
Development of Powtoon-Based Animated Videos to Improve Critical Thinking Skills Junior High School Students In Science Learning

Teresa Dinasty Mulyana, Sri Wahyuni*, Rusdianto

Science Education Department, Faculty of Teacher and Training Education, University of Jember, Jember, Indonesia

*Email: sriwahyuni.fkip@unej.ac.id

Article History:

Received date: January 4, 2023

Received in revised from: May 16, 2023

Accepted date: May 30, 2023

Available online: June 8, 2023

Citation:

Mulyana, T.D., Wahyuni, S., & Rusdianto. 2023. Development of powtoon based animated videos to improve critical thinking skills junior high school students in science learning. *JUPI (Jurnal IPA dan Pembelajaran IPA)*, 7(2):145-155.

Abstract. Students critical thinking were crucial problem that affected to all learning system. The aim of this study was to develop the science learning media by using powtoon-based animated video that can be valid, practical and effective in order to build the students' critical thinking. This research is a development research with the ADDIE model which consists of analysis, design, development, implementation and evaluation. The data used in this study was based on the research instruments including validation sheets, learning implementation sheets, questionnaires, and tests of students' critical thinking. The research subjects were consist of 31 students of Class VIIIB at SMP Negeri 12 Jember. The result of this study showed that first the animated video has 90% validity score by the expert. Furthermore, this animation videos had 3.87 average of practicality which can be categorized as practical and was carried out very clearly. For the effectiveness of the animated video achieved an N-gain of 0.92 that can be classified as high category. Finally, for the students' respon from the questionnaires showed that 92% was categorized as very good. Based on the result can be concluded that the development of Powtoon-based animated video was effective in improving the students' critical thinking.

Kata kunci: Animation video, powtoon, critical thinking skill

Introduction

Learning in the 21th century emphasizes that individuals are required to master the competencies and skills such as creative and critical thinking, problem solving, communication and collaboration which is commonly referred as 4C (Filjani, et al., 2022). The ability to think critically is a learning competency that must be mastered by every individual in 21st century learning (Arifah, et al., 2018). Indicators of critical thinking ability include interpretation, analysis, evaluation, inference, explanation, and self-regulation. 21st century learning emphasizes student-focused learning, is no longer teacher-centered (Laili et al., 2022). Based on curriculum 2013 (K-13) the critical thinking skills plays an important role in producing the next generation of the nation who can guide this nation in a better direction, as well as to help create and understand a concept. The critical thinking skills can help students when analyzing the main problems presented by educators, therefore students are able to do analysis and draw conclusions from the problems encountered, especially in learning science (Mahanal, et al., 2019).

Science learning is learning that contains systematic theory which is the result of the discoveries and thoughts of scientists in an experiment that carried out by using

methods and scientific attitude (Wedyawati, et al., 2019). Science is a knowledge that is presented in a different form unlike other knowledge. It focuses on experiments, research and trials that carried out repeatedly in order to get an appropriate data scientifically (Ulum, et al., 2021). Science learning also aims to show how the occurrence of natural events. Besides, it not only provides the knowledge but also the concept and the fact about the scientific discoveries (Oktaviana, et al., 2020).

However, the fact shows that science learning has not yet reached the competency of critical thinking skills. The low ability of students' critical thinking can be caused by the use of learning media that is not optimal during the implementation of teaching and learning activities. The efforts of the teacher to build students' critical thinking skills are still being developed and remain a major topic of research until now. Some cases are founded that the teacher meet the difficulties in seeking methods in order to increase the critical thinking skills of junior high school students (Liwa, et al., 2020) . Evidenced other where science learning is still far from the level of students' critical thinking abilities in analyzing the problems they face, especially junior high school students at an age range of 13-15 years which are included in the category of abstract thinking (Budiarso, et al., 2020). The ability of Indonesian students in thinking critically is still minimum especially in activities such as identifying problems, explaining phenomena scientifically, evaluating and finding the basis of scientific discoveries, interpreting data and using scientific evidence (Warsah, et al., 2021).

