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Vocational College's Students Preferences on Practical Teaching Methods for Electronic Subject

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Abstract: Practical teaching approaches in the classroom or workshop plays an important role in teaching and learning process especially for hands-on subjects. The practical teaching methods that teach according to the ability of the students can give them better understanding in a specific subject. Hence, this paper will look at the practical teaching methods that are preferred by the Malaysian Vocational College's student for electronic subject. Quantitative studies approach has been employed which adopted the survey design using questionnaires as the instrument for data collection. The respondents of this research were selected from 306 students in 58 Vocational Colleges which offer Electrical and Electronics Engineering Technology courses. Descriptive analysis has been carried out for this study and the data such as mean, standard deviation and ranking were analysed. The result showed that student preferred teaching method that provide easy understanding on the hands-on topic based on the Needham 5 phase constructivism model. In the beginning phase, the student preferred demonstration, practical activities use video clips, diagram and hand note. However in Idea Generation, Strengthening of Ideas and Applying Ideas phase, they preferred the teaching that focusing on group rather than individual such as practical work, discussion, mind map and invention. In the reflection phase, the students most preferred using question and answer openly in class and small group. Based on this study, the findings will help the teachers to use the specific teaching methods that provide easy understanding for the students' especially for the hands-on subject.

Keywords: Teaching method, vocational college, electronics, industry based

1. Introduction

Producing students who are able to adapt to the global industrial revolution requires a fairly relevant and dynamic transformation to the national education system (Azmi et al., 2020). The transformation of Vocational Education that has been initiate is one of the positive efforts to uplift the education to suit to the industrial revolution 4.0 in particular for the technical and vocational fields (Pelan Strategik Transformasi Pendidikan Vokasional, 2011; Adnan Ahmad; 2012, Ahmad Nabil et, al, 2018). This is very important because with a good technical and vocational education system it can produce students who are able to master the practical skills that are parallel and required by the industry (Euler, 2013). Changes to the technical and vocational fields have led to the specialisation of the Vocational College to be focusing in producing the best graduates with highly skilled workers (Pelan Strategik Transformasi Pendidikan Vokasional, 2011). For that reason, the Vocational Colleges syllabus has been designed to encompasses eighty percent (80%) practical content (Pelan Strategik Transformasi Pendidikan Vokasional, 2011). The practical teaching method that uses in the classroom or workshop by teachers play a very important role in teaching and learning to make sure the student

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understands the practical knowledge. This is because, teachers need to highly focus on the teaching content, interaction with the students and ability to deliver practical content well (Lucas, Spencer & Claxton, 2012), because all aspects of practical teaching are entirely dependent on lecturers (Elbaz, 1983; Carter, 1990; Verloop, 1992; Ahmad Nabil et al., 2018). The maximum involvement of students in practical teaching process in the classroom / workshop will give a positive impact on their understanding of a topic better (Ramsden, 1992; Cummings & Teng, 2003). Teaching content should be tailored to the way student learns (Hattie, 2012)

1.1 Practical Teaching Method in Technology Electronic Subject

The world's electronics sector moves fast enough, including Malaysia. The emphasis on the four main sub-sectors, Integrated Circuit, Solar Photovoltaic, Light Emitting Diodes (LED) and Integrated Solid and Electronic Lighting (2011 Annual Economic Transform Program, 2012) have shown that electronic fields need to be more focused. The convergence of electronic technical knowledge must be given considerable emphasis in the early stages. Electronic technical teaching and learning should be more geared towards current phenomena in the industry (Ahmad Nabil et al., 2014). The changes in the teaching and learning process of electronic learning have begun to change from the traditional concept to the more relevant concept and in accordance with current requirements. Emphasis on working in groups, problem-based learning, doing parallel projects with the industry and demonstration of the current electronic teaching and learning methods (Myllymaki, 2002; High Beam, 2013).

The focus on practical teaching that reaches up to eighty percent (80%) in the syllabus of the Standard Curriculum in Vocational College (KSKV) presents challenges to lecturers in planning their teaching in the practical workshop at Vocational College (Ahmad Nabil et al., 2014). Practical lessons cannot be equated with theoretical teaching because it is implicit and difficult to be taught solely by oral conversation. In the teaching of practical subjects, students must be fully involved in teaching sessions so that the knowledge to be delivered is achieved successfully. This is because practical lessons parallel to the real problems in the industry and are done in the group have a significant impact on the overall achievement of students in theoretical and practical aspects (Bernhard & Carstensen, 2003; Myllymaki, 2012).

