



3D Animation Interactive Media on High-Level Thinking Skills of Elementary School Students

Yunita Sari¹, Arita Marini², Yuli Rahmawati²

¹The State University of Jakarta, Postgraduate, Department of Basic Education, Jakarta, Indonesia,

²The State University of Jakarta, Faculty of Education, Department of Elementary School Teacher Education, Jakarta, Indonesia

YunitaSari_9919919010@mhs.unj.ac.id

Abstract. Learning media are tools that are used or exploited so that teaching can take place well. The success of the learning process cannot be separated from the support of supporting facilities, one of which is the use of learning media. Currently, very little use of 3D animation media has been developed in elementary schools in its application as a learning medium. The aim of this research is to determine the practicality and effectiveness of 3D animation learning media. The methodology in this research uses descriptive quantitative which aims to determine the practicality and effectiveness of 3D animation media. The instruments used are test and non-test instruments. Test the practicality of providing a readability questionnaire for 3D animated learning media to teachers and students and test the effectiveness of providing high-level thinking skills tests to students. The results of the teacher response questionnaire obtained an average score of 4.73 while the student response obtained a score of 4,70 with criteria suitable for use. The results of the N gain test for high-level thinking skills obtained a result of 78.89 with high criteria. It can be concluded that 3D animation interactive media is practical and effective for improving high-level thinking skills.

Keywords: 3D Animation, High-Level Thinking Skills, Elementary School Students

1 Introduction

The application of Higher Order Thinking Skills (HOTS) is a 21st century demand that students must have as a level of thinking process that is developed as concepts, cognitive methods and learning taxonomies [1]. HOTS is measured through Bloom's Taxonomy which has levels C4 to C6 [2], [3] explain that there is at least a complex thinking process, namely: problem solving, decision making, critical thinking, and creative thinking [4]. Lu et al. (2021) suggest that teachers should encourage students of all academic levels to engage in tasks that involve higher order thinking skills. Furthermore, Lo and Feng (2020) [5] argue that higher-order thinking skills at the elementary school level present some additional challenges, resulting from children's relatively basic language competencies and abstract thinking. On the other hand, high-

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level thinking skills are very important in elementary schools which are not only mastered from the start of learning activities, but require other higher abilities, in the form of analyzing, evaluating and applying [6].

Preliminary studies through interviews with students obtained information that students still find it difficult to absorb the learning material presented, students think that science content material is material that is memorized, teaching materials used in learning use textbooks, media used by teachers to support learning in the form of pictures, and power points that are less interesting for students. Regarding smartphone ownership, 85% of students have smartphones owned by themselves, 15% of students use smartphones belonging to siblings or parents to support learning. The results of interviews with teachers obtained information that in delivering material, teachers used textbooks, media to support learning in schools was limited, media development was mostly in the form of pictures, and material in the form of power points. So we need help with learning media that is designed to provide concrete examples such as animations, photos, drawings and others.

In relation to high-level thinking abilities, teachers in developing test instruments have not yet fully used questions that hone high-level thinking abilities, the proportion of questions is still dominated by 50% of level 1 question criteria, 30% of level 2 questions and 30% of level 3 questions. 20%. The results of the pre-research test by providing 5 descriptive test questions to measure the high-level thinking abilities of class V students from the students' answers showed that only some students were able to demonstrate high-level thinking abilities in solving questions using the criteria of analyzing, evaluating and creating. Generally, students do not understand and are less able to explain the problems in solving the questions given. This condition should not be expected to occur, the position of science content in the world of education is very important [7]. Science content is one of the subjects at every level of education [8]. Where the elementary school level is the basis for studying science content [9]. Another reason is that science sharpens students to think, analyze and design to create findings [10]. Therefore, this subject is not just a rote subject but has the potential to shape the student's overall personality (Darling-hammond et al., 2019). The role of elementary school teachers is expected to be able to design higher quality learning, carry out learning reforms or innovations that have an impact on students' high-level thinking abilities in science subjects.

