Effects of Learning Using EDPUZZLE Interactive Video Application on Students' Interest, Engagement and Achievement in Science Subjects

Vinohthini Ramasany[1], Norah Md Noor*[2] and Norasykin Mohd Zaid[2]

[1] Sekolah Kebangsaan Parit Lapis, Batu Pahat, Johor, MALAYSIA
[2] Universiti Teknologi Malaysia, Johor, MALAYSIA
**Corresponding author: Norah Md Noor (norah@utm.my)*

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ABSTRACT

This study was conducted to identify the effect of learning methods using the Edpuzzle interactive video application on students' interest, engagement, and achievement in science subjects. The purposive sampling technique was used in this study to select the sample. A total of 40 students were selected as a sample in this study. The selected sample is students from a primary school in the Batu Pahat Johor district. The sample was selected from two classes of year 2 students who had similar ICT backgrounds in primary school. Pre-tests, post-tests, checklists, and questionnaires were used as instruments in this study. This study's objectives are to identify the effectiveness of the use of the interactive video application, Edpuzzle in increasing students' interest, engagement, and achievement in science subjects. The data were analysed through inferential statistics using Statistical Package for Social Science (SPSS) software. The data analysis results show significant differences in the level of interest, engagement, and achievement of primary school students in science subjects when using the EdPuzzle application. This suggests that the use of interactive video in the classroom has a promising approach to improve the quality of teaching and learning (TnL) among science teachers. However, considering the limitations of the research, specifically in relation to the context and the period of application, more studies are needed with different methodological approaches and in extended periods and samples.

Keyword
Interactive video, Edpuzzle, students' interest, students' engagement, students' achievement, Science

1.0 Introduction

The effective implementation of the Teaching and Learning process (TnL) is the main goal of education in Malaysia. According to the aspirations set by the Ministry of Education Malaysia (MOE), the TnL process conducted according to the Secondary School Standard Curriculum (KSSM) and Primary School Standard Curriculum (KSSR) is effective 21st-century learning from 2014 to now (Ainun, 2017). MOE's aspirations are in line with the "National Education Transformation" outlined in the "Malaysian Education Development Plan" (PPPM, 2013-2025). The introduction of Information and Communication Technology (ICT) innovation is a new initiative in the second wave of PPPM (2016-2020). Therefore, to realise this effort, MOE has examined new opportunities to enhance the use of ICT in teaching and learning (TnL) by further strengthening the basic knowledge of ICT in the education system in Malaysia. The Ministry has also identified strategies following several international research related to the integration of Information and Communication Technology in TnL to improve high-level thinking skills (HOTS) among students.

According to Hassan (2007), in order to realise the requirements of the Ministry of Education Malaysia, teachers should be responsible for generating first-class human capital and determining the future of students. Therefore, TnL methods and strategies used by teachers should be creative and innovative both in and out of the

classroom; learning is fun and effective for students if teaching methods are varied and adapted according to course content and the needs and abilities of students in the classroom. TnL materials can enable the use of multiple senses, making this teaching process effective. The use of various learning mediums and applications also helps achieve the learning goals the teacher sets.

Therefore, it is the duty and responsibility of teachers to plan student-centred TnL activities to apply the characteristics of 21st-century learning in the hearts of their students. Effective methods and strategies are important factors in helping students improve their ability to master the required knowledge and skills. New TnL techniques and strategies and creative and interesting TnL planning can help in enhancing students' understanding of a subject. Traditional teaching methods need to shift to student-centred teaching, and lesson planning should be innovative and focus on the development of thinking skills and technological skills. The use of different teaching strategies during TnL is an initiative to diversify teachers 'teaching methods.

2.0 Literature Review

The goal of primary school Science classes is to allow students to learn about themselves and their environment through real-life experiences and scientific research, to acquire scientific knowledge and skills, and to enable students to apply this knowledge and skills based on scientific attitudes and values in daily lives to make judgments and solve challenges. The curriculum also strives to establish a solid scientific basis in order to prepare pupils for secondary school science classes.

Science education in Malaysia promotes a science and technology culture by emphasising the development of competitive, dynamic, strong, and resilient individuals capable of mastering scientific knowledge and technological competence (Paripurany Boopalan, 2015). In general, students are encouraged to employ science process skills, thinking abilities, and thinking strategies for meaningful learning through the investigative learning process in primary school (Paripurany Boopalan, 2015). With the implementation of the new curriculum, this effort is intensifying.

