SEMARAK ILMU PUBLISHING

Journal of Advanced Research in Applied Sciences and Engineering Technology

Journal homepage:
https://semarakilmu.com.my/journals/index.php/applied_sciences_eng_tech/index
ISSN: 2462-1943

Impact of Digitalization on Automotive Technology Curriculum Concerning Student Psychomotor Achievement

Muhammad Shahrir Mohamed Shafieek[1], Affero Ismail[1,*], Siti Soleha Razali[2]

[1] Department of Technical and Vocational Education, Fakulti Pendidikan Teknikal dan Vokasional (FPTV), Universiti Tun Hussein Onn Malaysia (UTHM), Persiaran Tun Dr Ismail, 86400 Parit Raja, Johor, Malaysia
[2] Labtech International (M) Sdn Bhd, No. 16, 2nd Floor, Jalan Tengku Ampuan Zabedah D9/D, 40100 Shah Alam, Selangor, Malaysia

ARTICLE INFO

Article history:
Received 5 June 2023
Received in revised form 27 October 2023
Accepted 14 November 2023
Available online 16 January 2024

Keywords:
Digitalization; automotive technology curriculum quasi-experimental; functionality and usability

ABSTRACT

Through the implementation of digital learning content, this study sought to investigate the impact of digitalization on automotive technology curriculum. A quasi-experiment was conducted to assess the functionality and usability of the digital content, as well as its effect on psychomotor performance. 47 students enrolled in the Bachelor of Engineering Technology (Honours) in Mechanical, Manufacturing, and Mechatronic (Automotive) programme participated in the study. The study found that the digital learning content had a significant positive influence on the psychomotor achievements of the students. The functionality of the digital learning content was evaluated based on its capacity to deliver the desired learning outcomes and its compatibility with the existing curriculum. In addition, we evaluated the efficacy of the digital content by measuring its usability, navigation, and overall user experience. The analysis is based on the four primary research questions to determine the effect of digital learning content on students' cognitive and psychomotor achievement in automotive technology programs. IBM SPSS Statistical Version 23 was utilized to analyse the listed variable. p 0.05 is the significance level for all analyses. The findings are presented in the sections that follow. These evaluations revealed that the digital content is functional and effective, providing students with a positive learning experience. In addition, the results of these tests indicated that the digital learning content effectively facilitated the learning process. Finally, students were evaluated based on their ability to complete practical tasks related to the course material. The results of these evaluations demonstrated a significant increase in the psychomotor performance of the students, indicating that the digital learning content was able to improve their practical skills. This study concluded that incorporating digital learning content into the curriculum for automotive technology had a significant positive influence on the psychomotor achievements of students. The digital content is functional, usable, and effective in facilitating learning, providing students with a positive educational experience. These results suggest that incorporating digital learning content into a programme for automotive technology can be a valuable addition to conventional learning methods.

* *Corresponding author.*
E-mail address: affero@uthm.edu.my

https://doi.org/10.37934/araset.37.2.141155

1. Introduction

As stated by Borge Brende, President of the World Economic Forum, fundamental educational growth in developing countries is always attached to the country's financial requirements, political development, and social needs. In Malaysia, it is distinguished by the government's endeavours to incorporate more Technical and Vocational Education and Training (TVET) instruction into the country's national development requirements. By digitizing teaching and learning methodologies, most TVET institutions have developed curriculum to satisfy the requirements of Industry 4.0 over the past decade. Digitizing learning is an effective teaching method that enhances a high-quality teaching experience while granting students access to challenging content, formative assessment via feedback, and self-learning opportunities at their own pace [1].

Digital learning in a learning context is frequently criticized for creating intrinsic motivation outside of learning, oversimplification of complex issues, a manipulative framework, and ineffectiveness for all types of learners. Despite all the criticism, this need translates into one of the world's most dynamic and fastest-growing industries [2]. The greater availability of digital learning content across the globe has altered the perception of what was once referred to as "knowledgeable," where the focus of literacy is the ability to read and write linear texts, which is markedly different for young people. A growing need for young people to comprehend the various possibilities of concepts and ideas that can be explained or presented via various texts associated with multimodal forms, such as visual images, videos, hypertext, and graphical user interface elements that contain written text in the mode of learning content [3].

This learning content is typically developed in a one-way process initiated by the industry's knowledge producers and communication experts. It reaches the end-users only after being refined by a subject matter expert [4,5] study on the multimodal literacy practices of Malaysian youths in a digital environment concluded that educators and content producers must consider several factors when designing digital learning content for teaching and learning, including the type of content preferred, the types of information included, multimodal elements, interactive elements, usage aspects, and the reason for accessing it. These factors will help educators and content creators understand how marginalized youth perceive educational content in digital format, creating a more conducive learning environment and enhancing their learning experience.

