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Empirical Validation of Static Electricity Animation Videos to Improve the Cognitive Abilities of Physics Science in Junior High School Students

Cynthia Hasibuan[✉1)], Z Zulirfan[2)], Muhammad Syafi'i[3)]
[1,2,3)] *Physics Education, Universitas Riau, Indonesia*

e-mail: [✉1)] cynthiahasibuan99@gmail.com
[2)] zulirfan@lecturer.unri.ac.id
[3)] forsyafii@gmail.com

Abstract: *This research aimed to determine the perceptions of students and teachers and describe the cognitive abilities of students after learning using static electricity animation videos. The research sample consisted of 31 students of class IX-6 who were randomly selected. The researcher gave a questionnaire sheet that had been validated by experts as a research instrument in collecting teacher and student responses regarding the practicality of the media with 10 indicators of practicality and gave 20 post-test questions which were analyzed descriptively. The results showed that based on teacher responses obtained an average of 3.7, student responses obtained an average level of media practicality of 3.5 with a very high category and the results showed that students' cognitive abilities obtained an average of 82.2 with a good category. The results of teacher and student responses as well as practicality test results concluded that animated video-based learning media on static electricity material was effective and practical to use as learning media for Class IX Junior High School students.*

Keywords*: animated video, cognitive ability, media practicality, static electricity.*

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Validasi Empiris Video Animasi Listrik Statis untuk Peningkatan Kemampuan Kognitif IPA Fisika Siswa SMP

Abstrak: Penelitian ini bertujuan untuk mengetahui persepsi siswa dan guru serta mendeskripsikan kemampuan kognitif siswa setelah pembelajaran menggunakan video animasi listrik statis. Sampel penelitian terdiri dari 31 siswa kelas IX-6 yang dipilih secara acak. Peneliti

memberikan lembar angket yang telah divalidasi oleh para ahli sebagai instrumen penelitian dalam mengumpulkan tanggapan guru dan siswa mengenai kepraktisan media dengan 10 indikator kepraktisan dan memberikan 20 soal post-test yang dianalisis secara deskriptif. Hasil penelitian menunjukkan berdasarkan respon guru memperoleh rata-rata 3,7, respon siswa memperoleh rata-rata tingkat kepraktisan media sebesar 3,5 dengan kategori sangat tinggi dan hasil penelitian menunjukkan kemampuan kognitif siswa memperoleh rata-rata 82,2 dengan kategori baik. Hasil respon guru dan siswa serta hasil uji praktikalitas disimpulkan bahwa media pembelajaran berbasis video animasi pada materi listrik statis efektif dan praktis digunakan sebagai media pembelajaran bagi siswa Kelas IX SMP.

Kata Kunci: video animasi, kemampuan kognitif, kepraktisan media, listrik statis.

Introduction

The main issue in formal education was the low absorption capacity of students, which negatively impacted their learning outcomes. These conditions were influenced by less-maximum learning and inadequate support for required learning components. Students were less active, and teachers were the sole source of learning, leading to a lack of development in potential and talent (Yustian, 2014).

However, the reality in the field shows that the learning methods and media applied by most science educators generally do not prepare students to engage in efforts to use and develop scientific reasoning patterns (Susanti, 2014). Learning is generally more teacher-centered. As a supporter of learning activities, a teacher must prepare learning tools that will be used to help achieve the objectives of the learning activities carried out. Learning tools are used as a teacher's guide so that they can carry out classroom learning properly.

Based on the results of preliminary observations in class IX/1, it was found that there were still many students who had difficulty understanding physics material. This is due to less active learning, less creativity, and reluctant to ask questions even though there is something they do not understand. With a scientific approach, teachers try to teach students to recognize problems, find solutions or test temporary answers to a problem/question, by conducting investigations (finding facts), and ultimately being able to draw conclusions and present them orally or in writing (Sari, 2020; Rahmayanti & Jaya, 2020).

The discovery learning model requires students to be active, creative, and innovative to involve science and process skills in building concepts, laws or principles, and to involve potential cognitive processes in stimulating intellectual development (Arianda, 2018; Kusumaningrum, et al., 2021).

