



Development of Science Education Videos Based on Digital Storytelling as An Independent Learning Resource for Late Adolescents

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Article Info	Abstract
Article History : June 2023 Accepted September 2023 Published December 2023	The increasing interest of late adolescents in digital content provides an excellent opportunity to distribute self-learning resources that can facilitate understanding science concepts in daily life. Unfortunately, social media as a means of disseminating digital content is still dominated by entertainment content. The lack of science education videos that are interesting and suitable for the characteristics of late adolescents on social media causes late adolescents to prefer entertainment content over educational content. Therefore, this research was initiated to develop a science education video based on digital storytelling and identify aspects of validity, practicality, and effectiveness of educational videos as a source of independent learning for late adolescents. This research includes Research and Development (R&D), using the 4D model of defining, designing, developing, and disseminating. This research produced a product in the form of a science education video based on digital storytelling as an independent learning resource for late adolescents that has been declared valid, practical, and effective. The validation percentage score of 82.5% is included in the very valid category. The practicality aspect met the very practical criteria, with a score of 92.66%. Effectiveness received an N-Gain score of 0.78 and was included in the high category. Based on the study's results, this digital storytelling-based science education video can be utilized as an independent learning resource for late adolescents.
Keywords: digital storytelling; late teens; science; independent learning resources; educational videos	

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INTRODUCTION

Learning resources support learning independence, so learning resources are significant for students in the learning process. Lack of learning resources can cause students to lack knowledge and ultimately be less active in learning. Students become very dependent on the teacher and cannot develop their knowledge; therefore, learning resources are very important to determine the success of a lesson. Learning resources are everything in the form of messages, people, materials, tools, techniques, and environments, individually or in combination, allowing learning to occur. Learning resources can be obtained in various ways, such as reading, internet browsing, discussions, listening to audio media, multimedia, or even through digital content on social media (Widyastuti et al., 2022).

The increasing interest of Indonesian people in digital content on social media (Aripadono, 2020), should provide a great opportunity for teachers to be able to disseminate independent learning resources for late adolescents. Based on data from Kepios (2022), late adolescents dominate the use of social media by 32%. One of the popular social media used in Indonesia is Instagram. Unfortunately, educational content still cannot compete with entertainment content on social media. It is known that the types of accounts most followed on social media after friends, family, or people they know are entertainment and memes, as well as artists and influencers (musicians, comedians, bands, performers, and actors). This shows that late adolescents' interest in educational content tends to be less than entertainment content.

According to A'Yuni et al. (2022), using the internet as a second world for late adolescents can affect their mindset. This greatly influences their learning style and interest in learning. Teachers who act as facilitators in learning are required to create new innovations in order to adjust students' learning styles and habits, one of which is by developing learning resources in the form of digital content on social media. Therefore, it is necessary to have a science educational video that is entertaining and has educational value to facilitate independent learning resources that are suitable for late adolescents.

Adolescence is when a person has passed through childhood, which is weak and full of dependency, but has not yet reached adulthood, which is strong and full of responsibility. There are various opinions regarding the start and end of adolescence, according to Santrock (2007) in his book on adolescence, although the age range for adolescence can vary, most use the range of early adolescence to take place in junior high school or high school (10 – 18 years), and late adolescence occurs in the middle of the second decade of life (18 – 22 years).

From a cognitive perspective, late adolescents have reached the level of formal operational thinking, which is they are able to think abstractly and hypothetically. At this level, late adolescents can think about something that will or might happen, connect cause and effect, make plans, and predict various possibilities that will occur as the basis for their thinking. However, of course, not all late adolescents can immediately reach this level of thinking; they need practice, experience, and various other influencing factors (Santorck, 2007). Based on the characteristics of late adolescents, it is very important to form a reference as a basis of the mindset and experience of late adolescents to train their cognitive development. Teachers can provide appropriate learning facilities for late adolescents according to the characteristics, habits, interests, and learning styles of today's teenagers.

