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The Effectiveness of Using Vehicle Electric and Electronic Self-learning Module towards the Understanding of Automotive Students At Vocational College: Preliminary Study

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Abstract--- *The automotive sector is a fast-growing sector in our country. Self-learning modules are defined as learning materials that allow students to work independently with minimum teacher guidance to achieve solid knowledge and skills. The study reported that Vocational College Automotive Technology students do not have a standardized curriculum for automotive learning, instead they still use the worksheet as reference material. The research thus aims to define the level of difficulty of topics, the level of student understanding in electrical and electronic subjects, as well as the importance of using self-assessment module. 48 students of Diploma in Automotive Technology (DAT) were chosen using purposive sampling techniques from three vocational colleges. Analysis of data was done using the SPSS-Windows software version 24. The results of descriptive analyses for the difficulty level of topics in vehicle electric and electronic subject shows that the automotive students are weak in the topic of charger system, starting systems and wiring systems. Meanwhile, the outcome of formative test results showed that majority of students receive low scores, which are in fail category. The importance of using a self-learning module result showed that students strongly agreed to use self-learning module. Thus, during the process of teaching and learning the user is expected to have an effective alternative learning material.*

Keywords--- *Self-learning Module, Learning Materials, Automotive, Vocational College*.

I. INTRODUCTION

As a developing country, Malaysia gives priority to the education system in order to ensure a continuous increase in economic transformation. The development of educational institutions also contributes to national development [1]. The education system plays an important role in an individual in the process of gaining and transferring knowledge, skills and also moral values in order to meet the latest technological needs.

Malaysia is giving serious attention to the automotive technology sectors. This situation can be proved with the establishment of 700 companies or vendors in our country to produce vehicle components. This is also supported by Prime Minister Tun Dr Mahathir Mohamad who stated that Malaysia car manufacturing can increase the automotive industries in line with the latest technology development [2]. This shows that the automotive field offers many quality job opportunities to enhance the economic growth of the country.

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According to the Ministry of International Trade and Industry (MITI), the opportunity of seeking jobs in the automotive sectors has increased year by year, which rises to 29,641 jobs in 2018 compared to 27,175 in 2017 and 25,850 in 2016 [3]. Therefore, Malaysia has taken initiative to increase the number of schools and skills institutions to create more local skilled labours in the automotive field. In order to meet the national transformation requirement of 2050 (TN50), the target of 35% of the skilled workforce by the year 2020 and will hit 100% by 2050 [4].

Nevertheless, the automotive technology subject has a significant change due to the impact of technological change. Automotive students should learn about the use of technology in new cars so that they don't left out in momentous advancement of the technology. Special emphasis should be given to ensure that students have the skills and knowledge in the automotive field in line with the current development in the automotive world.

Subjects like vehicles electrical and electronic are an important subject in automotive technology. Hence, the selection of learning methods is also equally important to ensure that the teaching and learning goals are achieved. According to Othman, N., Amiruddin, M. H., 2010 [5], self-learning is an effective method because students can construct their knowledge in flexible time. Therefore, appropriate, orderly and interesting learning materials such as the Automotive Self Learning module can help the students to master the skills and knowledge in electrical and electronic of the vehicle subject.

II. PROBLEM STATEMENT

The appropriate selection of learning methods is important to achieve the learning objectives of occupational-oriented vocational training in a teaching and learning process. However, very limited automotive learning materials available for vocational college students to refer. Therefore, students are only using non-standardized worksheets as their reference and it leads to lack of interest towards vehicle electric and electronic subjects. Furthermore, less attractive teaching and learning materials that used in the classroom also affects their interest in the subject.

In addition, individual differences are one of the indisputable problems in teaching process. However, the instructors still use the same approach to teach the entire class without considering on students' individual capabilities and abilities. Besides, teachers prefer to use traditional approaches in teaching and learning process where teachers are being tutors to students with chalk and whiteboard [6]. Thus, there must be a teaching and learning revolution that can attract students and improve their strengths, abilities and interests.

