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A CONCEPTUAL FRAMEWORK FOR THE DEVELOPMENT OF COLLABORATIVE LEARNING ENVIRONMENT BASED ON TPACK FRAMEWORK

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Abstract

Learning in the 21st century has been taking a new dimension due to the technological innovations in pedagogy. Where mobile devices offer new prospects for learning within and beyond the conners of classroom. Though creating standard technological pedagogy content for interactive learning is of concern among teachers in tertiary institutions. This research proposed a concept based on Technological Pedagogical Content Knowledge (TPACK) framework for effective creation of pedagogy content for collaborative seamless learning. This work also proposed a model architectural design for the development of collaborative e-learning environment. Therefore, the paper recommends that the model should be used by teachers for creation of learners-centric content. Also, programmers should use the model designed to create interactive environment for e-learning.

KEYWORDS:
Student-centric learning, TPACK framework, collaborative learning, e-learning, and pedagogy

INTRODUCTION

Advances in technological today such as palmtops, laptops, digital blackboards, Virtual Learning Environments (VLEs), and internet have transformed educational contexts into varied bionetworks of technological and social resources. While mobile devices offer new prospects for learning within and beyond the corners of classroom. The

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use of these technological gadgets may engage students in knowledge discovery and facilitating the integration of pedagogical approaches like the flipped learning.

A typical scenario of teaching in most academic institutions classrooms is that a teacher goes to the front, and explain the course contents and write on the blackboard or develop exercises for students to solve. In this traditional teaching method, the teacher is the central figure in the learning system, while the students take notes and write homework at the end of the days' class (Salazar, 2017). The traditional education system suggests that majority of higher education institutions is based on the explanation of the course contents to the students to fulfill the class hours and the demonstration of knowledge through exams. This learning system can be somewhat artificial and far from the work reality that the graduates will face in real life (Salazar, 2017).

Information and Communication Technology (ICT) provides chance for interaction and cooperation among students and teachers regardless of distance between them. It also offers the opportunities for everyone to work with others from different cultures and Socio-economic background. Students working together in groups across the institutions will help the group members to enhance their communication skills as well as their global awareness (Raja & Nagasubramani, 2018).

The importance of online delivery of courses is on the increase especially with the recent Covid-19 pandemic that have crippled academic activities in the entire globe. Presently educators have urgency to provide quality content remotely to students spread across the country. There various educational technological tools for online teaching and learning, or one may think of developing and applying some innovative technical gadget. Thus, developing an innovative approach and inventing new concepts in online teaching and pedagogical initiative is needed such as collaborative learning.

Though, integrating ICT into teaching and learning is a challenge for some teachers. Mostly, the challenges are teachers' lack of techno-pedagogical knowledge, self-efficacy and time to design useful interventions. In order to address this issue, we proposed a model

architecture that would provide a sound Technology-Enhanced Learning (TEL) environments that could reduce efforts and time for teachers' design. This research aimed at studying the basic components of the Technological Pedagogical Content Knowledge (TPACK) framework to design a model that can help teachers create technological pedagogic content for collaborative e-learning in academic institutions. The research also designed a model architecture for creation of innovative e-learning environment.

LITERATURE REVIEW

Collaboration is a philosophy of interaction and personal lifestyle of people where individuals are responsible for their actions. These includes learning and respecting the abilities and contributions of their peers (Khanapurkar et al., 2020).

A study on flipped classrooms, one of the forms of Massive Open Online Courses (MOOC) designed for in-service teachers to understand their learning motivations and engagement within the MOOC, and the connections they felt between the MOOC and their teaching has revealed that the teacher-learners considered the MOOC for various reasons such as refreshing domain understanding, improving grades, and addressing practical problems (Chen et al., 2020).

Analyzing the educational benefits of the concept of Collaborative learning techniques shows that educational experiences that are active, social, contextual, engaging, and student-owned leads to deeper learning (Chandra, 2015).

Chandra (2015) stated the benefits of collaborative learning as: Development of higher-level thinking, oral communication, self-management, and leadership skills; Promotion of student-faculty interaction; Increase in student retention, self-esteem, and responsibility; Exposure to and an increase in understanding of diverse perspectives; Preparation for real time lifelong social & employment situations.

