ISSN: 2289-7844 | e-ISSN: 0127-9750
DOI: https://doi.org/10.37134/jictie.vol10.1.8.2023

Journal of ICT in Education (JICTIE)
Volume 10, Issue 1, Pages 91-103, 2023

Research Article

A Study on The Effectiveness of Direct Current Video (*e-DC*) Improving Learning Outcomes of Students and Motivation Towards Learning Physics

Nurazlin Ahmad[1*], Fatin Amirah Ahmad Shukri[2], Azuraida Amat[1], Nur Azalia Ahmad[3], Syarifah Norsuhaila Syed Mahmud[3]

[1]*Department of Physics, Centre for Defence Foundation Studies, Universiti Pertahanan Nasional Malaysia, Kuala Lumpur, Malaysia; nurazlin@upnm.edu.my, azuraida@upnm.edu.my*
[2]*Department of Mathematics, Centre for Defence Foundation Studies, Universiti Pertahanan Nasional Malaysia, Kuala Lumpur, Malaysia; fatin@upnm.edu.my*
[3]*Department of Physics, Kolej Matrikulasi Pahang, Pahang, Malaysia; azalia@kmph.matrik.edu.my, norsuhaila@kmph.matrik.edu.my*

Received: 12 March 2023; Revised: 17 April 2023; Accepted: 12 May 2023; Published: 10 June 2023

**corresponding author*

Abstract

COVID-19 is seen as a transformational agent for the widespread implementation of online learning at the school and higher education levels. A conducive learning environment, with the help of digital technologies, is essential to be incorporated into our learning process to enhance student's understanding of each course taken. The topic of Direct Current, in electricity, for foundation and matriculation level, is quite dense with formulas of electric current, resistance, and resistivity including the analysis of a simple Direct Current circuit. Therefore, we proposed the video of interactive notes (*e-DC*) which aims to improve students' understanding of the topic of Direct Current (DC). The notes created contain terminologies, formulas, and a brief description of electric parameters such as electric current, resistivity, and conductivity. The current study was carried out among 183 pre-university students to highlight the effectiveness of the *e-DC*. To achieve the objective of the study, two pre-university centres namely the Centre for Defence Foundation Studies, UPNM, and Kolej Matrikulasi Pahang (KMPh) were selected through convenient sampling. The null hypothesis was that there would be no difference in the achievement between the students' scores using *e-DC*. The pretest-posttest comparison was used to test the effectiveness of the *e-DC*. The result indicated more improvement between their pre-test and post-test data causing the null hypothesis to be rejected. The findings of the study also found that most students (96%) stated their agreement that the learning process becoming more engaging and fun with the use of *e-DC* and students are motivated to learn Physics.

Keywords: online learning, interactive video lecture, direct current, Physics, motivation, achievement.

INTRODUCTION

In Merriam Webster Dictionary, motivation is generally regarded as a state of being ready to take action or work, a force or influence that induces someone to do something (Dictionary, 2002; Gedera, Williams, & Wright, 2015). Motivation is an important component in determining how many students will be learning from a learning activity or how much to absorb the information presented to them. Motivation acts as fuel to ignite abilities and turn them into achievements (McCoach & Flake, 2018). Students who are motivated to learn something will use higher cognitive processes in learning the material so that students will absorb the material better (Riswanto & Aryani, 2017). According to Muhammad (Muhammad, 2020), based on a sociocultural approach through Vygotsky's constructivism theory, students' cognitive development is influenced by environmental, social agent and community cultural factors. Therefore, learning is a development process of the cognitive system in interaction with the learning environment (Niedderer, 2001).

