Pedagogical Practices of Design and Technology Teacher Trainees

Baharudin Saleh, Mohamad Sattar Rasul, Haryanti Mohd Affandi

In-Text Citation: (Saleh, Rasul, & Affandi, 2018)
To Cite this Article: Saleh, B., Rasul, M. S., & Affandi, H. M. (2018). Pedagogical Practices of Design and Technology Teacher Trainees. *International Journal of Academic Research in Business and Social Sciences*, *8*(5), 315–325.

Pedagogical Practices of Design and Technology Teacher Trainees

Baharudin Saleh
Faculty of Education, Universiti Kebangsaan Malaysia.

Mohamad Sattar Rasul
Associate Professor (Dr), Faculty of Education, Universiti Kebangsaan Malaysia.

Haryanti Mohd Affandi
Senior Lecturer (Dr), Faculty of Education, Universiti Kebangsaan Malaysia.

Abstract
This study aims to identify the pedagogical practices of the teacher trainees of Design and Technology option in conducting lessons in teaching training practice to become competent teachers. The samples of this study are 81 teacher trainees in Design and Technology option of Institut Pendidikan Guru (IPG) Kampus Tun Hussein Onn, Batu Pahat, Johor. The study was conducted through a quantitative approach using questionnaires. The research findings revealed that the teacher trainees using discussion (mean=2.90) and project work (mean=2.87) method is too modest. Also, the usage of lecturing (mean=3.22) and demonstration (mean=3.05) method is encouraging high. The overall results showed that the level of the teacher trainees' pedagogical practices is medium (mean=2.65) in the teaching and learning process. From the mean comparison, the research shows that the teachers' trainees pedagogical practice are still focused on the lecturing method for the teaching and learning process in the classroom during teaching training practice. Therefore, diversifying pedagogical practices by trainees should be emphasized to motivate students to learn.
Keywords: Pedagogical Practices, Design and Technology, Teaching and Learning.

Introduction
Teachers play a vital role in teaching students. In class, teachers are an educator or a facilitator. A good teacher at teaching will make the student understand a concept or skill more accessible, and a not good teacher at teaching will only make the student struggle harder to comprehend the concept or skill. It will also cause the lesson to be dull and boring, the students unable to pay attention and even worse, they will not want to enter the class (Palmer, 2017). An effective

teaching and learning practice is when the teacher varies his teaching method, prepares his teaching aids and studies the lessons that he will be teaching beforehand. Coinciding with Shulman (1986), he emphasized that the necessary knowledge for teachers' education focused on the knowledge of his or her subject contents. He explained that the mastery of teachers in their subject content and their ability to change it into pedagogical forms would be an advantage for the teacher in carrying out teaching and learning process in the classroom. The pedagogical forms are choosing strategies and teaching methodology for the teaching and learning process, to capture the students' interest so that they follow the lessons that will be taught.

Slavin (1987; 1995) had built a sufficient new teaching model, which focuses on four factors that lead to excellent teaching; quality of instruction, an appropriate level of instruction, incentive and time. Quality of instruction is the ability for the teacher to make the lessons, concept or skills more accessible for the students to understand and memorize and also fun to learn. Teachers need to deliver the lessons accordingly and systematically, using simple and easy instruction Atkins and Brown (2002), explicit explanation and relevant examples, emphasizing main points of the lesson, relating the new lesson with the previous one and use teaching aids to explain new concepts to the students (Taber, 2007). Furthermore, learning objectives must be clear and specific, subject content must be sufficient, and at the end of the lesson, teachers have to give an assessment or test to the students.

The appropriate level of instruction is the suitability of the lesson to the students' ability and strength. If the level of instruction is high, weak students will not be able to catch up, and lastly, they will be left out in his studies. If the level is too low, intelligent students will not be paying attention to the lesson taught by the teacher. This will waste their time as the teacher has to pay attention to the weaker students. One way to solve this problem is by grouping intelligent students in one group and the weaker ones in the other, based on their ability and mastery of a certain skill. Teachers can also carry out individual teaching (Slavin, 1989) though it did not show the positive impact on the student's achievement (Horak, 1981). One way to achieve an effective teaching and learning process is through cooperative learning group that group the intelligent student with the weaker ones so that the smart student can help the other students in his group. With this, the teacher will be able to teach and pay full attention to his lesson.