Blended learning demonstrated promising results in a quantitative study of university students, with a substantial positive correlation between learning and student engagement and increased lecturer support [6] reported that students' motivation increased when digital learning content was implemented in the classroom, regardless of students' personality traits or prior gaming experience. [7] note that digital learning content allows for greater flexibility in structuring curriculum in conjunction with increased student engagement in the classroom, particularly among students with low motivation. An empirical study conducted with Malaysian polytechnic students revealed increased student engagement if the simplicity of use is ensured [8]. These studies examined student engagement and motivation, but none assessed the impact of digital learning content on students' abilities. Employers seek the same skills they should obtain during these formative years.

Based on the discussions of the problem's context, several problems have been identified in the learning methods, which have affected the students' skills and academic levels. Among the identified issues is that matriculation pupils must satisfy the labour market requirements and possess low skill levels. It is because educators in TVET institutions continue to employ traditional teaching methods, encouraging students to be passive and teacher centred. In addition, students have become acclimated to learning through memorization due to their desire to perform well on exams. Through

this method of instruction, students need to be instructed to think creatively and experiment with novel ideas.

It is now prevalent in educational institutions because instructors are more at ease using lecture and exercise methods to prepare students for exams based primarily on textbooks. In addition, learning materials for automotive technology must be more difficult due to the high apparatus cost. Educators also need a suitable platform for placing learning materials for students to review without restriction. Educators must address these challenges to produce academically and skilfully superior students. This study was conducted to determine the impact of digital learning content on the cognitive and psychomotor achievement of Automotive Technology students. Labtech International Limited developed this digital learning content. This Automotive TVET manufacturer has been in the TVET industry for over 37 years and has developed numerous digital learning contents for automotive subjects.

This study evaluates the functionality and efficacy of digital learning content in an automotive technology program. Consequently, the researcher's objective is to examine the impact of digital learning content on students' cognitive and psychomotor achievement in automotive technology programs.

2. Literature Review

In Malaysia, TVET programmes are available at the level of upper secondary education, post-secondary education, and tertiary education, depending on the need and type of institution offering the programme. Malaysia's TVET strategy seeks to increase the number of qualified workers by providing education and training in response to market and industry demands. In 2011, UNESCO and the Malaysian Ministry of Higher Education reported that 129,725 students were enrolled in TVET programmes at the tertiary level, representing 11.4% of all enrolled students in tertiary education. Meanwhile, 178,480 students were enrolled in TVET programmes at the secondary level. Various institutions provide these initiatives. As shown in Table 1, polytechnics, technical institutes, and community colleges provide tertiary vocational education, with graduates typically occupying management and supervisory positions corresponding to National Occupational Skills Standard (NOSS) levels 3 to 5. Both public and private vocational institutes offer vocational instruction corresponding to an upper secondary education [9]. The graduates of these institutions will occupy skilled and semi-skilled worker positions for production and operational tasks corresponding to NOSS level 1 and level 2 as depicted in Table 1.

Table 1
The double qualification structure matching level and required competencies in TVET framework as established by NOSS

NOSS level	Required competencies
Level 5	Competency in a significant range of fundamental and complex tasks and skills, Personal autonomy and high responsibility, allocation of resources, analysis, diagnosis, design, planning, execution, evaluation, and demonstrates specialized technical skills.
Level 4	Competency in a broad range of Complex technical skills and work activities, requires personal autonomy and responsibility, involves directing and guiding others on a regular basis, allocation of resources is required.
Level 3	Competency in complex and non-routine tasks, requires to provide guidance and supervision of others. Higher technical skills are required.
Level 2	Competency in a significant range of technical skills, some activities are non-routine, requires some autonomy.
Level 1	Competency in varied activities, mostly routine and predictable.

Recent technological advancements, especially Artificial Intelligence (AI), Augmented Reality/Virtual Reality (AR/VR), big data analytics, and the Internet of Things (IoT), define Industrial Revolution (IR) 4.0 [10]. They are additionally referred to as the digital economy. According to [11], the order of the most important skills for new employees in 2020 should be as follows: complex problem solving, critical thinking, creativity, people management, coordinating with others, emotional intelligence, judgement, and decision making, service orientation, negotiation, and cognitive flexibility. Their analysis also included a projection of the top ten most required skills in the year 2022: analytical thinking and innovation, active learning and learning strategies, creativity, originality and initiative, technology design and programming, critical thinking and analysis, complex problem solving, leadership and social influence, emotional intelligence, reasoning, problem-solving, ideation, system analysis, and evaluation [12].