Those who have good mastery of the material will make the material they learn as knowledge, skills, and changes in attitudes in everyday life and increase the cognitive value of students in learning (Rahman et al., 2020). However, mastery of the material rarely gets serious attention because teachers prioritize mathematical problem-solving

over solving using computer simulations and animations. According to Sandiman (Tanjung & Faiza, 2019), the things that need to be considered in media selection are objectives, learner characters, types of stimuli, class conditions, and the range to be applied. The use of technology in learning is very necessary in terms of designing, analyzing, evaluating, developing, and implementing materials in the learning process (Triyanti et al., 2022).

The low level of critical thinking ability is caused by several things, including (1) students having difficulty in solving the problems given, (2) students having difficulty identifying equations when solving problems, (3) students having difficulty connecting the results of calculations with real phenomena (Priyadi et al., 2018).

Hardianti (2018) said that the importance of analyzing the cognitive abilities of the student was to know the learning achievements and the level of achievement of the learning ability of the pupil. Cognitive fields that contained behaviors that emphasized intellectual aspects, such as knowledge and thinking skills that included low-level thinking abilities or Lower Order Thinking Skills (LOTS) remember (C1), understand (C2), and apply (C3), then there were three aspects of high-level thinking abilities of High Order Thinking Skills (HOTS), namely analyze (C4), evaluate (C5) and Create (C6) based on Bloom's taxonomy revised by Anderson and Krathwohl.

The ability of student can be measured by giving the test to the student. The direct learning process requires support from various components such as using learning media. The use of learning media will greatly help the effectiveness of the learning process and the delivery of information (messages and content of learning) at that time. The presence of media in learning was also said to help improve student understanding, the presentation of data/information was more interesting so the media functions as a tool in the learning process (Nisyak & Syafi, 2021).

Practicality was the clothing of the learning media that has been developed. To find out the practicality of the learning media that has been developed, the researchers conducted product testing (Yanto et al., 2022). The researchers conducted a product trial of static electricity animated video media at SMPN 1 Pangkalan Susu. Practicality was obtained from the results of the analysis of the observation data of the learning process in the form of a sheet of practicality using the learning media that has been declared valid by the validator. Practicality was obtained by analyzing observation data and comparing teacher and student responses after using the media. The test of practicality aims to determine the effectiveness of learning media in the learning process.

Based on the research above an empirical validation of static electricity animated video in improving the cognitive capabilities of SMPN 1 students, Langkat North Sumatera was expected to improve students' cognitional abilities and know the response of teachers and students to the learning media based on static electricity animation.

Research Methods

The research was conducted at SMPN 1 Pangkalan Susu in the year 2022. This type of investigation in Pre-Experiment with the research project One Shot Case Study where Treatment by using media (X) and post-test results for cognitive abilities and teacher and students responses (O) (Kuntjojo et al., 2009). The group received treatment on electrostatic learning using discovery learning and video animation media followed by observation or posttest after the treatment.

The subjects of the empirical testing of static electricity animated media video in improving cognitive abilities in this study were as many as 31 students of class IX-6 consisting of 22 female students and 9 male students. Empirical test subjects used practicality in knowing the perceptions of teachers and students of learning media using animated video as well as described the cognitive abilities of students after being given posttest as their behavior.

The data collected in this study was about students' physical cognitive abilities collected through posttest questions after applying static electricity animated video-based learning media. This post-test consist of 20 multiple-choice questions that were structured based on Anderson & Krathwohl's cognitive ability indicators: remembering, understanding, applying, analyzing, and evaluating. On the practicality of learning media instruments in the form of leaflet lifting practicality learning media made as many as 10 indicators that have been validated by the instructor. Each instrument was structured with a response option using a scale of 4 (Likert scale).

The data analysis technique to be used in this study was descriptive analysis, by calculating the practicality score of each indicator of the evaluation instrument of the learning media. Assessment of aspects of the experimental device on the elevator (questioner) media practicality test determines the average value of each indicator.

$$\bar{x} = \frac{\text{Number of score items of the practicality indicator}}{\text{Total of students}} \quad (1)$$

The assessment of the practicality of video media using a Likert scale determines the categories according to Table 1.

