



Teachers' Practical Teaching Methods for Electronic Course in Vocational Colleges

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Abstract: There are many challenges faced by teachers to ensure that every student is able to master the knowledge which is in line with the industry. Hence, the practical teaching approach that is used by teachers needs to be in line with the syllabus that is being constructed. Teachers are seen to be important characters in order to ensure that each student can master the contents of the lessons in the classroom well. The objective of this study is to investigate the practical methods of teaching electronic subject at Vocational Colleges which is often used by teachers in conducting the practical workshop. Quantitative studies were employed using questionnaires and the respondents of this research were 135 electronic teachers in 58 Vocational Colleges which offer Electrical and Electronics Engineering Technology courses. Descriptive analysis was used in this study and the data such as mean, standard deviation and ranking were analysed. The results showed that the Electronics teachers used several methods in delivering the electronic practical subjects which are in line with the industry nowadays. Based on this study, teachers used several practical teaching methods in class in order to ensure that every student will understand and they can use it when they become professional workers in specific electronics industry.

Keywords: Vocational College, Practical Teaching Method, Electronics

1. Introduction

Producing students who are able to follow the global industry cycle requires relevant and dynamic changes to the national education system. The transformation of Vocational Education that was implemented was an excellent effort to elevate the new millennium education particularly in technical and vocational education (Vocational Education Transformation Strategic Plan, 2011; Rasul et, al. ,2015). This is very important as a good technical and vocational education system will produce students who are able to master the practical skills that are parallel with and needed by the industry (Euler, 2013). Changes to technical and vocational fields led to the specialization being undertaken at the Vocational College to be formulated in order to facilitate the majority of practical fields. Overall, up to eighty percent (80%) of the proposed syllabus encompasses a specific practical vocational area (Vocational Education Transformation Strategic Plan, 2011). Practical teaching approaches in the workshop used by teachers play an essential role in the teaching and learning process in the workshop. This is because teachers need to focus on the teaching content, interaction with students, ability to deliver good practical content (Lucas, Spencer and Claxton, 2012), since all aspects of practical teaching are entirely dependent on teachers (Ahmad Nabil, 2016).

The maximum involvement of students in practical teaching in the workshop positively impacts their understanding of topics (Bernhard and Carstensen, 2003; Myllymaki, 2012). The success of a lesson is strongly influenced by the teachers, as well as students who are able to absorb the teaching results well (Cummings and Teng, 2003; Ismail et al., 2017).

Teaching content should be tailored to the way students learn (Hattie, 2012; Muhammad Aiman and Roziyah, 2017; Muhd Khaizer et.al.,2019). For vocational students, the presentation of practical teaching should be constructive, focusing on the development of content in steps and stages, so that the students' learning does not deviate from the teaching objectives that need to be addressed (Myllymaki, 2012; Ahmad Nabil, 2016). However, the diversity of practical teaching methods practised by teachers should be adapted to the suitability of students to facilitate their understanding. Frequently used and proven effective teaching methods ensure that students are able to master practical learning in the classroom (Ahmad Nabil Md Nasir et al., 2018a). Therefore, this paper will delve into the practical methods of teaching the electronic subject at Vocational Colleges which is often used by teachers in conducting the practical workshop. This is because choosing effective teaching methods used by teachers can provide input and ideas for other teachers to continue using teaching methods that have proven effective for teaching in Vocational College.

2. Methodology

This paper uses a descriptive study method. A questionnaire was used as an instrument in this research. There was a set of a questionnaire used for electronic teachers at Vocational Colleges in Malaysia. The questionnaire was focused on the practical methods of teaching the electronic subject at Vocational Colleges which is often used by teachers in conducting the electronic practical workshop. The questionnaire comprises two sections, Section A related to respondents' background which are gender and teacher teaching experience. Section B is about teaching methods used in electronic teaching at Vocational College, according to the Model of Five-Phase Constructivism Needham. It consists of five sub-sections which is the beginning of the class, the idea generation session, the strengthening session ideas, application of ideas and reflection sessions. There are 54 items of all sections. To ensure that the content of the questionnaire constructed is appropriate, the researcher has submitted a questionnaire to two experts and its contents are reviewed.

After being certified by the experts, the questionnaire constructed was given to thirty (30) electronic teachers at Vocational College to test reliability the instrument. This is because of the minimum number of respondents to participate in the study are thirty (Chua Yan Piaw, 2014). Table 1 indicates the reliability according to the teacher's questionnaire. According to Mohd. Najib (2003), the reliability coefficient used in the assessment of a measuring instrument is that of a reliability coefficient over 0.60

Table 1 - Reliability Score

Phase	Reliability coefficient score
Beginning	0.850
Idea Generation	0.874
Strengthening the Idea	0.875
Application of ideas	0.789
Reflection	0.914

The data obtained from this study were analyzed using descriptive analysis, such as mean and ranking. According to Mohd Najib (2003), a questionnaire can be used in the study to measure the relevant concepts such as attitude, perception and opinion of a research respondent. The population in this study is 338 electronics teachers from Vocational Colleges which offer Electrical and Electronics Engineering Technology courses (Technical and Vocational Education Division, 2015). According to Krejcie and Morgan table (1970), the samples for this research are 135 teachers.