Recent technological advancements, especially Artificial Intelligence (AI), Augmented Reality/Virtual Reality (AR/VR), big data analytics, and the Internet of Things (IoT), define Industrial Revolution (IR) 4.0 [10]. They are additionally referred to as the digital economy. According to [11], the order of the most important skills for new employees in 2020 should be as follows: complex problem solving, critical thinking, creativity, people management, coordinating with others, emotional intelligence, judgement, and decision making, service orientation, negotiation, and cognitive flexibility. Their analysis also included a projection of the top ten most required skills in the year 2022: analytical thinking and innovation, active learning and learning strategies, creativity, originality and initiative, technology design and programming, critical thinking and analysis, complex problem solving, leadership and social influence, emotional intelligence, reasoning, problem-solving, ideation, system analysis, and evaluation [12]. Digital learning is a term that encompasses a diversity of pedagogical approaches that are augmented using technology. Digital learning encompasses integrated, reversed, personalized, and other strategies that rely on small and large-scale digital instruments [13]. The data indicate that providing students access to technological instruments does not improve their performance. However, the judicious integration of technology enables students to engage with their ideas actively, enhancing their classmates' learning experiences. It becomes a complex strategic challenge involving innumerable intangible and abstract variables, such as electronic devices, software, classroom practice, professional development, and collaboration among numerous stakeholders [14].

The evolution of technology is influencing the development of digital learning. Digital learning can be developed for wholly online distance learning courses or integrated with traditional classes as blended learning [15]. According to [16], the lack of student participation in online activities is one of the most prevalent issues in digital learning. It is due to several factors, but most importantly, students need help to do so. For students to participate in online activities, teachers (instructors) must ensure that students comprehend the task, its significance, and its applicability. The digital learning model enables teachers, lecturers, and instructors to update learning materials easily, respond to the most recent scientific development demands, develop themselves, research to improve their insights and manage students' learning activities [17].

According to [18], psychomotor learning is demonstrated through physical abilities such as agility, obedience, grooming, and strength. The objectives of the psychomotor domain include the application of bone and muscle skill in addition to coordination requirements such as physical activity in performance, following, and constructing or creating. According to Jansma and French (1994), the psychomotor domain is concerned with the human limb movements. Psychomotor domain assessment measures motor, physical, fitness, and play-related competencies and abilities. In addition, the psychomotor domain can identify the development of physical movement and behaviour-related skills and divides motor skills into five levels: imitation, manipulation, behavioural

accuracy, linking, and natural action. Teachers can identify the process of skill development related to learning and the behaviour of students during activities based on the level of the psychomotor domain. In the implementation of the teaching and learning process, the psychomotor domain is crucial and significant for evaluating students' abilities.

3. Methodology

Prioritizing the methodology before and during data acquisition is crucial for the success of a research project [15]. The relevant methodology relates to the means of data acquisition, compilation, and analysis [16]. To ensure that research can be conducted in an orderly and systematic manner, the choice of methodology is a crucial aspect of the research process. In this chapter, the description of the selected study methods, including the study design, study population, study sample, study instruments, instrument validity, pilot study, data analysis methods, and study assumptions, will be provided in greater detail.

3.1 Research Design

To carry out this research, the researcher chose a quasi-experimental study design. "Pretest-Posttest Nonequivalent Comparison Group Design". Quasi-experimental designs are typically used to evaluate the effectiveness of a program when study respondents cannot be randomly distributed [17]. Therefore, this design is in line with the purpose of the study which is to see the effectiveness of the use of digital learning content in learning on the cognitive and psychomotor achievement of students for the Automotive Powertrain subject. Researchers used a quantitative approach involving the Treatment Group (TG) and the Control Group (CG). In this study, this design was used to study the effect of the independent variable on the dependent variable. Table 2 shows the variables involved in this study.

Table 2
Study variables

Group	Dependent variable	Independent variables
Treatment	Digital learning content	• Cognitive achievement • Psychomotor achievement
Control	Conventional leaning methods	• Cognitive achievement • Psychomotor achievement

In this investigation, TG will learn via the digital learning method, whereas CG will only use conventional methods. Several control factors, such as instructor, subject, topic, length of study, and external input, should be the same for both the treatment group and the control group when conducting the study [18]. This is due to the numerous hazards to the experiment's validity. To obtain excellent experimental results, it is necessary to minimize and control all such effects [19].

