Lee Ming Foong, Tee Tze Kiong, Marina Ibrahim Mukhtar, Jailani Md Yunos & Maizam Alias (Universiti Tun Hussein Onn Malaysia)

Vocational Pedagogy Approaches Framework for Malaysian Engineering TVET Teachers

Abstract

Vocational Colleges (VC) play an important role in producing a skilled and semi-skilled workforce in Malaysia. Consequently, TVET teachers must master the occupational skills required to deliver the contents of the lesson to create a harmonious and effective learning environment which enhances the quality of TVET graduates. Thus, this study was conducted to explore the practice of vocational pedagogies among the engineering TVET teachers. The vocational pedagogy approaches in this study consisted of (1) the dominant use of teaching and learning strategies (UNESCO-UNEVOC 2014), (2) the dominant practice of vocational pedagogical decisions (UNESCO-UNEVOC 2014), and (3) the dominant activities and web apps used to achieve the goal of learning outcomes (Padagogy Wheel 4.1 by Carrington 2015). A cross-sectional survey was employed as research design for this study by utilizing a set of questionnaires. A total number of 230 VC engineering teachers from 14 states in Malaysia were randomly selected as a sample in this study. Frequency and percentage distribution were used to analyze the gathered data. Findings showed that engineering TVET teachers in VC tend to have different teaching strategies when conducting the teaching and learning session for different learning contents (theory, practical and drawing). A framework was developed based on the findings to provide an understanding of basic vocational pedagogy approaches among the Malaysian engineering TVET teachers. This descriptive framework can be the reference for those novice teachers in selecting the most suitable teaching and learning strategy and vocational pedagogy, applying the most appropriate learning activities to create an effective learning environment.

Keywords: *Vocational pedagogy, teaching strategies, dominant activities, engineering TVET teachers*

1 Introduction

Most Southeast Asian countries now place Technical and Vocational Education and Training (TVET) at the forefront of the education system, making it a priority in their educational agenda to support the country's socio-economic development (SEAMEO VOCTECH 2012). Most countries still face pressing issues due to the lack of quality and quantity of TVET teachers. Most of the recruited TVET teachers are recent graduates from vocational and technical colleges and universities, resulting in a lack of industry experience. In the context of a rapidly growing population, it is important for Malaysia to provide comprehensive and up-to-date engineering education for its citizens. Therefore, Vocational Pedagogy plays an important role in this context, and that is why institutions that produce Technical and Vocational graduates are very important in educating Malaysian young people to become

successful trainers, educators and teachers of technical and vocational skills. According to Lucas, Claxton and Spencer (2013), vocational pedagogy is the science, art, and teaching craft that prepares people for a working life. This is shaped critically by the decisions made by teachers, whether it is high-level strategy, or day-to-day 'in-the-moment' ones, and values that inform all interactions with students. Pedagogy is necessarily related to specific practices and processes because where knowledge is generated, how skills and habits of mind are developed, are factors that determine the success of vocational education.

However, do TVET teachers really master vocational pedagogy to create the best learning environment for our students? Are they able to master the technical and vocational skills to ensure that they are well trained to compete in today's workplace? Students in Technical and Vocational Education and Training (TVET) institutions must learn the high level of technical skills that are expected for a job in their field, as well as transferable skills that enable them to maintain their job or advance to a better place than others in the job market. However, most TVET teachers may still be deploying traditional teaching methods that are not considered as vocational pedagogy. Teachers often adhere to a small number of methods that they feel comfortable with during the teaching and learning process (Lucas, Claxton, & Spence 2013). They may fear to take risks outside of their comfort zone. Also, the effects of vocational pedagogy are currently under-researched and under-theorized (Cedefop 2015). Therefore, the main objective of this study is to develop a descriptive and generic vocational pedagogical strategy for all types of TVET programs that can demonstrate similarities and differences between teaching and learning practices among TVET teachers. This study provides insights into the current practice for vocational pedagogical strategies in teaching and learning in Malaysia.

The main focus of this study will be on the teaching and learning strategies used in vocational education. The majority of the TVET educators pointed out the challenges in choosing the best pedagogical strategy for different kinds of subjects in vocational education. So, this study will apply the concept of vocational pedagogy proposed by Lucas, Spencer & Claxton (2012), which focuses on these three main areas, namely (1) physical materials, (2) people, and (3) symbols (words, numbers and images). Furthermore, the impact of technology on today's educational institutions is significant. The widespread use of technology has completely changed the way teachers teach and students learn. Teachers have to learn how to teach with new technologies such as tablets, iPads, Smartphones, digital cameras and computers. Students also use advanced technology to shape the way they learn. Only by embracing and integrating technology in the classroom will teachers be able to prepare students to successfully overcome the challenges of the future workplace (Cox 2016). Therefore, effective integration of education technology in teaching and learning plays a significant role for successful education – and TVET is not excluded. The Wheel Padagogy 4.1 proposed by Carrington (2015) consisting of the Digital Bloom Taxonomy, SAMR (Substitution, Augmentation, Modification and Redefinition) web applications and models have been referred to in conducting this study.