The success of lecturers in designing practical lessons in the workshop will create fluency in the learning process and consequently impact on the generation of skilled workers who want to be released. The ability of lecturers in delivering practical knowledge in line with the industry's needs will give students the advantage of preparing for the nation's talent. Hence, practical teaching at Vocational College is an aspect that can affect the generation of skilled and skilled generation of skilled national skilled generation at present.

The electronic teaching syllabus at Vocational College begins with the construction of a good concept to ensure that students are able to apply them when they go to work. Along with that, diodes and transistors are taught in the first semester of the year as the basis of electronic teaching topics. It requires a full and good understanding to ensure the development of a good concept. Hence, the subject of electronic technology is chosen as the subject of attention to the best practical teaching method.

The majority of practical teaching approaches can give a good impression in the concept of diodes and transistors. Lecturers need to be more aware of current industry situations as the basis for today's modern electronic field is to use diodes and transistors as a circuit builder. Hence, the need to engage in current knowledge in the industry in the subject of electronic subject practical instruction needs to be emphasised. The labour force who understands the industry's current needs can benefit them later

1.2 Practical Teaching Method and the Needham Constructivism Model

Practical teaching is an activity that involves students observing and manipulating real objects and being able to connect with current daily situations (Millar, 2004; Lucas, Spencer & Claxton, 2012). Effective practice teaching has the rules of organised steps. Start with problem identification, identify the cause of the problem and arrange for it to be clear in accordance with the topics and objectives of the study of practical topics. Problems are also obtained from the observation, experimental, demonstration of past issues. It was developed with the construction through the solution of practical problems i.e. through experimental and demonstration methods so that the problem was successfully completed. Construction of the concept during this problem-solving session will make someone competent in practical aspects. For effective practice cover, lecturers need to draw conclusions, reflections and some of the following related topics (Millar, 2004 & KSKV, 2013). Implementation of practical teaching refers to the preparation or technique of how a lecturer is to teach a good subject. Good practice teaching methods have three phases, beginning, content and closing (Gary, 1996). Constructivism-based teaching requires that lecturers provide opportunities for students to explore knowledge and engage them directly in 'hand-on' and 'minds-on' activities. Hence, Needham (1987) has proposed teaching methods in facilitating the effective teaching process through the Model Five Phase Needham Constructivism Model has the orderly teaching and learning phases. There are five phases: Beginning, Generation ideas, Compilation and Strengthening Ideas, Application of Ideas and Reflections.

1.2.1 Beginning

The beginning of teaching is an important phase for lecturers. Currently, the role of the lecturer is to attract students' attention and interest in the teaching topic at that time. It also serves as a method to motivate students to be more sensitive to the content of teaching. The student's existing knowledge needs to be known by the lecturer as it is the basis for new information to be tested. Existing knowledge structures for students need to be reviewed and constructed before the contents of new knowledge are provided to them.

1.2.2 Idea Generation Phase

The process of generating ideas is a process in which a lecturer identifies a student's initial idea. The ideas obtained from students need to be guided to coincide with the teaching and learning objectives at that time. This process is important because the knowledge that the student needs to receive is focused, comprehensive and complete but not in the form of blurring fragments that are too general or not focused on teaching objectives.

1.2.3 Strengthening of Ideas Phase

The preparation and consolidation phase of the idea is a student process of exploring and researching all aspects of new knowledge received. Lecturers need to use teaching methods that help students in this process to be more organised. By sharing knowledge with other students, it is a method of how students can ensure that the knowledge received is similar to those of other students. If it is not parallel, it can be corrected by sharing with other students and assisted by lecturers to strengthen the knowledge. If scientifically correct correction is required, it is appropriate to ensure that new ideas are accepted can be understood with the correct meaning. The learning environment within the group is only effective if the lecturer provides a clear teaching guide. It is important for students to follow, understand the concepts and objectives of each requirement that a matter can be implemented accurately. The overall involvement of students in the group for teaching and learning activities can enhance the process of strengthening new knowledge among students. Implementation within the group facilitates lecturer's tasks to monitor and provide students with the convenience of asking questions, discussing in groups of friends and expressing opinions in a discussion of the process of strengthening the idea (Newby et al., 1996; Australian Universities Teaching Committee, 2002).

1.2.4 Applying Ideas Phase

Students are given the opportunity to apply their ideas and use them in the form of reality. In this way, students can apply their ideas to new situations that may be different. This will help students widen the level of understanding and scope of their knowledge. Students should be able to apply new ideas and knowledge as a result of acquiring knowledge in the classroom. Lecturers need to encourage students and create an understanding that the inquiry process of the students increases especially to the industry's current knowledge (Adnan, 2012).

