SEMARAK ILMU PUBLISHING

Journal of Advanced Research in Applied Sciences and Engineering Technology

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

Development of Learning Management with Animated Video to Increase Motivation and Learning Outcomes

Sri Utaminingsih[1,*], Machfud[1], Santosa[1], G. K. Kassymova[2]

[1] Department of Master of Elementary Education, Faculty Teacher Training and Education, Universitas Muria Kudus, Indonesia
[2] Department of Pedagogy and Psychology, Institute of Pedagogy and Psychology, Abai Kazakh National Pedagogical University, Almaty, Kazakhstan

ARTICLE INFO

Article history:
Received 29 September 2023
Received in revised form 30 December 2023
Accepted 16 January 2024
Available online 20 March 2024

Keywords:

Management; Thematic learning; Animation video; Motivation

ABSTRACT

The aim of this research is to analyse the development of learning management using thematic animated video media to increase motivation and learning outcomes for fourth grade elementary school students in Theme 9. The method used is research and development according to Borg and Gall. The data sources in this research were fourth grade elementary school students in Grobogan and Kudus Regencies, Central Java, with data collection tools used including questionnaires, tests, observations and interviews. The data analysis used was the validity and reliability test of the instrument, normality test, homogeneity test, n-Gain test and Independent Sample t-test. The research results show that the design begins with planning with components of thematic learning analysis, analysis of motivation and learning outcomes in online learning, planning consists of curriculum analysis - formulation of objectives - analysis of sources and materials - analysis of learning models, designing media animation videos by making storyboards, preparing assets – complementary assets and video animation tools. In the process with PowerPoint video components and Camtasia 2019 specifications. Animated video content with "My Country's Wealth Theme" in online learning with initial stage components (basic competencies (KD), objectives, learning materials, core activities and evaluation. Material feasibility test results get a score 3.3 with very good criteria, and media expert eligibility received a score of 3.4 with very good criteria. The results of the effectiveness test in 2 regions obtained an n-Gain value of 0.659 in the Hake n-gain table in the good category. In conclusion, thematic learning management with animated videos effectively increases learning motivation and learning outcomes in thematic learning.

1. Introduction

The rapid advancement of technology and information has undeniably brought about significant changes in society, particularly in the realm of education, where technology serves as a crucial support for promoting learners' motivations, interest, readiness and engagement [1,2]. The 21st century is marked by quickening technical progress and a more digitally connected world, thus it's

* *Corresponding author.*
E-mail address: sri.utaminingsih@umk.ac.id

https://doi.org/10.37934/araset.41.2.3142

more important than ever to have flexible and interesting teaching resources [3]. The younger generations are driving the digital marketing industry and is eager to study, comprehend, and develop in more competitive ways. The outdated, conventional educational approaches no longer satisfy them. Services for educational video animation are excellent in the modern world. They are the more contemporary method of instruction that increases student interest and improves efficiency. Students are encouraged to connect with the concept and the information through animated educational movies [4].

In contrast to earlier times, contemporary learners have shorter attention spans, often lacking the patience to engage with course content that fails to captivate them. Animation has emerged as a potent tool in the eLearning sector over the years [5]. Technological progress is on the rise, including the integration of media technology like computers and smartphones equipped with software and hardware to enhance the learning experience through digital-based technology systems [6,7]. The widespread utilization of learning media, including animation, video, design, and analysis, has become a prevalent means of incorporating technology into the educational process. These tools are extensively employed by educators for imparting materials, conveying messages, disseminating information, and providing references [8].

The utilization of animated video content in the educational process is more productive and efficient, facilitating a deeper and more thorough understanding of the material. Student learning success is determined by the animated. The animated video content can pique students' interests in learning activities that will enhance their learning outcomes by stimulating their ideas, worries, sentiments, and abilities or skills [9]. Learning with text, graphics, music, and video that is applied dynamically to help students develop their understanding is known as animation-based learning media [10]. Through the use of animation in the classroom, students can improve their performance or learning objectives [11]. An additional useful approach to the execution of practicum, independent study, and interactive media presentations is the application of learning through animation-based media [12]. A subcategory of multimedia materials are animated videos. Children's and young adults' entertainment sometimes includes animations, which have educational purposes [13,14] and have an impact on popular culture [15]. Research has shown that animated images enhance learning across a range of age groups, including high school students and small children [16-18].

During the learning journey, students need the motivation to foster their eagerness to acquire knowledge [19]. Given their current level of motivation, they have the potential to enhance their academic achievements significantly [20]. From a different perspective, fostering a genuine desire to inspire students can lead to the achievement of desired learning outcomes. Through these outcomes, students can discern their capacities and abilities following the completion of the learning process [21]. To facilitate students' comprehension of the teacher's explanations, it is essential to provide them with tools that support and aid their learning journey. This assistance not only enhances motivation but also contributes to the attainment of positive learning outcomes [22]. Utilizing animation in the educational process has proven to simplify intricate topics, fostering a pleasurable learning experience without inducing time-related anxieties [23,24]. Animations offer a distinct advantage over static images as they have the ability to visually convey conceptual changes, processes, and dynamics. In comparison to static images, animations are not only more lifelike but also more effective for imparting practical information in educational settings [25]. Additionally, the presentation of material in a visually distinctive manner is believed to boost students' motivation, particularly when it aligns with their interest in cutting-edge technology [26-28]. Interactive videos serve as an additional educational platform capable of enhancing motivation and facilitating the effective management of cognitive load.