To conclude, vocational pedagogy is complex and needs further study, arguably more so than general or academic pedagogy because of the lower levels of current interest among teachers and academics, even researchers. Understanding vocational pedagogy is critical to improve students' outcomes in TVET, at the same time helping to improve the status and quality of TVET. Moreover, to be a qualified TVET teacher requires a model virtue, knowledge and skills. A TVET teacher has a more challenging role compared to those teaching at general education schools because the context of teaching is so different. It requires expertise in vocational discipline and vocational pedagogy. In this specific circumstance, the country needs TVET teachers who have the confident and broad vision to produce competitive TVET graduates (UNESCO-UNEVOC 2014). The vocational pedagogy approaches in this study comprise (1) the dominant use of Teaching and Learning Strategies (UNESCO-UNEVOC 2014), (2) the dominant practice of vocational pedagogical decisions (UNESCO-UNEVOC 2014), and (3) the dominant activities and web apps used to achieve the goal of learning outcomes (Padagogy Wheel 4.1 by Carrington 2015). The conceptual framework as illustrated in Figure 1, is designed to explore vocational pedagogical strategies in order to develop structured vocational pedagogical strategies for all types of TVET programs.

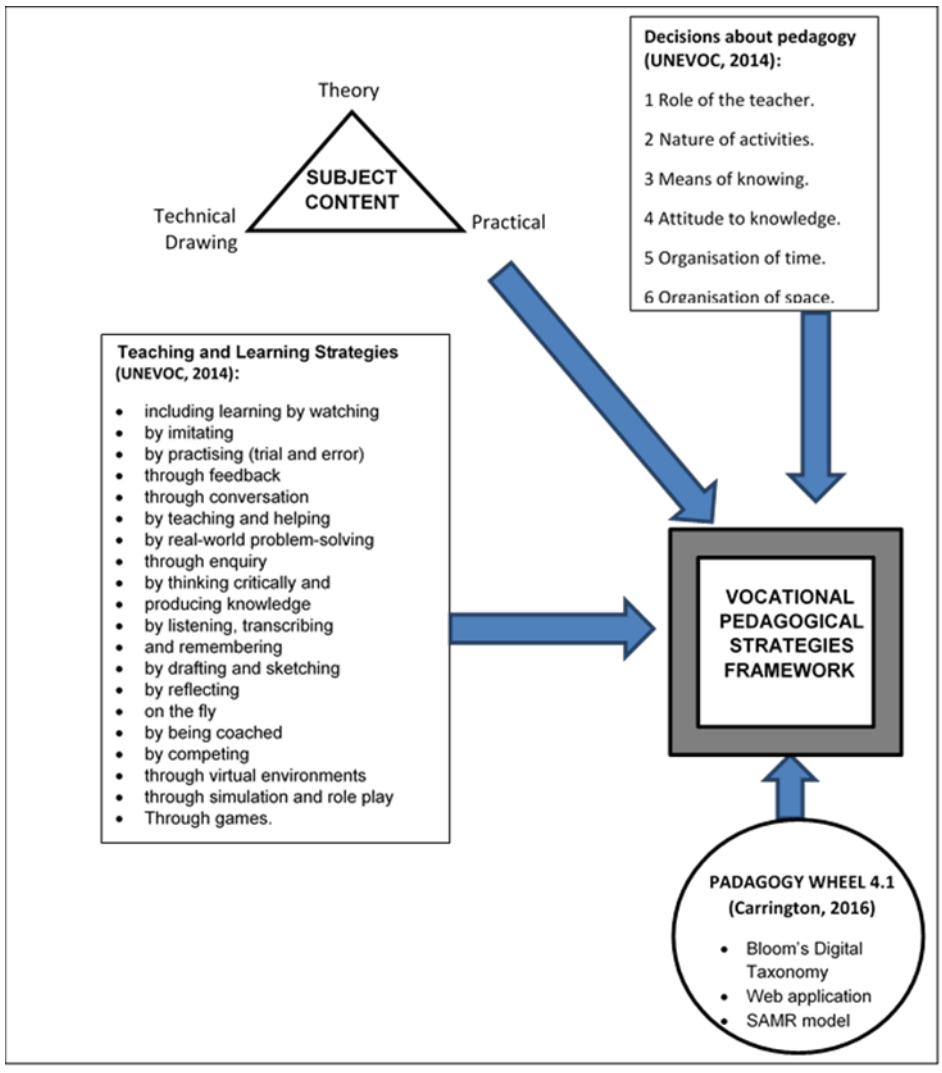


Figure 1: Conceptual framework

2 Methodology

This study was conducted using a cross-sectional survey method to determine the teaching and learning methods, pedagogical decisions, web applications and activities used by engineering TVET teachers in Malaysia. The data was used to develop a framework for basic vocational pedagogy approaches among the Malaysian engineering TVET teachers. A total numbers of 450 engineering teachers from vocational colleges were randomly selected as the sample in this study. However, only 230 of the samples returned the distributed questionnaire.

