International Journal of Psychosocial Rehabilitation, Vol. 24, Issue 01, 2020
ISSN: 1475-7192

The Effectiveness of the Electromagnetic Trip Model as a Teaching Aid for Electrical Wiring Subjects

A. Jamaat, M.H. Yee, T.K. Tee, B.C. Kok and N. Azid

Abstract--- *Teaching Aids Tools are all the needs and equipment used by teachers and students to assist in the delivery and understanding of information. This study aims to test the effectiveness of Electromagnetic Trip model as teaching aids for Electrical Wiring Course at two Vocational Colleges (KV) and students' perceptions of teaching aids used. The study design used is an experimental quasi. The KV involved are KV Setapak Kuala Lumpur (KVS) and KV Kuala Klawang Negeri Sembilan (KVKK). The study was divided into two groups of student's namely KVS as the Treatment Group (KR) and KVKK as the Control Group (KK). Each group consists of 33 samples of the study. The research instrument used was pre-test and post achievement test to see the effectiveness of 'Electromagnetic Trip' model. The questionnaire was also used to examine students' perceptions of teaching aids. The results showed that the pre-test score of the two groups was at the same level and grade, which was a good level and obtained grade B. This shows that both groups are homogenoues. The results showed that there was a statistically significant difference between the post test score between KR (75.36%) and KK (68.73%). This shows that KR has a mean score of 5.57% and a level increase from grade B to grade B +. In addition, students are positively perceptive towards design, user-friendly, functional and acceptance and safety of the Electromagnetic Trip model used as teaching aids is very positive. In conclusion, the use of the Electromagnetic Trip model in PdPc can improve students' achievement for Electrical Wiring subjects.*

Keywords--- *Effectiveness, Teaching Aids, Electrical Wiring, RCCB.*

I. INTRODUCTION

TVET in Malaysia serves as a channel for processing and producing local talent and also as the driving force for national development (Jailani, 2015). Efforts to improve the quality of training by strengthening the learning method should be emphasized on an ongoing basis so that the industry and the general public will receive the good graduates to be produced. The delivery approach that is relevant to the technological and psychological developments of the students is able to create a more dynamic learning climate and to have a better effect while encouraging the development of students' minds (Human Resources Department, 2014). In the 21st century, the PdPc process has been using less textbooks. The teacher-centered teaching method or the use of the whiteboard has lessen (Ahmad Zanzali & David, 2010). In the Study of Musa & Mohamad (2014) states that the use of teaching aids which provides interactive learning can attract students in PdPc sessions. Therefore, the mastery of techniques and teaching methods alone will not help in ensuring the effectiveness of learning without using teaching aids.

A. Jamaat, Department of Technical and Vocasional, SMK Dato' Sheikh Ahmad, Seremban, Malaysia. E-mail: kancilwhc911@gmail.com
M.H. Yee, Department of Engineering Education, UTHM, Batu Pahat, Malaysia. E-mail: mhyee@uthm.edu.my
T.K. Tee, Department of Technical Education, UTHM, Batu Pahat, Malaysia. E-mail: tktee@uthm.edu.my
B.C. Kok, Department of Electrical Engineering, UTHM, Batu Pahat, Malaysia. E-mail: bckok@uthm.edu.my
N. Azid, Curriculum Development, UUM, Kedah, Malaysia. E-mail: nurulwahida@uum.edu.my

DOI: 10.37200/IJPR/V24I1/PR200160
Received: 15 Nov 2019 | Revised: 20 Dec 2019 | Accepted: 05 Jan 2020

II. LITERATURE

The use of teaching aids in the appropriate PdPc process allows students to master and understand well what the teacher is saying. This is because teaching aids is an effective way to attract attention and potentially make learning more cheerful and interesting (Jamian et al., 2012). Relevant teaching aids can help explain a concept more clearly than verbal explanations (Azman et al., 2014). The teaching aids used in teaching can enhance the academic performance of students (Ibeh et al., 2013). The study conducted by Priyadarshini et al. (2014) show teaching aids can improve students' academic achievement. In addition, the use of teaching aids can sharpen the senses of students to help students achieve effective learning (Moksen, 2014). The study of Che Hata (2011) found that students' perceptions of animation implementation as teaching aids in learning on average were high.