Acquiring the skill of utilizing animated media can serve as a remedy, transforming abstract content into a more tangible and comprehensible form [29]. Animation serves as a platform incorporating processed images to generate both movement and sound, thereby creating a dynamic impression [30]. When utilized in video content, animation effectively elucidates material, providing a detailed explanation and possessing an engaging quality that facilitates enhanced comprehension for students [31]. Moreover, animated content has the ability to capture students' interest during the learning process by elucidating procedures and sequences of events [32]. Animated media proves to be more efficacious than conventional learning materials in enhancing student learning results [33]. This study seeks to create a learning management tool featuring animated videos, with the goal of enhancing motivation and improving learning outcomes among fourth-grade elementary school students Grobogan and Kudus Regencies, Central Java, Indonesia.

1.1 Problem Statement

The ongoing problem of promoting motivation and maximizing learning outcomes has become more prominent in today's educational environment [34]. Conventional teaching approaches frequently fail to hold students' attention in a way that is compatible with the 21st century's dynamic and digital environment [35]. Animated video integration with learning management systems appears to be a viable answer to this educational conundrum, but its full impact and effectiveness are still unknown [51]. In light of this, the study aims to investigate the potential enhancement of learning outcomes and motivation among fourth-grade elementary school students in the Indonesian regions of Grobogan and Kudus through the development of an animated learning management system.

Deeper comprehension and engagement are promoted by animated videos, which provide a dynamic and visually exciting way to communicate difficult ideas [36]. Through the use of animated content's interactive and visually stimulating qualities, the motivational focus seeks to foster a positive attitude toward learning. In order to contribute to a paradigm, change in education toward a more dynamic and individualized learning experience in the digital age, this research aims to close the gap between traditional education and the preferences of today's learners. Therefore, the purpose of this study is to investigate the following important question: Could adding animated movies to learning management systems be a trigger for more engaged students and better learning results? Our goal is to investigate this understudied area of technology and pedagogy in order to find out how well animated videos may be integrated to increase student motivation and outcomes. We also hope to provide useful information for educators and educational policymakers.

2. Methodology

The study adopts a research and development (R&D) approach, conducted over a six-month period (one semester) in the Godong District of Grobogan Regency, Central Java, Indonesia. The research focuses on 45 fourth-grade elementary students engaged in "Theme 9" at three different schools: SDN 1 Dorolegi, SDN 2 Manggarmas, and SDN 2 Harjowinangun. Data for the study was obtained from both students and teachers. Research and development involve a systematic process aimed at creating new products or improving existing ones, with a focus on accountability. The resulting products can manifest in various forms, such as hardware and software [37].

Data collection methods included questionnaires, tests, and interviews. The instruments employed for data collection comprised a student needs questionnaire, a teacher needs questionnaire, motivational questionnaires, a material expert questionnaire, and a media expert

questionnaire. During the analysis phase, observations and interviews were conducted to gather information about learner motivation and the use of media in the learning process. The questionnaire was administered to multiple validators, including school supervisors, media experts, and teachers, to assess and provide feedback on the animated video learning management system developed by the researcher. A test was utilized to measure the impact on student learning outcomes and motivation following trials with the developed animated video. This testing involved a pre-test administered prior to the media trial, and a post-test conducted at the conclusion of the testing period.

This study's reference is the development research conducted by Borg and Gall [38]. This research's foundation is an adaptation of this development model that yields a more straightforward model of development. This research has three steps: The initial stage involves planning, encompassing a needs analysis. The analysis phase is akin to the Targeting Phase [39]. To ascertain the demand for a product like an animated learning video, interviews with students and teachers were conducted. The planning process also encompasses the development of supplementary assets for the animated videos and the preparation of tools required for producing them.

The subsequent phase involves the processing aspect. This stage is dedicated to formulating learning tools and media for further development. Additionally, within the process stage, there is a focus on constructing the learning media system. The creation of animated videos utilized the PowerPoint and Camtasia 2019 application. Furthermore, researchers incorporated cartoons and animation media. Consequently, the design efforts by the researchers aimed for optimal outcomes to generate engaging and attractive media.