The pre- and post-tests will be administered to TG and CG during the same week to minimize the threat of the validity of "intergroup interactions" [20]. In the first week of this research, a pre-test will be administered before learning commences. Then, TG will receive an intervention involving the use of digital learning content, while CG will continue to utilize conventional learning methods. The duration of the intervention for TG is eight weeks. After the intervention period has concluded, TG and CG will be given a post-test to compare their previous scores.

The study design for the pre- and post-tests against the treatment and control groups is presented in Table 3. The performance on the pre-test will be used to determine the distinctions

between TG and CG. Researchers used pre-test scores to control preliminary differences so that post-test results were not affected by preliminary differences that existed prior to the administration of treatment. While TG was treated with X using digital learning content, CG received no treatment.

Table 3
Study design for pre and post-tests against TG and CG

Group	Pre-test	Treatment	Post test
TG	O_1	X	O_2
CG	O_3	-	O_4

O1 = O3 is Pre-test, O2 = O4 is Post-test, X = Digital learning content

3.2 Sampling

To collect data from the study cohort, the researcher has chosen two courses containing a total of 6 experts from both TG and CG. Intact classroom groups may be utilized in an experimental design in the absence of random sampling, i.e., if existing classroom groups are utilized. Therefore, a non-random sampling procedure will be employed in this research, with the study sample consisting solely of the extant class population of 47 students across two classes. Table 4 displays the study group's division.

Table 4
Study group's division

Group division	Number of students
Treatment Group (TG)	24
Control Group (CG)	23

3.3 Questionnaire

Questionnaires are the simplest way to collect data. In addition, the questionnaire is also suitable for use if the researcher is only interested in the respondent's opinion and not the reasons behind it. In this investigation, a questionnaire served as the instrument. This questionnaire consists of six (6) sections, as shown in Table 5.

Table 5
Division of questions in the questionnaire

Question	Item form	Number of items
Section A	Demographics	3
Section B	Evaluation of functionality	5
Section C	Evaluation of content	9
Section D	Evaluation of interaction	6
Section E	Evaluation of presentation	6
Section F	Comments and suggestions	1

3.4 Study Procedure

Before conducting the actual study, the researcher conducted a pilot study to ensure that all instruments used were accurate and met the study's intended goals. After conducting a pilot study, the researcher met with lecturers who teach Automotive Powertrain at Universiti Kuala Lumpur Malaysian Spanish Institute (UniKL MSI) to request permission to conduct research on students who are enrolled in Automotive Powertrain. Once the lecturers consented to allow the research to be

conducted in their class, a meeting was convened to provide them with explanations and briefings regarding the study's objectives and implementation procedures. This is intended to expose instructors to the implementation of digital learning content.

On the respondents, questionnaires, tests, and a practical evaluation rubric were administered. This instrument is designed to assess the functionality and usability of digital learning content, as well as student achievement. Students were divided into the Treatment Group (TG) and the Control Group (CG) for the duration of the study. The control group uses conventional learning methods, whereas the treatment group uses digital learning content for the duration specified in table 6. Upon conclusion of the intervention, participants were administered a post-test to determine the differences between TG and CG achievement.

Table 6
Implementation period of the actual study

Week	Step
Week 1	The lecturer explains the topic to be studied as well as the teaching and learning methods that will be conducted for TG and CG.
Week 2	Pre-tests are conducted on students for TG and CG to see the students' level of knowledge. Students were tested using a set of theory tests and practical tests.
Week 3-7	The researcher assists the lecturers in carrying out the teaching and learning process by using digital learning content for TG and conventional approach for CG.
Week 8	Post-tests were conducted for both groups after the teaching and learning process is completed. Students were tested using a set of theory tests and practical tests. The functionality and usability questionnaire were only given to students from TG.

Malaysian Spanish Institute (UniKL MSI). The study was conducted at UniKL MSI since the Labtech digital learning content is already deployed and utilized at the institution. In the first week, the researcher explains only the topic to be examined and the teaching and learning strategies that will be implemented for TG and CG. During the second week, the researcher conducts only TG and CG pre-tests. In the third week, the researcher implements a five-week treatment method for the TG, while the CG receives conventional teaching and learning strategies. In the concluding week, which is the eighth week, the researcher administers a post-test to both groups of students to assess their performance. To assess the functionality and efficacy of the digital learning content, a questionnaire will be disseminated separately to TG students only.

4. Result

Figure 1 summarises the user experience score for the functionality and usability of digital learning content. Most students concurred that digital learning content is effective, efficient, and beneficial for enhancing their subject-matter knowledge and comprehension.