The instrument used in this study is a set of questionnaires that consisted of four different sections. Section A was designed to collect information about the sample's demographic data and basic information such as gender, age, education level, service duration and courses. Section B consisted of questions relating to teaching and learning methods with a total of 28 items. Section C comprised questions relating to pedagogical decisions with a total of 11 items and Section D looked into web application and learning activities used by engineering TVET teacher with 78 items in total.

Descriptive statistical analysis including frequency and percentage was used to analyse and interpret the data gathered in this study. An explanation of the frequencies and percentage was based on the interpretation of the Likert Scale in the questionnaire. Level of agreement was used to measure the perception ranging from 'Never' to 'Always' and also 'Not applicable'.

3 Results

3.1 Teaching and Learning Strategies used for Different Learning Content

Teachers use specific teaching and learning strategies for different learning content to create an effective learning environment. In this study, learning content refers to theoretical, practical and technical drawing subjects. A 4 scales response was used to measure the frequencies (F) and percentages (%) in determining the most dominant strategies used by Malaysian TVET teachers. The scale starts with 1=Never, 2=Sometimes, 3=Always and 4=Not Applicable.

Table 1 shows the results of the most frequently used strategy in teaching and learning for theoretical subjects by engineering teachers, i.e. discussion F = 176 (76.5 %), while teaching and learning through games shows the lowest score with F = 70 (30.4%). Besides that, for practical subjects, results show that imitating is the most commonly used strategy by engineering teachers: F=176 (76.5%), whilst the most rarely used strategy is through games, F=87 (37.8%). On the other hand, two strategies are the most common for technical drawing: imitating and doing an assignment share the same score F=125 (54.3%).

Table 1: **Teaching and learning strategies used for three different learning content**

Strategies	Theory		Practical		Technical Drawing	
	F	%	F	%	F	%
watching	150	65.2	165	71.7	110	47.8
imitating	164	71.3	176	76.5	125	54.3
practicing	173	75.2	173	75.2	117	50.9
drawing	124	53.9	147	63.9	116	50.4
sketching	137	59.6	130	56.5	123	53.5
competing	118	51.3	126	54.8	90	39.1
searching	153	66.5	139	60.4	86	37.4
presentation	131	57	120	52.2	82	35.7
feedback	124	53.9	128	55.7	68	29.6
conversation	129	56.1	122	53	84	36.5
teaching and helping	157	68.3	162	70.4	104	45.2
solving real problem	122	53	132	57.4	73	31.7
enquiry	171	74.3	173	75.2	102	44.3
transcribing	104	45.2	103	44.8	73	31.7
listening	140	60.9	140	60.9	95	41.3
remembering	169	73.5	144	62.6	102	44.3
coaching	159	69.1	167	72.6	117	50.9
virtual environments	116	50.4	108	47	83	36.1
..through simulation	118	51.3	138	60	86	37.4
games	70	30.4	87	37.8	57	24.8
discussion	176	76.5	153	66.5	111	48.3
role play	128	55.7	130	56.5	80	34.8
doing assignment	163	70.9	173	75.2	125	54.3
experience	155	67.4	158	68.7	101	43.9
reading	154	67	113	49.1	73	31.7
field visit	99	43	123	53.5	59	25.7
..to work in teams	148	64.3	159	69.1	91	39.6
..from every available opportunity	144	62.6	152	66.1	84	36.5

3.2 Dominant Practice of Vocational Pedagogical Decisions for Theory, Practical and Technical Drawing

The elements of pedagogical decisions are used to decide teaching and learning activities based on learning content for theoretical, practical and technical drawing subjects. The dominant practice of vocational pedagogical decisions used by Malaysian engineering TVET teachers consists of 11 elements such as the role of learner, proximity to teacher, visibility of processes, approach to a task, organisation of space, means of teaching, organisation of time, attitude to knowledge, means of learning, nature of activities and role of teacher.

The findings for the dominant practice of vocational pedagogical decision for theoretical subjects used by Malaysian engineering TVET teachers are illustrated in Figure 2. Teachers are more partial to didactic (55%) than facilitative (45%). Meanwhile, it shows that teachers lean more towards the authentic (75%) than contrived (25%) and prefer practice (54%) to theory (46%). The results also illustrate that they are more likely to use the method of questioning (73%) than certain (27%) and more inclined to bell-bound (83%) than extended (17%). Engineering teachers choose more specified content (52%) methods than limited content (48%) in their pedagogical decisions and are more likely to choose the individual (59%) method as opposed to group (41%) method. In their choice of method, teachers prioritize high and explicit (95%) over the hidden (5%) method and prefer the face to face method (88%) to the virtual one (12%). Teachers prefer to be in the classroom (57%) than in the field (3.9%) or workshops (39.6%), and opted for the counselling method (60%) in preference to self-managing (18%) or directed (23%).