The final stage involves assessing the product. Once the animated video learning media system has been developed, it undergoes validation by experts. The outcomes of this validation serve as the foundation for determining the appropriateness of the media for student learning, guiding decisions on whether to implement or further test it. Students are then administered a questionnaire to gauge their learning motivation. Data pertaining to the increase in student learning motivation following the use of animated video media is collected through questionnaires distributed to students after they have watched and comprehended the learning animation videos. The learning process involving animated video media is conducted independently, wherein students begin with a pre-test, proceed to watch and understand the material presented in the animated videos, and conclude by addressing post-test questions along with completing student learning motivation questionnaires. The flow of this research is shown in Figure 1.

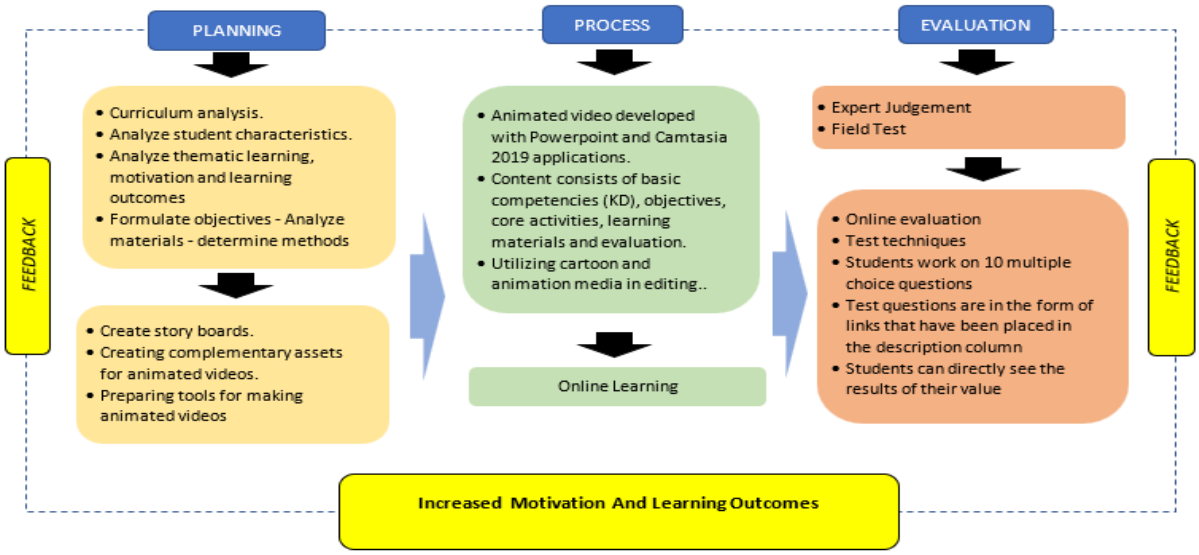

Fig. 1. Concept of Development

3. Results and Discussions

3.1 Planning

This study's initial phase, analysis, was a component of the planning phase. Interviews with instructors and students were used to analyse needs at this point. The purpose of the needs analysis is to determine how much the grade IV primary school pupils in the Grobogan and Kudus Regencies, Central Java, need an animated video learning management system. Ninety percent was the average response obtained after answering the student needs questionnaire. On the other hand, an average response of 88 percent was obtained from the teacher needs questionnaire. This leads one to the conclusion that in order to improve fourth grade students' motivation and performance, a certain amount of thematic learning animation video media was required. Learning through animation is one of the most engaging forms of media because it exposes pupils to real-world situations. It is anticipated that using this type of educational media will increase students' motivation and interest in the material that their teachers are teaching [40,41]. The outcome is also consistent with the research conducted by Wiyono [42], which demonstrates how video animation in ICT-based learning can represent abstract processes that are hard to perceive or comprehend while still replaying the relevant data.

3.2 Processing

Based on the findings presented in the analysis, the product undergoes design and manufacturing as integral components of the processing phase. This study focuses on creating learning materials, specifically an animated video, aimed at enhancing the motivation and academic achievements of fourth-grade elementary school students in Theme 9, "My Country's Wealth." The utilization of this animated video involves students accessing the provided YouTube link shared by the teacher within the designated WhatsApp group.

Students will attain fundamental competencies and learning objectives on the main page. To enhance comprehension of learning materials, an animated video is incorporated into the learning media interface. Upon accessing the video link, the initial interface displayed is the title page, illustrated in Figure 2 below

Fig. 2. Animated video preview

The animated video was crafted utilizing computer technology, specifically a computer or laptop equipped with the Power Point and Camtasia applications in 2019. Various assets were incorporated in the production process, such as image resources sourced from Freepik.com, music assets obtained from bensound.com, and written content accessed through collogo.com. Once uploaded to YouTube, the media is accessible on both laptops and smartphones. The content of this animated video is detailed in the figure presented below as Figure 3.