Critical thinking skills is not only can be formed and processed by students themselves. The role of the teachers has an important contribution because the teachers are required to be able to develop an appropriate learning media and be able to keep up with technological advances in current developments (Kivunja, 2014). The lack of using learning media and students' books as teaching materials makes the learning process monotonous and less interesting, the minimal use of interactive learning media also affects in decreasing the students' interest and has an impact on learning outcomes received. The lack of using learning media causes students to find difficulties in understanding the subject and the learning outcomes obtained are not optima (Basri, et al., 2019).

Based on the results of observations at school, the observation regarding the teacher's obstacles in teaching and learning activities, showed that there was still lack of understanding by the students in learning science. Therefore, it caused decreasing the students' scores in the previous year. This problem can be caused by various factors. One of the factors is the use of media that is not maximal yet. The conventional methods are still applied, for example lecturing and relying on the blackboard to explain the subject. Some of the science materials are still using books and still focusing on the material itself. Keeping up with technological developments in the field of education, of course, there are many applications and websites that support the learning activities, one of which is powtoon media (Giannakos, et al., 2018). Powtoon is an online facility whose function is to create presentations with various interesting and simple animated characteristics that are able to provide animated videos with various superior features. Animated videos have the advantage of being able to convey messages and capture students' interests, video media can be tested for its credibility as having an effective capacity (penetration of more than 70%) to channel information, entertainment and education (Fayanto, et al., 2019).

Based on these problems, a breakthrough is needed as a reference to improve students' critical thinking skills through teaching and learning activities that emphasize the learning media. With the existence of learning media that is interesting, easy to understand, and able to sharpen the students' critical thinking, it can be suitable for powtoon-based animated videos to be implemented for students to learn the science. Based on the

description that has been presented, the researcher intends to develop a powtoon-based animated video to improve junior high school students' critical thinking skills in learning science at odd semester Grade VIII. Through this research, the effectivity and validation of animation video based on powtoon will be found. This observation can be initial design for the develop science learning media using powtoon-based animation videos that are valid, practical and effective to improve students' critical thinking skills at SMP Negeri 12 Jember.

Methods

This research was conducted by applying the development model. Research design was applied in the form the model analyze, design, development, implementation, evaluation (ADDIE), that's form sequence make this research specific and suitable to applied. The trials of the powtoon-based animated videos used the human digestive system material. This research took place at SMPN 12 Jember that located in Jember Regency. The subjects of the research consisted of 31 students of class VIII B.

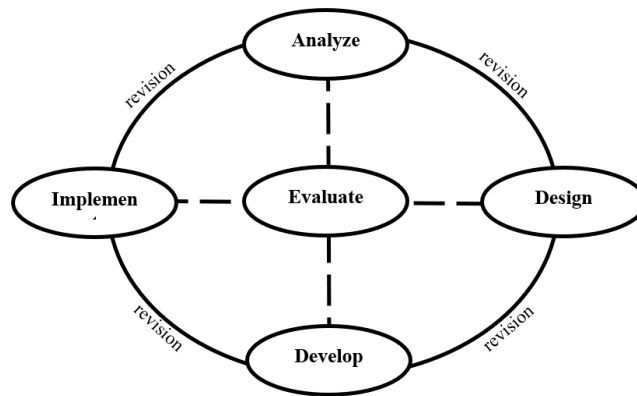


Figure 1. ADDIE Stages (Robert, 2020)

The procedure for developing a powtoon-based animation video research is explained as follows: (1) Analysis; the analysis phase is carried out by visiting the research location and conducting an interview toward the teachers of the class VIII SMPN 12 Jember to find out the state of the field, students, and get the material information that will be used as a the main material in developing the media. (2) Design; the design stage is conducted for designing animated video products that will be developed. The animated video products will be developed based on the design that consist of basic competencies, competency achievement indicators, learning objectives, designing media, compiling materials, and making critical thinking skills tests. (3) Development; the development stage is making the media by assembling all of the components namely material, examples of animated images, audio, and evaluation. Those components will be applied into a powtoon-based animated video. At this stage it also aims to get the feasibility of the product that has been developed. (4) Implementation; the implementation stage is the stage where the animated video that has been developed is implemented at SMP Negeri 12 Jember.