As a result of the empirical study of Ying et al. (2015) found that teaching aids has a diverse influence. Teaching aids can influence the curiosity, understanding and it imagination of a concept. Teaching aids is the most important factor in determining the success of the learning program, enabling the stimulus of the student's desire to know something and to make learning better and more engaging (Mohd Khozam, 2013). The use of teaching aids in the PdPc session of the teacher will make the material presented according to the student's cognitive structure. A meaningful learning will take place (Nasab et al., 2015).

Yusuff et al. (2016) states that teaching aids is one of the tools that facilitates delivery and can increase students' motivation to learn more seriously. In the context of this study, the teaching aids used is applicable to Electrical Wiring courses. Taale & Mustapha (2014) noted that there was a significant difference in mean achievement for students studying electrical base using teaching aids built by teachers on postal exams. Advantages to teaching aids are able to solve many sub topics in electrical fields such as magnetic theory, electromagnetic, Ohm Law, Current Kirchoff Law, Faraday Law and relay concept (Ali, 2013).

III. PROBLEM STATEMENT

The barriers to using teaching aids are time constraints, lack of teaching aids, limited space, technical problems and less creativity (Ilias et al., 2013). In addition, the use or provision of a particular teaching aids is not provided by the school. According to Jasmi et al. (2011) teachers are forced to withdraw their own money to produce teaching aids. Knowledge and skills in the use of teaching aids are the main obstacle that restricts teachers from continuing to use teaching aids consistently in PdPc (Ilias et al., 2013). The school should work to improve the needs of teachers' knowledge and skills in school such as creating access to relevant current books as well as providing appropriate courses and training for teachers mastering skills using teaching aids that makes PdPc more attractive and effective (Yusuff et al. , 2016). Chung et al. (2010) stated that the attitude of negative and moderate teachers especially for teachers who are inexperienced and who did not have the opportunity to attend teaching aids related courses have influenced their motivation and willingness to use teaching aids. Failure to apply teaching aids during the PdPc process will cause the student to become bored and tired of learning due to the same way of delivery (Abdul Rasid, 2011).

According to Jamian et al. (2012) teachers need to create a PdPc environment that can stimulate the interest and motivation of teachers and students and increase the effectiveness of learning to teachers and students. High

DOI: 10.37200/IJPR/V24I1/PR200160
Received: 15 Nov 2019 | Revised: 20 Dec 2019 | Accepted: 05 Jan 2020

memory, imagination skills, intelligence and expertise are needed in solving electrical problems (Abdul Halim & Lai, 2011). Teaching in the field of electrical and electronics is quite challenging as the field is considered to be a difficult area for students (Mustapha & Abdul Rahim, 2014). The PdPc process for electrical topics can be presented in a more attractive way by using multiple teaching aids because this topic is difficult to understand and requires high skill (Ali, 2013).

The specific objectives of this study are to:

i. Test the achievement of pre-test for the topic Residual-Current Circuit Breaker (RCCB).
ii. Examine the effectiveness of the Electromagnetic Trip Model as a Teaching aids in RCCB topics.
iii. Identify the perception of treatment group students on the Electromagnetic Trip Model as a Teaching Aids in the RCCB topic.

IV. RESEARCH METHODOLOGY

Researchers use quantitative methods to carry out this study. The study design used is an experimental quasi.

4.1 Sample Study

The sample of this study was the semester four, second year students who took the subject of Electrical Wiring at Kuala Klawang Vocational College and Setapak Vocational College. Chua (2006) states that sampling is a process of selecting individuals for research from individual groups representing large groups. In the context of this study, selected sampling techniques are random sampling of clusters. Kuala Klawang vocational college as a control group and Setapak Vocational College as a treatment group.

4.2 Study Instruments

According to Chua, (2006) the instrument of study is a measuring tool that is used to determine whether the required information and data can be obtained or vice versa.