1.2.5 Reflection Phase

The reflection process is a process by which students move abstractly received knowledge into the classroom into reality. The changes in the teaching and learning process are in the form of the arrangement understood by the student itself. The methods used by lecturers to implement the refraction process include self-reflection, reflection within the group, written reflection, questions in the group and open class (Needham, 1987; Zahorik, 1995).

1.3 The Needham Constructivism Model in Practical Teaching and Learning

The teaching approaches that use the Needham Constructivism Five Phase Model in practical learning subjects have been used by lecturers who teach technical subjects in Malaysia. Various findings that give positive impact to the students using the method are obtained based on the findings of the previous researchers. In the teaching of technical students, the use of the Needham Constructivist Five-Phase Model has greatly helped students acquire technical knowledge more easily and quickly. They have acquired practical knowledge from lecturers rather than passive in only one direction, but they actively and actively seek technical knowledge through two-way teaching and learning (Yahya & Amirudin, 2011; Adnan et al., 2014; Mohd Hisyam & Mazni, 2012).

It is in line with the opinion of some previous researchers who are using constructivist approaches in the teaching of technical subjects to make the students look more active, learning classes are better, more energetic and the students who follow it have a more responsible attitude towards the learned knowledge (Caprio, 1994). Students appear to be active in learning sessions as positive situations as they will always express their opinions, interact with other colleagues and lecturers. This active discussion can help students transform and reinforce their ideas that have been raised in the classroom, but the supervision of the lecturers in developing a better understanding of the student's knowledge framework (Center for Developmental Curriculum of the Ministry of Education, 2001).

The technical students who have gone through the approach through the Needham Constructivist Five Phase Model are easy to adapt and use their existing knowledge to reinforce the newly learned practical knowledge in the classroom

(Yahya & Amirudin, 2011; Nasir et al., 2020). The study is consistent with the statement by the Curriculum Development Center, Ministry of Education Malaysia (2001), which states that students will adapt any new information with existing knowledge so that they can create new knowledge in their minds with social interactions with other students and lecturers in the classroom during the learning session. The constitutional approach makes the student-centered learning more meaningful, with lecturers and students exchanging ideas and quicker questions and brainstorming. Lecturers play a role to create a conducive environment for students to boldly express opinions and questions in the classroom (Margetson, 1994).

Information and guidance through a two-way approach provide opportunities and opportunities for technical learners to learn more quickly. According to Rebecca (1994), students who are good listeners will easily be a good problem solver. Hence, in the technical teaching of technical subjects, lecturers need to know to choose the method and the way how to work with students solving problems easily. According to Adnan (2012), his research on automotive students found that students were more focused on assignments to be completed, more responsible for assignments and easier to achieve practical learning objectives at school.

The Needham Constructivism Five-Phase Model approach is that lecturers are always required to give their students the opportunity to develop ideas and to respect the ideas and opinions they have provided (Tobias, 2009). The result of a good understanding of the model led to the majority of technical teachers in schools in the State of Pahang and applied constructivism in their teaching thoroughly (Yahya & Amirudin, 2011). In addition, the constructivism approach using the Needham Constructivist Five-Phase Model is a more systematic practical approach in phases. Provide guidance lecturers and ways in designing and limiting student knowledge in practical teaching classes (Mohd Hisyam & Mazni, 2012).

2. Research Methodology

This paper uses descriptive research method. The researcher implemented quantitative research and questionnaire was used as the research instrument. The survey is focused on the practical teaching method of electronic subjects that were used in Vocational College. There are two parts in the questionnaire, which are section A is focusing on the demography of respondents and section B focusing on practical teaching methods that implemented in the electronic subject using Needham five phase constructivism model. The data obtained from this study were analysed using descriptive such as mean and ranking. According to Abdul Ghafar (1999), a questionnaire can be used in the study to measure the relevant concepts such as attitude, perception and opinion of a research respondent.

This research used a random cluster sampling technique. The population for this study were the students who has been selected from 58 Vocational College, which offered Electrical Engineering and Electronic Engineering program (Bahagian Pendidikan Teknik & Vokasional, 2017). A total of 1452 students has been identified registered for the Electronic Technology subject. According to Krejcie and Morgan table (1970), the samples for this research are 306 students.

