

# Use of Technology in Active Learning Teaching Practices to Enhance Lecturers' Self-Efficacy in Technical University Environment

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**Abstract:** This article is a literacy highlight for the study of the use of teaching technology that enables active learning in teaching and learning practices to enhance lecturers' self-efficacy and teaching and learning quality. Teaching that enables active learning is one of the new teaching formats that involves the use of simulations, experiments and lectures directly in the curriculum or teaching process; various technologies are used to achieve the goals of teaching. The usage of technology applications in active learning encompassing five elements, namely online learning, hands-on experiments, blended learning, collaborative teaching and laboratory activities. The study involved technology applications in teaching and learning technology, pedagogy and content (TPACK) to enhance the quality and affordability of the technical and vocational education (TVE) student market through more effective educational curriculum and teaching elements. With the help of technology in the teaching and learning process, student production will be better prepared to meet the needs of the industry as professionals and excellent workers. Indirectly, self-efficacy of lecturers also would be increased and expertise in Malaysian Technical University Network (MTUN) would also be enhanced.

**Keywords:-** *Technology, pedagogy and content knowledge (TPACK), Technical and Vocational Education (TVE).*

## 1. INTRODUCTION

The rapid development of technology in Malaysia has led to high rates of economic growth every year. Indirectly, the education sector in the country has also undergone transformation resulting from this development followed by changes in teaching and learning methods to complement the current trend. Technology innovations have been used to produce quality graduates who meet the needs of national development (KPM, 2015). The ultimate goal of this transformation is to make Malaysia a center of academic excellence by 2020 in the Asian and international region.

To achieve this goal, today's education system needs to incorporate technological innovation in teaching, which empowers students to think creatively, critically and intelligently as well as innovative in all their undertakings. They will be equipped with the technology skills needed to solve problems and communicate effectively (Ruey., 2012). Local newspapers have reported evidence that the use of good technology among lecturers had enhanced students' motivation and learning. (Daily News, April 5, 2019). In addition, many research studies have been conducted on innovative ways of learning technology that can help to improve the education system (Yahudit et al., 2003). One of the methods of teaching is the use of technology that enables such active learning. The above evidence suggests that a lecturer should work on each TPACK model effectively to make the learning environment more active and enjoyable and that learning outcomes can be achieved more effectively.

Active Learning Methods were introduced in the education system a few years ago. This technology innovation study was first used at the University of Massachusetts Institute of Technology (MIT) in 2001 by John Belcher. According to James & Philip, (2009), this method is used to improve student quality, where students learn in an active environment, various opportunities are available to use technology to better understand what they are learning by simply exploring new concepts in learning or experimentation to generate experience. In the era of Industrial Revolution Education Transformation 4.0, this approach has been adopted by local TVE universities. To implement the format of Active Learning Techniques to improve student quality, lecturers need to apply the concepts of creativity and innovation in the application of technology to produce active learning in teaching activities. Lecturer's expertise in the field of ICT enables the process of transforming knowledge smarter and more effectively (Nor Asmawati & Najihah, 2017). In addition, according to Hassan, NF & Puteh, S. (2017), technology-based teaching media enables effective active learning. This is reinforced by a statement by Cinganotto et al., (2016) that says that the quality of teaching and learning outcomes is the most important element that will determine the level of self-efficacy of lecturers. Active Learning Techniques are one of the new learning formats where they need to be designed specifically for teaching and learning. With this learning concept, students can use the elements of simulation technology, experience and lecture in their learning, in addition to using technology tools such as multimedia, information and communication technology (ICT), audio, visual and animation or 3D images (Belcher, 2009). The findings of Ruey, (2012) and Hassan, F., white, S. & Buharic, R (2015) reinforces that this approach will improve the quality of innovation and creativity and produce the effect of

active teaching and learning as well as to improve self-efficacy of educators themselves in achieving a targeted teaching goal (Nor Asmawati & Najihah, 2017).

Implementation of active technology and learning applications encourages innovative faculty and students through the use of electronic media, software and ICT. In addition, simulation design, visualization for students in learning is important, particularly in the subjects of science, engineering and mathematics (Ruey, Chang & Tang, 2010). According to Koehler & Mishra (2009) and Mary & Katia (2016), active teaching and learning process requires technology, pedagogy and knowledge of teaching content (TPACK). This is to improve the quality of the learning curriculum, where technology is used in content learning and pedagogy is used to assist lecturers in guiding students to understand any concept in all subjects taught in the classroom (Khaira, 2017; Melisa, P. (2018)). Therefore, TPACK is essential for success in the transformation of educational technology and the realization of a concept or technique Active Learning.