4.2.1 Pre-Achievement Testing and Post Achievement Testing

The researcher has set a set of achievement test questions to be used as a pre-test and post-test achievement test. According to Brown, Irving & Keegan (2008), the ideal timing for post-test is after three or six weeks after the pre-test. According to Cambell & stanley (1963), the ideal timing for post-test is a month, six months and a year after the pre-test

Table 4.1: Test Achievement Format

Section	*Type of question*	*Number of Items*	*Marks (%)*
A	Multiple choice	10	50
B	Structure	5	25
C	Essays	1	25
Total			100

4.2.2 Feedback Form

The most appropriate instrument for getting good cooperation from respondents is the questionnaire (Wen et al., 2011). This is because it is easy to distribute and correspond to the willingness of respondents. The questionnaire

DOI: 10.37200/IJPR/V24I1/PR200160
Received: 15 Nov 2019 | Revised: 20 Dec 2019 | Accepted: 05 Jan 2020

was on the students' perception of Electromagnetic Trip model as teaching aids (Table 3.5). The questionnaire consists of four sections, namely evaluation of design, user-friendly, functionality and acceptance and security aspects.

Table 4.2: Questionnaire Form

Number	*Section*	*Assessed Aspects*	*Number of Items*
1.	A1	Design	8
2.	A2	User friendly	6
3.	A3	Functionality and Acceptance	5
4.	A4	Safety	3
Total			22

V. DATA ANALYSIS

Table 5.1: Data Analysis of the Study

No.	*Research Questions*	*Research Form*	*Statistics*
1.	What is the pre-student test achievement for the topic (RCCB)?	Descriptive	Frequency (f)
2.	Is there a difference in post-test achievement for control group and treatment groups on RCCB topics?	Inference	Percentage (%)
3.	What are the students' perceptions of the "Electromagnetic Trip" Model as a Teaching Assistant in the RCCB topic?	Descriptive	ANCOVA

5.1 Pre-test Achievement of the Control Group and the Treatment Group Students for the RCCB Topic

Table 5.2 shows the achievement of pre-test for treatment group (KR) and control group (KK). Overall, pre-test achievement for both groups is at a good level. This means that students in both groups are homogenous in terms of academic achievement.

Table 5.2: Pre-test Achievement Analysis of the Control Group and Treatment Group Students

Group	*Excellent*		*Good*		*Pass*		*Fail*		*Total*	
	f	*%*	*f*	*%*	*f*	*%*	*f*	*%*	*f*	*%*
KR	0	0	29	82	4	12	0	0	33	100
KK	0	0	30	91	3	9	0	0	33	100

Both groups have similar academic backgrounds whereby students are admitted into college through the general terms set out. Additionally, college students are in the same environmental factor of the Vocational College being supervised and monitored by BPTV KPM. The physical atmosphere of a conducive learning center affects the effectiveness of PdPc (Mok, 2013). In addition, the background of instructors in each KV is the same. Teachers with similar experience and background will produce the same achievement (Zakariya & Bamidele, 2015). The syllabuses and modules used by the two colleges are the same as those provided by BPTV. Both colleges conduct the same assessment as determined by the Examination Board (LP). Each rating is based on the questions constructed based on the JSU set by the LP. According to Alade & Omoruyi (2014) JSU helps teachers relate teaching objectives, cognitive level instructions and the number of tests that need to be emphasized.

The teaching approach used is based on the guidelines laid down by BPTV, a student-centered learning. According to Jani et al. (2009), the same teaching method at all times does not give any effect to student performance. Interest is one of the factors that can influence the academic achievement of students' based on the chosen field (Noor Emma & Leong, 2014). The field selection factors that are appropriate with the students will

DOI: 10.37200/IJPR/V24I1/PR200160
Received: 15 Nov 2019 | Revised: 20 Dec 2019 | Accepted: 05 Jan 2020

affect the academic achievement of students (Abd Rahiman & Abdul Shukor, 2017). Therefore, both KVs or groups comprise the same educational background, specialization area, syllabus, module, assessment and similar interests. With this, students tend to have the same achievement.

5.2 The Difference in Post-test Achievement of the Control Group and the Treatment Group for the RCCB Topic

Table 5.3 shows ANCOVA test analysis of the mean difference in the individual post test score between KK and KR. The results of the ANCOVA test data analysis showed that there was a significant difference mean results in post test scores between KK and KR as a whole (p <.05).