This study used the techniques that used to see the effectiveness of the developed powtoon-based video animation media. The measurement technique used a critical thinking ability test. In order to maintain the quality of the instrument, several opinions

from the experts are needed which are known as validation (Hikmah & Purnamasari, 2017). This study used instruments such as (1) expert validation sheets; (2) learning implementation sheet; (3) critical thinking skills test questions; (4) student response questionnaire. The data in this study were obtained through interviews, tests and documentation. The formula used to calculate the validity score of learning media is as follows (Akbar, 2013).

$$V - ah = \frac{T_{SE}}{T_{SM}} \times 100\%$$

Evidence:

V = Validate score
 T_{SE} = Total score achieved
 T_{SM} = Total maximum Score

The criteria for the validity of learning media are as follows.

Table 1. Criteria for the validity of animated videos

Score Quality Criteria (%)	Category
$80 < v \leq 100$	Very valid or usable without improvement
$60 < v \leq 80$	Valid or usable but minor improvement
$40 < v \leq 60$	Valid enough but used after major revisions
$25 < v \leq 40$	Less valid to use

The implementation formula is as follows.

$$\text{Averager scores} = \frac{\text{total practical scores}}{\text{total assessment criteria}}$$

Table 2. Learning implementation score criteria

Score Quality Criteria	Category
$80 < p \leq 100$	Very practical
$60 < p \leq 80$	Practical
$40 < p \leq 60$	Less practical
$25 < p \leq 40$	Impractical

(Sumber: Ebtasari & Ismayati, 2016))

The effectiveness of powtoon-based animated videos used is normalized (N-gain). The N gain formula according to Hake (1998) is as follows.

$$g = \frac{S_{\text{post}} - S_{\text{pre}}}{S_{\text{maks}} - S_{\text{pre}}}$$

Table 3. Category scale of students' critical thinking abilities

g score	Category
$g \geq 0,7$	High
$0,3 \leq g < 0,7$	Medium
$g < 0,3$	Low

(Sumber: Hake, 1998)

Result and Discussion

The results of the study have been completed by applying the ADDIE development model. Powtoon-based animated video media is a product that produced through this research. The feasibility of a powtoon-based animated video was obtained based on validity sheet data that assessed by three validators. Validity is an activity to obtain approval or validation of the device based on the suitability of the required criteria (Ridlo, et al., 2022). Validation aims to find out in detail the deficiencies and weaknesses of the product before it is tested on students (Khulsum, et al., 2018).

Table 5. Results of the validity of animated videos.

No.	Assessment aspects	Interval scores			Validity (%)	Criteria
		Validator 1	Validator 2	Validator 3		
1.	Material substance	95	93	86	91.3	Very valid
2.	Learning design	90	90	85	88.3	Very valid
3.	Media utilization	86	100	80	88.6	Very valid
	Average score	92	93	85	90.0	Very valid

The validity score of the animated video from the average calculation of the three validators gives a validity percentage score of 90% with very valid criteria. The indicators for the validity of the animated videos used include the essence of the content, learning design, and the use of animated videos that have been developed are valid in being tested on students. The results of the pretest and posttest in each study were analyzed by the N-gain test.

A teaching material is said to be valid if it meets the minimum criteria, namely the criteria of "valid" or "very valid" (Manumpil, et al., 2022). In other results emphasized that the results of media validity can be obtained through various aspects of the material and aspects of media utilization that have completed valid and valid criteria used during the learning process (Kurniawan, et al., 2018). Based on research data explained that according to the results of the actual evaluation of the product which deserves to be developed in the form of animated videos are very good in many ways, namely in terms of material content, aspects of the use of the learning environment, and perspectives on planning learning media (Susrawan, 2016).