The incentive is the ability for a teacher to give motivation to the students to continue studying and complete the tasks assigned. There are two ways to motivate students to pursue studying (Slavin, 1995). First, the teacher must prepare eye-catching and exhilarating lessons for the students by varying teaching methods and teaching aids. Secondly, the teacher can give incentive to the students by providing the rewards or compliments to those who have mastered the lesson or by providing small punishment to those who do not. Teaching and learning time is the sufficient time for the students to learn a concept or skill. Usually, a lesson is affected by two factors; time allocated by the school to the teachers, time-on-task or engaged time which is the time used by the teachers to teach and the students to learn to acquire new knowledge or skills. Research by Marliave, Fisher and Dishaw (1978) shows that time allocated to a specific subject do not give impact to the students' achievement when it is measured in class level. Research on

engaged time or time-on-task shows that there is a significant relationship to the students' achievement in the academic field.

Research Objective
The objective of this research is to determine the pedagogical practices of Design and Technology teacher trainees when carrying out activities during teaching training practice in several schools in the district of Batu Pahat, Kluang, and Mersing, Johor, Malaysia.

Research Question
To achieve the objective of the research, these questions are asked, that is:
1. What are the pedagogical practices of Design and Technology teacher trainees during the third phase of teaching training practice?

Literature Review
Teachers play an essential role in determining the effectiveness of curriculum changes in the school. Teachers can evaluate and shape how curriculum changes can be carried out in their class; choosing the right material, teaching strategies, preparing activities and also teaching skills (Habib, 2007). Thus, to produce an effective teaching and learning practice in class, teachers have to master the subject so that the students can understand precisely what is taught by the teacher.

Shulman (1986) states that the necessary knowledge for teachers focused on their understanding of their subject content. He had developed a new frame for teacher education by introducing pedagogical content knowledge (PCK). It was established in the project "Knowledge Growth in Teaching" as a more comprehensive perceptive model to understand the process of teaching and learning. This project research how the new understanding affects their teaching methods.

"Pedagogical content knowledge is a unique knowledge for a teacher, and it is based on the teacher's method in relating his pedagogical knowledge to his subject content knowledge. The integration of both pieces of knowledge is the pedagogical content knowledge (PCK)."
(Shulman, 1987: 15)

Shulman (2004) introduced Model of Pedagogical and Action to explain how teachers think and act to translate their knowledge of their teaching subjects into lessons that made the students understand easier and faster. According to him, it is a process of planning and carrying out action that involves six aspects: (i) realizing the objectives of learning a subject and the organization of the subject that will be taught, (ii) a transformation, that is the teacher has to change the content of their subject into effective pedagogical forms such as lecturing and discussing, (iii) teaching using the suitable and relevant method, (iv) assessing students to test their understanding such as question and answer session, (v) reflecting the students' ability to absorb the lesson and the teacher's teaching capability, (vi) using the new knowledge acquired as guidance to teach for the next class. Frostig and Maslow (1973) states that in choosing teaching strategies or method, teachers have to think of a way that promises the students' participation and active class interaction so that the learning process is more effective and efficient. They also said that a high-

quality learning process could be achieved if the teacher has an in-depth knowledge and understanding teaching and learning process.

According to Abdul Malik (1997), to determine that the teaching is useful, the teacher must master teaching methods, has a broad and deep knowledge on the subject that he taught, and equipped with expertise related to education and the provided curriculum. Teachers must include recent issues and problems in the teaching and learning process so that the students will be knowledgeable and resourceful. Lilia and Norlena (2000) agreed on the above statement, saying that a teacher who is weak in pedagogical knowledge will carry out teaching and learning process traditionally, where the teacher will only give lectures whereas the students will learn through memorizing, instead of understanding. Consequently, it can be concluded that less knowledgeable teachers will not be able to stimulate the students' creative and critical thinking. This teaching and learning process is no longer relevant and will not meet the requirement of our curriculum now.

Ahmad Tajuddin (2009) suggested that to equip the teacher with curriculum knowledge, professionalism of the teachers must be upgraded parallel to the recent curriculum changes. The upgrading and improving the teachers' professionalism is to increase their knowledge, skills, attitude, and values that will enable the teachers to be competent and excellent teachers. He suggested the following aspects must be improved; (i) pedagogy general knowledge; that include teaching strategies, class management, knowledge about students and learning, (ii) subject matter knowledge: knowledge on the subject matter that will be explained, (iii) pedagogical content knowledge: the methods on teaching a specific subject (example: automotive field is different than any other vocational fields), knowledge on curriculum and curriculum tools, (iv) knowledge about the students and their context; families and school, (v) the relation between theory and practical, (vi) knowledge on strategies, techniques and instruments to sustain the learning atmosphere, (vii) knowledge, skills and values to interact with students from different culture and religion and (x) knowledge and skills to use technology for effective teaching. Schank and Berman (2003) explained that learning through experience and activities rarely practiced due to the difficulty to carry it out in a classroom that has many students and limited facilities. Because of that, the teachers took the most accessible way which is by delivering the lessons by lecturing although they knew the method is not a sufficient teaching method. To put it simply, the teacher and the school reality are two essential factors in determining the quality of our education system. We have to know that changes in education practice will take a long time. Thus, it is not enough to suggest a cooperative or constructive learning method without knowing the detailed elaboration of the methods and how to carry it out and experience it until the teacher can master the techniques very well (Azis, Hashim & Hamedi, 2006)