Table 5.3: ANCOVA Test Analysis of the Difference between Individual Post Test Scores between the Control Group and the Treatment Group

Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
Corrected Model	2223.521[a]	2	1111.761	109.552	.000
Intercept	406.468	1	406.468	40.053	.000
Pretest	1496.839	1	1496.839	147.497	.000
Group	544.057	1	544.057	53.611	*.000
Error	639.342	63	10.148		
Total	345439.000	66			
Corrected Total	2862.864	65			

Significant differences in p <.05

Table 5.4: Min Score and Level of Individual Post-test Achievement between Control Group and Treatment Group

Group	*N*	*Individual Post Test*		
		Min Score	*Level*	*Grade*
KR	33	75.36	Good	B+
KK	33	68.73	Good	B

Table 5.5 shows the MANOVA Test analysis that there is a significant difference mean score between pre and individual post-test for KR (p <.05). For KK, there was no significant difference between pre and post-test achievement marks.

Table 5.5: MANOVA Test Analysis of Mean difference between Pre-test and Individual Post-test for Control Group and Treatment Group

Source	*Measure*	*prapos*	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
prapos	KR	Linear	512.970	1	512.970	50.503	*.000
	KK	Linear	.742	1	.742	.154	.698
Error (prapos)	KR	Linear	325.030	32	10.157		
	KK	Linear	154.758	32	4.836		

* Significant differences in p <.05

The results showed that there was an increase in mean score between individual pre-test and individual post-test achievement tests. If evaluated in terms of grades, KR shows an increase of grade B to grade B +.

When the analysis through the min score was found that there was an increase to KR of 4.09% i.e. from 69.79% to 75.36%. KK has no improvement if it is assessed in terms of grade. Pre-test and post-achievement tests get grade B. When evaluations are based on min score, there is an increase of 0.21% for individual post-test achievements.

DOI: 10.37200/IJPR/V24I1/PR200160
Received: 15 Nov 2019 | Revised: 20 Dec 2019 | Accepted: 05 Jan 2020

Table 5.6: Min Score and Achievement Level between Pre-test and Individual Post-test for Control Group and Treatment Group

Group	*N*	*Min Score Achievement Testing*					
		Pre			*Post*		
		Min	*Level*	*Gred*	*Min*	*Level*	*Gred*
KR	33	69.79	Good	B	75.36	Good	B+
KK	33	68.52	Good	B	68.73	Good	B

Overall, the post-test test between KR is higher than KK. In addition, there were significant differences in pre-test and post-test test results for KR. There is a high increase in KR achievement grade. The results of the study show that the use of "Electromagnetic Trip" Model as teaching aids in the RCCB topic affects the improvement of students' achievement compared to KK which only uses conventional learning and does not receive any treatment. The results of this treatment have shown that students who have been treated with teaching aids are able to achieve good test achievement grade. This is attainment because the use of teaching aids can provide interesting learning (Musa & Mohamad, 2014). Teaching aids help to increase students' interest in the learning process and improve students' academic achievement (Priyadarshini et al., (2012); (Ibeh et al., (2013); Joseph, (2015)).

In the context of this study, after the students receive treatment, KR students are able to respond to better performance tests than KK students. With this "Electromagnetic Trip" model as teaching aids it can help students to understand the contents of the lesson more clearly and effectively. According to Ying et al. (2015), teaching aids has a great influence that can create students' curiosity, deep understanding and give imagination a concept. Relevant teaching aids can also help to explain the concept more clearly than verbal explanations (Azman et al., 2014). As a result of the KR test achievement test, it can be concluded that students can better understand RCCB topics than KK students. According to Moksen (2014) teaching aids can sharpen the senses of students and help students in effective learning. Students will be more focused in PdPc sessions and provide a deeper understanding of the topics being taught. With the use of teaching aids, students are more understanding of the delivery of learning (Che Hatta et al., 2013).

5.3 The Students' Perception of the Electromagnetic Trip Model as Teaching Aids in the RCCB Topic

Overall, the result of the analysis of the students' perception of the "Electromagnetic Trip" model as teaching aids in the RCCB topic found that, 97.9% of students agree and there are 2.1% students who disagree with the teaching aids used. Perceptions of students are very positive towards safety aspects followed by functionality and acceptance, design and subsequently user-friendly. This gives a clear picture that teaching aids can have a positive impact on the students.