Teachers and students in science subjects are not restricted to classrooms or laboratories. In fact, depending on the topic being taught, science sessions can be successfully held on school grounds, parks, assembly places, or even in canteens. The fundamental goal is to involve students in the learning process by allowing them to act in this way. Pupils of the twenty-first Century are referred to as the digital generation since they live their lives digitally daily (Pearlman, 2010; Tapscott, 2018). Outside of school, they smoothly use the internet, text messaging, social networking, and multimedia. As a result, kids should be provided with the opportunity to stay up with technological advancements in their academic lives to boost their enthusiasm and participation in science study. Differences in students' lifestyles and learning styles lead to a loss of interest and, eventually, a drop in their engagement (Blackmore, 2008).

According to the findings of a study by Siti Hendon Sheikh Abdullah (2016), a few exceptional teachers in the study were able to build an effective 21st-century learning environment. In Science class, technological tools are well-used, and students interact and collaborate to complete tasks in science learning. According to UNESCO (2015), the impact of information and communication technology (ICT) on daily life has been demonstrated in a variety of disciplines, particularly in primary schools. ICT is not only used as a learning or information tool in elementary schools, but it also helps to improve the teaching and learning process (June, Aizan Yaacob & Kheng, 2015). Students can use ICT to improve pedagogical practises and complete assigned work while boosting their learning abilities, knowledge, and motivation (Jacobs, 2014).

Video is one of the ICT-based mediums that is well-suited to educational purposes. It creates a multi-sensory learning environment that can help pupils remember things better (Syed, M. R., 2001). Previous research has investigated whether the simultaneous visual and spoken presentation of information in video affects learning outcomes, but the results aren't promising. The videos used in the study were not interactive. Some argue that video can improve the quality of learning outcomes because of its clear and engaging presentation. For example, Nugent (2012) compared several components of video presentation and generally found that information conveyed through a combination of visual and audio leads to better memory. Although research shows that instructional videos increase students 'interest in content and learning motivation, non -interactive videos can reduce the potential for this effect.

Interactive videos in teaching and learning inspire and encourage maximum student engagement. According to Squires (2008), interactive video-based learning systems can help constructivist learning environments. Interactive video removes barriers by giving learners control over the learning process and direction in developing self-competence for learning goals, resulting in improved performance. Past studies have shown that students prefer interactive video over linear video (Dalton, D.W. & Hannafin, M.J. 2007). Students will learn more effectively from interactive videos than from non-interactive or linear ones.

According to Julinar and Yusuf (2019), there are various reasons why students love the interactive video app. Students taught with interactive video were able to study wherever and whenever they wanted, watch it multiple times, and, most importantly, they were able to gain preliminary information about the content to be presented by the teacher, giving them confidence and motivating them to actively participate in brainstorming sessions. This shows that interactive video can activate students' pre-existing knowledge, which is crucial in the early stages of knowledge formation. In addition, Yesyika's (2017) study on the effectiveness of EdPuzzle as one of the interactive video Apps in improving the English writing skills of high school students proved that EdPuzzle media is more effective than other conventional media.

Edpuzzle equips with an interface design that is very simple and user-friendly. This is a video platform designed to assist teachers in increasing student engagement and enhancing their learning effectiveness through video elements. Among the advantages is that this application can collect data while students watch and interact. It saves teachers' time. According to Swenson (2016), this free application can be downloaded and used by teachers and students easily. According to Van Horn (2016), teachers can produce and upload their own videos, use other teachers' videos, or select videos from YouTube, Khan Academy, LearnZillion, and so on. Teachers can edit a video if it is too long, insert sound recordings into the produced video to explain their own way, and even insert quizzes into the video (Moeller, J., 2016).

Students' interest in science has always been a hot topic of discussion among the public. It has been proven that most students have difficulty understanding science when science is taught (Lindahl, 2003; Lyons, 2006; Jenkins & Nelson, 2005). Dawson (2000) argues that the content of science taught in schools has not changed much over time, whereas students' interests have changed significantly. Interest in a subject increases students' opportunity to strive to increase their knowledge and understanding of a subject as they tend to sacrifice time, effort, and energy to learn the required content.

Much research shows that the increase in students' interest in a subject can significantly impact students' positive achievement in terms of their affective and cognitive engagement with the subject's content. For example, increased student interest simultaneously increases students' intrinsic motivation and engagement in learning (Schraw, Flowerday, and Lehman, 2001) while improving their achievement in the subjects taught (Harackiewicz et al., 2014). Low levels of classroom engagement cause negative effects on performance and the learning process. In this context, Freeman et al. (2014) demonstrated that good teaching and learning activities in the classroom result in student engagement.