2.1 Scale of Teaching Method

In this study, the level of utilization of practical teaching methods by electronic teachers at Vocational Colleges is divided into four (4) namely; *frequently used* , *in-use* , *less-used* and *very less-used* in electronic teaching of Vocational Colleges. Table 2 shows the level that will be used by the researcher.

Table 2- Scale of practical teaching method used by electronic teachers at Vocational Colleges

Mean Score	Use
4.76 - 6.00	Frequently Used
3.51 - 4.75	Used
2.26 - 3.50	Less Used
1.00 - 2.25	Very Less

(Chua Yan Piaw, 2014)

3. Results and Discussion

3.1 Demographic Data

Teachers' demographic are divided into two, namely gender and teaching experience. Table 3 and Table indicates the data. From the data, Male which is fifty-six percent (56%) and the experienced teachers (20 years and above) are the majority of the respondent in this study.

Table 3 - Gender Data

Gender	Number	Percentage (%)
Male	76	56
Female	59	44
Total	135	100

Table 4 - Teacher's Teaching Experiences

Teaching Experience (Year/s)	Number	Percentage (%)
1 to 9 years	36	27
10 to 19 years	28	20
20 years and above	71	53
Total	135	100

3.2 Teaching Methods Used by Electronic Teachers

The practical teaching methods by electronic teachers at Vocational Colleges are divided into five phases, namely beginning, generating ideas, reinforcement of ideas, application of ideas and reflection. Table 5 shows the mean, standard deviation and ranking regarding the phase-in teaching the practical electronic subject in Vocational Colleges. Based on the findings, the researcher found that the practical teaching methods used by the teachers were focused on teaching approaches that were in line with the industry's current needs. The conventional approaches used by electronic teachers to initiate practical teaching sessions are through demonstrations and using hand notes. The beginnings of teaching are an essential phenomenon to attract students the first time for each teaching session. During the beginning session, the teaching method used should be comprehensive by giving the initial picture of a topic that will be implemented in the classroom. Teachers focus on the general understanding of the topics to be addressed. A general approach to the contents of practical teaching can give students time to know the original content of the topic.

The use of the demonstration method as the beginning of practical teaching is a good way, as teachers can show students in general about the topics to be learned in the practical class (Adnan *et al.*, 2014; Chowdhury, Alam and Mustary, 2019). The findings are in line with the study of Abdul Rahim and Mohd Zawawi (2011) which explain that the demonstration is very suitable for use as it is easy to explain in general to students and they can easily understand what will be learned in the class. The teacher's approach to using the demonstration during the teaching session will also provide an opportunity for students to evaluate, experiment and respond to the knowledge that has been delivered (McLain, 2018). Students will be able to discover in general what topics to learn. This will further expedite the students' understanding of the general concept of teaching and learning.

Table 5 - Mean, Standard Deviation and Ranking of Teaching Methods by Electronic Teachers

Phase	Teaching methods	Mean	Standard Deviation	Ranking	Use
Beginning	Demonstration	5.20	0.56	1	Frequently Used
	Hand notes	5.07	0.58	2	Frequently Used
	Using diagram	4.72	0.99	3	Used
	Practical activities use video clips	4.69	0.87	4	Used
	Current phenomenon / problem	4.58	0.86	5	Used
Idea Generation	Concept maps	4.91	0.59	1	Frequently Used
	Using diagram	4.91	0.60	2	Frequently Used
	Open discussion in class	4.84	0.68	3	Frequently Used
	Question and answer sessions	4.83	0.62	4	Frequently Used
	Practical work	4.75	0.66	5	Frequently Used

Phase	Teaching methods	Mean	Standard Deviation	Ranking	Use
Strengthening the Idea	Discussions in small groups	4.71	0.66	6	Used
	Demonstration	5.16	0.54	1	Frequently Used
	Discussions in small groups	5.00	0.68	2	Frequently Used
	Practical work	4.87	0.76	3	Frequently Used
	Project	4.83	0.73	4	Frequently Used
Application of ideas	Project report	4.99	0.77	1	Frequently Used
	Discussion	4.87	0.81	2	Frequently Used
	Assignment	4.79	0.83	3	Frequently Used
	Problem solving	4.72	0.78	4	Used
	Invention	4.66	0.91	5	Used
Reflection	Answer questions in small groups	5.10	0.65	1	Frequently Used
	Answers in the classroom openly	5.07	0.75	2	Frequently Used
	Reflection in groups	4.92	0.76	3	Frequently Used