Table 5.7: Overall Students' Perception Analysis Against the Electromagnetic Trip Model as a Teaching Aids for RCCB Topics

Aspek	*TS*		*S*	
	f	*%*	*f*	*%*
Design	4.7	14.5	28.3	85.5
User friendly	6.3	20.8	26.7	79.2
Functionality and Acceptance	1.6	4.8	31.4	95.2
Safety	1.3	4	31.7	96
AVERAGE	**0.7**	**2.1**	**32.3**	**97.9**

DOI: 10.37200/IJPR/V24I1/PR200160
Received: 15 Nov 2019 | Revised: 20 Dec 2019 | Accepted: 05 Jan 2020

The findings show that students have a positive perception of the model "Electromagnetic Trip" as teaching aids for the RCCB topic. The students strongly agree with the safety aspect of teaching aids. The use of teaching aids in the PdPc session against students and lecturers should be emphasized (Hanif et al., 2016). Students' perceptions are very high on the functionality and acceptance of teaching aids used. Good teaching aids can provide motivation and enthusiasm for what to deliver (Mohamed Yusoff, et al., 2014). The design aspect also gets the highest approval. The teaching aids design that meets the student's performance is based on a survey conducted (Zakaria et al., 2016). According to Che Hatta (2011) students have high perceptions and provide positive feedback in PdPc with the use of teaching aids. Students' perceptions are very positive towards user-friendly aspects. The quality of teaching aids is that teaching aids must be durable, have easy operation, suitable in size and easy to maintain and operate (Zain, 2013). Mahidi (2011) states that teaching aids must have user-friendly features to facilitate the use and maintenance of it well. A quality teaching aids is a user friendly teaching aid (Md Nor, 2102).

Overall, it can be concluded that the students' perception of the Electromagnetic Trip model as teaching aids in the RCCB topic is high thus has a positive impact on PdPc and the improvement of student performance. The use of teaching aids in PdPc enhances students' academic achievement (Priyadarshini et al. (2012); Joseph (2015)).

VI. CONCLUSION

The findings show that both KR and KK groups are homogeneous, having the same pre-test achievement. The use of teaching aids in PdPc can have an impact on the improvement of post-test achievement while conventional learning alone cannot have a significant impact on the improvement of academic achievement. With this, it is clear that the use of teaching aids can help in attracting students, motivating students as well as improving students' academic achievement.

Analysis also shows that there has been no significant improvement in the pre-test and post-mortem test for KK. This means that PdPc conventionally does not have a positive impact on effective learning. Furthermore, the results of the study on pre-test and post-test test results for KR found that there was an increase in scores and grades. This means that the group of students given treatment using teaching aids is better than those who use conventional methods. The findings on the question of the third study showed that students' perception of teaching aids was very positive. Students' perceptions of design, user-friendly, functionality and acceptance, as well as security, get a high level of consent from KR students.

REFERENCES

[1] Ab. Halim, H.H. & Lai C.S. (2011). Penilaian Keberkesanan Kit Pengajaran Transistor Bagi Aliran Vokasional. *Seminar Pasca Ijazah yang Pertama 2011 - 6, Fakulti Pendidikan Teknik dan Vokasional, UTHM*.

[2] Abd Rahiman F. & Abdul Shukor A. S. (2017). Hubungan Minat dan Sikap Terhadap Pencapaian Pelajar dalam Kursus DPA3043 – Auditing. *National Innovation and Invention Competition Through Exhibition (iCompEx'17)*.

[3] Abdul Rasid, J. (2011). Permasalahan Kemahiran Membaca dan Menulis Bahasa Melayu Murid-Murid. *Jurnal Pendidikan Bahasa Melayu*, 1-12.

[4] Ahmad Zanzali N.A. & Daud N. (2010). *Penggunaan Bahan Bantu Mengajar Di Kalangan Guru Pelatih UTM*. Johor Bahru: Fakulti Pendidikan, Universiti Teknologi Malaysia.

DOI: 10.37200/IJPR/V24I1/PR200160
Received: 15 Nov 2019 | Revised: 20 Dec 2019 | Accepted: 05 Jan 2020

[5] Ali, S.J. (2013). KIT "Residual Current Circuit Breaker‟ (RCCB) Sebagai Alat Bahan Bantu Mengajar (ABBM). *Laporan Projek Ijazah Sarjana Muda Pendidikan Teknik dan Vokasional*.

[6] Azman, M.N.A.; Azlia, N.A.; Mustapha, R.; Balakrishnan, B.; Mohd Isa, N. K. (2014). Penggunaan Alat Bantu Mengajar ke Atas Guru Pelatih Bagi Topik Kerja Kayu, Paip dan Logam. *Sains Humanika*, 77–85.