E-learning, which refers to the use of ICT for learning purposes, could improve the students' achievement and motivation. Students also actively participate in learning through the e-learning platform (Hoerunnisa, Suryani, & Efendi, 2019; Pallavi, Ramachandran, & Chinnasamy, 2022). There are various interactive learning tools used by educators in the classroom such as board games (Cardinot, McCauley, & Fairfield, 2022) incorporating augmented reality (AR) exploration (Hou, Fang, & Tang, 2021), interactive physics simulation like Java applets and Physics Education Technology (PhET) (Candido, Gillesania, Mercado, & Reales, 2022; Najib, Md-Ali, & Yaacob, 2022; Perkins et al., 2006), videos (Brame, 2016; Escalada & Zollman, 1997; Hatiku et al., 2022; Zollman & Fuller, 1994) presented via YouTube (Abdullah, Sastraatmadja, Lestari, Saputra, & Al Haddar, 2023; Aragoneses & Messer, 2020; Gustafsson, 2013; Irvani & Warliani, 2022) and many more. The application of short interactive videos is nowadays an important element to engage learners in the online classroom, especially when the COVID-19 outbreak. The elements that need to be considered in designing a video are cognitive load, student engagement and active learning which provide a solid base for the development and use of video as an effective educational tool (Brame, 2016). Researchers argue that through the combination of the use of audio, video and elements of graphics in the learning process, students more motivated by learning methods draw the result of a combination of sensory elements of the sense of hearing, sense of sight and sense of touch in an integrated manner.

The topic of Direct Current is quite dense with formulas all about electric current, resistors, and resistances as well as the analysis of a simple direct current circuit. Many tools are available in today's technology to assist in the communication of certain concepts. Therefore, the idea of creating short interactive notes (*e-DC*) is intended to improve students' understanding of the topic of Direct Current. In addition, *e-DC* can be easily accessed through the Edpuzzle application. Edpuzzle provides an active learning and student-centred learning environment where through real-life problems as the main

learning topic, then students are encouraged to participate in the learning process (Leu-Timmermann, 2023; Liu, Du, Zhang, & Zhou, 2019; Mawaddah, Mustofa, & Putra, 2022).

The main purpose of creating interactive notes called *e-DC* is to help students understand the topic of Physics, especially the chapter on Direct Current. The notes created are short notes that contain the meaning, formula and brief description of parameters such as electric current, resistance, resistivity, and conductivity.

In order to monitor the percentage of "viewed" *e-DC* by students, the Edpuzzle application is chosen as an online learning platform that is readily available on the internet and free to be used by lecturers and students. Besides that, the lecturers can assess students' understanding by uploading questions while students watch *e-DC* videos in Edpuzzle software. The aim of this study is to evaluate the degree to which students' interest and academic success in learning Physics are increased when using interactive Direct Current (*e-DC*) notes. The design of this study is a quantitative study in the form of a survey involving students who pursue online learning as a mode of learning. The following (see Figure 1) is a summary of the research steps carried out. Pre- and post-test are the same set of multiple-choice questions (MCQ) related to Direct Current to test students' learning outcomes before and after watching *e-DC*.

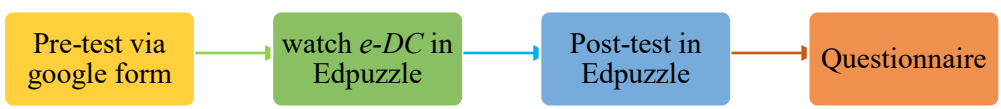

Figure 1: Research methodology summary flow chart.

INTERACTIVE NOTES *e-DC*

Figure 2(a) shows the creation of interactive notes *e-DC* embedded with animation and music uploaded to a YouTube channel. Our *e-DC* is created using free online tools such as Canva for presentation templates and paid software such as Filmora for image and sound editing. *e-DC* offers tips for solving DC circuit problems, e.g. to calculate the total resistance and to determine the current and voltage for each resistive component in a DC circuit.

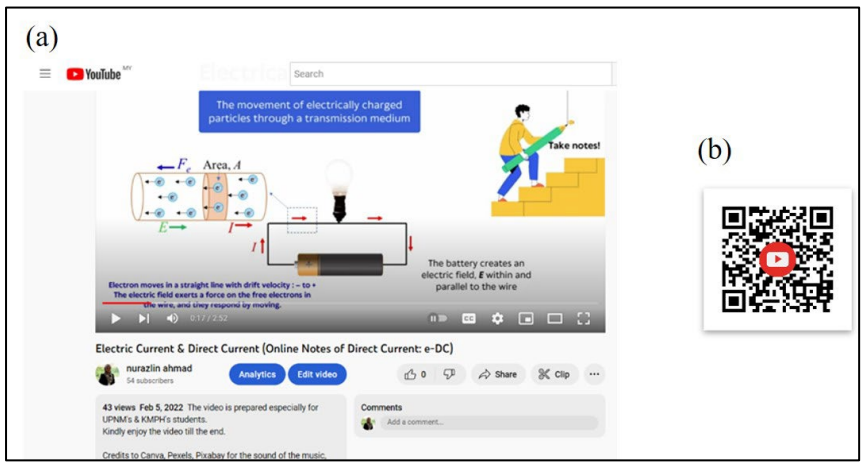

Figure 2: The innovative video e-DC (a) uploaded to YouTube channel (b) via QR code.