Collaborative learning is an educational method of teaching and learning which involves groups of learners working together to solve a problem,

complete a task, or to create a product. The main characteristics of collaborative learning are: a common task or activity; small group learning (co-operative behavior); interdependence; and individual responsibility and accountability (Khanapurkar et al., 2020). Collaboration will not just happen by putting the students in groups. But social interaction is the key to collaboration.

Technological Pedagogical Content Knowledge (TPACK)

The TPACK framework is a requirement for designing, implementing, and evaluating curriculum and instruction with technology (Taopan, Drajati, & Sumardi, 2020). TPACK framework was first developed by Shulman (1986) and then expanded by Mishra & Koehler (2006) with the addition of the technology element. The framework has currently been upgraded by Mishra (2019) who labeled the outer circle as "Contextual Knowledge" represented as XK where X comes from the work ConteXual and knowledge (K).

TPACK is an emergent theoretical framework that is employed to integrate ICT into teaching of various subject (Wong et al., 2015). The TPACK framework suggests that effective ICT integration for the teaching of specific content or subject requires understanding and translating the relationships between these three components of the framework (technology, pedagogy, and content).

Many recent studies (Eichelberger & Leong, 2019; Inpeng & Nomnian, 2020; Alharbi, 2020) have adopted this framework to design teachers' professional development activities, and these studies have shown efficiency for enhancing teacher competencies and better student understanding.

Recent scholars that Wijaya, Tang, & Purnama (2020) design an interactive mathematical learning media based on TPACK framework using Hawgent dynamic mathematics software. The study involved 30 students divided into five groups, and each group consisted of six students. Each group conducted a research to discover the difficulties faced by the teachers in school when explaining mathematics concept. The experiment revealed that the proposed model based on TPACK was

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easier for the students to understand mathematical concepts. Similarly, Hernawati & Jailani (2019) design a mobile learning model for mathematics learners, proposed for learning between places by means of the use of technology that is easy to advance when the learner is in a mobile situation. Using mobile learning, teaching materials becomes available which can be accessed at any time.

Taopan, Drajati, & Sumardi (2020) applied the TPACK framework for teaching English language. The study specifically intended to know the challenges and the opportunities in using the TPACK framework in teaching English. Findings revealed that technology integration in teaching English language is complicated. Thus, teachers face various challenges such as IT literacy, internet connection, and lack of ideas to create meaningful tasks using technology. While integration of technology offers some opportunities such as flexible classroom, motivate students and teacher to improve themselves and various opportunity to develop the multimodal product.

TPACK Framework

TPACK framework is concern with what teachers need to know with respect to technology integration in the classroom. The TPACK framework provides theoretical measure that describe whether a teacher can effectively design and conduct technology-enhanced instruction and describe the kinds of knowledge needed by teachers for effective pedagogical practice in a technology-enhanced learning environment (Taopan et al., 2020).

The TPACK framework specifies three basic forms of knowledge such as technological pedagogical knowledge (TPK), technological content knowledge (TCK), pedagogical content knowledge (PCK) which are needed to integrate technology into classrooms. When these three forms of knowledge interacted, they form TPACK. Thus, TPK are knowledge about how to use different technologies in a pedagogically manner, TCK are possible forms of content representations that technology can provide for specific form of content knowledge (CK) e.g. Google Earth for geographical knowledge, and PCK are knowledge that

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teachers possess to help bridge students' understanding of CK pedagogy. Mishra & Koehler (2006) presented the TPACK framework as shown in figure 1.