The obstacle faced by teachers in managing learning is still minimal knowledge about learning media, methods, strategies to be able to provide learning that suits the needs of students in the classroom [11]. Lack of media use in the learning process can reduce high-level thinking, students will tend to feel bored with learning that only uses minimal media [12], especially for elementary school (SD) students, because for elementary school students learning must use concrete and varied media [13]. With the help of interesting media, students will find it easy to understand the subject matter and this is thought to have a positive impact on student learning outcomes [14]-

The success of the learning process cannot be separated from the support of supporting facilities, one of which is the use of learning media [15]. Both simple learning and using multimedia are an important part of implementing education in schools, however the provision of learning media is still an obstacle or problematic [16]. Students need visualization that is more practical, effective, and learning time is more optimized [17]. This visualization need can be fulfilled with the help of learning media [18]. The variety of learning media is an example of the development of science and technology in the field of education. The need to use media in the learning process can be an effective solution by engineering learning conditions so that they become more real [19]. The importance of developing innovative learning media is very necessary for the continuity of the learning process. One alternative as a solution in this case is: combining technology-based learning media. From several study articles, one of which is recommended by Alonso et al. (2021) findings state that animation can improve students' understanding if used in a way that is in accordance with the cognitive theory of multimedia learning. In addition, research from Piatykop et al. (2022) reported that 3D visualization and 3D simulation into other teaching materials create new immersive environments, where students can gain knowledge and develop higher-order thinking skills [20]. The aim of this research is to determine the practicality and effectiveness of 3D animation-based interactive media on high-level thinking abilities in fifth grade elementary school students.

2 Method

The methodology in this research uses descriptive quantitative which aims to determine the practicality and effectiveness of 3D animation-based interactive media in improving high-level thinking skills in science content in elementary schools. The sample in this research was SDN Sembojo students with a total of 24 students. Data collection techniques through tests and non-tests. The research instruments include a high-level thinking ability test sheet and a student readability questionnaire sheet. The design in this research was pre-experimental (one group pretest-posttest design). Data analysis uses the Gain test to determine high-level thinking abilities before and after using 3D animation media.

Tabel 1 One Group Pretest-Posttest Design

<i>Pretest</i>	<i>Treatment</i>	<i>Posttest</i>
A1	X	A2

Information:

A1 = pretest points (value before treatment is given)

A2 = post-test points (value after being given treatment)

X = Treatment (3D animated interactive media)

3 Result and Discussion

This research aims to determine the practicality and effectiveness of 3D animation interactive media on the high-level thinking abilities of elementary school students in class V. To find out the practicality of 3D animation media using student and teacher response questionnaire sheets. The following are the results of the student response questionnaire to 3D animation media as follows. Below are presented the results of assessments from teacher and student users.

Table 2. Student Response Results

No.	Aspect	Average	Percentage	Interpretation
1.	Presentation of Material	4,75	95,00%	Very good
2.	Learning model	4,70	94,00%	Very good
3.	Appearance	4,87	97,40%	Very good
4.	media benefits	4,50	90,00%	Very good
The final result		4,70	94,10%	Very good

From the results of student responses, results were obtained as in Table 1, where the four aspects assessed were related to the presentation of the material and the quality of learning, appearance and benefits. The average value given by student respondents was above 4.70, the range between 4.50 to 4.87 could indicate that the student respondents objectively and from their perspective considered that the media being developed was appropriate and valid in terms of the quality of the content presented in the media. (Ghazali et al., 2018) The results of teacher responses regarding interactive media based on 3D animation in science content are as follows

Table 3. Teacher Response Results

No.	Aspect	Average	Percentage	Interpretation
1.	Presentation of Material	4,72	94,40%	Very good
2.	Learning model	4,70	94,00%	Very good
3.	Appearance	4,80	96,00%	Very good
4.	media benefits	4,70	94,00%	Very good
The final result		4,73	94,60%	Very good

Based on the table above, it can be explained that the teacher's response to interactive media based on 3D animation on science content was 4.73. So it can be concluded that the readability of 3D animation-based interactive media with science content is high and suitable for use and can train high-level thinking skills. In general, from the responses of teachers and students to interactive media based on 3D animation in

science content, 3D animation media is practically used for fifth grade elementary school students.