Teachers should transform their traditional approaches to modern approaches in line with current technological developments. Teachers need to choose the appropriate approach or method by considering their students' level of knowledge, abilities, and background. Teachers should plan activities that interest students and, in turn, allow them to be actively involved in the TnL process. For example, teachers may choose to use interactive videos such as EdPuzzle as an alternative to the traditional teaching methods used. This is supported by Fah Campbell's (2015) study, which found that teaching with ICT aids is a significant and positive teaching style in improving the learning achievement of science subjects when compared to traditional face-to-face classes.

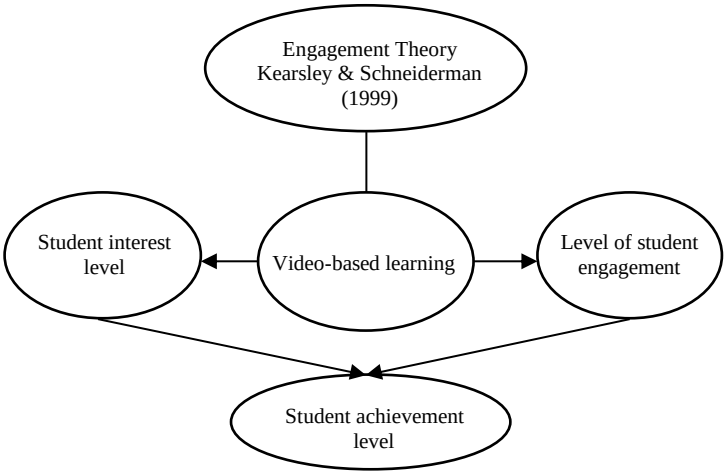

Figure 1 Research Conceptual Framework

Engagement Theory is a technology-based teaching and learning framework. Technology, according to Kearsley and Schneiderman, can help people engage in ways that might otherwise be difficult. The interactive video is utilised in this study to boost students' interest, engagement, and accomplishment in science topics after taking into consideration their history and motivation. Students can actively participate in learning activities by interacting with the interactive video application. In principle, technology can facilitate engagement in ways which are difficult to achieve in conventional teaching and learning. Therefore, engagement theory is intended to be a conceptual framework for technology-based learning and teaching" (Kearsley & Schneiderman, 1999).

Interest means the feeling of wanting to learn more deeply about something or be involved in something. The term interest in this study means the tendency to want to learn while using the interactive video application that is EdPuzzle when the teaching and learning process (Tnl) is controlled. This engagement theory is based on the idea that when students get meaningful lessons and have high levels of motivation and interest in activities, they learn more effectively, tend to store information, and can transfer it to other contexts.

3.0 Research Objective

Three main objectives have been set in this research namely:

(a) Identify students' level of interest in the subject of science when using the EdPuzzle interactive video application.
(b) Identify the level of student engagement in science subjects when using the EdPuzzle interactive video application.
(c) Identify the effectiveness of the use of EdPuzzle interactive video application on student achievement in science subjects.

4.0 Research methodology

A quantitative approach and quasi-experimental design (control group and treatment group) were chosen in this study by the researchers. Study data were collected by defining several procedures as shown in Figure 2 below:

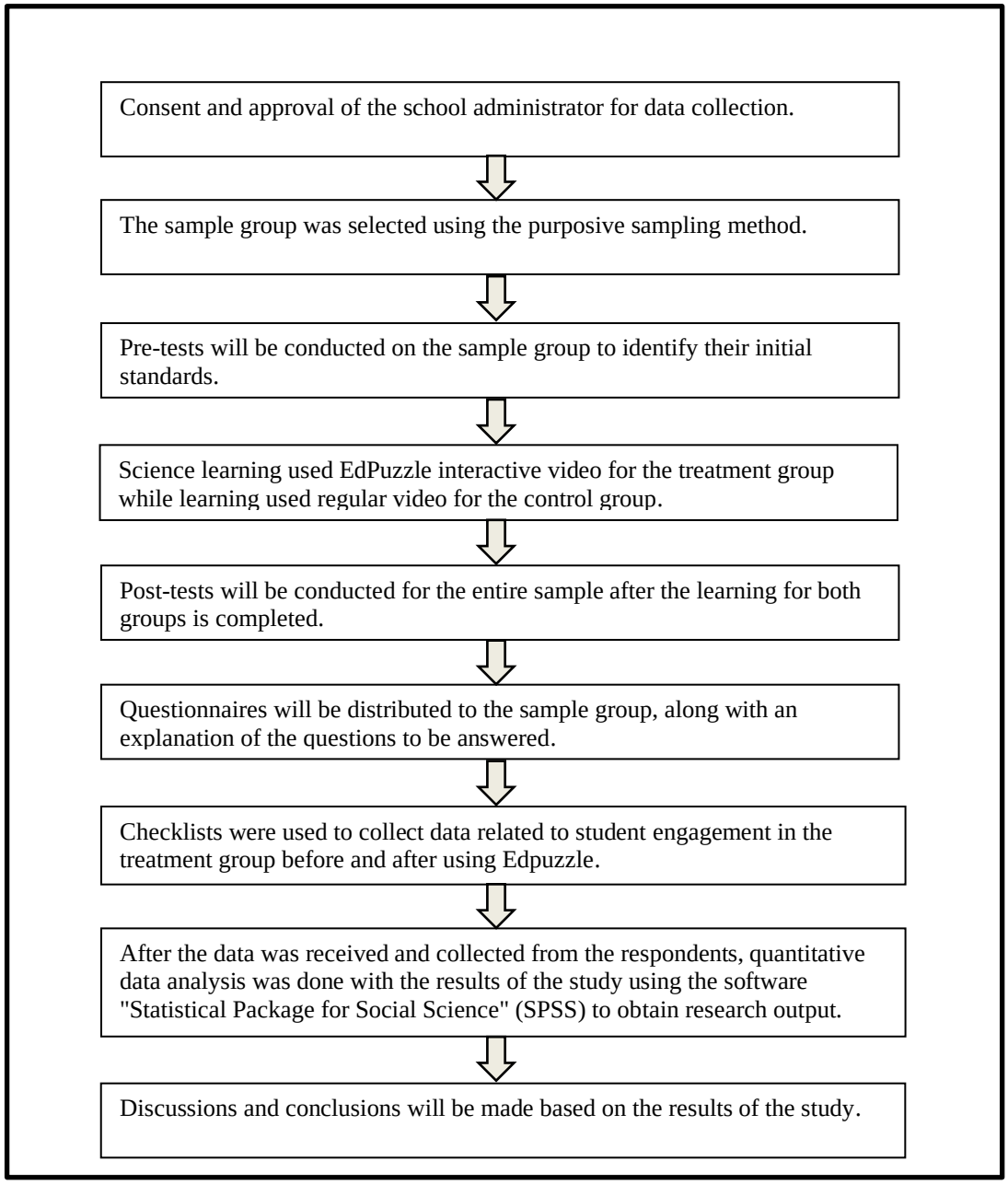

Figure 2 Research procedure flow chart

A Science topic, Animals under the theme of Life Science from the Year 2 Science Content and Assessment Standard Document (DSKP), was selected for this study. The control group will be taught using a common lecture-based video from Youtube, while the treatment group will be taught using the same lecture video constructed into an interactive video through the EdPuzzle application. Multiple-choice questions, additional notes and hints were embedded in between the lecture video to allow interaction between students and the learning content.

Table 1 Themes, titles, content standards, division of subtopics by week and video links were used in the study.

Subject	:	Science Year 2 *(Sains Tahun 2)*
Theme	:	Life Science *(Sains Hayat)*
Title	:	Animal *(Haiwan)*
Standard content	:	4.1 Animal breeding and growth *(Pembiakan dan tumbesaran haiwan)*
Subtopic division by week		
Week 1	:	4.1.1 State how animals reproduce. *(Menyatakan cara haiwan membiak).* 4.1.2 Classify animals based on means breeding *(Mengelaskan haiwan berdasarkan cara pembiakan)*
Youtube Link	:	https://www.youtube.com/watch?v=3uXOepKrqhQ https://www.youtube.com/watch?v=6JOaBA2EhoU
EdPuzzle Link	:	https://edpuzzle.com/media/6041dc6f3cf98542522b3211 https://edpuzzle.com/media/6041dd6218d11e424b508f74
Week 2	:	4.1.3 Explain with examples of animals laying many eggs and laying few eggs. *(Menjelaskan dengan contoh haiwan bertelur banyak dan bertelur sedikit).* 4.1.4 Explain with examples that animals give birth to many children and few children. *(Menjelaskan dengan contoh haiwan melahirkan anak yang banyak dan anak yang sedikit).*
Youtube Link	:	https://www.youtube.com/watch?v=BMtxYdbcgww https://www.youtube.com/watch?v=700v_P6hNYk
EdPuzzle Link	:	https://edpuzzle.com/media/6041deb7e84c914257c306e6 https://edpuzzle.com/media/6041e72cf6506e4269955121
Week 3		4.1.5 Record changes in animal growth by observing the life cycle of animals. *(Merekod perubahan tumbesaran haiwan dengan memerhati kitar hidup haiwan).*
Youtube Link	:	https://www.youtube.com/watch?v=_fCWZAkhE_w&t=9s https://www.youtube.com/watch?v=CBkJITwJegw
EdPuzzle Link	:	https://edpuzzle.com/media/6041eaea322df6426bf2118e https://edpuzzle.com/media/6041f547255b5642bf0da217
Week 4		4.1.6 Explain with examples the offspring of animals that resemble their parent and that do not resemble their parent. *(Menjelas dengan contoh anak haiwan yang menyerupai induknya dan yang tidak menyerupai induknya).*
Youtube Link	:	https://www.youtube.com/watch?v=CBkJITwJegw
EdPuzzle Link	:	https://edpuzzle.com/media/6041dc0a1261f64259ba6fc7