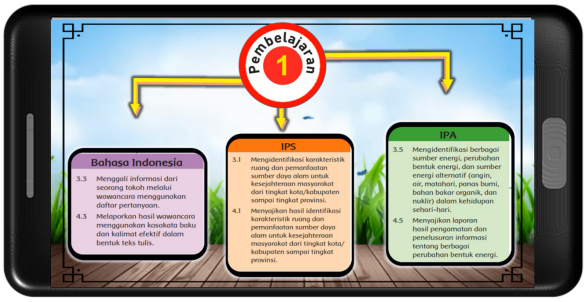

Fig. 3. Learning Objectives Display

The second component comprises educational content, encompassing:

i. Thematic material for Indonesian language instruction
ii. Thematic material covering Natural Knowledge in Science
iii. Thematic Material addressing Social Science Content, as illustrated in Figure 4 below.

Fig. 4. Material display

The reliability of the assessment tool, designed to evaluate student learning outcomes through 10 assessment items, was assessed using a specific method—statistical calculations employing Cronbach's alpha.

Table 1
Instrument Reliability Statistics

r 11	r table	k (Total Item)
0,961	0,6	10

From the analysis results, the r11 value (instrument reliability) or Cronbach's alpha is 0.961, while the critical r value (2-sided test) is at a significance of 5% with n = 17. Because r11 > r table, it can be concluded that the research instrument items are reliable.

Data on the validity of animated video media for thematic learning was obtained through media expert validation questionnaires distributed to 2 competent learning media experts.

Assessment is given as a score with a range of 1-4. The aspects assessed consist of 23 indicators. The assessment aspects of this media suitability component include: language aspects, effectiveness for learning strategies, software engineering, and visual display aspects. The validity criteria for the assessment scores can be seen in Table 2.

Table 2
Media Expert Assessment Score

Score	Criteria
1,00 – 1,75	Poor
1,76 – 2,50	Fair
2,51 – 3,25	Good
3,26 – 4,00	Excellent

Table 3
The assessment results from media experts

Validator	Average Score	Assessment criteria
Validator I	3,5	Excellent
Validator II	3,4	Excellent
Average	3,4	Excellent

From the description above, the average data obtained from the Media Expert Team's assessment was an average score of 3.4, which means it is in the very good category. Based on this data, this thematic learning animation video media is suitable for use.

3.3 Evaluation

This phase represents the final step in the media development process, involving the analysis of data acquired from earlier stages. The assessment results from the learning outcomes test and the completion of the student learning motivation questionnaire serve as the foundation for gauging the effectiveness of the developed product. The learning outcomes tests are administered to students to gather insights into their comprehension of the provided material.

The assessment process relied on a questionnaire grid, with students engaging in online evaluation through a designated link accessible in the YouTube description section. By simply clicking on the provided link, students were able to respond to a set of 10 multiple-choice questions formatted as a Google Quiz. Upon completion, students could promptly view their attained scores. The third component involves LKPD and evaluation, with the LKPD content illustrated in Figure 5 below.

Fig. 5. Evaluation Content Display

The table of results of the analysis of student learning outcomes tests using the T-Test, which is shown in Table 4. The t-test was done to carry out the comparative hypothesis to determine the difference in the average learning outcomes of students in the experimental and control groups with the hypothesis formula: Ho = there is no difference in the average learning outcomes of the experimental and control classes, Sig value. > 0.05 Ho accepted Ha rejected. Ha = there is a difference in the average learning outcomes of the experimental class and the control class.

Table 4
Independent T-Test Test Table Group Statistics

Class	N	Mean	Std. Deviation	Std. Error Mean
Post-test Control Claas	22	68.6364	8.88844	1.89502
Experiment Class	17	81.1765	7.81213	1.89472

From the "Group Statistics" data output above, it is known that the average score for the experimental class is 81.17, and the control group is 68.63, so in descriptive analysis, there is a difference in the average learning outcomes of the experimental and control groups. From the independent sample test data, the Sig value is known. Levene's Test for Equality of Variances 0.535 > 0.05 means that the data variance for both classes is the same or homogeneous. Meanwhile, in the Equality of Variances section, it is 0.000 < 0.05, so as a basis for decision-making, Ho is rejected, and Ha is accepted, so there is a significant difference between the learning outcomes of the experimental and control classes.

To determine whether there is an increase in student motivation, student learning motivation is measured using two tests, with Hake's N-Gain test namely the initial motivation questionnaire (pre-test), which is carried out before the media trial, and the final motivation questionnaire (post-test) which is carried out after the media trial. The table of N-Gain criteria and results of student learning motivation before and after the trial is presented, as shown in Table 5 and Table 6.

Table 5
N-Gain Criteria Table

N-Gain Score	Criteria
N-gain< 0,3	Low
0,3 ≤ N-gain < 0,7	Average
0,7 ≤ N-gain	High

Table 6
Recapitulation of Experimental Student Learning Results

Average Pre-Test Score		Average Post-test Score	
50	89	100,0	0.709

Based on Hake's n-gain criteria table, it can be concluded that student learning outcomes using thematic learning animation video media are in the high category.