Table 1. Practicality assessment category

No	Score	Category
1	3.5 – 4.0	Very High
2	2.5 – <3,5	High
3	1,5 – < 2.5	Low
4	< 1.5	Very Low

Source: Sugiyono (2019)

The data analysis technique used in this research was the descriptive analysis employed to assess students' cognitive and physical abilities at post-test results. To calculate the skill scores obtained by the student, the following terms were used.

$$\text{Power of Absorption} = \frac{\text{Score obtained by students}}{\text{maximum score}} \times 100 \quad (2)$$

The evaluation of the test results can be seen in Table 2.

Table 2. Criteria for testing learning results

Scale of Value	Criteria
85-100	Very Good
75-85	Good
60-74	Enough
0<55	Less

Results and Discussion

The results of the practicality test were given to both teachers as subjects of evaluation in 10 evaluation indicators obtained an average score of 3.7. in detail, the score can be seen in Table 3.

Table 3. Results of practicality tes t media learning video based statistical electric animation according to teachers

No.	Assessment Indicators	Average	Category
1.	Facilities	4.0	VH
2.	Features	4.0	VH
3.	Efficiency	3.0	H
4.	Presentation of material	3.5	VH
5.	Review	4.0	VH
6.	Strength	4.0	VH
7.	Benefits of video	4.0	VH
8.	Facilitator	3.0	H
9.	Increased learning activity	3.5	VH
1 0.	Variation of media	4.0	VH
	Average	3.7	VH

H= High, VH = Very High

Based on Table 3 of data analysis results, each aspect of the evaluation indicator that has been evaluated by 2 teachers obtained a level of practicality for each item of the statement on the lift was at a very high level as well as supported by the total value of

the practicality of learning media of 3.7 with very high category, then the learning media based on video animation static electricity as the learning medium declared practical use of the teacher as a learning medium for students easier to understand the materials taught.

Data results filled of the elevator by students of class IX-6 then obtained the practical value of the overall learning media by obtaining an average score of 3.5. then the practicality of learning media based on the evaluation of each student's item of the statement can be seen in detail in Table 4.

Table 4. Results of practicality tes t media learning video based statistical electric animation according to students

No.	Assessment Indicators	Average	Category
1.	I could easlly understand concepts/learning materials using static electricity animation video	3.5	VH
2.	I found it easy to use animated video media as lerning	3.6	VH
3.	I felt very lacking in identifying problems in static electricity material	3.25	H
4.	I was interested in animated videos complied using illustrations and image	3.7	VH
5.	I was interested in working with LKPD accompanied by images	3.6	VH
6.	I made animated videos as an attraction for students to be more active in learning	3.6	VH
7.	I felt using video animation can facilitate in the learning process	3.30	H
8.	I felt motivated by the animated video that made me more focused on learning	3.6	VH
9.	I felt helped with the presence of static electricity animated video which could improved the activity in learning	3.5	VH
10.	I feel the animated video suits as a variation in the learning media	3.32	H
	Average	3.5	VH

H = High, VH = Very High

Based on the results of Table 4 data analysis, each aspect of the evaluation indicator thatt has been evaluated by 31 students obtains a level of practicality foe each item of the statement on the lift was at a very high level, which was supported by the total value of the practicality of learning media of 3.5 wuth very high category, then the learning media based on video animation static electricity as the learning medium declared practical use as a learning medium for students.

The average of each evaluation indicator for the practicality of educational media based on static electricity animation video according to teachers 3.7 is the very high category, and the average of each evaluation indicator of the practicality educational medium based on statistical electricity video animation according to students 3.5 is in a very high class of the average evaluation of both indicators of practicality of such

learning media, obtained an average of indicator assessment of 3.6 and was included in the category very high. Based on the explanation above, the graph results of the practicality test of media learning in class IX-9 are shown at figure 1.