The key vision for implementing TPACK practices is how to generate a new generation of graduates with knowledge, skills, marketability, productivity, creativity and innovative ideas, as there is a serious need for TVET graduates to generate intellectual capital in the global technology environment (Oster-Levinnz, Anat & Aviva, 2010). To ensure that this matter may not realize the quality of education that is based on the technology to be implemented in technical and vocational education (TVET) to help students become more proficient in the various fields of knowledge and practical (Hillier & Figgis, 2011; Friedman, Howard & Schustack, 2016). As such, Active Learning Techniques should be practiced in all educational institutions, especially in TVET institutes as this will create an effective learning curriculum in the education system that prepares students to have high technology, quality pedagogy and content knowledge, and to become professionally competent professionals. in various industrial areas (Nurul Nadya et al., 2011; Chiu, 2016). This is supported by the study from Wan Zuhairi, Rohana & Amirmudin (2011) that Active Learning Techniques not only trains a student to become a good worker, it also helps him set goals in life in an effective way. This concept benefits students in creating experiences with the use of technology to improve their performance and sharpening skills in the future (Oster-Levinnz, Anat & Aviva, 2010). Although there are many challenges in initiating the concept of Active Learning in the education system, this method is an important component for ensuring the quality of lecturers and students in the future. This ethnographic research study investigates the three beliefs of professors who believe in self-efficacy and their attitude toward instruction in enhancing learning technologies (Friedman, Howard & Schustack; Chiu, 2016). Through the use of TPACK as a guiding theory, researchers seek to determine how three components of knowledge form the basis of the Lecturer Framework (TPACK) (OECD, 2016), technology, pedagogical knowledge or content that will enhance the faculty's self-efficacy. In conclusion, an active teaching and learning environment that uses technology, pedagogy and content is closely linked to the level of self-efficacy of lecturers (Mary & Katia, 2016).

### **1.1 Problem Statement**

As a result of preliminary research conducted by researcher on a number of public higher education (IPTA) lecturers, most of them are not happy with the workload they have been carrying out even after nearly 20 years of service. They feel that the burden of the workload is causing the actual work of the lecturer to be disrupted, the teaching and learning process is irregular. This will indirectly affect the effectiveness of their tasks and stress them throughout the service. The results also show that the average lecturer thinks that frequent changes in curriculum structure (content, technology and pedagogy) cause some confusion in their minds, as it requires a more appropriate time to grasp the changes and not just go through it alone. This is because active learning takes place only when a lecturer can truly appreciate the changes that are taking place especially in relation to the use of technology today. Therefore, it is a prerequisite for this study to look at how the use of technology affects the implementation of lecturers' active learning in teaching and its impact on the self-efficacy of lecturers in particular.

## **2. HIGHLIGHTING LITERACY: ACTIVE LEARNING TECHNIQUES, SELF-EFFICACY AND TPACK PRACTICE**

This section describes the literature review regarding some of the variables studied, including active learning techniques, self-efficacy and TPACK practices.

### **2.1 Active Learning Techniques**

Implementation of Active Learning Techniques can be defined as a method of technology innovation learning, where course instructors combine the use of laboratory and simulation technology as well as explanations as learning style practices in higher education institutions (Hillier & Figgis, 2011). Active Learning Techniques is an innovative learning format that uses a variety of technologies to help students understand the visualization and simulation concepts in their lessons. Techniques Enabling Active Learning transforms the process of setting new educational goals and environmental planning and transforming them into a better curriculum learning process that provides TVET students with a comfortable environment for their learning (Ruey, Chang & Tang, 2010). This comfortable learning environment enables students to build vast knowledge and be creative and innovative in their thinking by using technology to get the right information in their learning (RS Shieh et.al., 2010)

The point to be emphasized is the use of technology in education, although it costs a lot of money to provide technology tools that help students generate ideas about planning, creation and gain more knowledge in exciting exploration; this will enhance student progress and self-efficacy with the help of high quality curriculum in teaching and learning process (Ducan, 2014).