4.1 Research Sample

The purposeful sampling technique was used in this study to select the sample. The selected sample is students from a primary school in the district of Batu Pahat, Johor. A total of 40 students were selected as a sample in this study. The sample was selected from year two classes who had similar ICT backgrounds in primary school. Two groups of Year 2 students were selected; one group was the control group, while the second group was the treatment group.

4.2 Research instruments

There are three research instruments used in this study, namely:

4.2.1 Pretest and post-test

For answering the research questions, pre-test and post-test were distributed to the sample group selected in this research. The main purpose of the pre-test and post-test was to identify the effectiveness of interactive video through EdPuzzle on the interest and engagement of primary school students in science subjects. The study sample was tested based on the learning content and topics studied with the help of interactive videos and regular learning videos. An experienced Science teacher validated both tests to confirm that the questions in the test were suitable for year two students. The answer scheme for both tests was provided as a scoring standard for the uniformity of marks given in both tests.

4.2.2 Questionnaire

The questionnaire designed in this study consisted of two parts. Part A is about the respondents' demographic information, and Part B includes items consisting of 2 constructs based on the study's objectives, namely student interest and student engagement after using Edpuzzle in Science subjects. All items in the questionnaire for this study were adapted and modified from the study conducted by Muhammad Aiman (2018) based on a 4 scales consisting of 1 : highly disagree, 2 : disagree, 3 agree, 4: highly agree.

Some of the items used in the questionnaire to identify the level of interest are as follows:

- I feel energised after following today's learning. 1
- I hope the teacher will use many more videos to teach the next Science topics.

Some of the items used in the questionnaire to identify the level of engagement are as follows:

- I will re-watch the video given by the teacher to get a better understanding.
- I always focus when watching videos so that I don't miss information even though the topics taught contain too many facts.

4.2.3 Checklist

Observations were conducted on 5 students randomly selected from the treatment group to identify their level of interest before and after the use of interactive video using a checklist. The checklist consists of two constructs, namely the interest construct and the engagement construct, where each construct contains five items to identify the level of interest and engagement of students when using EdPuzzle application in science learning.

Some of the items used in the checklist to identify the level of interest are as follows:

- Students often ask questions.
- Students concentrate during Teaching and Learning (TnL).

Some of the items used in the checklist to identify the level of engagement are as follows:

- Students can answer questions correctly and accurately.
- Students respond when the teacher asks any questions.

4.3 Pilot study

Before the actual study was conducted, the researchers had conducted a preliminary study known as a pilot study. A pilot study was conducted to test the validity and reliability of the items in the questionnaire and checklist before the actual study was conducted. This aims to identify whether the instructions, structure of the questionnaire and checklist, appropriateness of word usage and sentence structure used are appropriate to the level of understanding of the respondents.

Cronbach's alpha is a test commonly used to assess the reliability or internal consistency of a set of scales or test items. The Cronbach's alpha reliability coefficient is usually in the range of values of 0 and 1. The closer the value of the coefficient to 1.0, the greater the internal validity or consistency of the item in the scale.

To conduct this pilot study, a questionnaire was distributed to year three students in the primary school who are approximately in the age range of the selected study respondents. The ten students selected for this pilot study had ICT background characteristics similar to the actual study sample. A pilot study's results found that the Cronbach Alpha coefficient is 0.971. The Cronbach Alpha coefficient of 0.971, which is close to the value of 1, indicates that the items used in this questionnaire have high reliability and are suitable for use in this study.