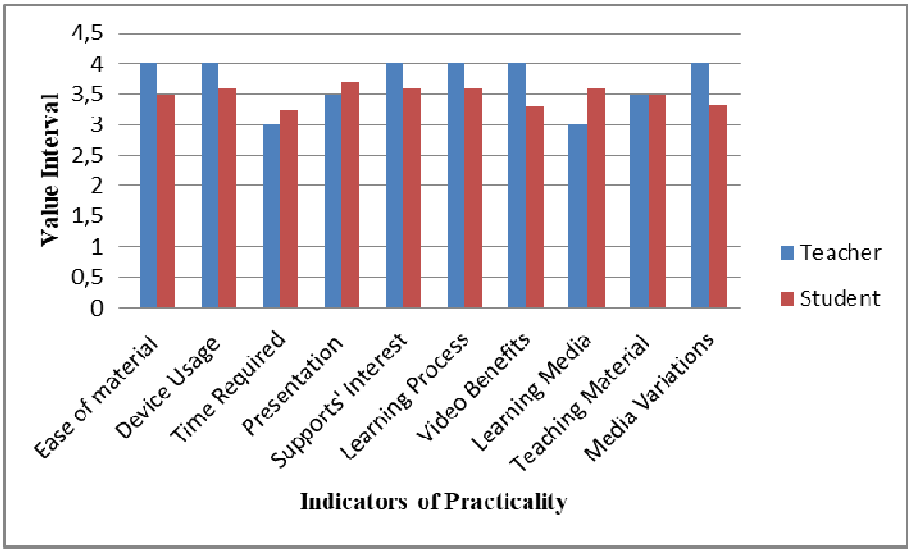

Figure 1. Indicators of practicality.

Based on what has been acquired and exhibited so far, the static electricity animation video was already worthwhile to use as a learning medium that allowed students to better grasp the subjects taught by teachers while also allowing students to be more engaged. As a result, the learning media that incorporated this video may be utilized both as a learning media in the classroom and as a media variant to support research (Yanto et al., 2022).

Table 5. Results of data analysis for each indikator of cognitive ability

Cognitive Ability Indicators	Posttest Average Score	Category
C1 (Remembering)	82.8	Good
C2 (Understanding)	94.4	Very Good
C3 (Applying)	97.3	Very Good
C4 (Analyzing)	74.2	Enough
C5 (Evaluating)	62.1	Enough
Average	82.2	Good

The teacher provides students with a discovery learning method to see students' abilities in static electricity material to be taught in the form of animated videos and learning support in the form of LKPD. Students are given treatment, namely learning using static electricity animated videos three times to determine the ability of students during learning using static electricity animated videos through tests, supported the

findings (Titiyanti et al., 2022). Researchers investigated students' cognitive abilities on static electricity subject matter which includes student cognitive taken from Anderson & Krathwohl's revised Bloom taxonomy covering from C1 to C5 indicators. Data on the results of students' cognitive abilities were obtained from the posttest results after applying the discovery learning model along with LKPD in class IX-6 as the research subject. The process of activities carried out by researchers regarding the cognitive abilities of children in understanding static electricity material and seeing the cognitive abilities of children in solving problems. The results of the analysis of posttest scores obtained after treatment of 20 multiple choice subjects on static electricity material are presented in Table 5.

Table 5 shows the results of each indicator on cognitive abilities, namely in Indicator C1 the value obtained is 82.8 stating that students remember phenomes occurring in everyday life which are included in static electricity such as the occurrence of lightning and hair rubbed against a ruler, indicator C2 of 94.4 which states that students' understanding of static electricity and distinguishing positive charges and negative charges is very good, indicator C3 of 97. 3 which states that the application of static electricity in everyday life is very helpful in the learning process such as what energy is contained in fans and wall clocks, indicator C4 of 74.2 which states that students are less careful in analyzing the problems given such as analyzing electricity in nerve cells, and indicator C5 of 62.1 which states that students are less careful in calculating questions about coulomb force and electrical energy.

The results of the posttest scores can be measured through the score and frequency intervals in class IX-6 students so that the percentage in each frequency is obtained. The results of the posttest data value of class IX-6 are as follows in Table 6.