Understanding science is very important in supporting the real life. Science is one of the basic sciences that needs to be studied because humans live interdependently with nature, starting from daily activities, to technology that helps human life is also related to science. However, there are still many late adolescents who cannot find the connection between theory and the application of science in everyday life (Hutomo, 2022). Dissemination of science educational content that explains the application of science in everyday life on social media is able to bring students closer to science. Unfortunately, most active social media users are still controlled by influencers, artists, or products, while teachers and students tend to only be passive users of content enjoyment. (Irwandi, 2016). Not much science education content has been developed as interesting as entertainment content. Dewi et al. (2021) have developed educational content via infographics on Instagram, which can

help students improve their understanding of science material and facilitate independent learning. This research develops learning media that can facilitate independent learning; the difference is that it uses infographics, whereas this research uses educational videos.

Seeing this situation, it is necessary to have a learning resource that is able to facilitate late adolescents in learning science independently, which is entertaining and has educational value. An alternative that can be done is to create independent learning resources based on digital storytelling. Robin (2008), The specialty of digital storytelling is in combining images, music, narration, and sound together, thus providing a more vivid picture of the characters, situations, experiences, and insights conveyed. Digital storytelling techniques also involve emotion, entertainment, meaning, and connection to real life and have a clear storyline and purpose, then supported by interesting visuals and audio so that they have the potential to increase interest in learning.

Prasetyawati (2021) mentions that in creating *digital storytelling* content, several writing and animation techniques are used, while also applying mindsets with various techniques, such as analogies, jokes, examples, dramatic questions, popular references, and famous *quotes*. All of these are combined in the concept of *digital storytelling* so that the *audience* feels closer to the information to be conveyed. *The tone of voice* in narrating the content is also very important to bring the *storytelling* atmosphere to life. *The tone of voice* can be casual, light, informal, grand, etc. *Digital storytelling* focuses more on creating interesting content first, then inserting educational points. Explanations used in digital storytelling also avoid using language or terms that are difficult to understand, instead, analogies are used to explain things that are not familiar to the wider community. Through these techniques, *digital storytelling* content is able to tell science stories that are often considered boring content or information for many people and turn them into something fun.

According to (Bull & Kajder, 2004) there are several elements in digital storytelling, which are as follows:

a. Point of view (point of view)

The digital storytelling perspective is tailored to the storyteller or author. Choosing a focal point of view

in telling a story is very important to make the material more interesting.

b. Dramatic question (drama question)

Drama questions are used as the goal and conclusion of the whole story, which will be answered at the end.

c. Emotional content (emotional content)

The content in the story is able to be emotionally appealing or persuasive, something that can also be felt by the audience or is relatable.

d. The gift of your voice (giving voice)

Providing a voiceover must convey the narrative well to make it easier for the audience to understand what will be conveyed.

e. The power of the soundtrack (power of accompanying music)

Accompanying music as a supporting element is used to build an atmosphere to accompany the speaker's voice-over.

f. Economy (economic level)

The material is presented simply and not excessively, but still effectively, so it doesn't make the audience bored.

g. Pacing (speed level)

The author or speaker needs to provide stories that are diverse, fresh, and unique so that the audience does not feel bored with what is being conveyed.

The development of science education videos based on *digital storytelling* is made to facilitate late adolescents to learn science independently by providing learning resources that can add references to science in real life. The positive impact of using social media can also be increased by presenting educational videos on science through storytelling, which can make late adolescents feel closer to science. This educational video can also be an alternative learning media for teachers to deliver science material independently or in class. This development research aims to develop science education videos based on digital storytelling and identify their validity, practicality, and effectiveness as an independent learning resource for late adolescents.