After conducting thorough due diligence, it can be inferred that implementing an animated video learning management system is viable for fourth-grade elementary schools. This approach has the potential to enhance student motivation and improve learning outcomes. According to [43] the use of animated movies that depict commonplace events in the classroom with appropriate audio and images will allow students to participate in the plot indirectly. Students will find learning enjoyable and self-motivating as a result of this. Additionally, Gellerstedt *et al.,* claimed that the use of animated movies will help students comprehend abstract material and grasp the topic of the material presented with ease. [44] Science classes could be made more engaging and fun by using animated video content, as demonstrated by Khalid *et al.,* [45].

[46] have also studied the creation of animated video content to improve elementary school pupils' character and drive for learning. It is claimed that the creation of video animation material increases pupils' motivation and attributes quite effectively. This study's utilization of instructional media in the form of animated videos results in learning materials that are entertaining and appropriate for pupils.

Furthermore, the study of [47] demonstrated that after watching animated videos to grasp physics principles, students' motivation was quite strong. The students claimed that "animation media employed in Newton's law material provides a full explanation of how force impacts the movement of an item," according to their interviews. This makes sense to me because the objects' motion appears realistic and the force's direction is shown clearly, making the information about Newton Law appear easy to comprehend. Additional studies' findings have demonstrated that animated video content can improve students' cognitive knowledge, assist students understand the subject matter more rapidly, and draw their attention to study [48].

Since animated movies are made more interactive to boost students' excitement and learning motivation, using them as instructional materials is thought to be more successful and engaging for pupils [49]. The findings of [50] research align with our own, affirming that animated videos have the potential to boost children's learning motivation and outcomes. This is demonstrated by highlighting the benefits of utilizing animated videos as educational tools. These advantages encompass the enhancement of children's foundational experiences in reading, thinking, discussing, and practicing. Furthermore, animated videos can serve as a viable substitute for actual environments, offering flexibility to create realistic representations. Another noteworthy point is that animated videos can effectively illustrate processes, allowing for repetitive presentations. Additionally, these videos play a pivotal role in fostering and amplifying children's learning motivation. Lastly, their versatility is evident as animated videos can be tailored for large audiences, small groups, or individual learners.

4. Conclusions

The conclusion drawn from this study asserts that the learning management development model employing animated video media proves to be not only effective but also apt for fostering independent student study, thereby significantly boosting motivation and improving learning outcomes. The conducted effectiveness test across two regions yielded an impressive n-Gain value of 0.659, categorizing it as notably good according to the Hake n-gain table. This robust result substantiates the overarching finding that the integration of thematic learning management with animated videos serves as a potent means to enhance both learning motivation and overall learning outcomes within the thematic learning context.

4.1 Implications for Practice

Strong research findings back up the potential benefits of involving classroom teachers in the pedagogical process through the use of animated videos. In addition to promoting learners' motivation, interest, deep learning and independent study among students, the use of animated videos skilfully meets the unique learning requirements of a variety of learners. Animated videos also have a significant educational value in that they foster critical thinking, creativity, and inventiveness in the classroom.

The intelligent use of animated videos emerges as a powerful tool for offering multilingual support in early years learning in areas where English is a second language, such as Malaysia. This method supports methods for language development that have been supported by research and makes it easier to become proficient in learning both native and foreign languages. Furthermore, it has been found that incorporating animated educational resources into classroom activities improves students' understanding through multimodal expression. This combines verbal, algebraic, graphical, and mathematical modalities, exhibiting an all-encompassing strategy that accommodates a range of learning preferences [52].

4.2 Implications for Policy Decisions

There is need for integration of animated aids into the school curriculum and providing comprehensive teacher training to encourage educators. These observations can serve as valuable guidance for policymakers and researchers, informing efforts to enhance curriculum design and optimize the implementation of educational technology for a superior learning experience.

5. Suggestion for Further Studies

Future studies should explore the long-term impact of interventions, conducting comparative analyses with traditional methods, and exploring student preferences to optimize educational interventions. Also, further studies should seek to validate the impact of animated video diverse research subject in relations to diverse demographic and socioeconomic factors.

Acknowledgement
The author would like to thank the selected public secondary schools for their participation. The author would also like to express appreciation to the University's graduate schools for their guidance and constructive analysis of the research results.

