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World Journal of
Advanced Research and Reviews

World Journal Series
INDIA

(RESEARCH ARTICLE)

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The effect of math learning video media on math learning outcomes analyzed based on learning motivation

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Abstract

We focus on examining whether video learning media are effective in amping up math learning outcomes of ninth graders at SMP Negeri 4 Gorontalo investigated based on learning motivation. The research was a quasi-experiment using a treatment by level 2 x 2 design and two-way analysis and the Tukey test. The results demonstrated that the math learning outcomes of students with high learning motivation using video learning were 17.16, and that of students with high learning motivation using PowerPoint learning media was 16.06. The test using a 5% significance level and dk = 134 exhibited $t_{count} > t_{table}$. For $\alpha = 0.05$, $t_{count} = 2.68$ and $t_{table} = 2.03$. Accordingly, video learning media were more effective than PowerPoint in augmenting student learning outcomes with high learning motivation.

Keywords: Math learning outcome; Video learning media; Learning motivation; Outcomes

1. Introduction

The global COVID-19 pandemic severely impacts countries worldwide, including ours. In Indonesia, first identified in March 2020, the pandemic has caused a multitude of death tolls. The government can mitigate it over time using some preventive measures, e.g., vaccination evenly distributed to all areas. The government manages to give vaccines stepwise to the general community, health workers, teachers, civil servants, and office workers. Today, vaccine administration has reached university and school students across Indonesia.

Law Number 20 of 2003 concerning National Education System Article 3 states that national education is aimed at developing learners' potentials so that they become persons imbued with human values which are faithful and pious to one and only God, who possesses morals and noble characters, who are healthy, knowledgeable, competent, creative, independent, and as citizens, are democratic and responsible.

Education is an absolute need and an integral part of human life. Math is considered a subject significant to create quality students in the educational world. Math allows students to think about and investigate an issue logically and systematically. It enables students to develop a more critical and structural way of thinking.

We can measure whether a math learning objective has been achieved through math learning outcomes. Referring to the 2013 Curriculum developed and made by the government which has also prepared supporting devices and general formats, teachers are expected to teach well so students can acquire the desired learning outcomes. Elevating learning outcomes calls for a new focus on the paramount importance of teacher instruction (Auntunes, 2012:459). Teachers are expected to translate general and abstract learning outcomes into meaningful, concrete, and measurable content. A learning outcome is considered good if the mean score as set by the national standard is attained.

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However, according to the Center for Educational Assessment, Ministry of Education and Culture, through the 2018 and 2019 National Examination Reports and Results at junior high school levels, math obtained the lowest mean scores, i.e., 45.13 in 2018 and 46.19 in 2019. The mean scores mentioned were of UNBK (the Computer-Based National Examination). The low mean scores were because students considered math a complex subject. Most of them disliked it, causing them to be unable to concentrate. Additionally, the current condition, obliging everything, including learning activities, to be held online, engendered more issues.

In math, students should be instructed to write the teacher's explanation down, enabling them to understand the materials given for a longer term. The materials presented should be related to the previous one, and so should the problems given. If teachers afford problems irrelevant to the materials student have learned, the second parties will be unable to solve them. As a consequence, the information delivered will be hard to process and store. According to psychological principles by Gestalt in Sarwono (2013:120), learning materials cannot just disappear from children's memory. Rather, they undergo systematic changes, namely refinement, affirmation, and assimilation. Sapa'at (2020:18) argues that math is a tool which can develop the way of thinking, thereby, a substantive subject useful for daily life.

Cognitive psychological experts convey that learning materials seemingly forgotten by students do not vanish from their memory. Instead, they are stored in students' permanent sense subsystem but are too weak to recall, entailing an instrument (a learning approach) which can boost students' memory systems to function optimally to process learning materials (Syah, 2006).

Research at SMPN 4 Gorontalo informed that student learning outcomes were not good as expected. Low learning outcomes may be the result of low learning motivation indicated by students. To attain a learning activity as expected, there should be some motivation for carrying it out. Correspondingly, students must have the motivation to participate in the learning activity going on in the learning process. Once having a strong motivation, students will also have stronger interest, activities, and participation in the learning activity delivered. Considering the urgency of motivation in human life, especially in education, teachers should be concerned about all means which can develop student motivation.