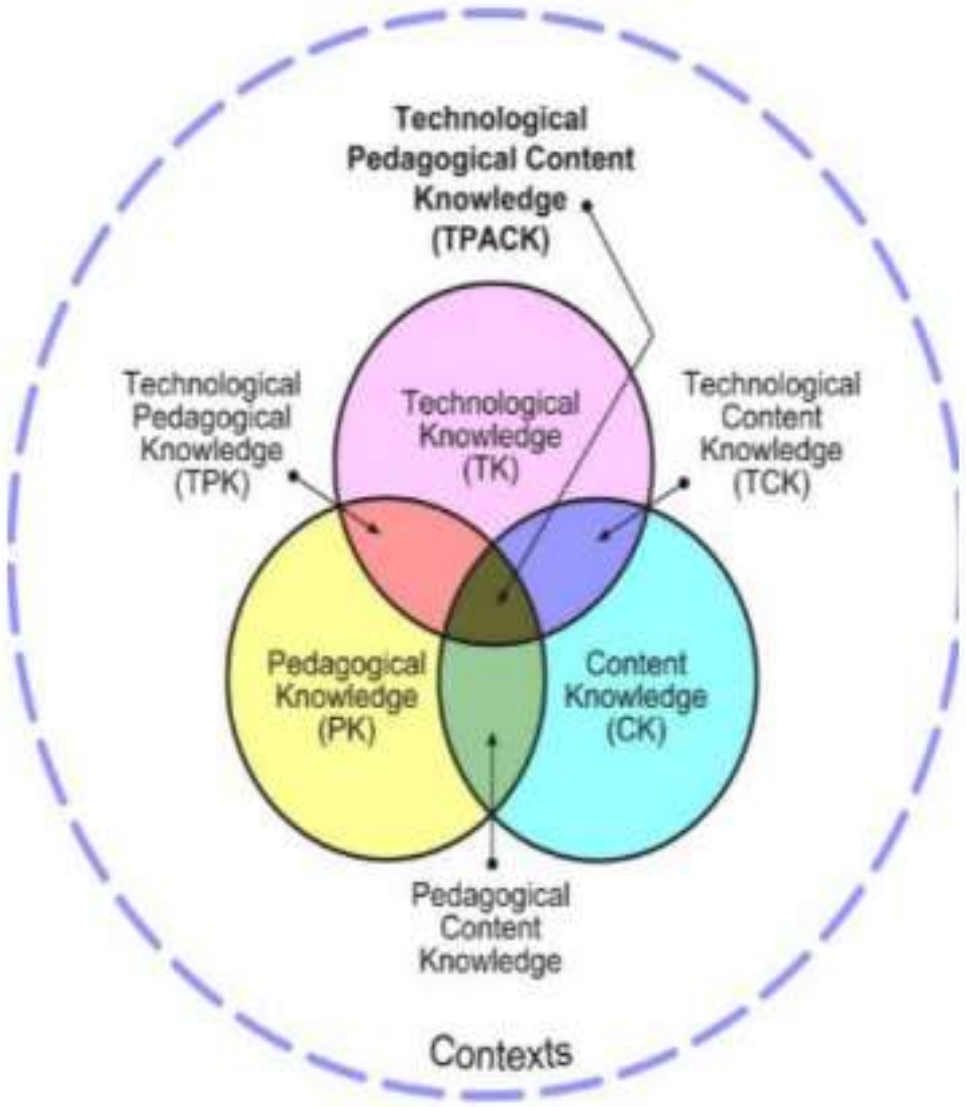

Figure 1: Mishra and Kohler TPACK framework (2006)

Challenges of Traditional Classroom Teaching

According to Wong et al. (2015), classroom practice shapes learners' language learning and influence their language competencies. Though, it is a content-centric learning where learners only listen to an instructor without freely contributing in the process.

The traditional learning method fails to support autonomous learning among the learners and encourage social interactions beyond the classroom. Therefore, such learning practices are not encouraging in

developing learners' communication skills and elevating their learning motivation.

Teaching and learning in 21st Century

The PK/TPK are demands of the 21st century where seamless learning emphasizes on providing enabling learner-centric learning environment. Wong et al. (2015) defines *seamless learning* as "when a person experiences a continuity of learning, and consciously bridges the multi-faceted learning efforts, across a combination of locations, times, technologies or social settings". This posit those students can learn whenever and wherever they are pleased, in different scenarios, and can switch from one scenario to another easily and quickly using the personal device as a mediator. These learning scenarios can take place in classes, at home, at work or outdoors, face-to-face or online. Although seamless learning can take place without the use of technologies, but electronic devices and connectivity play an important role in maintaining learning across settings. Seamless learning occurs when "learners are active, productive, creative and collaborative across different environments and settings" (Chan et al., 2006).

METHODOLOGY

The method used in this research was literature review which aim to give an overview on the use of TPACK framework in order to design a Seamless learning environment for effective delivery of content in a collaborative learning platform.

The proposed conceptual model was developed using Unified Modeling Language based on TPACK framework. The paper also presented a Use Case model that can be adopted to implement the proposed model for the development of collaborative learning platform. Figure 2 and figure 3 shows the conceptual models.

Proposed Model Architecture

The diagram in figure 2 represent architecture of the proposed model.