In line with that desire, researcher come up with an effective learning material that is vehicle electric and electronic self-learning module which comprise of images and drawings that can capture the readers' attention. This can be proved by [7], where majority of skilled students often prefer visual learning styles. This module also covered both theoretical and practical section with an explanation. This will help students participate actively in classroom activities, as well as attract interest towards the subject as well as to improve their level of understanding, knowledge, and skills.

III. RESEARCH OBJECTIVE

Based on the problem identified, three research objectives have been formed in this study. The objectives of this study are as below:

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1. To identify the level of difficulty of topics for vehicles electrical and electronic subjects.
2. To identify the level of understanding of automotive students who are taking vehicles electrical and electronic subjects at vocational colleges.
3. To identify the importance of using self-learning modules in electrical and electronic subjects.

IV. RESEARCH METHODOLOGY

This study measured the difficulty level of topics, level of students understanding in charging system and starting system and also the importance of using self-learning modules for electrical and electronic subjects. Sampling is a process to choose a subset (group) of cases (population) from one class.

The population of the study is about 55 students from three vocational colleges in the southern region. The sample of this study was selected from the total population of 55 students. According to Creswell, 2014 [8], the sampling technique (purposive sampling) is the best technique for this research because samples with specific attributes will be selected as respondents based on knowledge and specific purpose of a study. This means that not all the samples in the populations size will be selected as respondent. Therefore, the researcher only chose respondents from first-year Diploma in Automotive Technology students in a vocational college.

According to Hashim, Y. A., 2010 & S.A. Bakar, Esa, & Syed Abdullah, 2013 [9,10], the total sample size of more than 30 respondents are sufficient for a research study. According to [11] population table, the required sample size only 48 students. The following are the number of samples according to the vocational colleges selected in this study.

4.1 Research Respondent's Profile

The total number of respondents in this study were 48 students. and Table 1.1 demonstrates the list of samples according to vocational college.

Table 1: Sample Profile According to Vocational College

college	gender		total
	MALE	**FEMALE**	
college A	12	1	13
college B	21	0	21
college C	13	1	14
total	**46**	**2**	**48**

In this study, majority of the respondents were male students and only two of them were female respondents.

4.2 Validity and Reliability

Two automotive lecturers who are experts in module from the Vocational College and a senior lecturer from Universiti Teknologi Malaysia (UTM) were selected to validate the instrument. Meanwhile, to test the reliability of the instrument, studies were conducted on 10 Diploma in Automotive students from vocational colleges. According to [12] it is proved that the alpha value exceeds 0.8 has a high-reliability level. If the value of reliability does not meet a minimum value of 0.60, it means the consistency level is very low and need to reconstruct the instrument. Hence, the reliability test of this study reported readings of Alpha Cronbach value 0.74. The empirical data was

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analysed using Statistical Package of Social Sciences (SPSS) software version 24 through descriptive statistical analysis.

V. RESULTS AND DISCUSSION

5.1 Demographics of respondent

In this study, majority of the students were male respondents which were 46 students with a percentage of 95.8% and the remaining respondents were female students with 4.16%.

5.2 Difficulty Level topics

The following table shows the difficulty level of topics in vehicle electrical and electronic subject for automotive students. Table 1.2 demonstrates the difficulty level of topics and the findings with the highest mode were very difficult topics for students to learn.

Table 2: The Difficulty Level of Topics

No	Topics	Topic Difficulty Level				
		Frequency (%)				**Mode**
		Very Difficult (1)	Difficult (2)	Easy (3)	Very Easy (4)	
1	**Wiring System**					
	Theory	**22** (45.8)	**15** (31.3)	**5** (10.4)	**6** (12.5)	1
	Practical	**18** (37.5)	**16** (33.3)	**9** (18.8)	**5** (10.4)	1
2	**Charging System**					
	Theory	**23** (47.9)	**15** (31.3)	**6** (12.5)	**4** (8.33)	1
	Practical	**23** (47.9)	**12** (25)	**8** (16.7)	**5** (10.4)	1
3	**Starting System**					
	Theory	**18** (37.5)	**25** (52.1)	**4** (8.33)	**1** (2.08)	2
	Practical	**15** (31.3)	**13** (27.1)	**13** (27.1)	**7** (14.6)	1
4	**Ignition System**					
	Theory	**7** (14.6)	**13** (27.1)	**20** (41.7)	**8** (16.7)	3
	Practical	**9** (18.8)	**9** (18.8)	**20** (41.7)	**10** (20.8)	3