METHODS

This research is development research (R&D) using a 4D model adapted from Thiagaradjan (1997), consisting of 4 stages: define, design, develop, and disseminate. The first stage is defining, analyzing, and collecting initial information. Then,

the design stage is the selection of media and formats, testing, and creating initial product designs such as outlines, narratives, and storyboards. The next stage is development, which identifies the validity, practicality, and effectiveness of the product being created. If it has been proven valid, practical, and effective, the educational video will be distributed in the final stage, namely dissemination.

This development research aims to create a science education video based on digital storytelling as an independent learning resource for late adolescents and identify the validity, practicality, and effectiveness of the educational video developed. The validity of the educational video was assessed by two media and material expert lecturers. Then, data on practicality and effectiveness were taken from questionnaires and tests conducted on late adolescents (18-22) years old, totaling 17 people. The research was conducted online via Google form; respondents were asked to answer the pre-test first, then watch digital storytelling educational videos on everyday science topics about "why do eyes get minus?" followed by filling in post-test answers, and finally, respondents were asked to fill in the questionnaire to measure the practicality of the educational videos created.

Data collection techniques were taken from questionnaires and tests. A questionnaire in the form of a 5-level Likert scale was used to determine the validity and practicality of educational videos. Then, the effectiveness results are known through tests (pre-test and post-test). The data analysis technique for the validation questionnaire uses a Likert scale percentage formula based on the score results given by the validator, with media validity categories adapted from (Arikunto, 2018). Practicality data analysis uses a Likert scale percentage formula, and the practicality percentage results are interpreted into certain categories (Sugiyono, 2021). Learning effectiveness is measured from learning outcomes tests by conducting pretests and posttests. N-gain analysis is used to determine the increase in learning outcomes in the knowledge aspect.

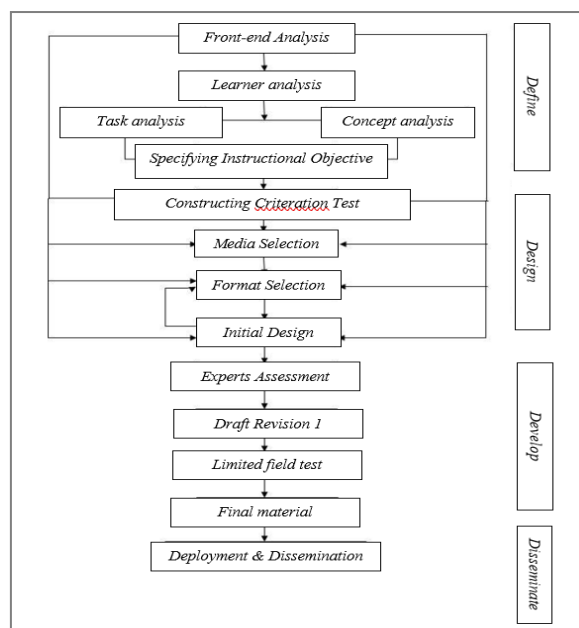


Figure 1. Procedure 4D model

RESULTS AND DISCUSSION

This development research produces a product as a science education video based on digital storytelling, which explains scientific concepts regarding myopic eyes in everyday life. This educational video is intended for late adolescents as a source of independent learning. The stages of development results using the 4D model (define, design, develop, disseminate) are as follows:

1. Define

The first stage in developing an educational video is defining and collecting information to determine a needs analysis. Starting from determining the problem and solution, then analyzing the learner to find out the characteristics of the intended target audience, followed by analyzing the tasks and concepts that will be presented, and formulating the objectives of the educational video. The results of this stage are used as a basis for development.