Research Objectives

The objectives of the study are:

1) to determine the extent to which the interactive notes of Direct Current (e-DC) increase student interest in learning.
2) to determine the extent to which the use of interactive Direct Current (*e-DC*) notes improves the learning outcomes of students.

The primary objectives of this study were to investigate the extent to which the interactive *e-DC* might motivate students to study Physics. Consequently, this study aims to verify the following research hypothesis:

1) H1. Is there any statistically significant difference between students' scores before and students' scores after using *e-DC* in the learning process?
2) H2. Is there any statistically significant difference between students indicating interest towards online learning using *e-DC* and student learning outcomes?

METHODOLOGY AND RESULTS

Method

Participants. A total of 183 participants, as shown in Figure 3, representing 23% of the foundation-level students from Universiti Pertahanan Nasional Malaysia (UPNM) and 77% from Kolej

Matrikulasi Pahang (KMPh), provided data for this study. Questionnaires were administered online at the end of a teaching semester.

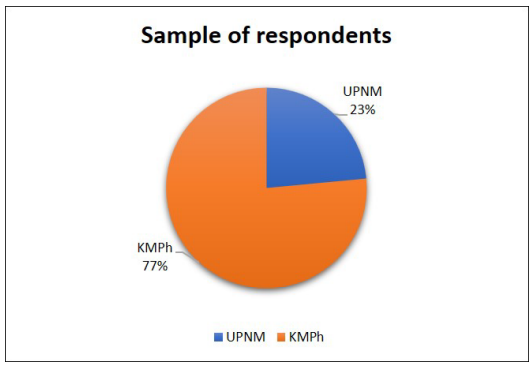

Figure 3: Percentage of respondents according to institution.

Questionnaire. The design of this study is a quantitative study in the form of a survey involving students who pursue online learning as a learning method. The questionnaire will be divided into 2 parts, namely Part A and B. Part A contains demographic information of the respondents, while Part B contains 16 related questions on students' perceptions of the effectiveness of *e-DC*.

The survey is in the form of an English-language questionnaire, which is made on a Google form so that it is easily accessible to students. There were 16 elements extracted from other works (Hassan, 2021) and the elements were adjusted according to the study context. The survey that was conducted aims to reveal in detail the motivation of students when using *e-DC* in learning Physics. The Likert scale shown in Table 1 is used to measure the attitudes, opinions, and perceptions of a person or group of people about social phenomena (Joshi, Kale, Chandel, & Pal, 2015). With a Likert scale, the variables to be measured are translated into variable indicators. The questionnaire was sent to students via the link provided, and they were asked to answer the questionnaire within a 2-week period at their convenience. A 5-point Likert scale will be used to determine the respondent's level of agreement with each statement (5-Strongly Agree; 4-Agree; 3-Natural; 2-Disagree; 1-Strongly Disagree).

Table 1: 5-Point Likert Scale.

ASSESSMENT CRITERIA	SCALE VALUE
Strongly agree	5
Agree	4
Medium/Neutral	3
Disagree	2
Strongly Disagree	1

The intrinsic and extrinsic aspect of motivation for learning Physics is tested by the elements stated in Table 2.

Table 2: A questionnaire survey in the present work.