Referring to table 1.2, it can be summarized that the wiring system, charging system and also the starting system are considered as difficult topics for the first year Diploma Automotive students. The descriptive analysis of mode shows that theory and practical for the three topics are in difficult category. These topics are less understood by the students whereas the theory and practical for ignition systems are easier to understand for students. However, the researcher has decided to choose the charging system and starting system for this research study. This is because, both the topics are the most basic topics in Automotive studies.

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5.3 Determine Student's Understanding Level

Based on the second objective, the level of student's understanding was determined based on the scores obtained by the students from the formative test. The grade for each respondent was based on the vocational college assessment and evaluation grading system. The score between 2.00 to 4.00 are passing score, while the score 1.67 and below are fail score. The table 1.3 shows that grade of the scoring based on assessment and evaluation system in the vocational college.

Table 3: Vocational College Assessment and Evaluation Grading System

Marks	Grade	Performance Assessment (General Studies)		Competency assessment (Vocational Studies)	
		Point	Level of Achiement	Point	Level of Competence
90 – 100	A+	4.00	**Excellent Pass**	4.00	**Highly Competent**
80 – 89	A	3.67		3.67	**Competent**
70 – 79	B+	3.33	**Good Pass**	3.33	**Medium Competent**
65 – 69	B	3.00		3.00	
60 – 64	B-	2.67		2.67	
55 – 59	C+	2.33	**Pass**	2.33	**Not Competent**
50 – 54	C	2.00		2.00	
45 – 49	D+	1.67	**Fail**	1.67	
40 – 44	D	1.33		1.33	
35 – 39	D-	1.00		1.00	
0 – 34	E	0.00		0.00	

BPTV, 2017 [13]

The following is a written test result of automotive students from three vocational colleges in southern region.

Table 4: Formative Test Results

MARKS (%)		VOCAtIONAL COLLEGE		
		COLLEGE A	**COLLEGE B**	**COLLEGE C**
FAIL	0 – 34	6	2	1
	35 - 39	5	10	5
	40 – 44	-	2	2
	45 – 49	-	1	3
PASS	50 – 54	2	4	0
	55 – 59	-	1	2
	60 – 64	-	1	1
	65 – 69	-	-	-
	70 – 79	-	-	-
	80 – 89	-	-	-
	90 – 100	-	-	-
	TOTAL RESPONDENTS	**13**	**21**	**14**

Based on the written test result as displayed in table 1.4, it shows that total of 37 respondents (77.0%) failed their written test and only 11 (23%) students have passed the test. This result shows that the level of understanding of automotive students on the vehicle electrical and electronic subjects is very low. Based on the interview conducted with a number of automotive lecturers at vocational colleges, researcher has found that there are various factors that contribute to this failure. One of the main causes of this failure is the students are lack of systematic learning materials which comprise of theory and practical.

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5.4 Importance of Using Self Learning Module

A study was conducted for the third objective to analysed the importance of using the Self-Learning Module (SLM) in vehicle electrical and electronic subject. The results of the study were obtained from questionnaires which were distributed to the respondents. The collected quantitative data is explained by using mode, percentage and standard deviation.

5.4.1 Measuring the Level of Importance by Using SLM

Table 1.5 below shows the interpretation of the mode score. The data has been obtained and interpreted based on four-point Likert scale which was adapted from [14].

Table 5: The Interpretation of Mode Score by Four Point Likert Scale

Score	Interpretation
1.00	Disagree
2.00	Low Medium Agree
3.00	High Medium Agree
4.00	Agree

The data analysis results for the importance of using Self-learning Modules (SLM) for the topic of charging system and the starting system in the vehicles electrical and electronic subject are shown in Table 4 below.