Table 6. Results of N-gain analysis

Components	Class VIII B	
	<i>Pretest</i>	<i>Posttest</i>
The number of students	31	31
Minimum score	4	25
Maximum score	44	100
Average score	19.8	93.3
<i>N-gain</i>	0.92	
Category	High	

The results of the N-gain analysis for class VIII B have a result of 0.92 which is included in the high criteria. It means the increase in critical thinking skills achieves the expected criteria, which is very good. Increasing the students' critical thinking skills shows that power point-based animated videos are effectively used in learning. The powtoon-based animated video designs are adjusted to the needs of students, therefore it can attract

the students' interest in watching them. Learning media in the form of video has an impact on critical thinking skills, this is because learning media is able to increase students' curiosity, make students more active, and motivate students through shows that containing a combination of images, animations, and sound (Indayani, et al., 2021). A similar study stated that learning videos were interesting and appropriate to use and were able to improve the critical thinking skills of junior high school students (Diana, et al., 2019).

Table 7. The results of the data analysis increase in each indicator

Indicator	test	Activity	N-gain score	N-gain category
Interpretation	1	Pretest Posttest	0.95	High
Analysis	2	Pretest Posttest	0.96	High
Inference	3	Pretest Posttest	0.92	High
Evaluation	4	Pretest Posttest	0.85	High
Explanation	5	Pretest Posttest	0.94	High
Self-Regulation	6	Pretest Posttest	0.89	High

In learning by using the powtoon-based animated videos, a pretest was carried out before watching the powtoon-based animated videos. After working on the pretest, it continued by explaining teaching materials through the powtoon-based animated video, and before learning closed, it continued with a posttest. The results of the pretest and posttest are needed in order to see the effectiveness of powtoon-based animated videos in building the critical thinking skills of junior high school students in science learning, especially in the subject of the human digestive system. Based on Table 7, it is known that the assessment carried out before and after watching a powtoon-based animation video in the class VIII obtained high criteria and the powtoon-based animation video was classified as effective in boosting students' critical thinking skills.

The pretest and posttest were carried out to 31 students of class VIII B at SMP Negeri 12 Jember. The pretest was carried out before using the animated video and the posttest was given after using the animated video so that changes that occurred in students' critical thinking abilities could be identified. The results of the N-gain analysis at the pretest and posttest were 0.92 with high criteria, meaning that after using the product that had been developed, namely powtoon-based animation videos on the human digestive system, there was a growth in critical thinking skills. Based on the description above, it can be said that powtoon-based animated videos are very well used for learning in schools (Wulandari, et al., 2020). The results of this study are in accordance with several previous studies which also used electronic-based media. The use of articulate storyline-based interactive media can improve students' critical thinking skills (Wahyuni, et al., 2022). The use of animated media has a significant effect on increasing students' critical thinking (Putri, et al., 2020). The use of PhET simulations through a guided inquiry approach is able to improve students' critical thinking skills (Fithriani, et al., 2016). Other studies that also use learning media show an increase in students' critical thinking skills (Nizarullah, et al., 2017).

The indicators of critical thinking skills are interpretation, analysis, inference, evaluation, explanation, and self-regulation. The high indicators in the analysis are due to the fact that while the powtoon-based animated videos was implemented during learning activities, the students were trained to understand the concepts and material through videos and the student activities. Therefore, the students' understanding in understanding and expressing meaning was increasing. The lowest N-gain result is the evaluation indicator in question number 6 of 0.85. The low evaluation indicator can occur because of the low ability of students in analyzing problems and evaluating problems that exist in the questions. Based on Table 7. critical thinking skills use 6 description questions that refer to six indicators. The following is the average critical thinking ability test for class VIII B junior high school students.