4.4 Data analysis

At the end of data collection, pre-test and post-test papers, checklists as well as questionnaires were thoroughly checked for completeness, compiled, and summarised by the researcher. After the data collection process, all the raw data collected will be further analysed through inferential statistics using Statistical Package for Social Science (SPSS) software. The data will then be summarised and interpreted into meaningful data for the study. Inferential statistics were used in this study to identify the effectiveness of the use of EdPuzzle in increasing the level of interest and engagement of primary school students in science subjects. Table 2 shows a summary of the research questions, types of instruments and methods of analysis used by the researchers to discuss the research findings.

Table 2 Summary of research questions, instruments, and methods of analysis

Bil	Research questions	Instruments	Methods of analysis
1	Are there differences in the level of student interest in science subjects when using the EdPuzzle application?	Questionnaire Checklist	Mann-Whitney U Test
2	Are there differences in the level of student engagement in science subjects when using the EdPuzzle app?	Questionnaire Checklist	Mann-Whitney U Test
3	Is the use of EdPuzzle application effective in improving student achievement in science subjects?	Pre-test and post-test	Mann-Whitney U Test

5.0 Research Findings

5.1 Data analysis for research questions 1

The first research question was studied using a questionnaire and checklist instrument. Questionnaires were answered by students in the treatment group and control group after the intervention was completed, while a checklist instrument was used during the observation. Observations were conducted on five students randomly selected from the treatment group to identify their level of interest before and after the use of interactive video.

The first construct studied through the questionnaire was the student interest construct. This research tends to find out whether the use of Edpuzzle can increase students ’interest in science subjects. Therefore, the data analysis was made based on the research hypothesis as stated below, namely:

H0: There was no significant difference in student interest between the treatment group and the control group after the use of EdPuzzle.
H1: There was a significant difference in student interest between the treatment group and the control group after the use of EdPuzzle.

Table 3 Overall mean scores of the control group and treatment group for the interest construct in the questionnaire.

Group	Overall Mean
Control Group	2.91
Treatment Group	3.53

Table 4 Mann Whitney U test findings for interest constructs in questionnaires

	Item 1	Item 2	Item 3	Item 4	Item 5
Mann-Whitney U	105.000	129.000	92.000	82.000	119.000
Z	-2.822	-2.091	-3.286	-3.378	-2.367
Asymp. Sig. (2-tailed)	.005	.037	.001	.001	.018

The Mann-Whitney U test was conducted to compare the level of student interest in the control group and the treatment group after the treatment group finished following the learning using the Edpuzzle application, while the control group followed the learning through regular learning videos.

Based on Table 4, the mean score of the treatment group for all five items in the interest construct was higher than the mean score of the control group and the results of Mann Whitney U test analysis, as in Table 4 above, showed the p-value for all five items in the interest construct was lower than the value $\alpha = 0.05$. Therefore, the null hypothesis is rejected. This indicates that there is a significant difference in student interest between the treatment group and the control group after the use of EdPuzzle.

Findings from this questionnaire are supported by findings from a checklist for observations conducted by teachers on five students in the treatment. The checklist is used to note whether a trait is present. The teacher will check "Yes" if the trait as listed in the checklist items were present or "No" if not. Table 5 shows the findings from the analysis of teacher observation data on the level of student interest in the treatment group before and after the use of Edpuzzle.

Table 5 Analysis of teacher observation data on the level of student interest in the treatment group before and after the use of Edpuzzle.

Observation	Item 1		Item 2		Item 3		Item 4		Item 5	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Before	1	4	1	4	0	5	0	5	1	4
After	5	0	4	1	5	0	5	0	5	0

** Total 5 students being observed.*

The results of the teacher's observation found that almost all students responded positively after the intervention was carried out. It shows that the level of students 'interest in learning increased after the use of Edpuzzle. This further reinforces the findings from the questionnaire that there is a significant difference in the level of student interest when using the EdPuzzle application in science subjects compared to the control group who only used non - interactive learning videos.

5.2 Data analysis for research questions 2

The second construct studied through the questionnaire was the student engagement construct to determine whether using Edpuzzle could increase student engagement in science subjects. Therefore, data analysis was made based on the following research hypotheses:

H_0 : There were no significant differences in student engagement between the treatment group and the control group after the use of EdPuzzle.