2. Design

The design stage is needed to design the product to be developed. Starting from preparing test instruments, selecting formats, selecting media, and preparing initial product designs. The test preparation is adjusted to formulate objectives compiled at the defined stage. This research uses tests in the form of a pre-test and post-test with seven

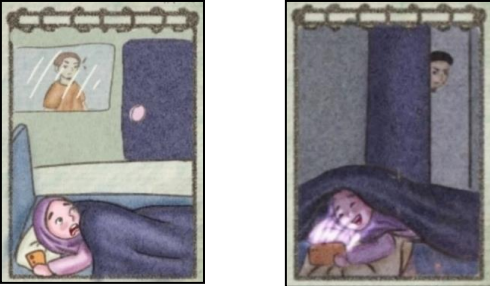

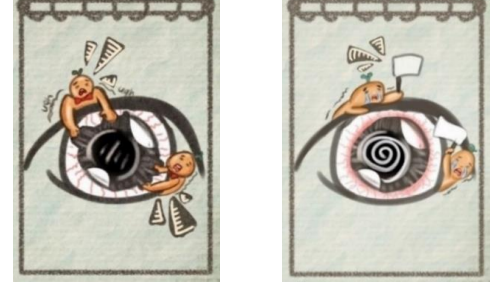

multiple-choice questions. Then, media selection in the form of videos that will be distributed on social media, namely Instagram reels, so that the video format created also adapts to Instagram reels, with a duration of around 2 minutes, and the type of video is motion graphics. Next, an initial product design is created as an educational video outline (choosing the topic, objectives, and initial concept), followed

by a narrative and storyboard to reference the scenes needed to make the video.

3. Development

At the development stage, a development product was produced as a science education video based on digital storytelling with the topic "Why do eyes get minus?" Below are some of the educational video results.

Table 1. Preview Video Education Sains Based Digital Storytelling

View	Description
	<p><i>Orientation</i> This section introduces the character, the situation, and the character's habits, which will eventually affect the health of his eyes.</p>
	<p><i>Complication (conflict/problem)</i> People started to experience symptoms of myopia and questioned why this was happening.</p>
	<p><i>Resolution</i> Through the storytelling analogy, the educational video explains scientifically why myopia occurs, and the character finds a solution to his problem about the causes and prevention of myopia.</p>
	<p><i>Koda (conclusion)</i> The ending of the story gives a message to the audience to prevent the same incident from happening again.</p>

The design and production of educational videos based on digital storytelling combines narratives/stories with multimedia in images,

audio, and text, making the information conveyed more interesting. Educational videos are also packaged with sequential story narratives starting

from orientation, conflict, resolution, and coda, use analogies and everyday stories that relate to the lives of late adolescents and do not use scientific terms that are difficult to understand. So that educational videos are easier to understand and interesting to watch. This aligns with what Kurniawan (2020) said: digital storytelling educational videos delivered in the narrative form can tell a story logically or sequentially through a series of events put together and look like a small film starring the main character who seems to be communicating with the viewer. In addition, Prasetyawati (2021) also said that creating digital storytelling content uses several writing and animation techniques. The main focus of creating educational content is to create exciting content first, then insert educational points into it. The techniques in writing stories can make analogies, jokes, various examples, intriguing question sentences, popular references, or famous quotes used to bring up information closeness with the audience. Apart from narrative writing techniques, providing a voice in narrating the content (tone of voice) to liven up the storytelling atmosphere. The tone of voice that can be used is relaxed, light, informal, majestic, and so on.

Furthermore, after the product has been successfully created, three assessments are carried

out on the educational video to identify aspects of validity, practicality, and effectiveness of the digital storytelling-based educational video that has been created. The results of the assessment are as follows:

a) Validity

The results of the validity assessment of educational videos based on digital storytelling received a fairly good score from both expert validators. The results of validator 1's assessment, digital storytelling-based science education videos, received a percentage of 85% and were included in the very valid category. Then, the score given by validator 2 is 80%, which is included in the valid category. The overall average validation percentage result is 82.5%, included in the very valid category. This means that the digital storytelling-based science education videos created have met valid quality standards based on expert assessment regarding material content, suitability, visuals, audio, benefits, and use. This also aligns with Pratama's (2018) research that developing digital storytelling media is valid based on expert assessments, which shows that digital storytelling media is good and makes the media more interesting. The preparation of the material is appropriate.