	Questionnaires
B1	I enjoy learning using e-DC
B2	I am better at focusing on stimuli (diagrams, tables, etc.).
B3	The use of virtual notes (*e-DC*) increases my learning motivation.
B4	I believe that using the Edpuzzle application in *e-DC* when delivering Physics courses improves my knowledge and skills.
B5	I think the Edpuzzle application of *e-DC* in teaching Physics courses is very useful.
B6	I find Physics courses easier when the lecturer uses *e-DC* in teaching.
B7	I hope the lecturers of Physics courses continue to use *e-DC* in their future teaching.
B8	Using *e-DC* for Physics courses is more interesting than any other online learning method.
B9	*e-DC* makes me more interested in taking Physics courses.
B10	Virtual brief notes (*e-DC*) provided by the lecturer helped me understand the lesson more effectively.
B11	The pop quiz questions provided in the Edpuzzle app while watching *e-DC* videos helped me to better understand the topic of Direct Current.
B12	Using *e-DC* for Physics courses gives me more opportunities to interact with my classmates.
B13	Using *e-DC* for Physics courses encourages me to continue learning online by myself.
B14	The interactive virtual notes on *e-DC* are fun and engaging.
B15	I think my grades will improve by using *e-DC* for Physics courses.
B16	Overall, I am satisfied with the production of *e-DC* virtual notes in the Edpuzzle application.

Pre- and Post-test. Two tests (pre-test and immediate post-test) assessed procedural learning before and after each *e-DC* chapter using The Analysis ToolPak Excel. The test items in all 10 questions in the pre-and post-tests presented formatting tasks in MS Word that were similar to tasks in both the demonstration and interactive videos. The test items in the pre-tests and post-tests are the same.

RESULTS

Descriptive Analysis of Respondent Demographics

Among the 183 participants, 62% of the participants were female, while the remaining 38% were male, as illustrated in Figure 4(a). The majority (91%) were Malay, with the remainder being Chinese (2%), Indian (6%), and other (1%) (refer to Figure 4(b)). There 49% of respondents used a laptop as their medium of online learning, while 46% used mobile phones, as depicted in Figure 5. Out of 183 respondents, the majority (92%) think that online notes and videos are useful for their learning process. Only 1% represents disagreement with this statement.

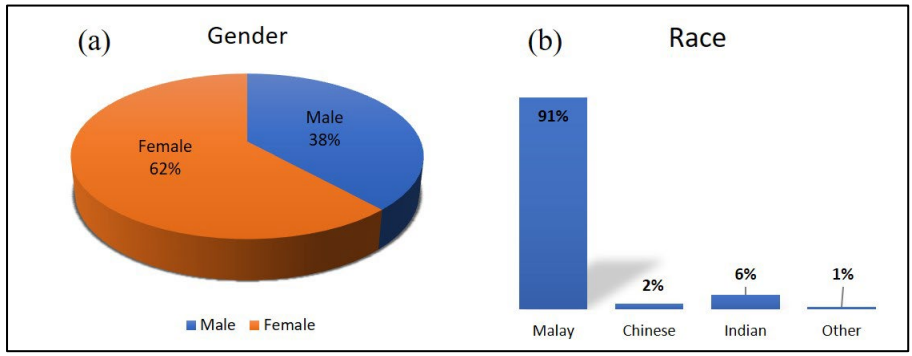

Figure 4: Percentage of respondents according to (a) gender and (b) race.

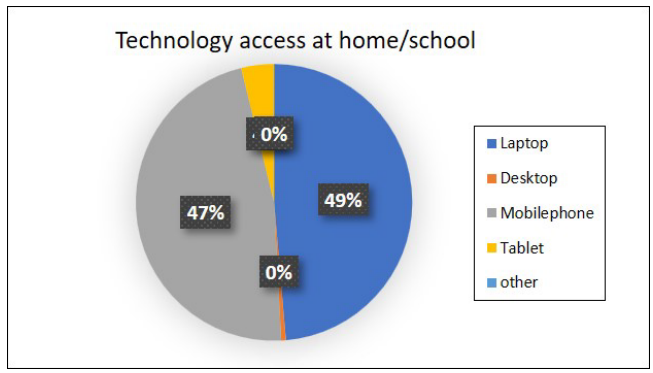

Figure 5: Gadgets used by students in online learning.