Teachers also often use hand notes during the beginning of practical teaching sessions. The hand notes are used to give a preliminary and overall picture of what the students will learn in the class. The use of hand notes during the beginning session is in line with the study (Ahmad Nabil, 2016) stating that the hand notes can give students an initial idea and make it easier for them to expect the knowledge to be learned in a classroom and to make them more prepared. The hand notes used by teachers should be clear, comprehensive and have noted that students can refer back to (Zainuddin and Noorsafarina, 2011). Teachers use hand notes as one way to provide understanding to the students in sequence and to compile the original teaching content. This can give students an overview of the topics to be learned in the workshop.

For the idea generation phase, it is a phase for teachers to generate and develop the teaching ideas that have been initiated during a session that focuses on general knowledge. This well-known science needs to be drawn with the idea of the students so that the development of the content is easier for them to translate (Adnan, 2012; Mohd Hisyam and Mazni, 2012; Ahmad Nabil, 2016). Teachers should always allow each student to develop their ideas and respect the opinions they have given to ensure that the idea generation process takes place actively in two ways (Tobias, 2009). Based on the findings of the study, electronic teachers often use open discussion methods, group discussions, diagrams and concept maps during the idea generation phase session in practical teaching.

An open discussion at the front of the workshop is a generational idea that is often used by electronic teachers during practical teaching sessions. An open discussion method can give students the opportunity to present their ideas and views to the knowledge delivered. It can also provide teachers with direct feedback and information regarding ideas received by the students, whether or not they are correct (Nurulwahida et al., 2019). The involvement of students in open discussions should be maximized and should be appropriately controlled by the teachers so that the ideas generated are accurate and correct according to the teaching objectives (Larson, 2000). The teacher needs to create a conducive atmosphere for students willing to express opinions and questions in the classroom during the discussion session. The idea generated through open discussions is easy to standardize to all students and the knowledge received is the same for all students. The question of the students can also be answered by the teacher and it is also understood by all students more easily. Teachers need to control the movement of the discussion activities in the classroom regularly so that the content of the lessons learned can be mastered by all students in the same context and concept.

The discussion approach in small groups during the idea generation session is also often done by teachers. Idea generation can be well implemented by group discussions through the differences in views and suggestions raised because in the group of students it is easier to express opinions more actively, they are not ashamed to speak and give insights because the number of members in the group is small (Wolfe, 2004). Teachers should act as facilitators by monitoring each group and regulating discussion activities so that the generation of ideas coincides with the teaching topics (Larson, 2000). The group leader should play a role to ensure that each member of the group understands and obtains a well-defined and clear idea.

The use of diagrams during the idea generation session in practical teaching is one of the methods of deductive teaching. The teacher gives an idea of what will be learned in the classroom, and they are discussing with students to generate and produce ideas in parallel with the teaching objectives. The diagram is used as the final objective of teaching to facilitate the focus and direction of practical teaching sessions (Heiser and Tversky, 2006). The use of clear, bright and easy to understand diagrams should be used to avoid the diagrammatic session taking the time. *Top-down* approaches help teachers and students to generate ideas as they are clear about the final and more focused objectives (Ahmad Nabil,2016).

The process of generating ideas is a process that encourages teachers and students to create ideas and views that are incorrect and correct. However, the idea is to be compiled and streamlined using concept maps so that it is easier to understand and refer again. The development of a good concept map can make the teaching session active, and it can showcase the students' ability to develop well-learned ideas and concepts of knowledge (Hattie, 2012; Subramaniam and Harrell, 2015). The ideas that are generated and compiled using concept maps can facilitate teachers and students to see the entire contents of the lesson quickly, capable of connecting and systematically linking the concepts and ideas (Ahmad Nabil, 2016). The ideas generated and organized in the concept maps are easy to revisit and any new idea can be incorporated into neat and more organized.

For the strengthening phase of the idea, it is a process of students exploring and researching all aspects of the new knowledge received. The teacher needs to act as an observer when the student undertakes this consolidation process by compiling the knowledge acquired when they do so in the groups. Teachers often conduct group-strengthening processes in order to monitor efficiently and correct if student knowledge differs. Hence, electronic teachers often use teaching methods in groups, demonstrations, practical work and projects as a process of strengthening ideas in practical teaching.