Table 2. Result of validation by expert validators

Assessment Indicator	Validator		Maximum score
	1	2	
Content	21	20	25
Compatibility	17	16	20
Visual	34	32	40
Audio	26	24	30
Benefits	22	20	25
Usage	16	16	20
Total	136	128	160
Percentage	85%	80%	-
Average validity	82.5 %		
Category	Very Valid		

The two validators also provided suggestions and comments regarding digital storytelling-based science education videos. Then, these suggestions

and comments became material for revisions to improve the educational videos being developed to make it better.

Table 3. Expert validator comments and suggestions

Validator	Comment	Improvements
1	1) Keyword <i>highlighted</i>	1) Adding <i>highlights</i> .
	2) Illustrations adapted to the narrative	2) Customizing illustrations
	3) Add scientific concepts	3) Adding science concepts
	<ul style="list-style-type: none"> • Impact • Myopia glasses 	<ul style="list-style-type: none"> • Impact of minus eye • Minor glasses
2	4) Slightly lower text	4) Change the position of the text
	1) add how to prevent myopia	1) Additional ways to prevent myopia
	<ul style="list-style-type: none"> • Maintain a reading/eye distance from the screen of $\pm 33-40$ cm • Habit modification 20 minutes interspersed with relaxation • Maintain good lighting when reading/watching 	

b) Practicality

The practicality of educational videos was assessed by conducting limited field tests on 17 late adolescents. Respondents were given a Google form link, asked to watch an educational video, and then filled out a response questionnaire in the form of a Likert scale. The practical results of educational videos are as follows:

Table 4. Practicality Results of Educational Video

Number of Respondents	Total Score	Maximum Score
17	1024	1105
Average percentage of practicality	92.66 %	
Category	Very Practical	

The practicality aspect received a score of 92.66%, so it was categorized as very practical, meaning that this educational video was easy to use and received a good response from late adolescents as an independent learning resource, from the aspects of material delivery, benefits, and appearance. The results of the respondent's assessment showed that the narrative conveyed in the video was interesting, and the storytelling was also very relatable to late adolescents. Educational videos can visualize abstract science concepts to be more easily understood. This is also supported by research (Drajat & Purnama, 2020) that shows that material that is difficult to understand can become easier to understand with the help of digital storytelling. By creating more enjoyable content so that more viewers are interested, at least there is information that can be conveyed to social media users to provide a stimulus for viewers to want to find more complete information and increase

curiosity in learning. Fadillah (2021) also researched the use of digital storytelling as a new strategy for increasing the literacy of the younger generation. Through the literature study method carried out by researchers, it was found that digital storytelling could be a new strategy for increasing students' interest in reading. Digital storytelling can convey imagination, beliefs, hopes, impressions, and emotions. Humans whose lives are always side by side with events and phenomena always keep stories in their lives. So, this digital storytelling strategy will create a deep impression on students, according to Gürsoy (2021). Digital storytelling is very practical because it provides meaningful, permanent, fun, and motivating learning. It also follows 21st-century skills, which train the ability to learn and innovate, information skills, media and technology, life skills, and professional skills.

c) Effectiveness

The effectiveness of educational videos was determined from the pretest and posttest results in field tests. The research was conducted on 17 late adolescents. Respondents were given a Google form link and asked to answer pretest questions and watch educational videos. Finally, respondents answered post-test questions to determine the effectiveness of educational videos.

Table 5. Results of Educational Video Effectiveness

Data	Number of Respondents	Average score
<i>Pre-test</i>	17	59.29
<i>Post-test</i>	17	89.76
N-Gain	0.789	
Percentage	78.921	
Category	Very effective	

In the effectiveness aspect, it received a high effectiveness category with an n-gain score of 0.78, and this shows that science education videos based on digital storytelling can make late adolescents achieve the goals of educational videos, is known from the results of the pre-test and post-test that they have increased so that the n-gain score also shows high effectiveness in the developed scans educational videos.