A successful teaching lesson requires choosing the right teaching methods suitable for learning styles and learning objectives. By selecting the correct method, it is hoped that the students will be able to absorb the lessons taught by the teachers easier and better. Previous research had proven that there is a relationship between teaching and learning methods to the success on achieving learning objectives. For example, an analysis by Cage (1975) in Noraini and Shuki (2009) shows a positive result where teaching methods that are chosen and even the teacher's attitude

and personality traits will affect the students' perspective and achievement. The findings of Cage (1975) in Noraini and Shuki is supported by Reece and Walker (2006), agreeing that there is a relation between different teaching methods and their various uses. They suggested teachers use different teaching methods according to certain situations so that the students can absorb the information given better. In an instance, to deliver a lesson about a specific skill, teachers are advised to use demonstration, group teaching, video, laboratories, field work, simulation, and projects. To deliver a lesson on theories or concepts, it is advised to selecting method, demonstration, laboratories, and games. For explaining facts related to affective attitude, discussion, debate, field work, role play, simulation, and tutorial ought to be the best method for it. A clear view of the suitable teaching method for specific learning and teaching objectives can be seen from the Figure 1.

Teaching Method	Teaching Objective					
	Cognitive		Affective		Psychomotor	
	Low	High	Low	High	Low	High
Lecture	√					
Demonstration	√				√	
Group teaching		√		√	√	
Discussion		√		√		
Debate		√				
Question & answer		√				
Video		√	√		√	
Seminar		√	√			
Laboratories/workshop		√	√		√	
Games/Quiz		√	√			
Brainstorm		√				
Buzz group		√				
Fieldwork		√				
Roleplay		√				
Ice Breaker			√			
Simulation		√		√	√	
Case research		√				
Project		√	√		√	
Tutorial		√		√		
Distance learning		√				

Source: Reece and Walker, 2006, pp.128
Figure 1: Teaching and Learning Methods Based on Teaching and Learning Objectives

From the methods listed by Reece and Walker (2006), there are only a few methods that were explained clearly, and it will be used in the research. Lecturing approach is where the teacher orally delivers and demonstrate the lesson. This method is prevalent among teachers, probably because it is easy to be carried out and it only depends on the teacher's knowledge and ability to speak fluently. If the teacher has a deep understanding and masters the topic that he wanted to

teach, the teacher will successfully deliver the lesson to the students systematically and comprehensively. Nevertheless, problems will arise if the teacher does not master or understand the subject matter well. The process of teaching and learning during class period is only used to finish the subject syllabus; separately and with no continuation. Ordering method is a method where it does not involve the teacher much, but more to the students. In this situation, the teacher will give orders to the students while teaching. This method consists of the teacher providing instruction and guidance to the student before starting any lesson. The instruction given must be structured and systematic so that the teaching and learning process runs smoothly. The method of providing instruction usually takes a long time before the student are given freedom to carry out the activity during the lesson. For example, a Science teacher will instruct the students before carrying out any experiment in the laboratory. The teacher must make sure that the students follow the instruction given. It can also be seen in vocational subjects, Household Science and Living Skills.

Discussion method encourages exchanging ideas freely between students and between students and teacher. This method will produce creative and innovative students as the students can discuss a topic before the teacher explains. The teacher will be the first person to start the discussion by announcing the topic. To ensure that the argument is successful, it is essential to have a detailed and thorough plan so that the debate will not stray away from the topic. According to Kamaruddin (1993), the discussion is a teaching strategy in the form of conversations between student under the supervision and control of a teacher. This statement is supported by Dillon (1995), explaining that discussion is a form of interaction between several people and what is discussed is the topic of the issue.

A demonstration is used to teach how to do something so that the students see and follow the series of particular steps, events or situation. It involves the teacher as the demonstrator. The teacher will have to show the student the correct steps in carrying out specific activities. This method is usually used to deliver information or skills that require the students to do a particular exercise such as experimenting. This method is also used when it involves using expensive tools, and the students are prohibited from doing it by themselves. A demonstration is vastly used in subjects involving laboratories such as Science, Living Skills, and Vocational (Automotive, Welding, Air Conditioning, Electric, Electronic and). Teachers will show the steps one by one, and as soon as the students understand the steps well, they will be given an opportunity to carry out the activity by themselves. Project work is recently practiced by teachers nowadays. This method provides the same effect as exploration-discoveries method, only that this method focused on creating just one project and the process involved. Teachers must have a thorough and detailed plan to carry out this method. The teacher will have to give a detailed explanation on how certain parts of the project is carried out. The students will be able to gain knowledge throughout the project work.