Given the problems, teachers should find solving learning. One of the learning media appropriate for such situation is a video. Video will broaden student knowledge of the use of technology, particularly in this pandemic situation where it is vital to keep a distance and maintain health protocols during teaching-learning processes. As a result, teachers can orient students more easily when motivating them offline or online through video media. With the current technology development, teachers can make learning media by combining several media or multimedia. The generated media will contain not only pictures and texts (visual) but also sounds (audio). Sadiman proposes that videos are audio-visual media presenting both pictures and sounds. In addition, Daryanto posits that video media refer to anything which allows to combine signal with moving pictures sequentially.

Hence, video media can be used in math learning to help visualize abstract concepts. Using online platforms, e.g., Google, YouTube, WhatsApp, Facebook, and others, students can access these learning media anywhere and anytime. In so doing, videos are homologous media for both long-distance and face-to-face learning with strict compliance with health protocols during the pandemic era.

Motivation is a factor impacting the learning process. External motivation is critical to encourage the existing motivation, namely students' internal motivation, comprising a desire and whim for success and the need for learning, expectations, and aspirations. Having motivation, students will have the spirit and direction of learning, enabling them to gain better learning outcomes and the spirit of participating in teaching-learning processes. It conforms to Uno (2017:127-128) that parents and teachers can manage and provide certain situations which encourage healthy competition by giving off complacency of the achievement made, making them accustomed to the discussion of an opinion or aspiration, cultivating motivation, and fostering them through the statement that whether or not a goal can be achieved anchors on the motivation fostering them to realize the goal.

Taking the above explanation into account, we are interested in conducting experimental research on math learning using video media. To be specific, we are anxious to perform research on the effect of math learning video media on math learning outcomes of ninth graders at SMP Negeri 4 Gorontalo analyzed based on learning motivation.

2. Material and methods

This research was undertaken at SMP Negeri 4 Gorontalo, Kota Barat, Gorontalo City, and Gorontalo Province. It was carried out in the odd semester of the academic year of 2021/2022 from January-May. The steps were conducting

learning activities using videos and PowerPoint as learning media, collecting and processing data, and reporting the results. It was quasi-experimental research using a treatment by level 2 x 2 design involving some variables: (1) math learning motivation as the independent variable (Y), (2) learning media (A) as the independent treatment variables consisting of video learning media (A_1) and PowerPoint learning media (A_2), and (3) math learning motivation (B) as the moderator variables made up of high learning motivation (B_1) and low learning motivation (B_2). In general, the research data were composed of (1) data on math learning outcomes and (2) data on learning motivation. Data (1) were collected using the test instrument of multiple-choice questions, while data (2) were collected using a non-test instrument of a questionnaire. However, we only developed one instrument, which was the multiple-choice test. The instrument of learning motivation used to group intrinsic and extrinsic learning motivation was a questionnaire. Data analysis used in this research was related to requirement tests, namely homogeneity analysis and normality analysis. Another analysis was the two-way variance analysis (ANAVA 2 x 2) to test the research hypothesis using an F-test at a significance level of alpha = 0.05.

3. Results

In general, the descriptions of the eight groups of the math learning outcome data are presented in Table 1.

Table 1 The Description of Research Result Data

Data Source	N	Min. Score	Max. Score	Mean ($\bar{x}$)	Modus (Mo)	Median (Me)	St. Dev. (s)	Variance (s^2)
A_1	46	4	19	14	14	14	2.65	7
A_2	44	3	25	13	13	13	4.26	18.12
B_1	36	89	125	112	111	112	9.07	81.97
B_2	36	68	117	101	94	104	12.18	148.33
A_1B_1	23	7	17	14	12	11	2.65	7
A_2B_1	22	7	21	13	13	13	3.18	10.09
A_1B_2	22	4	19	14	16	15	4.21	17.7
A_2B_2	22	3	23	12	13	13	4.97	24.68

Description

A_1 : The math score of students learning math using video media.
A_2 : The math score of students learning math using PowerPoint media.
B_1 : The math score of students with high math learning motivation.
B_2 : The math score of students with low math learning motivation.
A_1B_1 : The math score of students with high math learning motivation and learning math using video media.
A_2B_1 : The math score of students with high math learning motivation and learning math using PowerPoint media.
A_1B_2 : The math score of students with low math learning motivation and learning math using video media.
A_2B_2 : The math score of students with low math learning motivation and learning math using a direct learning model.

From Table 1, the mean math score ($\bar{x}$) was 14.06 with a standard deviation (s) of 10.79. The following calculation figured out a modus (mo) of 14.25 and a median (me) of 14.08.

The two-way variance analysis (ANAVA 2 x 2) was a calculation technique (parametric statistics) to observe two effects, i.e., the main effect and the interaction effect.