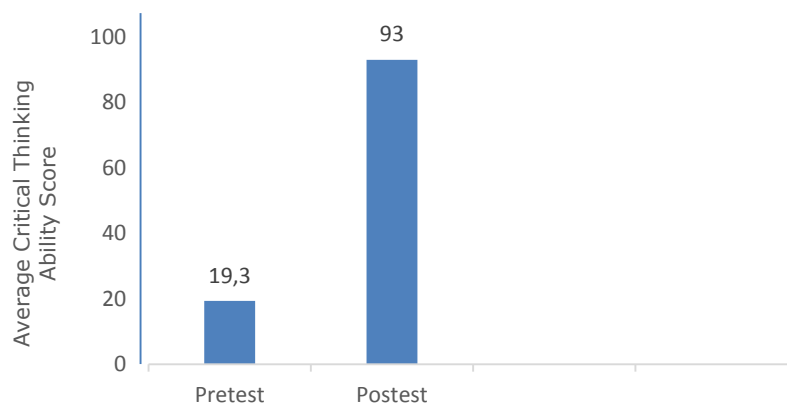


Figure 2. Average critical thinking skill test score

Based on the Figure 2, it shows that the developed Powtoon-based animation video can boost students' critical thinking skills by looking at the results of the pretest and posttest of the learning. The results of the observation sheet analysis are seen in Table 8.

Table 8. The results of the analysis of the implementation of learning

No.	Assessment activities	Execution of each meeting				implementation of learning (%)	Category
		1	2	3	4		
I.	Introduction	91	100	100	91	96	Very practical
II.	Core activities	96	96	100	98	97	Very practical
III.	Final activities	100	97	94	100	98	Very practical
IV.	Class situation	100	98	93	91	95	Very practical
Average		96.75	97.7	96.7	95	96.55	Very practical

Based on Table 8, it can be seen that the percentage of the implementation of learning using video animation results with an average of 96,55% and is carried out very clearly. Practicality is a process in developing a product that aims to test the ease of the use of a

product during learning. The results of observing the implementation of learning using powtoon-based animated videos shows that learning activities using powtoon-based animated videos get a total percentage of 96.55%. These results are in accordance with the research, results of practical data analysis obtained a value of 96.55%, which means that powtoon-based animation videos are in a very practical category and can be operated in learning. State that teaching materials are practical if the observations show that the level of implementation of learning is in the high category and the teaching materials developed can make it easier for teachers to teach and easy for students to understand (Yusuf, et al., 2017). Other research shows that the practicality level of virtual lab media is in the very practical criteria (Sari, et al., 2022). The following is the result of a recapitulation of student response questionnaires presented in Table 9.

Table 9. Results of the student response questionnaire analysis

No.	Assessment indicator	Student response (%)	Category
1.	Interest	91	Very good
2.	Motivation	92	Very good
3.	Response	95	Very good
	Average Scores	92	Very good

Based on Table 9, the results of the questionnaire analysis of student responses after watching a powtoon-based animated video from 31 students showed an average percentage score of 92% that belonging to very good criteria. Based on the discussion that has been presented, powtoon-based animated videos are able to improve students' critical thinking skills. Stated that the very positive responses given by students through response questionnaires occurred because the products developed were able to support learning activities by making them more interesting which were complemented by several variations of learning so that it was easier for students to understand the concepts (Rismayanti et al., 2022). Based on the analysis of student response questionnaires from interest indicators, motivation indicators, and response indicators received very positive responses so that powtoon-based animated videos were effectively used in the learning process.

Conclusion

Based on the analysis of the data that has been obtained, it can be concluded that powtoon-based animated videos in science learning, especially in the topic of the human digestive system, it can foster the critical thinking skills of the junior high school students. It showed values in categories that are very valid, practical, and effective. Based on the product that has been developed, the product can be applied during teaching and learning activities in science subjects to improve students' critical thinking skills.

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