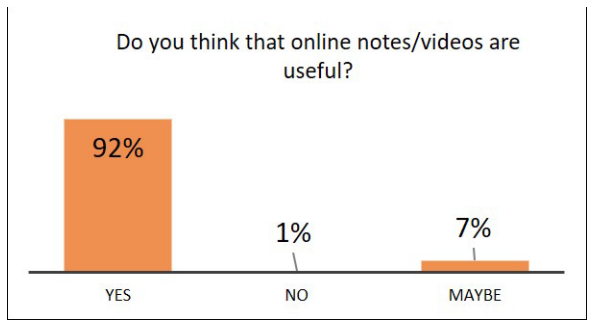

Figure 6: Finding the usefulness of *e-DC*.

Descriptive Analysis of the Effectiveness of e-DC in Teaching and Learning Towards Students Motivation and Achievement

Objective 1. To determine the extent to which the interactive notes of Direct Current (*e-DC*) increase student interest in learning.

Table 3: The mean score and frequency of *e-DC* increase in student motivation.

	Perception of students using e-*DC*	Mean	Frequency (%)
B1	I enjoy using *e-DC* for my Physics courses.	4.322	86%
B2	I am better at focusing on stimuli (diagrams, tables, etc.).	4.335	87%
B3	The use of virtual notes (*e-DC*) increases my learning motivation.	4.186	84%
B4	I believe that using the Edpuzzle application in *e-DC* when delivering Physics courses improves my knowledge and skills.	4.213	84%
B5	I think the Edpuzzle application of *e-DC* in teaching Physics courses is very useful.	4.264	85%
B6	I find Physics courses easier when the lecturer uses *e-DC* in teaching.	4.120	82%
B7	I hope the lecturers of Physics courses continue to use *e-DC* in their future teaching.	4.180	84%
B8	Using *e-DC* for Physics courses is more interesting than any other online learning method.	4.153	83%
B9	*e-DC* makes me more interested in taking Physics courses.	4.219	84%
B10	Virtual brief notes (*e-DC*) provided by the lecturer helped me understand the lesson more effectively.	4.208	84%
B11	The pop quiz questions provided in the Edpuzzle app while watching *e-DC* videos helped me to better understand the topic of Direct Current.	4.251	85%
B12	Using *e-DC* for Physics courses gives me more opportunities to interact with my classmates.	4.137	83%
B13	Using *e-DC* for Physics courses encourages me to continue learning online by myself.	4.230	85%
B14	The interactive virtual notes on *e-DC* are fun and engaging.	4.286	86%
B15	I think my grades will improve by using *e-DC* for Physics courses.	4.186	84%
B16	Overall, I am satisfied with the production of *e-DC* virtual notes in the Edpuzzle application.	4.251	85%

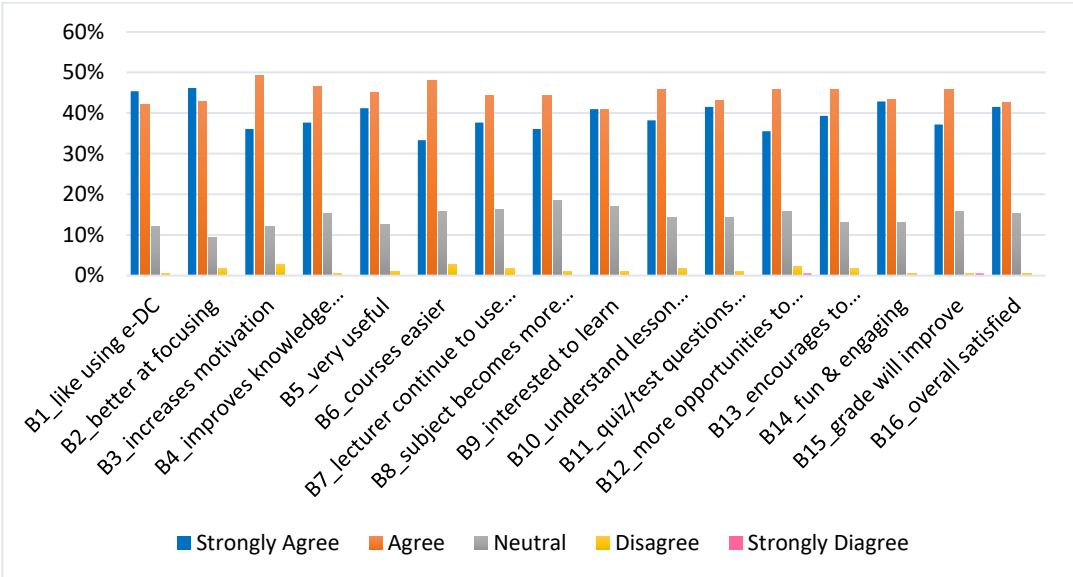

Figure 7: The respondents' motivation towards learning using *e-DC* based on the 5-Likert Scale.