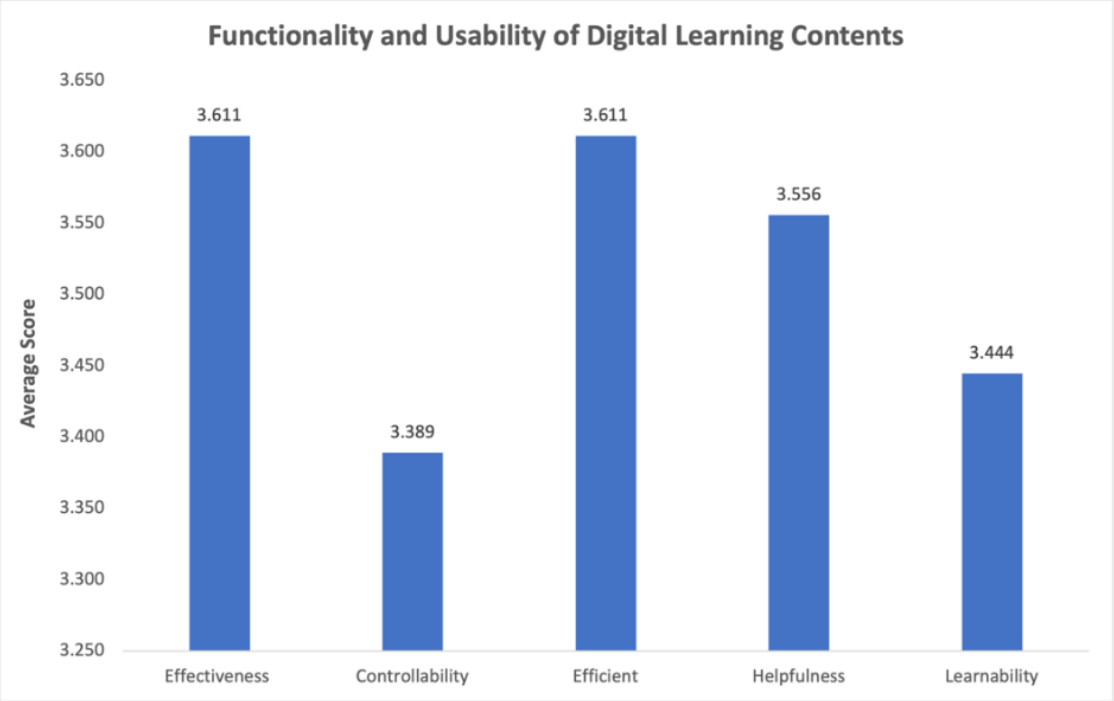

Fig. 1. Summary of user experience score on functionality and usability of digital learning contents

4.1 Effect of Digital Learning Content

This section discusses the impact of digital learning content on the performance of engineering students. In addition, the following section describes the results of an experiment conducted on two distinct treatment groups. The controlling bias was performed to validate the validity of the quasi-experimental research design's conclusion. Bias is any disposition that makes it difficult to examine a query without preconceived notions. For example, bias occurs in research when a systematic error is introduced into sampling or testing by selecting or encouraging one outcome or answer over others. In this instance, controlling prejudice based on gender is conducted to avoid bias, as students with similar backgrounds are chosen. In addition, the students in the control and treatment groups were not assigned randomly, and male and female students were distributed unevenly. Therefore, a Chi-Square test was conducted to determine the potential and similarity between each cohort. When the equivalent of both groups is obtained, selection bias disappears [23].

In addition, Pearson's Chi-Square test was conducted to determine whether there was a correlation between the genders of participants in the experimental and control groups. This is because Table 7 p-value of 0.413 is greater than the alpha value of =0.05, this analysis cannot reject the null hypothesis and concludes that the group appears to have similar gender distributions of pupils. Therefore, this study concludes that there was no correlation between genders and the two groups studied (the proportions of men and women in each group were identical). On the other hand, this study indicated that gender did not influence the results.

Table 7
Chi- Square test

Chi-Square tests	Value	df	Asymptotic significance (2-sided)	Exact sig. (2-sided)	Exact sig. (1-sided)
Pearson Chi-Square	.670[a]	1	0.413		
Continuity Correction [b]	0.145	1	0.703		
Likelihood Ratio	0.683	1	0.409		
Fisher's Exact Test				0.666	0.354
Linear-by-Linear Association	0.656	1	0.418		
N of Valid Cases	47				

[a] 2 cells (50.0%) have expected count less than 5. The minimum expected count is 2.94
[b] Computed only for a 2x2 table

4.2 Comparison of Student Achievements Between Groups

Table 8 provides basic information about the group comparisons, including the sample size (n), mean, standard deviation, and standard error for test score by group. In this study, there are 23 students in the control group which is without digital content assistance and 24 students for treatment group with digital content assistance.