The main effects were the effect of the difference between video learning media and PowerPoint learning media on math learning outcomes and the effect of the difference between learning motivations on math learning outcomes. The effect of the "interaction" intended was the effect of the interaction between learning media and learning motivation on math learning outcomes. The two-way ANAVA test results are pointed out in Table 2.

Table 2 The Two-Way ANAVA Test Results of Math Learning Outcomes

Variance Source	(J k)	Dk	R k	F count	F table $\alpha = 0.05$
Between learning approaches (A)	61.95	1	61.95	4.21	3.95
Between student learning motivations (B)	1597.18	1	1597.18	62.17	3.95
Within (d)	2260.9	88	25.69		
Total (T)	3919.98	90	1684.77		

Based on the F-test, F_{count} = 62.17 was higher than F_{table} = 3.95 at a significance level $\alpha = 0.05$ at a degree of freedom (dk) of the numerator = 1 and a degree of freedom (dk) of the denominator = 134. That is, the null hypothesis (H_0) stating that there was no effect of interaction between learning media and learning motivation on math learning outcomes was rejected. That being so, the alternate hypothesis (H_1) stating that there was an effect of the interaction between learning media and learning motivation on math learning outcomes was accepted. The effect of the interaction is visualized in Figure 1.
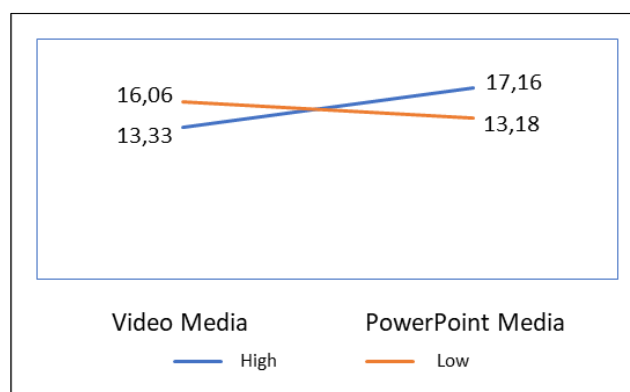
Figure 1 The Curve of the Effect of Data Interaction between Learning Media and Student Learning Motivation on Math Learning Outcomes

The following t-test of the two subject groups compared aimed to test the third and fourth hypotheses.

Table 3 The Paired t-Test Results

No.	Compared Groups	T count	$t_{table(0.05)}$	Conclusion
1	A1B1 and A2B1	2.68	2.03	Significant
2	A2B2 and A1B2	2.13	2.03	Significant

The third hypothesis was math learning scores of students using videos as learning media higher than that of students with high learning motivation and using PowerPoint as learning media.

Building on the t-test, $t_{count} = 2.68$ and $t_{table} = 2.03$ at $\alpha = 0.05$. Because $t_{count} > t_{table}$, the null hypothesis (H_0) stating that math learning outcomes of students with high learning motivation and using video media were lower than or equal to that of students using conventional learning was rejected. That being so, the alternate hypothesis (H_1) stating that math learning outcomes of students using video media were higher than that of students with high learning motivation and using PowerPoint media was accepted.

Student groups with high learning motivation and using video media $\left(\overline{X}_{A_1B_1}\right)$ had a higher mean score of 17.16 than those using PowerPoint media $\left(\overline{X}_{A_2B_1}\right)$. The latter group scored 13.33. The result justified the third hypothesis. It could be concluded that, therefore, videos were more suitable media for student groups with high learning motivation.

4. Discussion

4.1. The Difference in Math Learning Outcomes between Students Using Videos and Those Using PowerPoint as Media

The results indicated that using videos and PowerPoint as math learning media could increase the math learning outcomes of students. It could be studied from the student math learning outcomes building on data grouped by learning motivation levels of students with both high and low learning motivation.

Predicated on the two-way ANAVA test results, the use of videos and PowerPoint media inflected students' math learning outcomes. Students using video media acquired a higher mean score than those using PowerPoint media. It pointed out the higher advantage of using videos as learning media.

Using videos, teachers could relate learning materials to students' real life, especially in the middle of this advanced era development. Meanwhile, PowerPoint media highlighted learning whose all materials, from the beginning until the final, had been determined. Students learned by only receiving materials made by teachers, and teachers delivered them through lecturing, which was often monotonous because no moving-picture-containing application was used. Besides, using PowerPoint media would end up with teachers dominating learning as they had to present materials. Using the media, teachers started learning by preparing the devices used, oriented students to pay attention, explained the materials, opened a question-answer session, and gave exercises in which students had to answer. This teaching-learning sequence was allegedly unable to optimize student learning outcomes. Even though essentially, PowerPoint media consisted of some parts similar to video ones, the first media had a plethora of weaknesses, demotivating students to learn.