Julianingsih (2020) also stated that using digital storytelling video media has proven more effective in learning than learning that does not use digital storytelling videos. Apart from that, Qoidah (2018) also stated that digital storytelling, which combines visualized stories with images and sounds provided by native speakers or teachers, can make digital storytelling effective for use in learning. It is not only based on learning outcomes but can also help students practice solving problems. Dewi et al. (2018), who also researched the development of digital storytelling on students' metacognition, described that the effective use of digital storytelling was able to improve students' metacognitive abilities.

4. Disseminate

The final stage in this development is dissemination. After going through the development stage, the product can be disseminated after being declared valid, practical, and effective.



Figure 2. Cover and QR Code Video Education Science Based on Digital Storytelling

The distribution of science education videos based on digital storytelling is carried out via Instagram because Instagram is a medium close to late adolescents; besides that, it can potentially spread independent learning resources for late adolescents. Dewi et al. (2021), In the form of infographics distributed via social media, Instagram really helps students increase their understanding of science material. Using Instagram media makes it

easier for students to study independently or in class because it is easy to access. This can also help reduce the negative impact of using social media. Pujiono (2021) revealed that using social media as a learning medium is very relevant to the characteristics of the current generation, whose lives are very closely linked to technology. The use of social media needs to be addressed wisely, one of which is by reducing the negative impact and increasing the positive impact or benefits by distributing learning media through social media.

CONCLUSION

Based on the research that has been done, this development produces a product in the form of a science educational video based on digital storytelling with the topic "Why do eyes get minus?" This educational video is packaged with a storytelling narrative, and the educational video is displayed using the Instagram reel format. The video content is in the form of motion graphics, with a duration of 2 minutes and 3 seconds, which has been proven valid, practical, and effective for use as an independent learning resource for late adolescents.

The science education video based on *digital storytelling* as an independent learning resource for late adolescents received a validation percentage score of 82.5%, including a very valid category. Regarding practicality, science education videos based on digital storytelling as an independent learning resource for late adolescents meet the very practical criteria, with a score of 92.66%. Based on the N-gain results that determine the effectiveness of *digital storytelling-based* science education videos as an independent learning resource for late adolescents, the result is 0.78, which is in the high category. Thus, it can be concluded that developing science education videos based on *digital storytelling* for late adolescents is valid, practical, and effective.

REFERENCE

- Arikunto, S. (2018). *Evaluasi Program Pendidikan*. Jakarta: PT. Bumi Aksara.
- Aripadono, H. W. (2020). Penerapan Komunikasi Digital Storytelling Pada Media Sosial Instagram. *Teknika*, 9(2), 121 - 128.
- A'yuni, Q., Rizqi, F. N., Aiyuni, F., Rahmah, N., & Fauzi, I. (2022). Inovasi Guru dalam