H_1 : There were significant differences in student engagement between the treatment group and the control group after the use of EdPuzzle.

Table 6 Overall mean scores of the control group and treatment group for the engagement construct in the questionnaire.

Group	Overall mean
Control Group	2.84
Treatment Group	3.54

Table 7 Findings of the Mann Whitney U test for the construct of engagement in the questionnaire

	Item 1	Item 2	Item 3	Item 4	Item 5
Mann-Whitney U	92.000	109.000	93.000	97.000	57.000
Z	-3.245	-2.672	-3.178	-2.985	-4.368
Asymp. Sig. (2-tailed)	.001	.008	.001	.003	.000

The results of the Mann-Whitney U test for the engagement construct also showed significant differences in the level of student engagement for science subjects when using the EdPuzzle application. Based on Table 6, the mean score of the treatment group for all five items in the engagement construct was higher than the mean score of the control group, and the results of Mann Whitney U test analysis from Table 7 above showed the p-value for all five items in the engagement construct was lower than the value of $\alpha = 0.05$. Therefore, the null hypothesis is rejected. This indicates that there are significant differences in student engagement between the treatment group and the control group after the use of EdPuzzle.

Findings from this questionnaire are supported by findings from a checklist for observations conducted by teachers on five students from the treatment group to examine the level of student engagement before and after using the Edpuzzle application in science subjects. Table 8 shows the findings from the analysis of teacher observation data on the level of student engagement in the treatment group before and after the use of Edpuzzle.

Table 8 Analysis of teacher observation data on the level of student engagement in the treatment group before and after the use of Edpuzzle.

Observation	Item 1		Item 2		Item 3		Item 4		Item 5	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Before	2	3	1	4	1	4	1	4	2	3
After	5	0	5	0	5	0	5	0	5	0

The analysis results from the checklist showed that all students responded positively after the intervention was conducted. This further reinforces the findings from the questionnaire that there are significant differences in the level of student engagement when using the EdPuzzle application in science subjects.

5.3 Data analysis for research questions 3

The third research question was studied using pre-test and post-test instruments. Pre-tests and post-tests were conducted for both groups of samples selected in this research. The main purpose of the pre-test and post-test was to identify the differences between the level of achievement of the treatment group and the control group after the use of EdPuzzle in Science subjects. Therefore, the data analysis was made based on the research hypothesis as set out below, namely:

H_0: There was no significant difference in achievement between the treatment group and the control group after the use of EdPuzzle

H_1: There was a significant difference in achievement between the treatment group and the control group after the use of EdPuzzle.

Table 9 shows the number of respondents (N) and the mean scores of the control and treatment groups in the pre-test and post-test.

Test	Group	N	Mean score
Pre-test	Control Group	20	68.15
	Treatment Group	20	72.20
Post-test	Control Group	20	76.50
	Treatment Group	20	86.65

Table 10 Mann Whitney U test findings for pre-test and post-test score differences between the control group and Treatment Group

	Differences in test scores
Mann-Whitney U	75.000
Z	-3.390
Asymp. Sig. (2-tailed)	.001

The Mann-Whitney U test was conducted to compare the level of student achievement in the control group and the treatment group after the treatment group finished following the learning using the Edpuzzle application, while the control group followed the learning through regular learning videos.

The results of this test indicate that there is a significant difference in the level of student achievement when using the EdPuzzle application. Based on Table 9, the mean score of the treatment group post-test is higher than the mean score of the control group. The results of Mann Whitney U test analysis, as in Table 10 above, show the p-value for the difference of pre and post-test scores of the control group and treatment group is lower than the value $\alpha = 0.05$. Thus, the null hypothesis is rejected. It shows significant differences in the level of student achievement when using the EdPuzzle application.

6.0 Discussion

6.1 The effectiveness of the use of Edpuzzle in increasing students' interest in science subjects.

The results showed that the mean value of the treatment group for the interest construct in the questionnaire was higher than the mean value of the control group. This means that learning through interactive videos, primarily through Edpuzzle, has positively impacted students' interest in science subjects. This finding is in line with the opinion of Jonassen et al. (2013), who stated that interactivity is considered vital because it can positively affect the effectiveness of learning. Improving interactivity in the learning environment can strengthen the concepts learned and provide compelling learning opportunities while increasing students' interest in the learning activities. A study by Yesyika (2017) on the use of Edpuzzle in increasing the interest of high school students in English subjects also gave very positive results, and at the same time, it proved that Edpuzzle media turned out to be more effective than other conventional media.