Table 6. Frequency distribution of posttest of class IX-6 students

Score Interval	Category	Frequency	Percentage
$85 \geq x \leq 100$	Very Good	9	29%
$75 \geq x \leq 85$	Good	20	64.5%
$60 \geq x \leq 75$	Enough	2	6.5%
$0 \geq x \leq 55$	Less	0	0
Total		31	100%
Average		82.2	
Category		Good	

Table 6 shows that the dispersion of student values following the deployment of learning using static electricity animation film was only 82.2. This proved that children have advanced cognitive abilities when it comes to static electricity matter. Students with high enough scores were separated into two groups, each having a 6.5 percent percentage. With a percentage of 64.5 %, 20 pupils scored in the "good" category. The kids that won the category performed admirably finishing 10 with a 29% percentage.

Rochman & Hartoyo (2018) reinforced the aforementioned disagreement by observing that students seldom use HOTS-based questions and that their learning was

frequently centered on remembering (C1), comprehending (C2), and applying (C3). This is evident in the graph depicted in the following Figure 2.

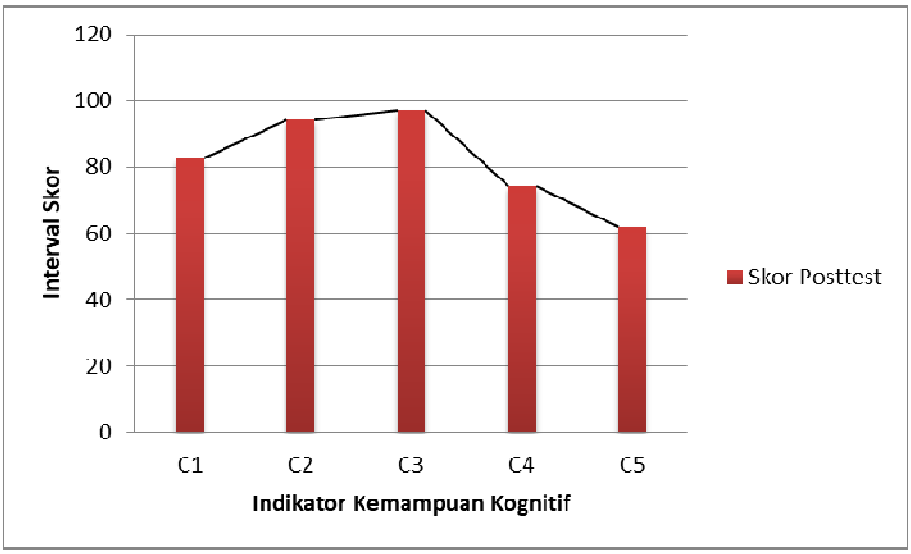

Figure 2. Cognitive ability by taxonomy Anderson & Krathwohl.

The results of the data obtained from the posttest are grouped according to Bloom's taxonomy which has been revised by Anderson & Krathwohl into 5 indicators of cognitive abilities including remembering, understanding, applying, analyzing, and evaluating, see Figure 2.

The results of data using animated video media in class IX-6, it can be seen from the teacher's response that static electricity animated video-based learning media is successfully used as a learning medium that helps students understand the material and makes it easier for teachers to teach, and the students' responses to static electricity animated video learning media as a learning support media are very practical to use in learning because students not only watch videos, but students can also understand the material taught in the learning to be carried out, So students will focus more on participating in learning and not make students dependent on learning from teachers but invite students to be more active in learning. Class IX-6 applies the Discovery Learning model as a method used in learning so that students are more independent and active in the learning process, as can be seen from the post-test that was answered by the students, the results on the cognitive abilities of students, which are on indicators C1 to C4, students in learning remember more, understand, apply and use in the learning process, while in C5 students are not used to evaluate learning through problem solving, so that the average value obtained on the overall post-test of indicators C1 to C5 is high, namely 82. 2 with a good category, meaning that static electricity animation videos in improving students' cognitive abilities are feasible to use in the learning process and invite students to be more active and sharpen students' critical thinking skills, in line with the research (Yanto et al., 2022).

Based on the results of the video media practicality test data that has been used through teacher and student responses, it was found that animated video-based learning media on electricity, static material is effective and practical to use as learning media in class IX Junior High School of Pangkalan Susu.

Conclusion

The results of the study concluded that static electricity animation video-based learning media in class IX-6 Junior High School was considered practical and effective to use as a learning media that was able to encourage students to be more focused, understand the material being taught more easily, and train students to think. critical in solving problems that exist in the Physics Science learning process.

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