Self-efficacy is the result of an individual's confidence in his or her ability to master the situation and perform tasks that determine how well a person performs (Bandura, 1994). Bandura in Omrod (2016) also states that self-efficacy is an assessment

of the extent to which a goal is achieved. According to Bandura's opinion in Albert (1997)' self-efficacy is a form of self-evaluation that influences actions, feelings, and thoughts. In terms of thinking, self-efficacy affects cognitive and appearance, decision-making and academic achievement. In terms of actions, effective self-efficacy in maintaining motivation, coping with something new, tend to choose challenges, have high effort, can withstand problems, explore the environment, or create new environment. Friedman & Schustack (2016) defines self-efficacy as hope and confidence about how competent an individual can be in every situation. Self-efficacy is important for all human beings as it can play an important role in how individuals achieve their goals and meet their challenges (Saeid & Eslaminejad, 2017) .

According to Koehler & Mishra, (2011), TPACK practices are used for active interactive learning content. It requires the addition of technology in content learning and pedagogy in the domain of learning that can help improve the quality of learning and skills of interest in TVET graduates. The practice of TPACK is essential to success in educational transformation as it will help graduates to increase knowledge acquisition, skills, productivity, creativity and innovative ideas, intellectual capital, innovation and technology (Oster-Levinnz, Anat & Aviva, 2010). This practice is essential to maintaining a high quality education system in engineering, which will help students to become proficient in various fields. To become better students, students themselves must use technology, pedagogy and content in their own education.

## 2.2 Elements of Technology Applications in Active Learning

TPACK is a three-component integration of technology knowledge, pedagogy and content. For the purpose of this study, technology refers to digital technologies such as computers, laptops, i Pads, mobile devices, interactive whiteboards, software programs and more. It contains five elements. The first element is that active learning is online networking. This approach is practiced by using the internet to help students access information more easily. Students can select learning content and related topics anytime and from anywhere. They can review their search materials off campus at their own time (Joshua, 2010). Online learning is important to create students free to access learning information using internet, web, e-learning, and other technologies. Therefore, online learning is an effective method that helps students acquire and build new knowledge based on educational content (Horn & Staker, 2011). This will reduce the burden of lecturers' work in saving time in knowledge transfer. The self-efficacy of lecturers in guiding students can be enhanced by more effective teaching.

The second element is *hands-on* experiments. This skill uses technology to present concepts that are invisible to 3D simulations and visualization applications. This procedure provides a space for students to explore, understand and learn new concepts more clearly and effectively as they help students build practical experiences in an active learning environment using technology (Young Lee et al., 2014). In addition, according to Airey & Linder (2009), direct trial design is important to incorporate learning by presenting concepts close to students through the use of technology tools.

The third element is blended learning. This approach combines face-to-face methods with online learning. It creates experience in learning content activities through integrated information and communication technology (ICT) to produce optimal learning in line with effective educational goals (Garrison & Vaughan, 2008). This learning method will enable students to integrate technological and innovative advances in online learning with digital materials to support face-to-face instruction using ICT devices (Napier & Smith, 2009).

The fourth element is collaborative learning, which involves students working in groups to find solutions, create products, and understand concepts using the power of technological processes and curriculum developed (Reihaneh et al., 2013). In addition, students can collaborate in their own environment and environment to build their learning through group discussions, sharing ideas and explaining concepts with each other, which can foster strong teamwork and team spirit (Chris, 2009) .

The fifth element is laboratory activity. This is a learning process that helps students connect concepts they have learned in class to real-world situations through ICT tools such as Power Point, whiteboards, projectors and other tools. By explaining concepts in laboratory activity sessions, students can also develop technical skills in handling future technology tools (RS Shieh et al., 2010 R. Davoudi et al. 2014). The goal of laboratory activities is to provide more effective student learning. The content of laboratory activities must incorporate technology tools that consistently provide students with the opportunity to engage in laboratory activities in their lessons. In this way, students will better understand what they are learning in the learning session (Reihaneh Rabbany et al., 2013)

Therefore, in order to produce quality education, lecturers and their students need to follow all the elements of Active Learning Techniques. This study uses five elements to prepare lecturers and students to become proficient in technology and develop creative thinking after engaging in active teaching and learning approaches. Each element has its own requirements for enhancing student performance in education, particularly in relation to quality skills and workforce skills to meet the global environment in technology learning and to have powerful technology management experience in the future (Ministry of Education, 2015; Oster-Levinnz, Anat & Aviva, 2010). If this procedure is not implemented, the learning process will not go smoothly as students are not given the opportunity to explore the use of technology in acquiring their own knowledge, skills and experience (Che Ahmad et al., 2010).