The results shown in Table 3 and Figure 7 indicate that using *e-DC* is more effective and has attracted students to enjoy learning Physics. It was found that 49% of the respondents agreed that the use of *e-DC* increases their level of motivation in learning Physics. These findings also proved that if students use *e-DC*, it helps them to understand the topics clearly, and 46% of the respondents strongly agreed that *e-DC* helps with their focus. In addition, 48% of students who utilise *e-DC* state that the semester's material is easier and faster to comprehend. Direct Current in Physics is taught to students at the foundational level during the second semester, and it is quite dense with formulae and intricate concepts that would eventually bore students and cause them to lose interest. However, with the aid of *e-DC*, the learning process becomes more interesting, as 44% of respondents had agreed, and with the added interactive capabilities, students may follow the topics conveniently and at any time throughout the semester.

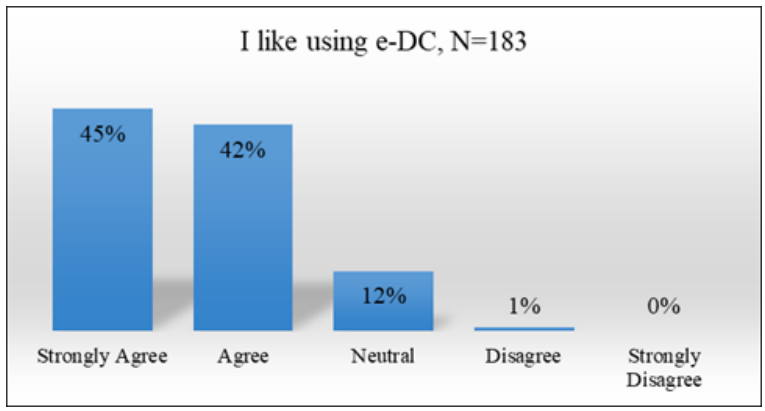

Figure 8: Student's perception of the "focus" element.

In this present work, students' perceptions elements on "*I am better at focusing on stimuli* (*diagrams, tables, etc.)"* for illustration purposes (refer to Figure 8) are used. The results show that 45% of respondents agreed that using *e-DC* helped them become more focused on Physics, while only 1%, or only two respondents, disagreed. The statistical outcome for motivation level is illustrated in Table 4(*a*). The outcomes indicate that the average academic student's level of motivation on "better focusing" is 4.33, ranging from agree to strongly agree with variances of 0.5. We further analysed the results to what extent the *e-DC* increases students' motivation level with respect to their test scores and found that the F statistics of the test data are greater than F-critical (as indicated in Table 4(*b*)), hence the null hypothesis is rejected. We can say that students were better at focusing on the stimuli in Physics when the *e-DC* virtual note was employed.

Table 4: *a)* ANOVA: Single Factor *b)* ANOVA test on motivation level by *e-DC*.

a) Summary

Groups	Count	Sum	Average	Variance
Q2	182	789	4.335165	0.511353
score	183	1540	8.415301	2.771633

b) ANOVA test

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1519.074	1	1519.074	923.6701	8.9E-102	3.867203
Within Groups	596.9921	363	1.644606			
Total	2116.066	364				

Objective 2. To determine the extent to which the use of interactive Direct Current (*e-DC*) notes improves the learning outcomes of students.

Table 5(*a*) and Table 5(*b*) show the results of the testing hypothesis that there was not found to be a significant difference between the pre-test scores and the post-test scores in the academic achievement of students who were taught with *e-DC* in Physics. The F value was found to be 17.409, and the p-value was found to be lower than 0.05, as determined by the statistical analysis. As the F-value is greater than the critical F of 3.867, the null hypothesis that there is no significant difference between the pre-test and post-test scores of students taught using *e-DC* is rejected. Compared to students who viewed *e-DC*, the Direct Current performance of students who did not view *e-DC* is much greater. According to an analysis of the student's scores before and after the test, there is a significant difference between test results obtained before and after the implementation of *e-DC*. Respondents who use *e-DC* to learn Physics achieve higher scores than they did before viewing the interactive video teaching. This was demonstrated by the average student's performance prior to and following the test. The average test score prior to viewing *e-DC* was 7.6, while the average score after viewing *e-DC* was 8.2. The achievement gap between the results of the pre-test and post-test is 0.80.