Table 6: Results of the Importance of Using SLM

NO	ITEM	FREQUENCY				MODE
		Strongly Disagree	Disagree	Agree	Strongly Agree	
1	The self-learning module can potentially be used as a reference material during the students ' teaching and learning process.	xx	xx	15 (31.3%)	33 (68.8%)	4
2	The Self Learning Module enhances my understanding of the learning process	xx	1 (2.1%)	29 (60.4%)	18 (37.5%)	3
3	Self-learning module helps me in preparing theoretical and practical tasks.	xx	2 (4.2%)	10 (20.8%)	36 (37.0%)	4
4	Self-learning module is filled with clear explanation and helps me in carrying out practical work.	xx	1 (2.1%)	13 (27.1%)	34 (70.8%)	4
5	Self-learning module is easy to use as a reference source compared to other reference materials.	xx	1 (2.1%)	13 (27.1%)	34 (70.8%)	4
6	Self-learning module trains me in practical work which is related to this course	xx	xx	12 (25.0%)	36 (75.0%)	4
7	The exercises in the module can enhance the understanding of the curriculum	xx	xx	25 (52.1%)	23 (47.9%)	3
8	Content of the module is easy to understand	xx	3 (6.3%)	8 (16.7%)	37 (77.1%)	4
9	A module can attract my interest and attention	xx	2 (4.2%)	12 (25.0%)	34 (70.8%)	4
10	I felt more comfortable using the self-learning module	xx	1 (2.1%)	15 (31.3%)	32 (66.7%)	4
OVERALL MODE SCORE						**4**

Referring to table 1.6, it can be summarized that the mode score that has been obtained for all the items are at a high level which the statement is strongly agreed by the students. Overall, the highest value of this study was reported in the data analysis is 4 (strongly agree). This means Diploma in Automotive students tend to use self-learning module for vehicle electrical and electronic subject.

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5.5 Supporting Data

The following are the statements given by the automotive lectures who are teaching vehicles electric and electronic subjects in vocational colleges during the interviews conducted by the researcher.

"…. Looking at the current teaching and learning atmosphere in the vocational college, most teachers or lecturers still use conventional methods to teach. In my opinion, self-learning methods is a most effective method that can be used to learn with their own convenience…. "

(Respondent A)

"…. Normally I'll refer an application like ' YouTube ' and develop my own notes to ensure students understand learning content due to very minimum reference materials. Therefore, learning materials such as learning module accompanied by theories and practical works are very much needed to help the students to recognize their potential and function as good reference tool for them…"

(Respondent B)

"…...The changes of technology in automotive field is very significant in this era. Hence, various teaching and learning methods have been applied but most of them only focus and help theoretical learning. It's complicating for students to obtain reference materials with the latest technology in the automotive field.... "

(Respondent C)

Based on the findings of survey conducted by the researcher on the importance of using self-learning module showed that the majority of students had a very low level of understanding in the topic of charging system and survival systems. The feedback also proved that students strongly agree to develop a self-learning module, especially for vehicle electrical and electronic subjects which is equipped with theoretical content and practical work measures.

As for result of an informal interview undertaken by the researcher with the automotive lecturers of the vocational college, it was discovered that students were inactive during the teaching and learning process in the classroom. One of the major factors of this problems is that the students are less interested or bored with the use of unattractive reference materials [15]. This lead the students fail to concentrate in the class and behave very passive when the teachers propose any questions.

In regard with this, the development of an appropriate, attractive and interesting self-learning module able to solve the problems identified among vocational college students. The use of Self-Learning Module (SLM) is very effective method in the teaching and learning process as the delivery of its content is more structured and systematic in accordance with the syllabus. This learning package will also facilitate users to learn independently and reduce their methods of conventional learning. At the same time, this method reinforces the level of understanding of students in a unit or subjects learnt [16]. In addition, student achievement performance also will increase when there is a module that facilitates their understanding [17,18].

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VI. CONCLUSION

Based on this study it can be concluded that, the study is to see the students ' level of understanding on charging system and starting system. This learning method can help students identify their potential in a subject, and help students become more independent in planning their learning. At the same time, this method is also beneficial to a vocational college's lectures to improve the quality of their teaching and learning.

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