References
[1] Eliezanatalie, Syahda, and Utama Alan Deta. "Needs analysis of physics learning media integrated local wisdom." *International Journal of Research and Community Empowerment* 1, no. 2 (2023): 39-45. https://doi.org/10.58706/ijorce.v1n2.p39-45
[2] Hajimia, H., BAMIRO, N., Rahimzhanovich, A., Taiyrzhan, I., Kassymova, G., & Shauki, N. I. "Exploring Artificial Intelligence Discourse on Students' Learning Environment and Performance: A Comprehensive Review." *Tuijin Jishu/Journal of Propulsion Technology,* 44(6), 1822-1828. (2023).
[3] Ertmer, Peggy A., Anne T. Ottenbreit-Leftwich, Olgun Sadik, Emine Sendurur, and Polat Sendurur. "Teacher beliefs and technology integration practices: A critical relationship." *Computers & education* 59, no. 2 (2012): 423-435. https://doi.org/10.1016/j.compedu.2012.02.001
[4] Gavin, A. "How To Make Animated Educational Videos? eLearning industry." (2022). https://elearningindustry.com/how-animation-based-learning-can-benefit-online-courses
[5] Neelakandan, N. "How animation-based learning can improve your online course. eLearning industry." (2020). https://elearningindustry.com/how-animation-based-learning-can-benefit-online-courses
[6] Farista, R., & Ali, I. "Development of learning videos." *Muhammadiyah University of Sidoarjo.* (2018). http://eprints.umsida.ac.id/id/eprint/1267
[7] Jimoh, A. S., N. B. Bamiro, T. A. Akapo, D. A. Ibrahim, and M. A. Ismaila. "Survey of determinants of the utilization of ICT facilities for instruction in Lagos state secondary schools." *Al-Hikmah Journal of Education* 7, no. 2 (2020): 42-53.
[8] Abdulrahaman, M. D., N. Faruk, A. A. Oloyede, N. T. Surajudeen-Bakinde, L. A. Olawoyin, O. V. Mejabi, Y. O. Imam-Fulani, A. O. Fahm, and A. L. Azeez. "Multimedia tools in the teaching and learning processes: A systematic review." *Heliyon* 6, no. 11 (2020). https://doi.org/10.1016/j.heliyon.2020.e05312
[9] Sari, Sultia Linika, Anton Widyanto Widyanto, and Samsul Kamal. "Pengembangan media pembelajaran berbasis video animasi dalam smartphone pada materi sistem kekebalan tubuh manusia untuk siswa kelas XI di SMA Negeri 5 Banda Aceh." In *Prosiding Seminar Nasional Biotik*, vol. 5, no. 1. 2018.
[10] Rahmawati, Ana Silfiani. "Penggunaan Multimedia Interaktif (MMI) Sebagai Media Pembelajaran Dalam Meningkatkan Prestasi Belajar Fisika The Use of Multimedia Interactive (MMI) as a Learning Media in Improving Physical Learning Achievement." *Pancasakti Science Education Journal PSEJ* 4, no. 1 (2019): 7-17. https://doi.org/10.24905/psej.v4i1.52
[11] Khamzawi, Syukron, Ketang Wiyono, and Zulherman Zulherman. "Pengembangan multimedia interaktif berbasis Model pembelajaran problem based learning Pada mata pelajaran fisika pokok bahasan fluida dinamis untuk sma kelas xi." *Jurnal Inovasi dan Pembelajaran Fisika* 2, no. 1 (2015): 100-108.
[12] P Rante, P. Rante, Sudarto Sudarto, and N. Ihsan N Ihsan. "Pengembangan Multimedia Pembelajaran Fisika Berbasis Audio-Video Eksperimen Listrik Dinamis di SMP." *Jurnal Pendidikan IPA Indonesia* 2, no. 2 (2013): 203-208.