## 2.3 TPACK in Active Teaching And Learning Practices

According to a study conducted by Schmidt et al., (2009), the implementation of TPACK in active learning practices includes conceptual technology to enhance teaching and learning curriculum through exploration and interaction. This is to increase content knowledge as a subject for teaching technological knowledge such as computers, internet, video, digital

knowledge and more. It also includes pedagogy such as practices, processes, strategies, teaching methods and methods to enhance student learning. As a model of teaching and learning, active learning is a TPACK concept that needs to be practiced in education. It can build and enhance technological knowledge which further enhances the learning curriculum by using technology, advanced machinery and technical equipment to gain understanding, knowledge and skills management (Guthrie et al, 2009).

Therefore, in this study, the researchers focus on three aspects of TPACK, namely technology, pedagogical knowledge and content to enhance teaching and learning quality, employment as well as student economic development and the effectiveness of the lecturers. First, based on technological knowledge, lecturers and students will learn to use ICT tools and software, as well as appropriate digital tools to produce effective teaching and learning (Yang & Tsai, 2010). Accordingly, appropriate technology should be used to aid student learning. Technology can also open the mind and engage students to actively learn and seek information, which helps them to understand concepts quickly learned and detailed (Davoudi et al., 2014).

Pedagogical knowledge refers to the processes and methods of teaching and practice. According to Koehler & Mishra, (2009), it also encompasses in-depth knowledge of teaching and learning that encompasses the entire learning to provide the true purpose of the education system such as values, visions, missions, objectives and learning goals. Pedagogical knowledge can give students exposure to the subject matter, and this will give them the knowledge and skills needed for further understanding of the benefits and concepts of the education system. Alvarez et al., (2009) says that these tools will help students create effective learning processes.

Meanwhile, according to Cox & Graham (2009), content knowledge is about what students need to learn from learning content. They weigh and choose the right learning material based on their lessons. Knowledge content generated is important as it enables students and educators to gain knowledge of the theory, concept and procedure in the field of service. This makes learning and teaching easier for students and lecturers involved in designing, evaluating and generating ideas, and they are able to explain teaching and teaching with strong evidence to support the learning content and further improve the quality of teaching and learning.

Therefore, all elements of TPACK practice must be used in active teaching and learning to produce quality graduates. In addition, students are able to choose the right technology that they can use to find information and improve their academic performance (Che Ahmad et al., 2010) and directly enhance the effectiveness of their lecturers and job satisfaction.

### 2.3.1 TPACK Model

The TPACK model is a model based on teaching using technology that requires understanding of: a) the concepts of technology use; b) pedagogical techniques using technology to teach the content of the subject constructively; c) knowledge of using technology to facilitate learning; d) knowledge uses technology to nurture existing knowledge and build new epistemology or strengthen existing knowledge (Mishra & Koehler, 2008). Figure 1.0 shows the relationship between the TPACK components introduced by Mishra and Koehler (2006).