Table 5: *a)* Statistics on pre- and post-score *b)* ANOVA test for pre-and post-test score using *e-DC*.

a) Summary

Groups	Count	Sum	Average	Variance
PRE	183	1401	7.655738	3.29292
POST	183	1540	8.415301	2.771633

b) ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	52.78962	1	52.78962	17.40924	3.77E-05	3.867132
Within Groups	1103.749	364	3.032276			
Total	1156.538	365				

CONCLUSION

The results of the research indicate that the use of *e-DC* as a learning medium has a positive effect on increasing student motivation and fostering resourceful attitudes. Based on the findings of this study, *e-DC* can increase student interest and motivation due to Edpuzzle's comprehensive teaching materials. According to the findings of several previous studies, *e-DC* is an effective method for boosting student achievement and motivation. This study's findings are intended for educators to consider the need to improve teaching and learning skills by employing internet-based digital technologies such as Edpuzzle to engage and motivate students in the classroom.

ACKNOWLEDGEMENTS

The authors are grateful for the financial support from the Universiti Pertahanan Nasional Malaysia Self Fund Grant (SF0117 – UPNM/2022/SF/ST/1).

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

DECLARATION OF GENERATIVE AI

The authors declare that no generative AI was used in the writing of the manuscript.

DATA AVAILABILITY STATEMENT

Data available within the article or its supplementary materials.

REFERENCES

Abdullah, D., Sastraatmadja, A. H. M., Lestari, N. C., Saputra, N., & Al Haddar, G. (2023). Implementation of YouTube as a learning media in the new normal era. *Cendikia: Media Jurnal Ilmiah Pendidikan, 13*(3), 476-481. https://doi.org/10.35335/cendikia.v13i3.3464

Aragoneses, A., & Messer, R. (2020). Developing educational youtube videos as a tool to learn and teach physics. *The physics teacher, 58*(7), 488-490. https://doi.org/10.1119/10.0002068

Brame, C. J. (2016). Effective educational videos: Principles and guidelines for maximizing student learning from video content. *CBE—Life Sciences Education, 15*(4). https://doi.org/10.1187/cbe.16-03-0125

Candido, K. J. O., Gillesania, K. C. C., Mercado, J. C., & Reales, J. M. B. (2022). Interactive simulation on modern physics: A systematic review. *International Journal of Multidisciplinary: Applied Business and Education Research, 3*(8), 1452-1462. https://doi.org/10.11594/ijmaber.03.08.08

Cardinot, A., McCauley, V., & Fairfield, J. A. (2022). Designing physics board games: a practical guide for educators. *Physics Education, 57*(3), 035006. https://doi.org/10.1088/1361-6552/ac4ac4

Dictionary, M.-W. (2002). Merriam-webster. *Online at https://www.merriam-webster.com*

Escalada, L. T., & Zollman, D. A. (1997). An investigation on the effects of using interactive digital video in a physics classroom on student learning and attitudes. *Journal of Research in Science Teaching: The Official Journal of the National Association for Research in Science Teaching, 34*(5), 467-489. https://doi.org/10.1002/(SICI)1098-2736(199705)34:5<467::AID-TEA4>3.0.CO;2-O

Gedera, D., Williams, J., & Wright, N. (2015). Identifying factors influencing students' motivation and engagement in online courses. In *Motivation, leadership and curriculum design* (pp. 13-23): Springer.

Gustafsson, P. (2013). How physics teaching is presented on YouTube videos. *Educational Research for Social Change, 2*(1), 117-129.

Hassan, S. A. A. (2021). Keberkesanan pembelajaran dan pengajaran dalam talian (epembelajaran) terhadap pembelajaran pelajar di Kolej Komuniti Hulu Langat. *International Journal of Humanities Technology and Civilization*, 1-14.