Table 8
Descriptive analysis

Cases	Group	N	Mean	Std. deviation	Std. error mean
Pre_Score	Control	23	10.65	3.472	0.724
	Treatment	24	8.63	2.7	0.551
Post_Score	Control	23	13.87	3.481	0.726
	Treatment	24	16.42	2.827	0.577

Figure 2 illustrates the boxplot for descriptive analysis from the descriptive analysis. Figure 2 shows the maximum and minimum student's score for both pre-test and post-test, where the maximum is 18 followed by minimum which are 4 and 8, respectively.

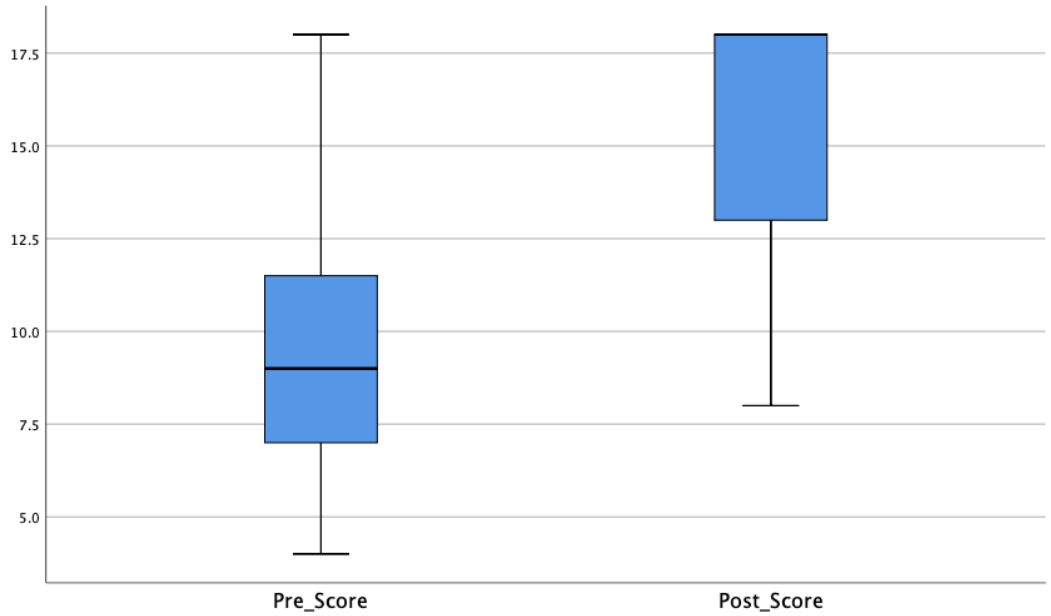

Fig. 2. Boxplot for descriptive analysis

4.3 Comparison of Student Achievements Between Testing Items

Table 9 displays the degree of comprehension for each item measured during the pre-test session. Twenty questions were designed for the comparison, revealing that the total scores for the treatment and control groups are likely equivalent.