[13] Anderson, Angelika, Brett Furlonger, Dennis W. Moore, Veronica D. Sullivan, and Maximilian P. White. "A comparison of video modelling techniques to enhance social-communication skills of elementary school children." *International Journal of Educational Research* 87 (2018): 100-109. https://doi.org/10.1016/j.ijer.2016.05.016
[14] Theobald, Maryanne. "Children as research participants in educational research using video-stimulated accounts." *International journal of educational research* 86 (2017): 131-143. https://doi.org/10.1016/j.ijer.2017.07.008
[15] Trifonas, Peter. "Simulations of culture: Disney and the crafting of American popular culture." *Educational Researcher* 30, no. 1 (2001): 23-28. https://doi.org/10.3102/0013189X030001023
[16] Takacs, Zsofia K., Elise K. Swart, and Adriana G. Bus. "Benefits and pitfalls of multimedia and interactive features in technology-enhanced storybooks: A meta-analysis." *Review of educational research* 85, no. 4 (2015): 698-739. https://doi.org/10.3102/0034654314566989
[17] Loong, Esther Yook-Kin, and Sandra Herbert. "Student perspectives of Web-based mathematics." *International Journal of Educational Research* 53 (2012): 117-126. https://doi.org/10.1016/j.ijer.2012.03.002
[18] Roschelle, Jeremy, and Roy Pea. "Research news and Comment: Trajectories From Today's WWW to a Powerful Educational Infrastructure." *Educational researcher* 28, no. 5 (1999): 22-43. https://doi.org/10.3102/0013189X028005022
[19] Fatayan, Arum, Safrul Safrul, A. Ghani Abd Rahman, and Sartika Ayu. "The Implementation of Problem-Based Learning on Multiplication and Division Lessons in Improving Elementary School Students' Learning Motivation." *JTAM (Jurnal Teori Dan Aplikasi Matematika)* 6, no. 4 (2022): 857-864. https://doi.org/10.31764/jtam.v6i4.9084
[20] Fuqoha, A. A. N., Budiyono Budiyono, and D. Indriati. "Motivation in mathematics learning." *Pancaran Pendidikan* 7, no. 1 (2018). https://doi.org/10.25037/pancaran.v7i1.151
[21] Lin, Ming-Hung, Huang-Cheng Chen, and Kuang-Sheng Liu. "A study of the effects of digital learning on learning motivation and learning outcome." *Eurasia Journal of Mathematics, Science and Technology Education* 13, no. 7 (2017): 3553-3564. https://doi.org/10.12973/eurasia.2017.00744a
[22] Firdayati, Ulfi, Darwan Darwan, and Hadi Kusmanto. "Android-Based Media Development in Mathematics Lessons." *Eduma: Mathematics Education Learning and Teaching* 10, no. 1 (2021): 49-59. https://doi.org/10.24235/eduma.v10i1.8138
[23] Davis, Richard C., and James A. Landay. "Informal Animation Sketching: Requirements and Design." In *AAAI Technical Report (6)*, pp. 42-48. 2004.
[24] Lin, Lijia, and Ming Li. "Optimizing learning from animation: Examining the impact of biofeedback." *Learning and instruction* 55 (2018): 32-40. https://doi.org/10.1016/j.learninstruc.2018.02.005
[25] Höffler, Tim N., and Detlev Leutner. "Instructional animation versus static pictures: A meta-analysis." *Learning and instruction* 17, no. 6 (2007): 722-738. https://doi.org/10.1016/j.learninstruc.2007.09.013
[26] Alessi, Stephen M., and Stanley R. Trollip. *Multimedia for learning: Methods and development*. Allyn & Bacon, Inc., 2000.
[27] Qaddumi, Husam, Brendan Bartram, and Ali L. Qashmar. "Evaluating the impact of ICT on teaching and learning: A study of Palestinian students' and teachers' perceptions." *Education and information technologies* 26, no. 2 (2021): 1865-1876. https://doi.org/10.1007/s10639-020-10339-5
[28] Komalasari, Mahilda Dea, Nina Widyaningsih, Gulzhaina K. Kassymova, Fang Yuqi, Lily Muliana Mustafa, and Nurudeen Babatunde Bamiro. "Exploring the Potential of Integrating Local Wisdom into the Development of Pocket Book Learning Media: A Systematic Literature Review." *International Journal of Learning, Teaching and Educational Research* 22, no. 10 (2023): 130-151. https://doi.org/10.26803/ijlter.22.10.8
[29] Sukiyasa, Kadek, and Sukoco Sukoco. "Pengaruh media animasi terhadap hasil belajar dan motivasi belajar siswa materi sistem kelistrikan otomotif." *Jurnal Pendidikan Vokasi* 3, no. 1 (2013). https://doi.org/10.21831/jpv.v3i1.1588
[30] Maryani, Erlin. "Implementasi model Pembelajaran Advance Organizer Menggunakan Animasi ditinjau dari Minat Belajar Terhadap Hasil Belajar Kognitif Siswa Kelas VII pada Pelajaran IPA di SMPN 1 Batukliang Tahun Ajaran 2014/2015." *Jurnal Penelitian Pendidikan IPA* 2, no. 1 (2016). https://doi.org/10.29303/jppipa.v2i1.34
[31] Garsinia, Dika, Ratih Kusumawati, and Arie Wahyuni. "Pengembangan media pembelajaran video animasi menggunakan software powtoon pada materi SPLDV." *Jurnal Riset Pendidikan dan Inovasi Pembelajaran Matematika (JRPIPM)* 3, no. 2 (2020): 44-51. https://doi.org/10.26740/jrpipm.v3n2.p44-51
[32] Lee, William W., and Diana L. Owens. *Multimedia-based instructional design: computer-based training, web-based training, distance broadcast training, performance-based solutions*. John Wiley & Sons, 2004.
[33] Aksoy, Gökhan. "The effects of animation technique on the 7th grade science and technology course." *Online Submission* 3, no. 3 (2012): 304-308. https://doi.org/10.4236/ce.2012.33048