2.1 Instrument Validity and Reliability

Prior to the distribution of the questionnaire for the pilot study, the content of the questionnaire was validated by two experts in teaching electronics. The verified questionnaire was distributed to thirty (30) first year students in the Electronic Technology course at Vocational College to examine the reliability of the instrument. According to Piaw (2014) the minimum respondents required for pilot study to see the reliability is thirty. Najib (2003) noted that, the appropriate reliability coefficient of a measuring instrument must be greater than 0.60. Cronbach alpha coefficient between 0.65 and 0.95 is considered satisfactory. If a Cronbach alpha value is too small indicating the capabilities of items constructed to measure constructs too low, whereas if alpha Cronbach exceeds 0.95 it is likely that all items are similar and overlapping among them (Piaw, 2014). The result for reliability test for all the phase is shown in table 1. The coefficient values showed values greater 0.79 which considered satisfactory.

Table 1 - Reliability score.

Phase	Reliability Score
Beginning	0.807
Idea Generation	0.862
Strengthening of Ideas	0.820
Applying Ideas	0.836
Reflection	0.791

2.1 Teaching Method Preferred Scale

In this study, the scale for practical teaching methods preferred by students at Vocational College is determined into four (4) scores namely, *most preferred, preferred*, *less preferred* and *poorly preferred*. Table 2 shows the level used by the researcher that adaptation from Piaw (2014).

Table 2 - The scale of practical teaching methods preferable by students at vocational college.

Mean Score	Description
4.76 – 6.00	Most Preferred
3.51 – 4.75	Preferred
2.26 – 3.50	Less Preferred
1.00 – 2.25	Poorly Preferred

3. Result

Practical teaching methods preferred by students in Vocational College divided into five phases according to Needham 5 phase constructivism model which are beginning, idea generation, strengthening of ideas, applying ideas and reflection. Table 3 shows the mean, standard deviation and ranking of the student's preferred of teaching method by phase.

Table 3 - Mean, standard deviation and ranking of the student's preferred of teaching method by phase.

Phase	Teaching Method	Mean	SD	Ranking	Selection
Beginning	Demonstration	5.20	0.72	1	Most Preferred
	Practical activities use video clips	5.10	0.76	2	Most Preferred
	Diagram	5.01	0.86	3	Most Preferred
	Hand note	4.98	0.77	4	Most Preferred
	Current phenomenon / problem	4.54	0.90	5	Preferred
Idea Generation	Mind map	4.94	0.70	1	Most Preferred
	Diagram	4.94	0.73	2	Most Preferred
	Question and answer	4.92	0.70	3	Most Preferred
	Practical Work	4.87	0.65	4	Most Preferred
	Discussion in class	4.84	0.73	5	Most Preferred
	Discussion in small group	4.72	0.83	6	Preferred
Strengthening of Ideas	Practical Work	5.11	0.67	1	Most Preferred
	Demonstration	5.10	0.62	2	Most Preferred
	Discussion in small group	4.87	0.78	3	Most Preferred
	Project	4.68	0.83	4	Preferred
Applying Ideas	Discussion	4.89	0.98	1	Most Preferred
	Assignment	4.75	0.82	2	Most Preferred
	Invention	4.58	1.1	3	Preferred
	Problem Solving	4.56	1.1	4	Preferred
	Project Report	4.51	1.09	5	Preferred
Reflection	Question and answer openly in class	4.77	1.07	1	Most Preferred
	Question and answer in small group	4.76	0.95	2	Most Preferred
	Group reflection	4.60	0.99	3	Preferred

4. Discussion

Based on the findings, the researcher found that the practical teaching method chosen by the students to achieve a better understanding is focusing on more creative teaching approach. Teaching methods often selected by students for initial sessions are demonstrations, hand notes, videos and diagrams. The beginnings of practical teaching should be of interest to students to ensure they continue to focus and focus on the classroom. The selection of the demonstration as a teaching method during the beginning session can attract students to focus more on teaching sessions because the demonstration can provide an overview of the contents in practical teaching that will be done by lecturers in the workshop (Nasir et al., 2020; Adnan et al., 2014; George, 2004). The hand notes will enable the students to know the initial idea that covers the entire teaching process that will be done by the lecturer during the beginning session (Azrul & Saifuddin, 2007). This will ensure that students are more focused and prepare for their knowledge and ideas after the handout is given at the beginning of the classroom.

The use of appropriate and clear diagrams can further enhance the pre-knowledge of the students as a whole on the topics in practical teaching. The diagram is used as the final objective of the lesson to facilitate the focus and direction

of practical teaching sessions (Mayer, 1989; Heiser and Tversky, 2006). The use of clear, bright and easy-to-understand diagrams should be used in order to avoid the diagrammatic drawing session taking time. While the use of video in the beginning of the class is chosen as it can attract students with sound effects, image display and special effects showed (Hajar, Shukri & Mohd Razha, 2011). It is to ensure that students are more focused and facilitate the students to know the entire teaching topic that will be done by the lecturer (Zainuddin, 2009). For ideas generation, it is a phase where students produce ideas that are generated and developed in more details. It will be controlled by lecturers so that every idea generated in line to the teaching objectives. Students are fond of open discussions, diagrams, concept maps, question and answer and practical work being used during the idea generation process (Ahmad Nabil et al., 2018).