Table 9
Comparison of the score in pre-test between control and treatment group

No	Item	Treatment	Control	Different	Indication
1	What does the differential split?	13	17	-4	
2	How many differentials do Rear-Wheel-Drive vehicles required?	9	8	1	√
3	What are the advantages of Rear-Wheel Drive compared to Front-Wheel-Drive?	7	6	1	√
4	Define Rear-Wheel-Drive (RWD)?	11	18	-7	
5	What is the most common layout of the engine location in a Rear-Wheel-Drive car?	7	13	-6	
6	Discuss transmission for RWD	4	9	-5	
7	Determine the type of engine layout for RWD in Figure 1 below	10	9	1	√
8	Determine the type of engine layout for RWD in Figure 2 below	9	14	-5	
9	A growling sound is heard from the rear of a Rear-Wheel-Drive vehicle during cornering only. Technician A says incorrect drive pinion bearing preload could be the cause. Technician B says defective rear axle bearings may be the cause. Who is right?	7	14	-7	
10	What rear axle measurement is being performed in Figure 3 below?	8	5	3	√
11	What rear axle measurement is being performed in Figure 4 below?	10	9	1	√
12	The ring gear to pinion backlash is less than specifications (too low). This will cause the ring gear tooth pattern to show contact in which of the following areas of the ring gear?	6	8	-2	
13	In Rear-Wheel-Drive, the main shaft or propeller shaft is required to transmit the power from front (engine and transmission) to the rear of the vehicle.	18	22	-4	
14	Why the rear transaxle shaft of the Rear- Wheel-Drive commonly same in length (right and left)?	11	10	1	√
15	Universal joint typically used in Rear-Wheel-Drive vehicle. Describe the advantages of universal joint.	14	11	3	√
16	RMR is the most common arrangement in current racing cars. This configuration is widely used in open-wheel Formula racing vehicles as well as purpose-built sports racing cars because to its weight distribution and excellent vehicle dynamics.	21	19	2	√
17	Understeer occurs when a car turns (steers) by more than the amount commanded by the driver.	8	12	-4	
18	Oversteer happens when a car steers less than the amount commanded by the driver.	14	16	-2	
19	The first Rear-Wheel-Drive car with the engine mounted at the front was an 1895 _____ model, so this layout was known as the "_____" in the early years.	15	17	-2	
20	Many automobile enthusiasts still prefer Rear-Wheel-Drive vehicles for their handling characteristics and power delivery. The statement is referred to; i. Large sedans and family cars. ii. Trucks and SUVs. iii. Commercial trucks and vans. iv. Sports and performance cars.	5	8	-3	

Table 10 displays the degree of comprehension for each test item measured. Twenty queries were created for the comparison. Table 10 shows that the total score of the treatment group is higher than that of the control group during the pre-test session. Except for item 15, "Universal joint typically used on Rear-Wheel-Drive vehicles," most students in the treatment group scored highly on all items. Describe the benefits of the universal joint and item 20: "Many auto devotees still favour rear-wheel-drive vehicles due to their superior handling and power delivery." This statement refers to:

i. large sedans and family automobiles
ii. pickup trucks and sport utility vehicles
iii. commercial trucks and trailers
iv. sports and performance cars.

Table 10
Comparison of the score in post-test between control and treatment group

No	Item	Treatment (T)	Control (C)	Different	Indication
1	What does the differential split?	22	19	-3	
2	How many differentials do Rear-Wheel-Drive vehicles required?	18	12	-6	
3	What are the advantages of Rear-Wheel Drive compared to Front-Wheel-Drive?	17	9	-8	
4	Define Rear-Wheel-Drive (RWD)?	24	21	-3	
5	What is the most common layout of the engine location in a Rear-Wheel-Drive car?	24	19	-5	
6	Discuss transmission for RWD	23	16	-7	
7	Determine the type of engine layout for RWD in Figure 1 below	19	12	-7	
8	Determine the type of engine layout for RWD in Figure 2 below	22	17	-5	
9	A growling sound is heard from the rear of a Rear-Wheel-Drive vehicle during cornering only. Technician A says incorrect drive pinion bearing preload could be the cause. Technician B says defective rear axle bearings may be the cause. Who is right?	23	19	-4	
10	What rear axle measurement is being performed in Figure 3 below?	17	11	-6	
11	What rear axle measurement is being performed in Figure 4 below?	18	12	-6	
12	The ring gear to pinion backlash is less than specifications (too low). This will cause the ring gear tooth pattern to show contact in which of the following areas of the ring gear?	17	9	-8	
13	In Rear-Wheel-Drive, the main shaft or propeller shaft is required to transmit the power from front (engine and transmission) to the rear of the vehicle.	24	23	-1	
14	Why the rear transaxle shaft of the Rear- Wheel-Drive commonly same in length (right and left)?	22	17	-5	
15	Universal joint typically used in Rear-Wheel-Drive vehicle. Describe the advantages of universal joint.	6	14	8	√
16	RMR is the most common arrangement in current racing cars. This configuration is widely used in open-wheel Formula racing vehicles as well as purpose-built sports racing cars because to its weight distribution and excellent vehicle dynamics.	22	19	-3	

17	Understeer occurs when a car turns (steers) by more than the amount commanded by the driver.	23	18	-5	
18	Oversteer happens when a car steers less than the amount commanded by the driver.	24	21	-3	
19	The first Rear-Wheel-Drive car with the engine mounted at the front was an 1895 _____ model, so this layout was known as the "_____" in the early years.	23	21	-2	
20	Many automobile enthusiasts still prefer Rear-Wheel-Drive vehicles for their handling characteristics and power delivery. The statement is referred to; i. Large sedans and family cars. ii. Trucks and SUVs. iii. Commercial trucks and vans. iv. Sports and performance cars.	6	10	4	√

4.4 Independent T-test Analysis

This study involves testing whether the sample means for score among control and treatment in sample are statistically different (and by extension, inferring whether the means for score in the population are significantly different between these two groups).