[34] Liu, Chelsea, and Philip Elms. "Animating student engagement: The impacts of cartoon instructional videos on learning experience." *Research in Learning Technology* 27 (2019). https://doi.org/10.25304/rlt.v27.2124
[35] Paul, A. "Combining Traditional and Digital Approaches for a Well-rounded Education." *Open Growth.* (2023). https://www.opengrowth.com/resources/combining-traditional-and-digital-approaches-for-a-well-rounded-education
[36] Farmer, Katharine. "The benefits of using animation for learning and development." *URL: https://boldcontentvideo. com/2021/06/29/the-benefitsof-using-animation-for-learning-and-development/(Jun 29, 2021)* (2021).
[37] Qurrota'aini, Saras Sinta, and Sukirno Sukirno. "Pocketbook as Media of Learning to Improve Students'learning Motivation." *Jurnal Pendidikan Akuntansi Indonesia* 11, no. 2 (2013). https://doi.org/10.21831/jpai.v11i2.1692
[38] Borg, Walter R., and Meredith D. Gall. "Educational research: An introduction." *British Journal of Educational Studies* 32, no. 3 (1984). https://doi.org/10.2307/3121583
[39] Najikhah, Fatikhatun, Robinson Situmorang, and Moch Sukardjo. "Analysis Study to Develop a Death Management Module with Islamic Sharia based on QR Code." *International Journal of Psychosocial Rehabilitation* 24, no. 02 (2020). https://doi.org/10.37200/IJPR/V24I2/PR200532
[40] Qistina, M., N. Hermita, M. Alpusari, E. Noviana, Z. Antosa, G. Witri, M. Munjiatun, and A. Indarni. "Improving science learning outcomes of elementary students by using interactive multimedia on human order materials." In *Journal of Physics: Conference Series*, vol. 1351, no. 1, p. 012075. IOP Publishing, 2019. https://doi.org/10.1088/1742-6596/1351/1/012075
[41] Mayer, Richard E. "The promise of multimedia learning: using the same instructional design methods across different media." *Learning and instruction* 13, no. 2 (2003): 125-139. https://doi.org/10.1016/S0959-4752(02)00016-6
[42] Wiyono, Ketang. "Pengembangan model pembelajaran fisika berbasis ICT pada implementasi kurikulum 2013." *Jurnal Inovasi Dan Pembelajaran Fisika* 2, no. 2 (2015): 123-131.
[43] Sumarni, Ria Asep, Yoga Budi Bhakti, Irnin Agustina Dwi Astuti, Dwi Sulisworo, and M. Toifur. "The development of animation videos based flipped classroom learning on heat and temperature topics." *Indonesian Journal of Science and Mathematics Education* 3, no. 3 (2020): 304-315. https://doi.org/10.24042/ijsme.v3i3.7017
[44] Gellerstedt, Martin, Said Morad Babaheidari, and Lars Svensson. "A first step towards a model for teachers' adoption of ICT pedagogy in schools." *Heliyon* 4, no. 9 (2018). https://doi.org/10.1016/j.heliyon.2018.e00786
[45] Khalid, Hamidon, T. Subahan Meerah, and Lilia Halim. "Teachers' perception towards usage of cartoon in teaching and learning physics." *Procedia-Social and Behavioral Sciences* 7 (2010): 538-545. https://doi.org/10.1016/j.sbspro.2010.10.072
[46] Wuryanti, Umi, and Badrun Kartowagiran. "Development of Animated Video Media To Increase Learning Motivation And Character Of Hard Work elementary school Students." *Journal of Character Education* 6, no. 2 (2016): 232-245.
[47] Sastradika, Dedi, Iskandar Iskandar, Boby Syefrinando, and Fauzan Shulman. "Development of animation-based learning media to increase student's motivation in learning physics." In *Journal of Physics: Conference Series*, vol. 1869, no. 1, p. 012180. IOP Publishing, 2021. https://doi.org/10.1088/1742-6596/1869/1/012180
[48] Saripudin, Endang, Indah Juwita Sari, and Mukhtar Mukhtar. "Using Macro Flash Animation Media on Motion Material to Improve Learning Achievement for Learning Science in Junior High School." *Jurnal Penelitian Dan Pembelajaran IPA* 4, no. 1 (2018): 68-75. https://doi.org/10.30870/jppi.v4i1.3316
[49] Nurrita, T. "Development of learning media to improve learning outcomes student." *Journal of Al-Quran, Hadith, Sharia and Tarbiyah Sciences,* 3(1) (2018): 171-210. https://doi.org/10.33511/misykat.v3n1.171
[50] Novelia, Syindi, and Nur Hazizah. "Penggunaan video animasi dalam mengenal dan membaca huruf hijaiyah." *Jurnal Pendidikan Tambusai* 4, no. 2 (2020): 1037-1048.
[51] Ahmad, Badrul Hisham, Osman, Aznoora, Wahab, Nadia Abdul, and Suryani, Ina. "Investigating English Language Learners' Experience in Using a Learning Management System in a Blended Learning Setting." *Journal of Advanced Research in Computing and Applications, 11*(1) (2018), 1-8. https://akademiabaru.com/submit/index.php/arca/article/view/4992
[52] Mohd Nor, Siti Rohani, Kamarudin, Adina Najwa, Jaafar, and Nurul Aini. "Comparison on the Student's Performances during Physical and Online Learning in Financial Mathematics Course." *International Journal of Advanced Research in Future Ready Learning and Education*, *28*(1), (2022) 1–8. https://akademiabaru.com/submit/index.php/frle/article/view/4519