Moreover, the dominant practice of vocational pedagogical decision-making by Malaysian engineering TVET teachers in practical subjects is more partial to didactic (55%) than facilitative at (45%). It also shows that teachers choose authentic (76%) over contrived (24%) and prefer practice (80%) to theory (21%). The results also indicated that they used the certain method (55%) more often than questioning (45%) and bell-bound (68%) more often than the extended method (32%). Results also reveal engineering TVET teachers' preference for a more specified content (52%) method than limited content (48%) in their pedagogical decisions and are more likely to choose the group (56%) method as opposed to the individual (44%) method. The tendency of the Malaysian engineering teacher seems to be high and explicit (92%) rather than using the hidden (7%) method and more partial to face to face interaction (93%) than the virtual method (7%). Teachers enjoy spending time in the workshop (82.6%) rather than in the field (13.9%) or classroom (4%), and prefer to choose the directed method (54%) than self-managing (23%) or counselling (23%).

Finally, in technical drawing, the dominant practice of vocational pedagogical decisions taken by Malaysian engineering TVET teachers can be seen to lean towards didactic (61%) rather than facilitative (39%). Furthermore, the findings also revealed that teachers gravitate towards the authentic (72%) rather than contrived (28%) and choose practice (80%) over theory (20%). Results confirm the certain method (61%) as more prevalent than questioning (39%) and bell-bound (59%) more than extended (41%). Engineering teachers are also pleased to choose limit specified content (60%) methods ahead of more specified content (40%) in their pedagogical decisions and are more likely to choose the individual (76%) method as opposed to group (24%) method. The tendency of the Malaysian engineering teacher is clearly on the side of the high and explicit (83%) rather than the hidden (15%) method, with a strong preference for face to face (93%) interaction, over the virtual method (7%). Nevertheless, teachers prefer to be in the workshop (40.4%) than in the field (33.9%) or classroom (26%), and tend to choose the directed method (54%) rather than self-managing (22%) or counselling (24%).