Open discussions and question and answer in the classroom are often preferred by students as they provide them with the opportunity to express their opinions and may continue to ask the lecturer if there is a problem for the idea. It can give them the opportunity to listen to the views and ideas of all students and exchange ideas to make sure that the idea generated is quite clear (Larson, 2000). Students also preferred diagrams as a way of generating ideas as it is easy to understand completely by simply using diagrams. The concept maps is used as a complement to the knowledge that has been generated by way of compiling, preparing the contents of teaching in a more organised arrangement method. It is easy to refer back to if it is needed (Kinchin, 2014). Idea generation can also be done by using practical work done by students in the classroom. It is through observation and analysis of a practical work done. A good understanding will produce great ideas for teaching and learning purposes.

For the phase of strengthening the idea, the teaching method used towards ensuring the exploration is parallel to confirm the knowledge is suitable for use. Hence, the selection of teaching methods such as group discussions, demonstrations and practical work are often chosen by students for the purpose of strengthening their ideas. The process of discussion within the group ensures that the idea that has been generated, developed and can be strengthened through discussions among group members. It is well suited because when discussions process, the ideas can be exchange and views can be done. This can indirectly ensure the ideas and knowledge gained are mutual between members within the group (McKeachie, 2002). The lecturer needs to monitor that the content of the consolidation is accurate and does not mean that the student's intention (Chen, 2005; Mohd Hisyam and Mazni, 2012). The implementation of discussions within the group is able to produce students who are able to communicate well, improve negotiation skills, explore new issues and be able to think better (Faraday, Overton and Cooper, 2011). This can help students not only in the areas of teaching and learning but also in their daily lives. The student preferred demonstration to reinforce the idea as a first-come-way before they did practical work. The lecturer's used demonstration to ensure the ways and methods they will use more accurately, as they can see by themselves the methods of implementation. The demonstration approach can ensure students are skilled in forming basic learning concepts and are able to complete tasks when dealing with a real problem (Faraday, Overton and Spencer, 2011; Chowdhury et al., 2019). While practical work is used to reinforce student ideas and better learned knowledge. It is in line with the Converged Learning Theory which emphasises on the application of theory and practical knowledge to current industry situations (Wilson 1993; Anderson, Reder, and Simon 1996). Practical work is used by teamwork, which makes it easier for lecturers to monitor practical work activities more easily (Australian Universities Teaching Committee, 2002; Ahmad Nabil et al., 2018; McLain,2018).

For the application phase of the idea, it is a way of how the ideas and knowledge gained and strengthened will be applied through effective methods. Students choose assignments and discussions as a way of applying ideas to suit the current industry needs. An assignment is a form of training how the student translates existing knowledge into the form of application in line with the needs of the current industry. Assignments that require students to think and search for additional information will help them to relate existing knowledge to the actual situation outside the classroom. Discussions through the assignment will further enhance the brainstorming among students in the group (Adnan, 2012; Mohd Hisyam and Mazni, 2012; Zurainu and Abdull Sukor, 2012; Ahmad Nabil et al., 2018; Nasir et al., 2020). It not only helps the idea to be applied, but it can also speed up the work done. This approach is in line with the concept of constructivist learning that gives students the opportunity to develop new knowledge by understanding them through serious involvement with current industry world situation (Ministry of Education, 2001).

Reflection is an important phase for teaching and learning sessions. It is complementary to the content taught to all students. Students are more likely to choose open-ended questions and answer questions within the group to ensure that the practical session are clear and understandable. Open answer questions are chosen because it facilitates students to get final conclusions and share the final ideas of students in the open classroom. Questions answered by other students can be well understood by all students through an open-ended lecturer's explanation. Questions in the group give advantages to students asking more specifically and the explanation done by the lecturers in the group is more in depth according to the question asked (Nasir et al., 2020).

5. Conclusion

Students always preferred a practical teaching method that is easy to understand by them. Hence, this study finds that teachers need to use teaching methods that facilitate students' understanding in the classroom. By using this research data, teacher will know which is the best teaching method should use in conducting practical session for electronic subject in Vocational College. Teachers also need to streamline and improve the quality of delivery in ensuring the practical teaching of electronic subjects at Vocational College can be implemented better.

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