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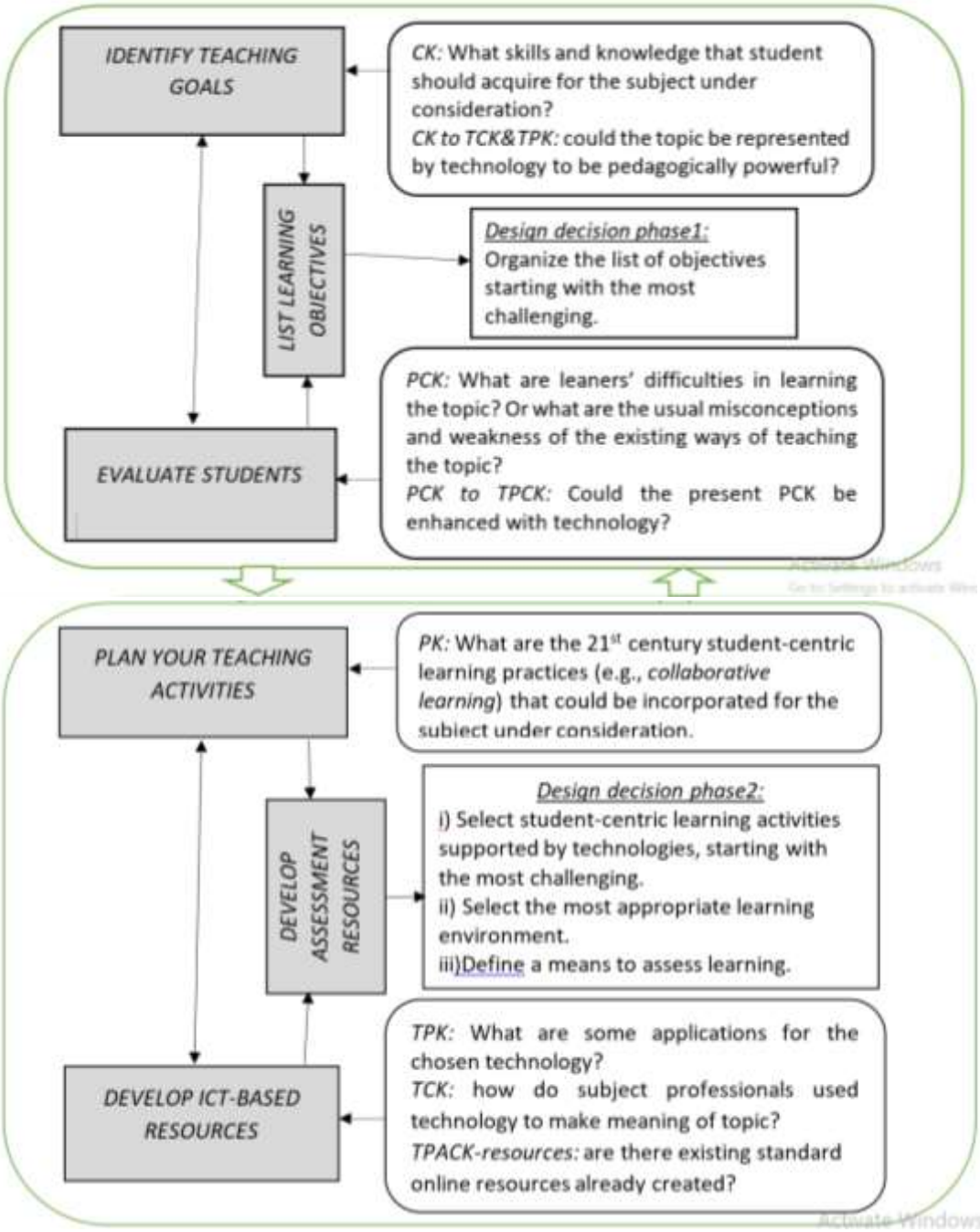

Figure 2: Proposed architecture for application of TPACK in designing collaborative learning content

Use case diagram

The use case diagram for the proposed model is shown in figure 3. The diagram depicts teacher's contribution and students' participation in the learning process.