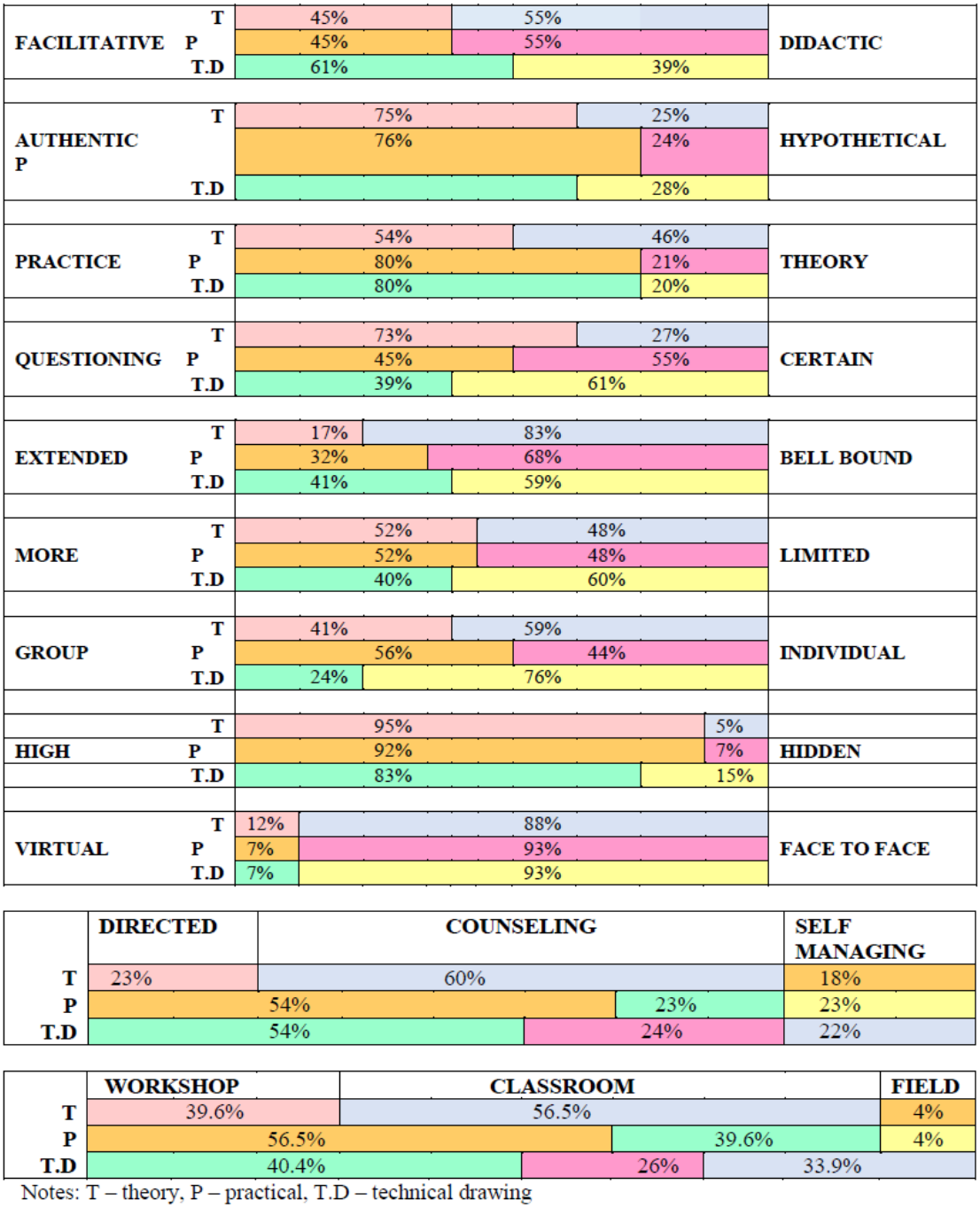


Figure 2: Dominant Practice of Vocational Pedagogical Decisions for Theory, Practical and Technical Drawing.

3.3 Perception on Used Technology devices in Teaching and Learning in Malaysia

This study investigates the activities organized by teachers to reach learning outcome goals according to Bloom's Taxonomy and how activities with web apps are commonly used and arranged. For the purposes of evaluative taxonomy, for example, judgement and survey come into play: meanwhile the active web apps in use are You Tube, Skype, Facebook and WhatsApp.

3.3.1 Dominant Activities Used by Engineering TVET teachers

Figure 3(a) shows the dominant activities for cognitive levels of memory and understanding among Malaysian engineering teachers: searching or Googling (97%) followed by mind mapping (84%). Subscribing is less popular among teachers (6%). Besides that, the dominant activities for cognitive level application among Malaysian engineering teachers are: presenting (87%), then demonstrating (78%). Sculpturing is least used by the teacher (5%), as presented in Figure 3(b). Figure 3(c) reveals the dominant activities of cognitive level analysis, with reporting (79%) followed by graphing (63%). Creating Mashup is not popular with teachers (16%). Teaching on an evaluative cognitive level, teachers tend towards opinion (53%) and reporting (51%) apps, while critiquing is less used by teachers (19%), as shown in Figure 3(d). Figure 3(e) reveals the most favourable activities on a creative cognitive level to be multimedia presentation at (47%) and mixing (39%), with teachers rarely using TV or radio (10%).