- Mengembangkan Konten Edukasi Platform Youtube sebagai Media Pembelajaran Biologi. *Bioilmi: Jurnal Pendidikan*, 8(1), 48-53.
- Bull, G., & Kajder, S. (2004). Digital Storytelling in the Language Arts Classroom. *Learning & Leading with Technology*, 32(46 - 49).
- Dewi, A. C., Adi, E. P., & Abidin, Z. (2021). Pengembangan Infografis melalui Instagram sebagai Penguatan Pemahaman Pokok Bahasan Sistem Pencernaan Manusia. *Jurnal Kajian Teknologi Pendidikan*, 119 - 232.
- Dewi, N.R., Kannapiran, S., & Wibowo, S.W. (2018). Development of Digital Storytelling-Based Science Teaching Materials to Improve Students' Metacognitive Ability. *Jurnal Pendidikan IPA Indonesia*, 7, 16-24. *Jurnal Pendidikan IPA Indonesia*, 7, 16 - 24.
- Drajat, H., & Purnama, H. (2020). Efektivitas Penggunaan Digital Storytelling Kanal Youtube 'Kok Bisa?' Dalam Meningkatkan Minat Belajar. *Journal Komunikasi Universitas Garut*, 382 - 390.
- Fadillah, I. N., & Dini, K. (2021). Digital Storytelling sebagai Strategi Baru Meningkatkan Literasi Generasi Muda. *Journal of Education Science (JES)*, 83 - 98.
- Gürsoy, G. (2021). Digital Storytelling: Developing 21st Century Skills in Science Education. *European Journal of Educational Research*, 10(1), 97 - 113.
- Hurlock, E. B. (1997). *Psikologi Perkembangan suatu pendekatan sepanjang rentang kehidupan edisi kelima*. Jakarta: Erlangga.
- Hutomo, B. A., Saptono, S., & Subali, B. (2022). Development of E-module Based on Science, Technology, Engineering, and Mathematics (STEM) To Improve Science Literacy of Junior High School Students. *Journal Innovative Science Education*, 11(2), 241 - 249.
- Irwandani. (2016). Potensi Media Sosial Dalam Mempopulerkan Konten Sains Islam. *Jurnal Keguruan dan Ilmu Tarbiyah*, 01(2), 173 - 177.
- Julianingsih, D., & Krisnawati, E. (2020). Efektivitas Video Digital Storytelling terhadap Hasil Belajar Siswa Kelas X Pada Materi Trigonometri. *Journal of Medives: Journal of Mathematics Education IKIP Veteran Semarang*, 129 - 139.
- Kepios, W. A. (2022, Februari). *Digital 2022 Indonesia; The Essential Guide to The Latest Connected Behaviours*. Retrieved from DataReportal.Com: Datareportal.com/library
- Kurniawan, M. R. (2018). Permainan Tradisional Yogyakarta sebagai Sumber Belajar Alternatif Berbasis Kearifan Lokal Bagi Pembelajaran di Sekolah Dasar. *Primiere Educandum: Jurnal Pendidikan Dasar dan Pembelajaran*, 8(2), 98 - 111.
- Prasetyawati, A. (2021). Digital Storytelling Kok Bisa?: Mengubah Keberlimpahan Informasi menjadi Konten Edukasi. *Jurnal Ilmu Pengetahuan dan Teknologi Komunikasi*, 199-212.
- Pratama, F. A. (2018). Pengembangan Media Digital Storytelling Dalam Pembelajaran Biologi SMA untuk Menunjang Model Pembelajaran Blended Learning. *Skripsi Universitas Muhammadiyah Surakarta*, 49 - 60.
- Pujiono, A. (2021). Media Sosial Sebagai Media Pembelajaran Bagi Generasi Z. *Journal of Christian Education*, 1-19.
- Qoidah, R. F. (2018). Efektifitas Penggunaan Media Digital Storytelling dalam Pembelajaran Menulis teks Narrative: Stufi Kasus di SMP Negeri 1 Widodaren Ngawi. *Prosiding Seminar Nasional Pendidikan KALUNI*, 1(1).
- Robin, B. R. (2008, July). Digital Storytelling: A Powerfull Technology Tool for the 21st Century Classroom. *Theory Into Practice*, 47(1), 220 - 228. doi:10.1080/00405840802153916
- Santrock, J. (2007). *Adolescence, eleventh edition*. Jakarta: Penertbit Erlangga.
- Sugiyono. (2021). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Bandung: Alfabeta.
- Thiagarajan, & dkk. (1974). *Instructional Development for Training Teachers of Exeptional Childern A Source Book*. Washington, D. C: National Center for Improvement of Educational Systems.
- Widyastuti, A., & al, e. (2022). *Media dan Sumber Belajar*. Yayasan Kita Menulis.