Hatiku, F., Umar, M. K., Supartin, S., Yusuf, M., Odja, A. H., & Payu, C. S. (2022). The Use of PowerPoint and Video as Learning Media in Online Learning and Physics Learning Outcomes in High School. *Jurnal Pendidikan Fisika Dan Teknologi, 8*(2), 176-183. https://doi.org/10.29303/jpft.v8i2.4279

Hoerunnisa, A., Suryani, N., & Efendi, A. (2019). The effectiveness of the use of e-learning in multimedia classes to improve vocational students' learning achievement and motivation. *Kwangsan: Jurnal Teknologi Pendidikan, 7*(2), 123. https://doi.org/10.31800/jtp.kw.v7n2.p123--137

Hou, H.-T., Fang, Y.-S., & Tang, J. T. (2021). Designing an alternate reality board game with augmented reality and multi-dimensional scaffolding for promoting spatial and logical ability. *Interactive Learning Environments*, 1-21. https://doi.org/10.1080/10494820.2021.1961810

Irvani, A., & Warliani, R. (2022). Development of physics demonstration videos on Youtube (PDVY) as physics learning media. *Jurnal Pendidikan Fisika Indonesia, 18*(1), 1-12. https://doi.org/10.15294/jpfi.v18i1.26723

Joshi, A., Kale, S., Chandel, S., & Pal, D. K. (2015). Likert scale: Explored and explained. *British Journal Of Applied Science & Technology, 7*(4), 396. https://doi.org/10.9734/BJAST/2015/14975

Leu-Timmermann, B. (2023). Edpuzzle. *Die Unterrichtspraxis, 56*(1), 95-97.

Liu, L., Du, X., Zhang, Z., & Zhou, J. (2019). Effect of problem-based learning in pharmacology education: A meta-analysis. *Studies in educational evaluation, 60*, 43-58. https://doi.org/10.1016/j.stueduc.2018.11.004

Mawaddah, N., Mustofa, M., & Putra, I. S. (2022). Improving students' listening ability using Edpuzzle interactive video. *Premise: Journal of English Education, 11*(1), 65-81.

McCoach, D. B., & Flake, J. K. (2018). *The role of motivation*. In S. I. Pfeiffer, E. Shaunessy-Dedrick, & M. Foley-Nicpon (Eds.), APA handbook of giftedness and talent (pp. 201–213). American Psychological Association. https://doi.org/10.1037/0000038-013

Muhammad, M. (2020). Pembelajaran Maharah Qiraah Menurut Teori Konstruktivis Sosial. *Lisan An Nathiq: Jurnal Bahasa dan Pendidikan Bahasa Arab, 2*(1), 64-75.

Najib, M. N. M., Md-Ali, R., & Yaacob, A. (2022). Effects of PhET interactive simulation activities on secondary school students' Physics achievement. *South Asian Journal of Social Sciences and Humanities, 3*(2), 73-78 https://doi.org/10.48165/sajssh.2022.3204%20.

Niedderer, H. (2001). Physics learning as cognitive development. *Bridging Research Methodology and Research Aims. Student and Faculty Contributions from the 5th ESERA Summerschool in Gilleleje, Denmark. The Danish University of Education*, 397-414.

Pallavi, D., Ramachandran, M., & Chinnasamy, S. (2022). An empirical study on effectiveness of e-learning over conventional class room learning–a case study with respect to online degree programmes in higher education. *Recent Trends in Management and Commerce, 3*(1), 25-33. http://doi.org/10.46632/rmc/3/1/5

Perkins, K., Adams, W., Dubson, M., Finkelstein, N., Reid, S., Wieman, C., & LeMaster, R. (2006). PhET: Interactive simulations for teaching and learning physics. *The Physics Teacher, 44*(1), 18-23. https://doi.org/10.1119/1.2150754

Riswanto, A., & Aryani, S. (2017). Learning motivation and student achievement: description analysis and relationships both. *The International Journal of Counseling and Education, 2*(1), 42-47.

Zollman, D., & Fuller, R. (1994). Teaching and learning physics with interactive video. *Physics Today*,*47*(4), 41–47. https://doi.org/10.1063/1.881428