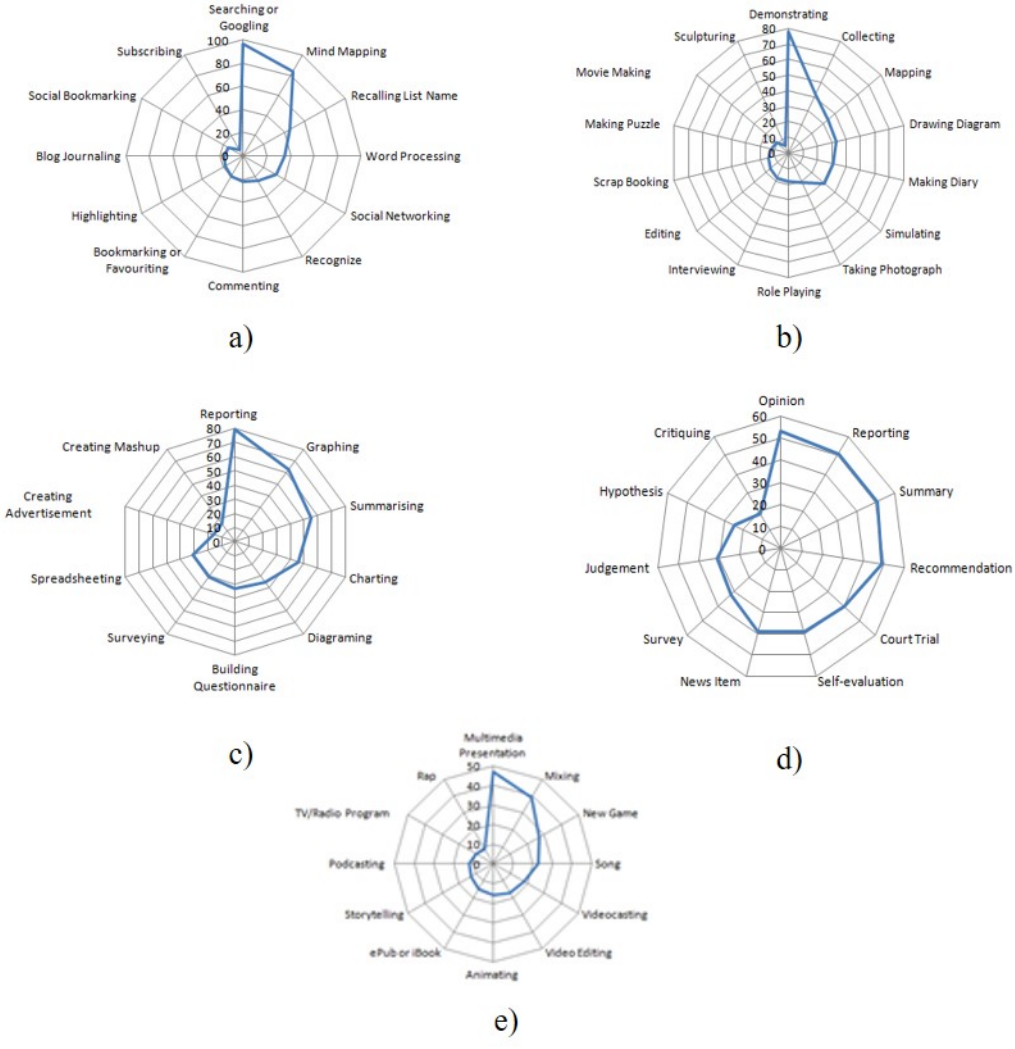


Figure 3: Dominant Activities Used by Engineering TVET teachers

3.3.2 Dominant Web Application Used by Engineering TVET teachers

Malaysian engineering teachers use Facebook (82%) and Google (70%) quite a lot. In contrast, Sonic Pics, Puffin Browser, Voice Thread and iAnnotate do not feature (0%) in teaching at the 'remember and understand' cognitive levels [Figure 4(a)]. Figure 4(b) indicates that the most popular applications used by teachers are IDesign (27%) and Flashcard Deluxe (24%). Meanwhile, Wunder List and I Wish are not used by teachers (0%) for the 'Apply' cognitive level. Figure 4(c) confirmed