency and time for their TPACK components and discusses their TPACK structural characteristics. Based on the semi-structural interview and their reflective journals, the present study tries to discover the effects of the community of practice on these 5 teachers' TPACK structural changes.

Table 3. Changes in Wang's TPACK

TPACK components	Wang's reflection on the changes
PCK	Adopting POA approach. Adjusting and redesigning classroom activities.
TK	Using various applications for teaching. Increasing the awareness of applying technology.
TCK	Asking the students to shoot videos on various teaching topics and uploading them to cloud disk. Explaining the specific use of technology.
TPK	Applying technology to improve students' learning interest. Reflecting on the application of technology in teaching. Assigning some online writing assignments.
TPACK	Engaging students in voting on Unipus platform in class. Requiring students to finish oral presentation assignments and upload the videos to Zhihuishu platform.

Firstly, college English teachers' PCK still occupies the largest proportion in the process classroom teaching, while TPACK is only next to PCK. Four prime behaviors of asking questions, giving explanations, giving guidance or instructions and interaction are encoded as TPACK. CK and PK are well-integrated. TK is reflected in multimedia auxiliaries like audio, video, cards, simple pictures or objects to make classroom teaching legible and visible under the circumstance of information technology. It motivates the creativity of the students.

Secondly, based on the research, it can be seen that the five college English teachers' TPACK was not static over time. They searched for new materials and updated their knowledge after learning in the community of practice. Their informational technology literacy was obviously affected by the community of practice. After active learning and participation in the community of practice, some changes in Wang's TPACK could be reflected by his new views on some components of TPACK. The changes in Wang's TPACK are listed in the following Table 3. Take Wang's reflection journal and changes in TPACK structure as an example:

According to the analysis of Wang's TPACK structure, it can be seen that Wang's TPACK got promoted. He acknowledged the inevitable use of technology in today's English classes was inevitable and paid a lot of efforts to integrate information technology into the design of more interesting, exploratory and challenging activities in English teaching, so that students could be motivated and immersed in content learning. What's more, after understanding the importance of instant feedback, Wang combined feedback with information technology. Wang's TPACK changed after he engaged in the community of practice. His TPACK was improved gradually in the process of her participation in a series of teaching and research activities. From the study, it was revealed that both experienced and novice teachers committed themselves to integrate technology into teaching methods to facilitate teaching and learning.

Thirdly, there are three problems in the promoting college English teachers' TPACK structure through the community of practice. The first is that teachers themselves were

easily influenced by their anxiety, phenomenon of language fossilization and pressures from families. The second problem is that some teachers still felt confused because of their insufficient frontier knowledge, training and resources about the new information technology. The third problem is that teachers sometimes felt they lost some autonomy because of the strict rules they must follow in the learning process. The lack of comfort, solidarity and cooperation in the community may pose some obstacles in their TPACK development.

Clearly, the related research findings would bring a lot of benefits for the college English teachers' TPACK development. But there are still some limitations in the research. The small sample size is one of the limitations. And for the problems found in the study, more solutions should be discovered.

4 Conclusions

The results of the study have confirmed that the community of practice is quite helpful in college English teachers' TPACK development.

First, it is proved that through the study in the community of practice, teachers may improve their TK, PK and even TPACK. The cooperation and the mutual inspiration among the teachers in the community of practice can largely facilitate their learning and development.

Secondly, schools leaders need to organize and develop regular learning activities to meet the needs of teachers' TPACK development.

Thirdly, some on-line courses and off-line courses need to be arranged to help the college English teachers promote their TPACK development. Seminars about the TPACK development are suggested to be hold more for the college English teachers, enhancing their abilities to integrate technology with pedagogy and content.

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