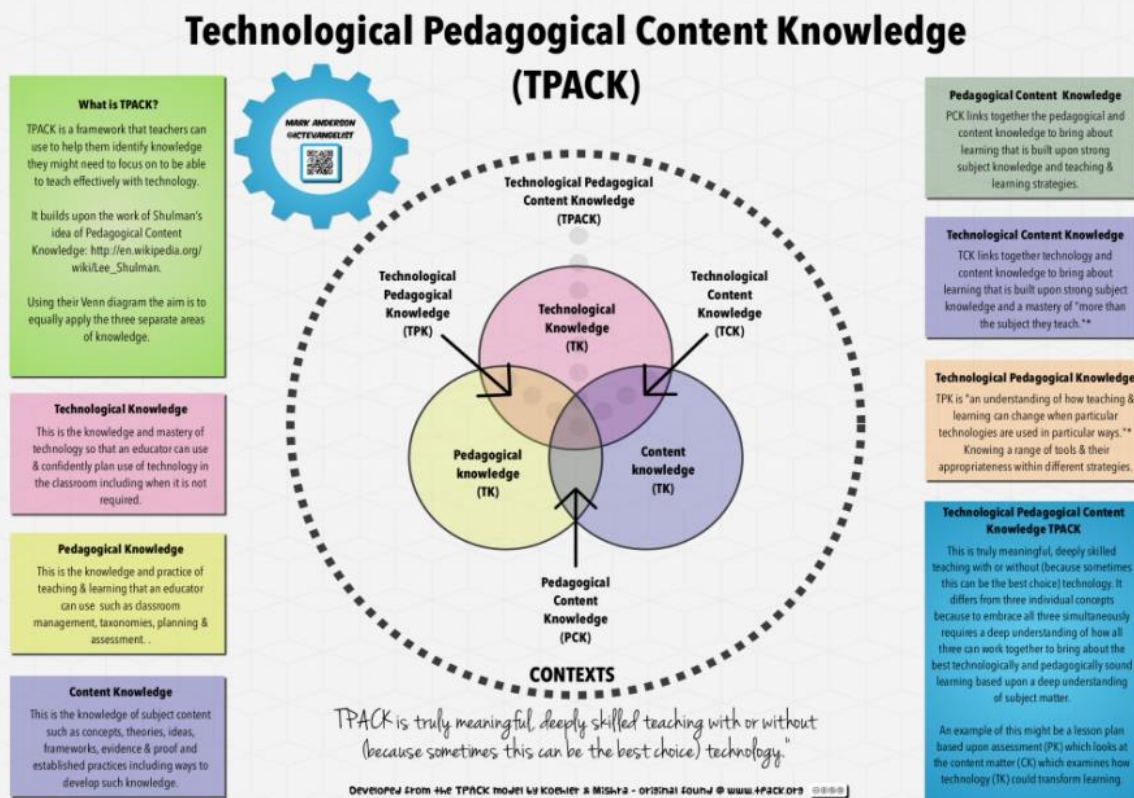


Figure 1.0: The TPACK Model (Mishra and Koehler, 2006)

Referring to Figure 1.0, the TPACK Model employs three forms of knowledge for the purpose of integrating technology in teaching and learning. It consists of three main sources of knowledge: content knowledge (CK), pedagogical knowledge (PK), and technology knowledge (TK) that are formulated in a specific context. From these basic sources of knowledge, four types of knowledge are gained through the relationships between: content pedagogical knowledge (PKC), content technology knowledge (TKC), pedagogical technology knowledge (TKP) and center content pedagogical technology knowledge (TPKC). Table 1 is a brief description of the seven components of TPACK.

Table 1: A brief description of TPACK

No.	Components	Description
1	Content Knowledge (CK)	Knowledge of the subject matter to be learned or taught
2	Pedagogical Knowledge (PK)	Knowledge of teaching and learning processes and practices involving learning issues, classroom instruction, preparation and implementation of lesson plans and student learning assessment
3	Technology Knowledge (TK)	As a result of the integration of content and pedagogy in understanding how certain aspects of a subject can be structured, modified and presented for teaching
4	Content Pedagogical Knowledge (PKC)	Knowledge of operating systems and computer hardware and the ability to use basic software
5	Content Technology Knowledge (TKC)	Knowledge of how technology can be used to provide new ways of teaching a particular content
6	Knowledge of Pedagogical Technology (TKP)	Knowledge of using technology to implement teaching
7	Knowledge of Content Pedagogy Technology (TPACK)	Knowledge and understanding of the relationship between PK, CK and TK when using technology in the teaching and learning process