To determine critical thinking skills by giving high-level thinking ability tests to students. In this case, the student has never studied the material discussed in science interactive media so that the learning outcomes represented by the test results are the output scores from the use of science interactive media in learning activities. The following are the results of students' high-level thinking skills tests before and after using interactive media based on 3D science animation.

Table 4. Results of Students' Higher Order Thinking Ability Tests

	Higher Order Thinking ability test	
	Pretest	Posttes
Lowest value	47	65
The highest score	77	92
Total score	1446	2208
Average	60,25	92,00

In the table above you can see the average pretest and posttest scores. The average posttest score is greater than the average pretest score. The Gain test results obtained a result of 78.89 in the medium category. This shows that interactive media based on 3D animation in science content can improve the high-level thinking abilities of fifth grade elementary school students.

3D animation learning media as teaching material in the fifth grade elementary school science learning subject is interactive and is considered suitable for the student learning process, because the learning material developed is packaged in animation, video and audio so that students feel more interested in learning than just using media. textbook. This is in accordance with the advantages of interactive multimedia stated by Munadi (2013), namely that students are invited to be involved audively, visually and kinetically so that it is possible for the information to be easily understood. In the field trials, students showed enthusiasm and seriousness in learning because students were interested in using interactive multimedia in learning. The advantages of this media are in accordance with research conducted by Hasan (2018) which states that learning with a scientific approach through Information and Communication Technology makes students more active, creative, effective and enjoyable in learning to achieve learning goals. The 3D animated learning media developed in this research includes material content, examples and exercises available in the program being developed which can be selected by students in the desired order so that it can attract students' interest in learning. This is in accordance with the advantages of interactive multimedia according to Smaldino, E. Sharon (2011), namely that it allows students to individually control the pace and sequence of learning which provides a lot of control over learning outcomes. Thus digital technology must be recognized as one of the main tools to improve teaching through the use of technology (Limani et al., 2019).

The research and development process for 3D animated learning media has advantages, supporting factors, as well as weaknesses and obstacles in this research, namely: Product advantages where the product developed consists of electronic teaching materials for 3D animated learning media which are packaged in programs or applications; 3D animation-based applications can be used in grade V elementary school science learning because they include analysis and description of competencies, materials, examples and evaluations which can help students learn more actively, such as building new knowledge, thinking critically, thereby forming learning competencies effectively. intact; 3D animation learning media as a multimedia-based application can be used either individually/independently or in groups according to the conditions of facilities and infrastructure; Products developed with scientific learning steps in accordance with the 2013 curriculum objectives are accompanied by concrete and contextual examples for each material.

The lack of products in 3D animation learning media in grade V science learning in elementary schools has several shortcomings. However, after several improvements and revisions were made, the deficiencies in the product were minimized. 3D animated learning media in grade V elementary school science learning can only be used on computers or supported devices; The material developed does not cover the entire content of the study material, but is only limited to the digestive system material, however the material or material developed can be a reference for the development of other material and can be adapted to student needs; The effectiveness of the teaching material products developed only measures the cognitive domain related to elementary school students' high-level thinking abilities.

4 Conclusion

Based on the research that has been conducted, it can be concluded that the results of the student response questionnaire from the four aspects assessed are related to the presentation of the material and the quality of learning, appearance and benefits. The average value given by student respondents was above 4.70, the range between 4.50 to 4.87 could indicate that the student respondents objectively and from their perspective considered that the media being developed was appropriate and valid in terms of the quality of the content presented in the media. The teacher's response to interactive media based on 3D animation for science content was 4.73%. So it can be concluded that the readability of interactive media based on 3D animation in IPA content is high and suitable for use.

The results of the high-level thinking skills test carried out by students before and after using 3D science animation-based interactive media obtained an N-Gain score of 78.89 in the medium category. This shows that interactive media based on 3D animation in science content is effective in improving the high-level thinking abilities of fifth grade elementary school students.

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