that engineering teachers use Poll Everywhere (34%) and myHomework (28%) in teaching the 'Analyse' cognitive level, but not Big World, Note Plus, Simple Note, Popplet or Easy Chart. Figure 4(d) points out that the applications best used by the teachers on teaching the 'Evaluate' cognitive level are Touch (40%) and Showbie (27%). Nevertheless, World and TED do not figure in the teachers' plans (0%). Lastly, teachers teach the 'Create' cognitive level by using iStopMotion (73%) and Story Creator but Video Play records zero interest among teachers (0%) [Figure 4(e)].

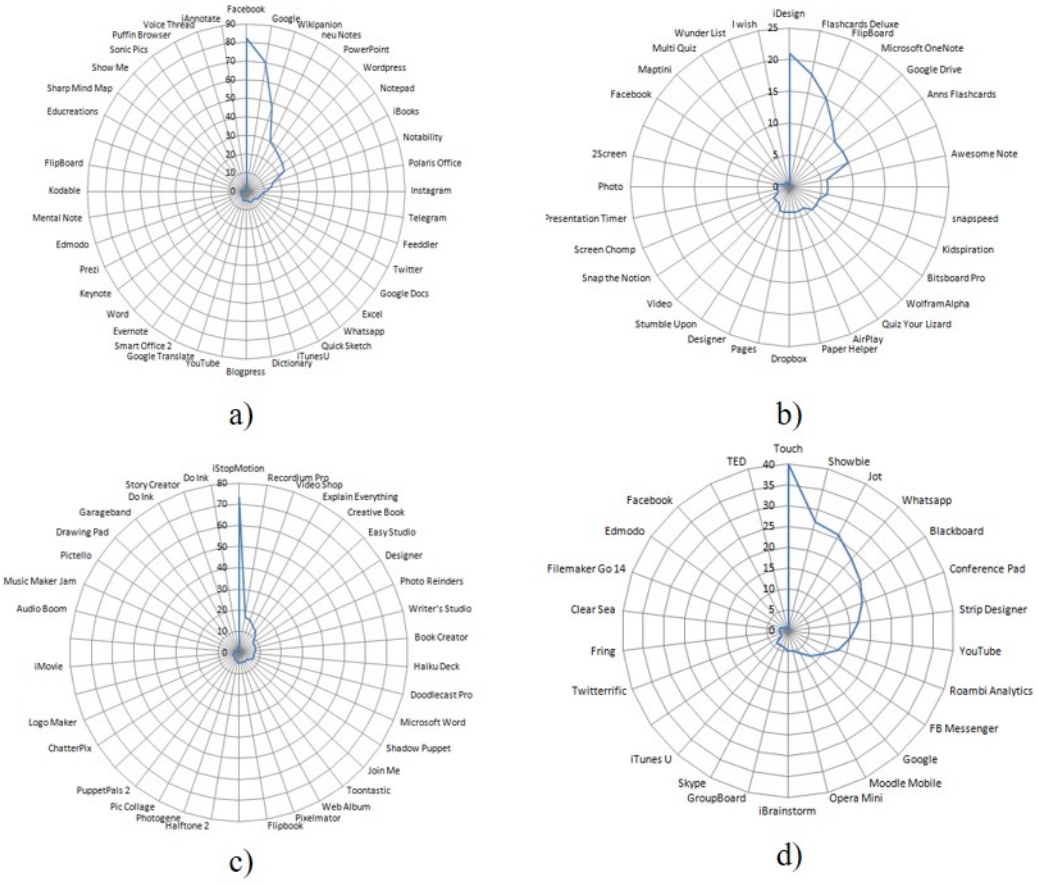
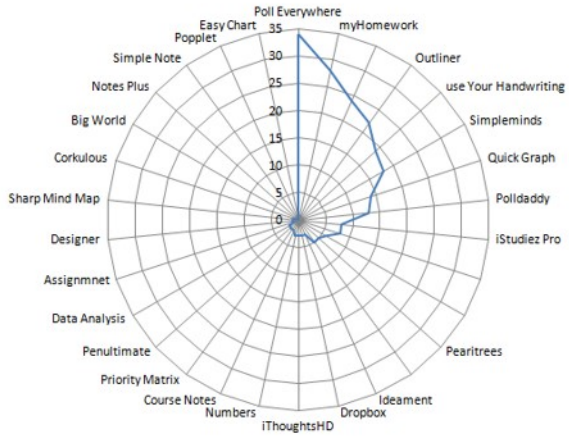