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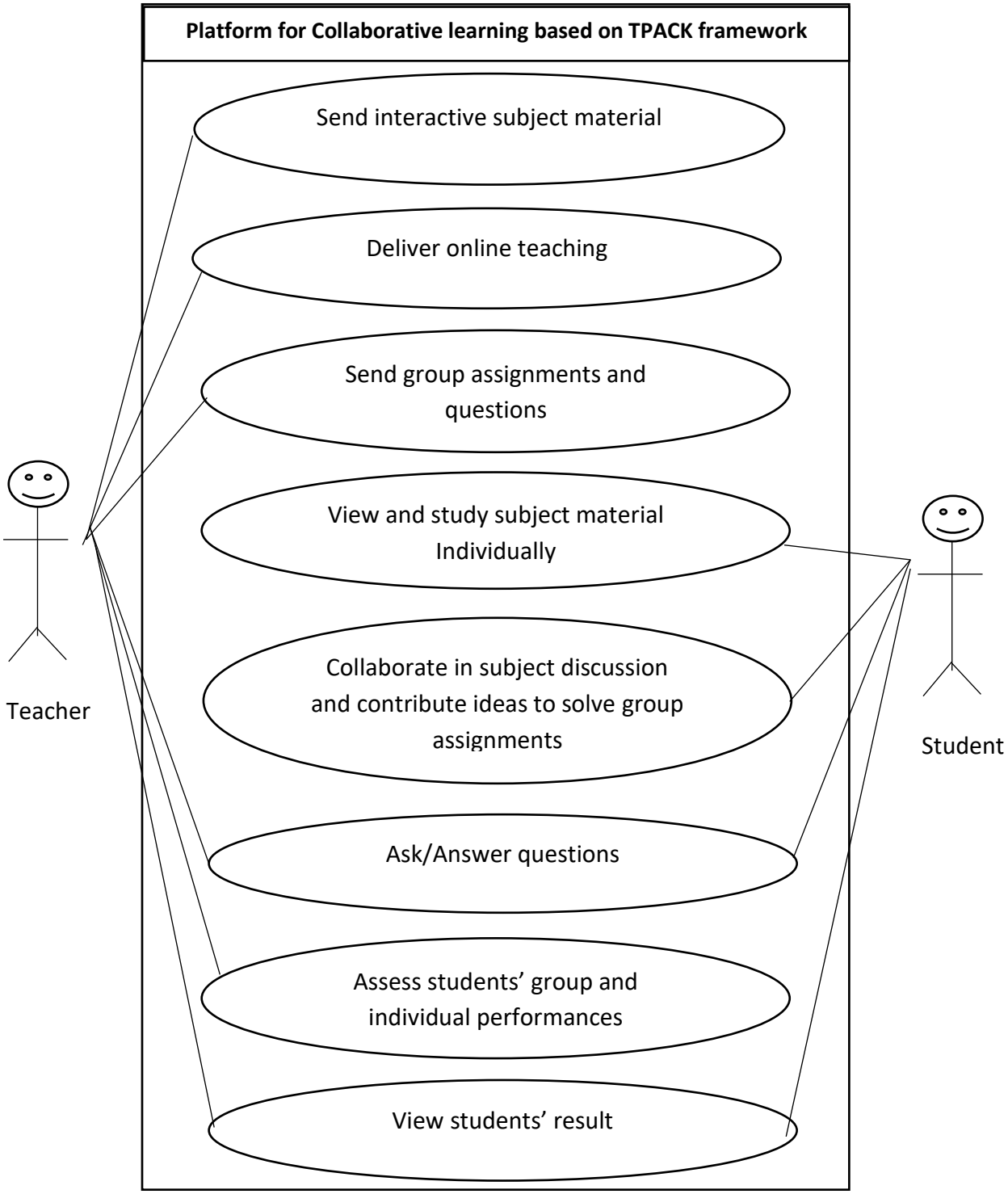

Figure 3: Use case diagram for the proposed model based on TPACK framework

Proposed Model Implementation

The front end of the proposed model can be implemented using HyperText Markup Language (HTML). The back end can equally be

implemented using Hypertext Preprocessor (PHP) and MySQL. The proposed model is a web-based platform to be run on internet enabled devices such as computers and mobile devices.

CONCLUSION

This research work presented an architecture that demonstrated how TPACK framework can be used to improve teacher's technological knowledge of content preparation and presentation for collaborative leaning on any online learning platform. The study also presented a proposed design for the development of a collaborative learning environment to improve students' confidence and involvement (i.e., student-centric learning) in the learning process. This will in turn improve students' academic performance.

RECOMMENDATIONS

The researchers made the following recommendations:

i. The proposed conceptual framework presented in this work should be adopted by teachers in preparing course materials for technologically inclined classes.
ii. Programmers should use the proposed use case representation to develop an interactive environment for seamless learning.

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