In conclusion, a teacher cannot deny that even though the knowledge and understanding of their subject matter is the requirements for teaching (in the aspect of what they want to teach), knowledge and mastery of various teaching methods (in the perspective of how to efficiently prepare, to coincide the teaching objectives) is just as valuable. In pedagogy field, both elements

complement each other. In the context of this research, the researchers want to see how far the identified teaching methods are used by the teachers when teaching in the class. The researchers also want to see if there is any significant relationship between their teaching method and their knowledge of their subject matter.

Methodology
This research is descriptive research using survey method that uses quantitative approach. This research uses questionnaires as research tools to obtain information regarding the pedagogical practice. The population of this research involves 81 teacher trainees who teach Design and Technology in primary schools in the district of Batu Pahat, Kluang, and Mersing when they were carrying out instructing training during semester 7. Based on the population, the suitable sample size is involving all the population as the sample for this research.

Research Findings
Pedagogical Practice Level of Design and Technology Teacher Trainees
According to the level of the pedagogical practice of the Design and Technology teacher trainees that is shown in Table 1, the data shows that in total, the pedagogical practice level amongst the teacher trainees is in moderate (mean=2.65). The research findings also revealed that the teacher trainees using discussion and project work method is too modest, where both of the means are 2.90 and 2.87 respectively. Nevertheless, the usage of lecturing and demonstration method is encouraging, both of the means are 3.22 and 3.05 respectively.

From the findings and mean comparison, the research shows that the teachers' pedagogical practice are still focused on the lecturing method for the teaching and learning process in the classroom. To summarize, the research also shows that the pedagogical practice amongst teachers are still in moderate level after all the teaching methods studied.

Table 1: Mean Scores, Standard Deviation and Pedagogical Practices of Design and Technology Teacher Trainees

	Teaching Method	Mean	s.d	Level
1	Lecture	3.22	0.475	High
2	Discussion	2.90	0.570	Moderate
3	Demonstration	3.05	0.504	High
4	Project	2.87	0.519	Moderate
	Total	2.65	0.298	Moderate

Note: mean 1.00-2.00=low; mean 2.01-3.00=moderate; mean 3.01-4.00=high

Discussion
Research findings show that pedagogical practice level of Design and Technology teacher trainees in using teaching methods during teaching and learning process in classroom or workshop is only leading to a specific approach. Majority of the teachers use lecturing method which is the most popular, and demonstration is the second method usually practiced by the teachers teaching Design and Technology. Such results are also displayed in the researches by Power and Cohen (2005), Mohd Azlan and Yahya (2009) and Dewa (2009) which all of them showed that the

teachers teaching vocational subject still bound to the lecturing method which centers on teachers whereas learning techniques such as projects, discussion and demonstration is not favorite among them. Earlier research by Knight and Wood (2005) also shows that teachers are more into lecturing method when they are teaching, compared to other teaching methods but they propose a general model for teaching that incorporates interactive engagement and cooperative work in place of some lecturing, while retaining course content by demanding greater student responsibility for learning outside of class.

Conclusion

Teachers' practices in carrying out curriculum are related to the teachers' mastery of three main elements which are subject content, pedagogy knowledge, and assessment. If the teacher master his subject content both theoretical and practical, able to adjust his subject content knowledge into suitable teaching method and carrying out assessing method that can test the students' understanding, and it will leave a tremendous positive impact in applying curriculum approach in the classroom (Habib & Baharudin,2012). Thus, the mastery of teacher trainees of Institut Pendidikan Guru Malaysia (IPGM) on pedagogy knowledge is essential in carrying out the curriculum of Design and Technology so that the previous curriculum approach which uses a conventional method that emphasizes on a cognitive domain can transform to produce creative thinking students. This, at the same time, will develop values and attitude of an individual student regarding effective and psychomotor domain. The integration of the three domains applied will be able to produce students with high creativity. It gives high motivation to teachers in content subjects taught at the school during training. Conclusively, this research findings suggested that by knowing the pedagogical practice of teacher trainees, it can be utilized regarding preparing development programs, training, motivation and building IPG infrastructure that focuses on the target of producing competent teachers.

Corresponding Author

Associate Professor Dr. Mohamad Sattar Rasul, Faculty of Education, Universiti Kebangsaan Malaysia. Email: drsattar@ukm.edu.my

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