Figure 4: Dominant Web Application Used by Engineering TVET teachers



e)

Figure 5: Dominant Web Application Used by Engineering TVET teachers

3.4 Vocational Pedagogy Approaches Framework for Malaysian Engineering TVET Teachers

Figure 6 depicts the Vocational Pedagogy Approaches Framework for Malaysian engineering TVET teachers as based on the findings. This descriptive framework outlines the most common practice in teaching and learning among engineering TVET teachers in vocational colleges in Malaysia. Learning content in Malaysian vocational colleges can normally be divided into three categories: theory, practical and technical drawing. Therefore, teachers will apply different teaching and learning strategies, even during the decision-making process for pedagogical selection in order to deliver effective learning content. Meanwhile, learning outcomes play an important role in ensuring that learning content can be delivered effectively. Learning outcome must involve learning activities and technological application. In this study, learning activities and technology application are based on Padagogy Wheel 4.1 (Carrington 2015). The proposed framework provides an understanding of the basics of vocational pedagogy approaches among Malaysian engineering TVET teachers to achieve learning outcome. It explores teaching and learning strategies, pedagogical decision-making, learning activity and technological applications in use.

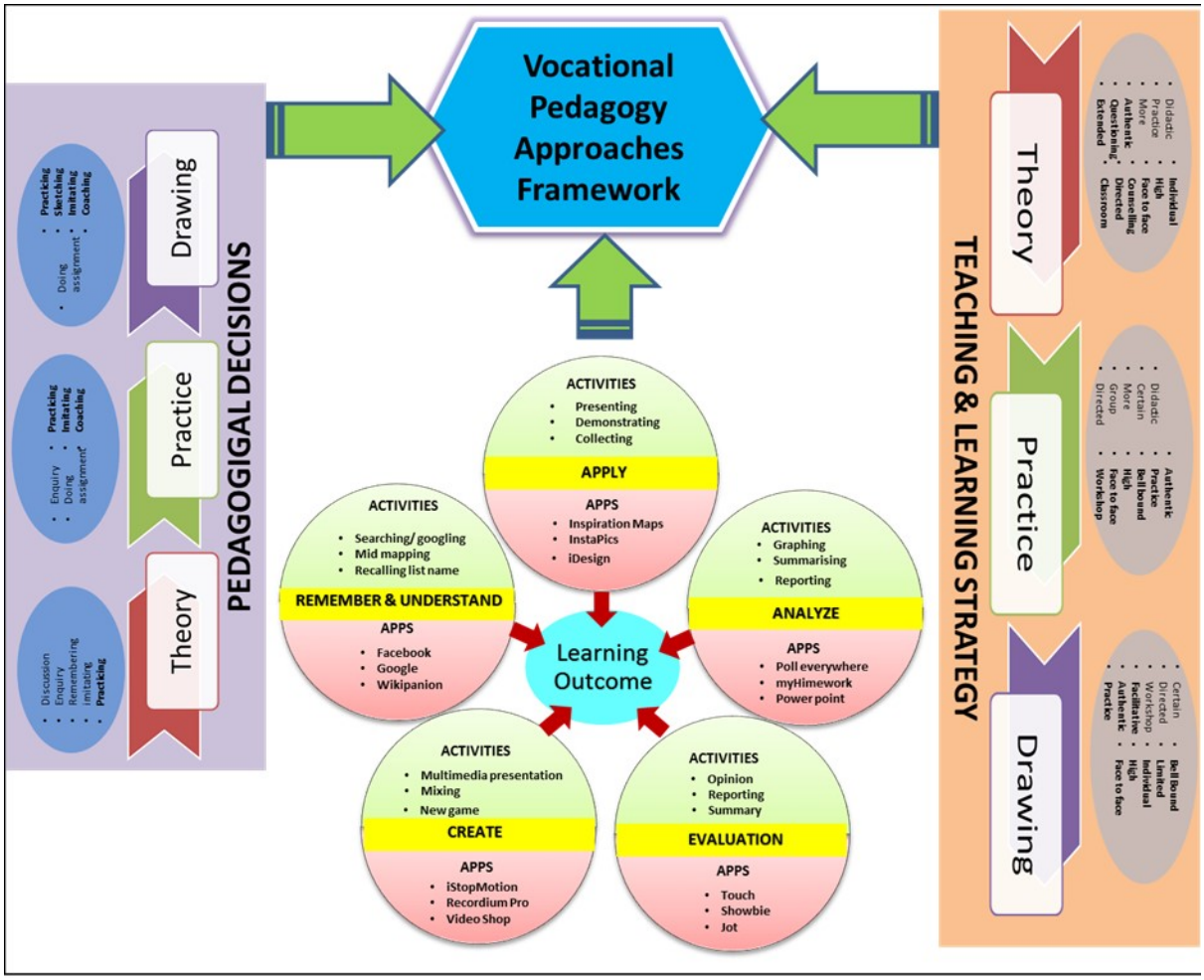


Figure 6: Vocational Pedagogy Approaches Framework for Engineering TVET Teachers

4 Conclusion

The teaching and learning strategy (some 20 strategies in total) in this study refers to UNESCO-UNEVOC (2014) as the best practice for teaching vocational subjects. Findings showed that TVET teachers tend to apply discussion, followed by practice and enquiry strategies when delivering theory-based subject material. To deliver practical-based subject matter, TVET teachers' strategy leans towards imitating, then practice and enquiry for teaching and learning purposes. Furthermore, TVET teachers like to use assignments or imitations, followed by sketching and then coaching or practising as teaching and learning strategies for technical drawing subjects. When carrying out this study, reference was made to approximately 10 pedagogical decisions proposed by UNESCO-UNEVOC (2014). Findings indicate that, in delivering theory-based subject matter, TVET teachers tend to use high visibility rather than hidden processes, face to face rather than virtual interaction, and extended rather than bell-bound organisation of time. When they deliver practical subject matter, face to face interaction takes preference over virtual and teachers tend to use high visibility of processes rather than hidden, favouring practice over theory. Technical drawing

sees TVET teachers follow similar practices to those evident in their delivery of practical subject matter.

On the other hand, teachers need to ensure learning outcome achievement by embracing and integrating suitable technology application and learning activity in the classroom. Thus, the Padagogy Wheel 4.1 proposed by Carrington (2015), which consists of Bloom's Digital Taxonomy, the web application and SAMR model was applied in this study. Findings show that in teaching students to 'remember & understand', the top three learning activities for TVET teachers are searching or Googling, mind mapping, and recalling list name techniques. The top three technology apps being used are Facebook, Google and Wikipanion. In order to support students to apply their knowledge, TVET teachers show a preference for presenting, followed by demonstrating, and collecting as the main activities. Thus, the top three technology apps being used are iDesing, InstaPics and Inspiration Maps. They also like to use reporting, graphing and then summarising as learning activities to achieve analysis learning outcomes. The top three technology apps in use are Poll Everywhere, myHomework and Power point. Moreover, to achieve 'evaluate' learning outcomes, TVET teachers tend to use the following learning activities: opinion, reporting and summarising, whilst the top three technology apps are Touch, Showbie and Jot. Finally, for 'create' learning outcomes, TVET teachers prefer multimedia presentation, mixing and new games as learning activities. The top three technology apps being used are iStopMotion, Recordium Pro and Video Shop.

Future study should focus on the effectiveness of tcurrent vocational pedagogy practice among TVET teachers in both engineering and non-engineering fields. The best practice for teaching different vocational disciplines must be identified and serve as a guideline for all the vocational teachers, especially for new teachers, as different vocational disciplines may use different pedagogical and technological resources. Guidelines thus developed can be used as a reference for vocational teachers to create efficient learning processes for our new generation.

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Author Profiles

Lee Ming Foong

Universiti Tun Hussein Onn Malaysia

E-mail: mflee@uthm.edu.my

Tee Tze Kiong

Universiti Tun Hussein Onn Malaysia

E-mail: tktee@uthm.edu.my

Marina Ibrahim Mukhtar

Universiti Tun Hussein Onn Malaysia

E-mail: marina@uthm.edu.my

Jailani Md Yunos

Universiti Tun Hussein Onn Malaysia

E-mail: jailani@uthm.edu.my

Maizam Alias

Universiti Tun Hussein Onn Malaysia

E-mail: maizam58@gamil.com