[7] Campbell, D.T., Stanley, J.C., & Gage, N.L. (1963). *Experimental and Quasi-experimental Designs for Research*. . Boston, MA, US: Houghton, Mifflin and Company.

[8] Che Hata N., Sha'aria S.H. , Abdul Hamida M. F. (2013). Persepsi Pelajar Terhadap Penggunaan Animasi dalam Pembelajaran Bahasa Arab. *aPusat Pengajian Bahasa Arab, Fakulti Bahasa dan Komunikasi, Universiti Sultan Zainal Abidin (UniSZA), Mala*, 2180–3722.

[9] Chou, Ying-Chyi; Yen, Hsin-Yi; Yen, Hong-Wei; Chao, Yu-Long; Huang, Ying-Hsiu. (2015). The Effectiveness of Teaching Aids for Elementary Students' Renewable Energy Learning and an Analysis of Their Energy Attitude Formation. *International Journal of Environmental and and Science Education*, v10 n2 p219-233 .

[10] Chua, Y.P. (2006). *Kaedah Penyelidikan/Chua Yan Piaw*. Shah Alam: McGraw-Hill.

[11] Chung, D., Lee, K.C. & Seong, S.C. (2010). Evaluation of Student Performance in Laboratory Applications using Fuzzy Logic. *Procedia Social and Behavioral Sceinces 2*, 902-909.

[12] Hanif, A.S., Azman, M.N., Pratama, H. & Mohd Imam Ma'arof N.N. (2016). Kit Pemantauan Penyambungan Litar Elektrik: Satu Kajian Efikasi Alat Bantu Mengajar. *GEOGRAFIA OnlineTM Malaysian Journal of Society and Space 12 issue 3*, (69 - 78).

[13] Ibeh, G.F., Onah, D.U., Umahi, A.E., Ugwuonah, F.C., Nnachi, N.O., & Ekpe, J.E. (2013). Strategies to improve attitude of secondary school students towards physics for sustainable technological development in Abakaliki L.G.A, Ebonyi, Nigeria. *Journal of Sustainable Development Studies*, 127-135.

[14] Ilias M.F., Ismail, M.F. & Jasmi K.A. (2013). Faktor Dorongan dan Halangan Penggunaan Bahan Bantu Mengajar oleh Guru Pendidikan Islam di Sekolah Bestari. *3rd International Conference In Islamic Education 2013 (I C I E D 2 0 I 3)*, 943-953.

[15] Jailani, N.H. (2015). Kecekapan Pembelajaran Berasaskan Model Contoh-Masalah Dalam Pembelajaran Teori Litar. *Tesis Ijazah Doktor Falsafah*, 2.

[16] Jamian A.R., Othman S. & Hashim H. (2012). Persepsi Guru Terhadap Penggunaan Kartun dalam Transformasi Pengajaran Penulisan Karangan Bahasa Melayu. *Jurnal Pendidikan Bahasa Melayu (MyLEJ)*, 129–140.

[17] Jani, J., Ong, K.B., Madon, M.S., Ahmad, H., Mohamad Khalid, N.H. & Ahmad, Y. (2009). Pendekatan Pengajaran, Gaya Belajar dan Jenis Penilaian dalam Mata Pelajaran Sains Sukan di Sekolah Menengah. *Jurnal Pendidikan Malaysia* , : 81 - 91.

[18] Jasmi K.A., Ilyas M.F., Tamuri A.H., & Mohd Hamzah M.I. (2011). Amalan Penggunaan Bahan Bantu Mengajar Dalam Kalangan Guru Cemerlang Pendidikan Islam Sekolah Menegah Malaysia. *Journal of Islamic And Arabic Education 3 (1)*, 59-74.

[19] Mahidi, M.M. (2011). *Pembangunan Bahan Bantu Mengajar Berasaskan E-peta Minda Bertajuk "The Reactivity Series of Metals and Applications" untuk Kimia Tingkatan Lima*. Skudai, Johor: Universiti Teknologi Malaysia.

[20] Md Nor, D. Selamat, M.A., Johari, A. & Omar, R. (2012). Pembangunan dan Penggunaan Pro-Trainer Kit Sebagai Alat Bantuan Pengajaran dan Pembelajaran untuk Robotik dan Sistem Kawalan Elektrik . *Konvensyen Teknologi Pendidikan Ke-18* .