It was thus apparent that video media could promote student learning outcomes. Students learning using video as media acquired a higher mean score than those learning using PowerPoint as media. The use of videos as media, from the aspects of learning procedures/stages to learning materials employed scaled up students' math learning outcomes.

4.2. The Effect of Interaction between Learning Media and Learning Motivation on Students' Math Learning Outcomes

Predicated on the statistical analysis results of math learning outcomes affected by two independent variables, there was an effect of interaction between learning media and student learning motivation on math learning outcomes. The two-way variance analysis between columns and rows resulted in $F_{count} = 62.17 > F_{table} = 3.95$ at a significance level $\alpha = 0.05$. Thus, the null hypothesis stating no interaction between learning media and math learning motivation was rejected. Accordingly, the alternate hypothesis stating the interaction between learning media and math learning motivation affecting students' math learning outcomes was significantly accepted.

The analysis showed that in implementing learning media, teachers needed to consider taking student learning motivation in mind. Every learning media came with distinctive characteristics. As such, teachers should find the congruency between learning motivation and the learning media used. The use of learning media which was consistent with student learning motivation was expected to realize high math learning outcomes. Contrastingly, implementing learning media not corresponding with student learning motivation would lead to low or poor math learning outcomes.

4.3. The Difference in Math Learning Outcomes between Students with High Learning Motivation and Using Video Media and Those Using PowerPoint Media

Based on the data analysis, student groups with high learning motivation and using video media ($\bar{x}_{A_1B_1}$) acquired a higher mean score of math learning outcomes than those using PowerPoint media ($\bar{X}_{A_2B_1}$). The t-paired test results suggested that H_0 was rejected and H_1 was accepted. That is, video media had a stronger effect than PowerPoint ones on students with high math learning motivation. It was attested to by $t_{count} = 2.68 > t_{table}$ 2.03 ($\alpha = 0.05$) and A_1B_1 acquired a higher mean score of math learning outcomes ($\bar{X} = 17.16$) than A_2B_1 ($\bar{X} = 13.33$). Accordingly, this hypothesis was accepted or significantly tested.

The results demonstrated that videos were appropriate media for students with high learning motivation, enabling them to amp up their math learning outcomes.

Students with high learning motivation were better at expressing ideas or thinking systematically. Additionally, they were creative and critical in understanding, identifying, and probing problems when learning maths and drawing conclusions or making decisions. The skills would help them solve math problems.

4.4. The Difference in Math Learning Outcomes between Students with Low Learning Motivation and Using Video Media and Those Using PowerPoint Media

We compared the mean score of math learning outcomes between students with low learning motivation and using video media ($\bar{x}_{A_1B_2}$) and students with the same learning motivation and using PowerPoint media($\bar{x}_{A_2B_2}$). The t-paired test results exhibited that PowerPoint media (A_2B_2) more positively impacted students' math learning outcomes than video ones (A_1B_2). It was shown by t_{count} = 2.13 > t_{table} = 2.03 (α = 0.05) and the mean score of math learning outcomes of student group A_2B_2 ($\bar{X}$ = 16.06) higher than that of student group A_1B_2($\bar{X}$ = 13.18). Hence, this hypothesis was accepted or significantly tested.

The results indicated that videos were homologous media for students with high learning motivation and made them augment math learning outcomes.

Students with low learning motivation were easily distracted by external factors. Nonetheless, they could understand, identify, analyze problems, draw conclusions, and make decisions in math learning. It would allow them to solve math problems easily.

5. Conclusion

Predicated on hypothesis tests and discussion, we draw the following conclusions.

- Students learning using video media acquired different math learning outcomes from those learning using PowerPoint media.
- A significant interaction between video media, PowerPoint media, and student learning motivation inflected math learning outcomes.
- Students with high learning motivation and using video media were compared to those using PowerPoint media in terms of learning outcomes.
- Students with low learning motivation and using PowerPoint media were compared to those using video media in terms of learning outcomes

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest.

References

[1] Abbas, N. 2011. Metode Penelitian Kuantitatif. The article was presented at Workshop Penulisan Karya Ilmiah Guru-guru SMA/SMK/MA se-Propinsi Gorontalo on 25 February 2011.