The hypothesis for this study is expressed as:

H0: μcontrol − μtreament = 0 ("the difference of the means is equal to zero")
H1: μcontrol − μtreament ≠ 0 ("the difference of the means is not equal to zero")

where μcontrol − μtreatment are the population means for control and treatment group respectively. Table 11 presented the mean comparison for group. This study found that, $p < .003$ is less than significance level $\alpha = 0.05$, null hypothesis is rejected and conclude that the that the mean of students for control and treatment group is significantly different. Besides, the mean difference is calculated by subtracting the mean of the treatment group from the mean of the control group. The sign of the mean difference corresponds to the sign of the t value. The positive t value in this study, indicates that the mean student' score (treatment group) is significantly greater than the mean for the control group.

Table 11
Independent t- test

Cases	Statistical test	Levene's test for equality of variances		t-test for equality of means					
		F	Sig.	t	df	Sig.	Mean diff	95% confidence interval of the difference	
								Lower	Upper
Pre_ Score	Equal variances assumed	0.931	0.34	2.24	45	0.03	2.027	0.204	3.85
Postscore	Equal variances assumed	1.804	0.186	-2.759	45	0.008	-2.547	-4.407	-0.688

This section discusses the findings regarding the impact of digital learning materials. Depending on how it is utilised, digital learning content can have both benefits and drawbacks. Among the prospective advantages of using digital learning content are that digital learning content is accessible from any location with an internet connection, making it simpler for students to access and complete coursework. Digital learning content is often accessible anytime, allowing students to learn at their tempo and schedule. Digital learning content can be interactive, which helps engage students and

maintain their interest in the material. As for personalization, digital learning content can be tailored to each student's specific requirements and preferences, ensuring that they are learning most efficiently. Digital learning content can facilitate student collaboration by allowing them to collaborate and discuss material online.

However, there are also potential disadvantages to utilising digital learning content, including some students may need access to the requisite technology or internet connection to access digital learning content. As for distractions, digital learning content can be distracting, as students may become more interested in other online activities than the material they are meant to learn. Technical issues, such as internet disruptions or problems with software or hardware, can disrupt digital learning content. Moreover, lack of personal interaction in digital learning content can lack the personal interaction and support that students receive in a conventional classroom. Overall, the efficacy of digital learning content is contingent on how it is utilised and whether it is effectively integrated into the learning process.

5. Conclusion

Engineers can benefit from digital learning content because it provides numerous resources and opportunities for learning and collaboration that can support their work. Utilising pre- and post-exam, digital learning content can be evaluated [24]. A pre-test is administered to students before their exposure to digital learning content, while a post-test is administered once the content has been completed. It is possible to evaluate the impact of digital learning content on student learning by comparing pre-and post-test results. According to this study, there are several advantages to evaluating the effectiveness of digital learning content using a pre-and post-test design. Adjust for pre-existing differences first; pre-tests can account for differences between student groups, such as prior knowledge or aptitude levels.

It can guarantee that differences in learning outcomes can be attributed solely to the digital learning content. By comparing pre-and post-test results, it is possible to determine how much students' knowledge and skills have improved due to the digital learning content. Pre-tests can provide a baseline for comparison, allowing researchers to determine the impact of digital learning content on student learning relative to their initial knowledge and skills [25]. This research provides a valuable method for assessing the effectiveness of digital learning content. It enables researchers to account for pre-existing disparities and measure how students' performance has improved due to the content.

The proposed digital learning content is highly usable. One method for measuring the efficacy of digital learning content is to request that students complete a survey evaluating their satisfaction with the material. It can provide valuable insight into the usability and comprehension of the material and any difficulties or frustrations that students may have encountered. Tracking students' time utilizing digital learning content is another method for determining its efficacy. If students can complete assignments swiftly and effectively, this may indicate that the material is highly usable. Additionally, evaluating the efficacy of digital learning content with a limited group of students can provide valuable insights [26]. Numerous applications and websites have been developed in recent years to aid students. Students agreed, however, that they would continue to use paper to solve problems and technology to compare and verify their answers. Therefore, technology in education can be implemented in the classroom to foster innovation and future-ready education and learning. Additionally, it compels students to acquire essential 21st-century skills.

Acknowledgement

This research was funded by Mr. Mohamed Shafieek Sultan Mohamad and Mrs. Mazidah Jamaldin, the Managing Directors of Labtech International (M) Sdn Bhd.

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