This study's findings align with the findings of a study conducted by Weston (2019) and Agius et al. (2014) that found interactive videos can help engage students to pay full attention to learning materials through active interaction between students and instructional videos. This statement is also supported by a study conducted by Julinar & Yusuf (2019), where students taught using Edpuzzle can learn anywhere and whenever they like, watch it repeatedly, and, most importantly, can gain initial information about the content to be presented by the teachers so that they are very confident and have an interest that triggers curiosity in the teaching and learning sessions conducted.

6.2 The effectiveness of the use of Edpuzzle in increasing student engagement in a science subject.

The findings of the study, obtained through questionnaires and observations for the treatment group engagement construct, showed a relatively high mean value compared to the control group and a positive p-value in the non-parametric tests conducted. It turns out that using the Edpuzzle application is very effective in increasing student engagement in science subjects. Students have shown excellent engagement in the TnL sessions conducted. A study by Oropeza, Sanchez, and Villagomez (2015) stated that using interactive video applications has produced better teaching results than other instructional learning aids. Findings from a study conducted by Povey (2016) also showed a positive perception of the use of the Edpuzzle learning application because it can maximise student engagement in learning compared to the use of other learning materials that are one-way or non-interactive and because of its ability to stimulate students' cognitive development.

The results of observations conducted on the treatment group also found that after the use of Edpuzzle in science learning, students are more responsive when teachers ask questions, actively engage in learning, and can answer questions asked by teachers correctly and accurately. This proves that interactive video applications such as Edpuzzle can positively impact student engagement in the TnL sessions conducted. These findings are supported by a study conducted by Stefania Pinnelli et al. (2016). They stated that when the Edpuzzle application is used in learning, students are thrilled and enthusiastic about completing the task independently with minimal help from the teacher. This shows that students are very committed to the tasks given, and indirectly, it increases the engagement of students in the TnL sessions conducted.

Findings from the study conducted by Surya Pulukuri & Binyomin Abrams (2020) further reinforce the findings of this study. They noted that the feedback on the learning conducted and the engagement of students in learning using Edpuzzle was very positive. Luki Emiliya and Muhammad Dzulfiqar (2021) in their study, focused on Edpuzzle application-assisted learning. They also proved that active student engagement had been seen in learning activities they do at home, such as watching Edpuzzle videos, asking questions related to learning videos, giving and so on. Students also show enthusiasm for performing and delivering assigned assignments. As a result, the Edpuzzle app is quite effective for teaching students to pay close attention to the required video by integrating questions into it.

6.3 The effectiveness of the use of EdPuzzle application on student achievement in a science subject.

This study supports previous studies examining the effectiveness of interactive videos in learning because interactivity in learning materials can be a very valuable criterion in increasing student interest, engagement, and achievement. Indahwati's (2020) study, which focuses on interactive video-based learning, has shown very positive findings. In his study, he found a significant improvement in student achievement and engagement after using interactive videos in learning, where students were given the autonomy to choose the desired time, place, and learning environment according to the learning materials presented.

With this, it can be concluded that Edpuzzle has the advantage of giving students more time to concentrate on learning because the material given to them can be accessed in or outside the classroom with their own devices. They will be attracted to the material contained in Edpuzzle because of its exciting features. The results of a study conducted by Febri (2018) showed that the use of Edpuzzle can improve students' listening skills, as evidenced by higher post-test results than pre-test.

The use of Edpuzzle can increase students' interest, engagement, and achievement in science learning. In this study, technology plays an essential role in the learning process. Not only does it allow students to learn in a new environment, but technology also attracts students to the learning materials provided and makes them more active in the classroom. Brown et al. (2015) concluded that technology provides important opportunities for learning real-life activities and problem-solving skills. Using interactive videos through Edpuzzle also helps students pay full attention and understand a concept better. Studies show that using interactive videos can better retain students' attention (Mischel, 2018). When students' levels of interest and engagement rise, it indirectly helps to raise student achievement.

7.0 Conclusion

The findings of this study suggest that Edpuzzle enhances students' interests while also assisting them in becoming more active in the classroom. The use of Edpuzzle in this subject has a favourable impact on student's

knowledge and skills. Students said that the desire to improve their attention, focus, interest, and engagement in science greatly motivated them to learn more. The findings of this study show that using interactive video in the classroom improves the quality of teaching and learning. However, considering the limitations of the research, specifically in relation to the context and the period of application, more studies are needed with different methodological approaches and in extended periods and samples.

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