#### 2.4 High Quality of Technology Application Enhance Self-Efficacy of Lecturers

The quality of teaching and learning is an aspect that is often emphasized in any educational institution regardless of the conventional method or the combination of online learning or a mixture of whatever teaching and learning methods. To ensure the quality of teaching and learning, the TPACK model is fundamental to effective teaching by using technology, requiring understanding of the concept of using technology; pedagogical techniques that use technology in a constructive way to teach content; find out what makes concepts difficult or easy to learn and how technology can help to solve students' problems; e and student epistemology theory; and knowledge of how technology can be used to enhance existing knowledge to develop new epistemology or to reinforce old ones" (Koehler & Mishra, 2009) This statement indicates that today, technology is the focus of emphasis especially in implementing innovation in education, such as ICT, digital tools, electronic devices, software and more. This technology is needed to provide students with opportunities and experiences to create new knowledge and improve work skills. This is particularly relevant for engineering students, especially in teaching and learning sessions that enhance their confidence, are eager to participate in sharing ideas and improving their learning performance (Parishan et al., 2011). The use of technology is important in teaching and learning in interaction with the content of knowledge, pedagogy and technology that can enhance the quality of teaching and learning. In particular, technology is needed in content and pedagogy to create learning domains that enhance graduate quality, skills of interest and economic value (Koehler & Mishra, 2009). This means that technology needs to be applied in education to enhance faculty and students' performance in educational skills as it directly relates to the effectiveness of lecturers and student quality, to enable them to face a more competitive global environment and become better candidates for their current careers or future (Belcher (2005). Technology enables active learning in teaching concepts are important for transforming a passive environment that does not encourage creative and innovative thinking where lecturers and students are less interested in sharing ideas during the teaching and learning process (Ruey, 2012). According to the author, the concept of technology enables active learning in teaching to be applied in the development of education to generate creative and innovative thinking among faculty and students, as well as improve their quality. The use of technology tools that will prepare students to enter the real world of work in the future. The purpose of this study is therefore to review the self-efficacy of lecturers in enhancing the quality of TVE graduates, which includes factors that will change the education system and how TVET students can acquire relevant skills to meet industry needs.

However, an important challenge in developing this active learning in teaching concept is the need to have the technology tools to create a new academic environment. Past research has shown that the application of Active Learning Techniques in teaching is often associated with academic achievement and academic adjustment. While the application of Active Learning Techniques in teaching sessions also increased the effectiveness of the teachers / lecturers. Active Learning Techniques in teaching process are important to use as they create an active learning environment that stimulates the generation of new ideas, creative and innovative ideas (Ruey, 2012). Students also experience increased *hands-on* skills with the use of technology in the learning process. In other words, the lecturers will be more responsive and students will be more interactive in their learning.

According to several studies conducted using quantitative methods to study active learning technologies in higher education, it is revealed that students achieve a more mature understanding of their learning, are more active in the classroom, and gain more experience in the use of technology ((R. Davoudi et al., 2014). They believe that the concept of active learning

based on technology is important in the areas of social, interactive technology, and knowledge-sharing culture as well as learning in developing meaningful experience processes (Parishan et al., 2011), enhancing students' understanding of concepts and analyzing concepts and phenomena in education, and enhancing students' visualization skills (Dori & Belcher, 2010), all of which will lead to improved learning performance and furthering job satisfaction and enhancing the self-efficacy of lecturers.

### 3. CONCEPTUAL FRAMEWORK

The conceptual framework for this study is divided into four sections namely inputs, processes, outputs and takes into account the external variables of modernization, namely education of the industrial revolution era 4.0. This conceptual framework including the application of technology enables active learning. First, the input section is on technologies that enable an active learning style consisting of five elements of online learning, *hands-on* experimentation, blended learning, collaborative learning and laboratory (practical) activities. The format of this study is the concept of a learning approach that involves lecturing, simulating and managing technology innovations to develop knowledgeable graduates who can use future technology skills to meet industry needs. Active teaching and learning practices using technology, pedagogy and content are closely linked to the level of self-efficacy of lecturers.

This practice is used to implement technology concepts that enable active learning in teaching that enhances the quality of student learning. In the meantime, the output of the conceptual framework is to improve the quality of TVET graduates to become skilled and professional technologists in the future at the same time increase lecturers' self-efficacy. The latest part of the modernization is to achieve the transformation of the Malaysian Education Plan (Higher Education) 2015-2025, which provides ten changes in education to make the current education system more effective and efficient. This study refers to the transition (quality of TVE graduates), which will be supported by the transition (global online learning level) to enhance teaching quality and lecturers' self-efficacy.