[21] Mohamed Yusoff, A.F., Hamzah, M.I., Wan Hamat, W.N. (2014). Pembangunan Perisian Pengajaran dan Pembelajaran Multimedia Interaktif Pengurusan Jenazah Politeknik Malaysia. *Journal of Islamic and Arabic Education*, 25-42 ISSN.

[22] Mohd Khozam, N.F. (2013). Penghasilan Perisian Multimedia Interaktif Dan Kesesuaiannya Sebagai Alat Dan Bahan Bantu Mengajar (Abbm) Bagi Pelajar Pendidikan Khas Vokasional Kursus Pemasangan Motosikal. *Ijazah Sarjana Pendidikan Teknikal dan Vokasional Fakulti Pendidikan Teknikal dan Vokasional Universiti Tun Hussein Onn Malaysia*.

[23] Mok, S.S. (2013). *Psikologi Pendidikan Untuk Pengajaran dan Pembelajaran Edisi Ke 2*. Selangor: Penerbitan Multimedia Sdn. Bhd.

[24] Musa N.E. & Mohamad M.H. (2014). *Keberkesanan Penggunaan Alat Bahan Bantu Mengajar Dalam Pelaksanaan Kursus Sains Kejuruteraan di Kalangan Pelajar Diploma Kejuruteraan di Politeknik Tuanku Sultanah Bahiyah.* Kulim, Kedah: Jabatan Matematik, Sains dan Komputer Politeknik Tuanku Sultanah Bahiyah.

DOI: 10.37200/IJPR/V24I1/PR200160
Received: 15 Nov 2019 | Revised: 20 Dec 2019 | Accepted: 05 Jan 2020

[25] Mustapha, R. & Abdul Rahim, Z.L. (2014). Exploring The Problems Faced By Technical School Students In Learning Engineering Courses. *Journal of Engineering Science and Technology*, Vol. 9, No. 6, 690 - 701.

[26] Nasab M.Z., Esmaeili R. & Sarem H.N. (2015). The Use of Teaching Aids and Their Positive Impact on. *International Academic Journal of Social Sciences*, 22-27.

[27] O.M Alade & I.V. Omoruyi. (2014). Table Of Specification And Its Relevance In Educational. *European Journal of Educational and Development Psychology* , 1-17.

[28] Priyadarshini. K.S, H.V. Shetty, Reena. R. (2012). "Assessment Of Different Teaching Aids And Teaching Methods For The Better Perception Of Biochemistry By 1st MBBS Students" Priyadarshini. *Journal of Evolution of Medical and Dental Sciences*, Page-1164.

[29] Taale K. D. & A. MUSTAPHA B. (2014). Effects Of Teacher-Constructed Electrical Models On Students' Academic Achievement In Basic Electricity In Technical Colleges Of Borno State, Nigeria. *International Journal of Innovative Social & Science Education Research*, 2(1):16-25.

[30] Ying, C.C., Hsin, Y.Y., Hong, W.Y., Yu,L. C. & Ying, H.H. (2015). The Effectiveness of Teaching Aids for Elementary Students' Renewable Energy Learning and an Analysis of Their Energy Attitude Formation. *International Journal of Environmental & Science Education*, 39-49.

[31] Yusoff A., Shafiril S., Zulkifli C.Z., Gary Wills, Lester Gilbert and Richard Crowder. (2016). The Application of Environmental Data from a Realtime. *IEEE 8th International Conference on Engineering Education (ICEED).* FSKIK, Universiti Pendidikan Sultan Idris,School of Electronics and Computer Science, University of Southampton,.

[32] Zakaria, N., Abdullah N.A.S., Suaji M.A. (2016). Model Kit Kaedah 4M Kod Jalur Warna Perintang 4 Jalur sebagai ABBM. *Fakulti Pendidikan Teknikal dan Vokasional, Universiti Tun Hussein Onn Malaysia*.

[33] Zakariya, Y.F. (2015). Investigation Into The Causes Of Poor Academic Performance In Mathematics Among Nigerian Undergraduate Students. *World Journal of Social Science And Humanities*, vol 1, No 1.1-5.

DOI: 10.37200/IJPR/V24I1/PR200160
Received: 15 Nov 2019 | Revised: 20 Dec 2019 | Accepted: 05 Jan 2020