Strengthening ideas is often done by teachers through discussions within the group. It is done as a method of knowing the ideas that have been developed can be strengthened and well organized. Knowledge of teaching can be strengthened with an understanding of ideas that is achieved in-depth through discussions among students within the group, but it needs to be monitored and compiled by teachers so that the agreed knowledge is correct, accurate and organized (Mohd Hisyam and Mazni, 2012). Discussions in the group not only combine thoughts, ideas and views but also help students to master problem-solving skills and motivate students to continue to learn (Sealfon, 2012; Ahmad Nabil Md Nasir et al., 2018a).

Electronic teachers often use demonstrations in practical work to ensure the strengthening of ideas in practical teaching can be well understood. The demonstration is done by showing students the practical way to make sure that practical work is done correctly. Teachers need to make sure that the steps are accurate, easy to understand but do not leave safety aspects (Chowdhury, Alam and Mustary, 2019). The demonstration done by the teacher is usually open and the question and answer session takes place to ensure the practical work done is understood. Only then, the students will do practical work to get better reinforcement on the ideas and knowledge previously learned. Practical work is grouped, making it easy for teachers to monitor practical work activities McLain, 2018; Chowdhury, Alam and Mustary, 2019).

Electronic teachers also use the project as a way to strengthen the idea of practical teaching in the classroom. The project work is to ensure that the previously learned knowledge is reinforced by the implementation of projects related to the knowledge that they learn. It is in line with the Converged Learning Theory, which emphasizes the application of theory and practical knowledge to the current industry. The project work is focused only on the use of knowledge that is more widely taught to reinforce their understanding (Ahmad Nabil Md Nasir et al., 2018a). Discussions within the group for implementing the given project can ensure the strengthening of the idea is done through the monitoring of teachers during project completion sessions within the group.

For the phase of application of the idea, it is a student process of applying ideas that have been obtained through an approach that is in line with the needs of practical teaching reality (Yahya and Amirudin, 2011). Electronic teachers often use discussion methods, assign tasks and report as a process for students to apply the ideas in practical teaching. Discussion is a good method for students to apply their ideas (McKeachie, 2002). The answer to how to apply the ideas learned in groups or openly is by linking the practical lessons learned with the knowledge and needs of the industry (Adnan, 2012; Mohd Hisyam and Mazni, 2012; Zurainu and Abdul Sukor, 2012; Ahmad Nabil, 2016). Teachers need to monitor, observe, listen to and evaluate every discussion conducted by students. It is to ensure that the scope of the applied ideas is appropriate and in line with the current teaching and electronic industry needs.

A teacher's approach by assigning students the ability to apply the knowledge gained in the classroom is in line with the current industry requirements. The assignment given could be a platform for students to link the knowledge learned in the classroom and its application outside the classroom. A realistic task linking to the industry is able to accelerate a better practical teaching process. It is in line with the Converged Learning Theory which emphasizes the application of theory and practical knowledge to the current industry situations (Ahmad Nabil, 2016). Writing a specific report on an assignment is the ability to translate the practical work done into writing. This is done as an effort to see the students' ability to formulate the application so that they are easy to understand in the form of writing.

Reflection at the end of teaching is a method used by teachers to summarize the contents of the whole lesson by ensuring that the contents of the knowledge taught in the class can be clearly understood by the students. Reflection methods often used by teachers in practical teaching are group reflection, open question and questions within the group. Reflection in the group is done by formulating specific teaching content in small groups. Teachers continue to conclude by detailing the contents of the teaching as a whole with every important ingredient described in the group. Teachers also make a question of reflection if there is a lesson that is difficult for students. It is to ensure that the contents of the teaching are well understood by each member of the group. Differences of questions for each member of the group can help teachers indirectly to assess which students understand and which students require attention for practical lessons to come. Open-ended answer questions are a standard reflection method performed by teachers. It facilitates the teacher to openly formulate questions in the classroom by giving questions to the students if there is any confusion in the

contents of the practical exercises. The advantages of open reflection methods make it easier for teachers to summarize and ensure that each student has the same summarization for the content of the lesson (Adnan, 2012; Zurainu and Abdull Sukor, 2012, Ahmad Nabil, 2016).

4. Conclusion

The practical teaching methods used by teachers are the best ways to ensure that every content of practical teaching can be delivered to students effectively. Hence, the findings of this study are to ensure the need for teachers to use the teaching methods that facilitate students' understanding in the classroom. Teachers use teaching methods that focus more on student participation, such as demonstrations, group project work, group discussion as effective methods for practical teaching. This is because engaging with students accelerates not only the process of students' understanding but also makes the teaching sessions in the classroom more lively. Teachers also need to streamline and improve the quality of delivery in ensuring the practical teaching of electronic subjects at Vocational Colleges can be implemented better. Effective teaching practices can ensure that the content and objectives of the teaching are well implemented.

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