[2] Ariani, N. & Haryanto, D. 2010. Pembelajaran Multimedia di Sekolah. Jakarta: Prestasi Pustaka.

[3] Arikunto, S. 2013. Prosedur Penelitian. Jakarta: Rineka Cipta.

[4] Arikunto, S. 2015. Fundamentals of Educational Evaluation. Jakarta: Earth Script.

[5] Arief, S.S. et al. 2011. Educational Media: Definition, Development, and Utilization. Jakarta: Rajawali Press.

[6] Arsyad, A. 2011. Learning Media. Jakarta: Raja Grafindo Persada.

[7] Auntunes, F. 2012. Tuning education for the market in Europe qualifications, competences, and learning outcomes: reform and action on the shop floor. European Educational Research Journal, 11(3), 446-470.

[8] Daryanto. 2010. Learning Media. Yogyakarta: Gava Media.

[9]   Fathan, F. et al. 2013. Learning Chemical Equilibrium with Interactive Multimedia to Improve Mastery of Concepts and Critical Thinking Skills of High School Students. Journal of Research and Practice of Chemistry Education, Vol. 1 No. 1, ISSN: 2301-732x.

[10]   Febrianti, C. 2017. Use of Video Media on Learning Motivation and Cognitive Learning Outcomes of Class V Elementary School Science Learning. (On line). journal.uny.ac.id. Prima Education Journal 5 (1), 11-21. Retrieved October 15, 2022.

[11]   Hamalik, O. 2004. Teaching and Learning Process. Jakarta: Earth Script. http:www.youtube.com/user/pakbeni/featured. Retrieved June 23, 2021.

[12]   Mawar, R. 2012. The Effectiveness of Using Web-Based E-Learning Learning Media in Information and Communication Technology Lessons on Student Learning Outcomes of Class X SMA Negeri 1 Kalasan. (On line). http://eprints.uny.ac.id/id/eprint/6803. Retrieved June 15, 2021.

[13]   Munir, G. et al. 2012. Information and Communication Technology-Based Curriculum. Bandung: Alphabet.

[14]   Nawawi, H. 1980. The Effect of Human Relations among Students on Learning Achievement in Elementary Schools: Social Strengthening in Learning in Schools. Institute of College and Educational Sciences.

[15]   Octiana, H. 2021. The Effect of Using YouTube Videos on Learning Motivation and Learning Outcomes of Islamic Religious Education (PAI) at SMP Negeri 20 Bengkulu City. (On line). http://eprints.uns.ac.id/id/eprint/25342. Retrieved October 15, 2022

[16]   where. 2014. Understanding PowerPoint and methods of use. Jakarta: Rineka Cipta.

[17]   Proitz, T. 2010. Learning Outcomes: Why Are Days? Who Defines Them? When and Where Are They Defined? Journal in Educational Assessment Evaluation and Accountability.

[18]   Riduwan. 2009. Thesis Compiling Methods and Techniques. Bandung: Alphabet.

[19]   Sadiman, A. et al. 2014. Educational Media: Definition, Development, and Utilization Jakarta: Rajawali Press.

[20]   Sapa'at, A. 2020. Development of Mathematical Thinking Skills through Learning Mathematics. Dompet Dhuafa Education Journal, Vol. 10, No. 1, May 2020.

[21]   Sarwono, S. W. 2013. Adolescent Psychology. Jakarta: Rajwali Press.

[22]   Slameto. 2008. Factors Affecting Learning. Jakarta: Rineka Cipta.

[23]   Sudijono, A. 2015. Introduction to Educational Evaluation. Jakarta: PT Raja Grafindo Persada.

[24]   Sudjana, N. 2015. Statistical methods. Bandung: PT Tarsito.

[25]   Sudjana, N. 2016. Assessment of Teaching and Learning Process Results. Bandung: PT Juvenile Rosdakarya.

[26]   Sugiyono. 2015. Quantitative, Qualitative, and R&D Educational Research Methods (Revised Edition). Bandung: Alphabet.

[27]   Sugiyono. 2019. Quantitative, Qualitative, and R&D Research Methods. Bandung: Alphabet.

[28]   Suprijono, A. 2012. Learning Methods and Models. Bandung: Alphabet.

[29]   Susanto, A. 2016. Theory of Learning and Learning in Elementary Schools. Jakarta: Prenadamedia Group.

[30]   Shah, M. 2006. Learning Psychology. Jakarta: Raja Grafindo Persada.

[31]   Uno, H. 2017. The theory of motivation and its measurement: analysis in the field of education. Jakarta: Earth Script