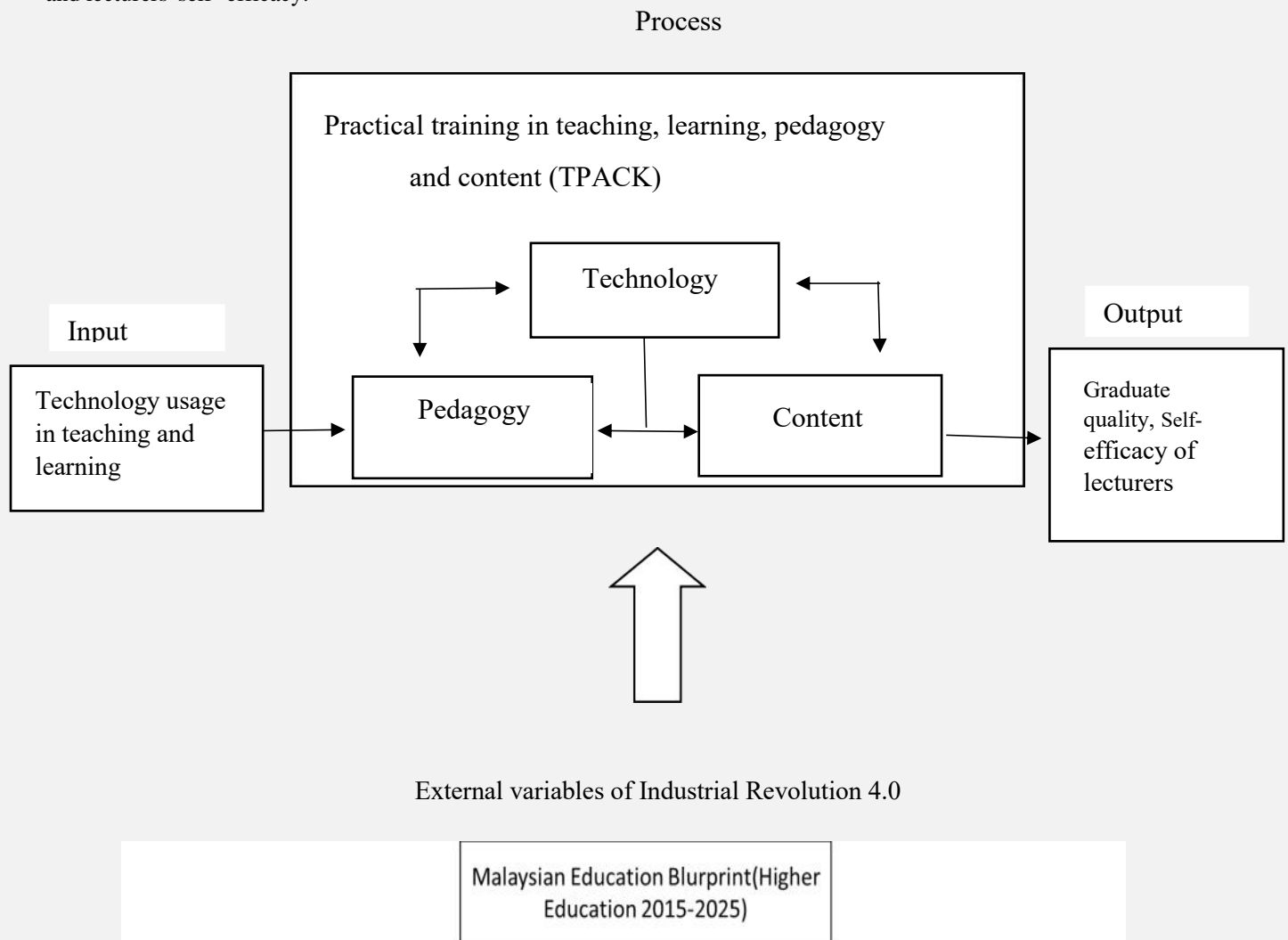


Figure 2.0: Conceptual Framework

#### 4. PREPARING FOR TOMORROW, TODAY

In short, an overview of Active Learning Techniques, TPACK practice shows that it positively affects student achievement. It helps students understand the concept of learning in the classroom to build skills and provide experience in the use of technology. The application of this technique concept can be defined as a new learning process. Students control their own learning process and they achieve their learning objectives using technology tools. The technological approach that enabled Active Learning in this study have five elements that should serve as a reference point: online learning, hands-on learning, blended learning, collaborative learning, and laboratory activities that really indispensable. Thus, Active Learning Techniques that is learning in teaching with practical applications of technology, pedagogy and content (TPACK) could help to transform the education system more generally improve students' quality and would enhance self-efficacy of lecturers in particular.

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