How to Improve Students' Analytical Ability: Using Sparkol Videoscribe Assisted by PhET Simulation

Siti Rofikoh ✉@, Siska Desy Fatmaryanti, Sriyono

Departement of Physics Education, Universitas Muhammadiyah Purworejo
Jl. KH.A. Dahlan 3 Purworejo, 54111, Jawa Tengah, Indonesia
| fikoh187@gmail.com ✉@ | DOI: https://doi.org/10.37729/radiasi.v14i2.1370 |

Abstract

The Covid-19 pandemic caused the learning process to carried out online, and to improve students' analytical skills, it was necessary to have supporting media in the online learning process. So that this study aims to determine the feasibility of physics learning media using Sparkol Videoscribe assisted by PhET simulation to improve students' analytical skills in terms of the validity, practicality, and effectiveness of the media developed. This study uses the ADDIE research model, namely analysis, design, development, implementation, and evaluation. The subject of this research is the students of class X MIPA MA Syamsul Huda Kedungreja. Data collection techniques used are validation sheets, student response questionnaires, observation sheets, and learning outcomes tests. The results of this study indicate that: (1) the validation results obtained from the validator expert get a value of 3.84 by material experts and 3.85 by media experts include a very good category, so it can be said to be valid, (2) physics learning media using Sparkol Vvideoscribe is practical because it can be carried out in limited trials and broad trials well, and gets a positive response from students, (3) the results of the analytical ability test increase learning outcomes with an N-gain of 0.71 including the category high, so it is declared effective. Thus the physics learning media using sparkol videoscribe assisted by PhET simulation in this study is declared valid, practical, and effective so that it is feasible to use it to improve students' analytical skills.

Keyword: *Teaching media, Sparkol videoscribes, PhET, Analysis skills*

Abstrak

Pandemi Covid-19 yang menyebabkan proses pembelajaran dilakukan secara daring, serta untuk meningkatkan kemampuan analisis peserta didik, maka diperlukan adanya media penunjang dalam proses pembelajaran daring. Sehingga penelitian ini bertujuan untuk mengetahui kelayakan media pembelajaran fisika menggunakan videoscribe sparkol berbantuan simulasi PhET untuk meningkatkan kemampuan analisis peserta didik ditinjau dari validitas, kepraktisan, dan keefektifan media yang dikembangkan. Penelitian ini menggunakan model penelitian ADDIE yaitu analisis, desain, pengembangan, implementasi, dan evaluasi. Subjek penelitian ini adalah peseta didik kelas X MIPA MA Syamsul Huda Kedungreja. Teknik pengumpulan data yang digunakan yaitu lembar validasi, angket respon siswa, lembar observasi, dan tes hasil belajar. Hasil penelitian ini menunjukkan bahwa: (1) hasil validasi yang diperoleh dari validator ahli mendapatkan nilai 3,84 oleh ahli materi dan 3,85 oleh ahli media yang termasuk dalam kategori sangat baik, sehingga dapat dikatakan valid, (2) media pembelajaran fisika menggunakan sparkol videoscribe praktis karena dapat dilaksanakan pada uji coba terbatas dan uji coba luas dengan baik, serta mendapat respon positif dari peserta didik, (3) hasil tes kemampuan analisis terjadi peningkatan hasil belajar dengan N-gain sebesar 0,71 termasuk kategori tinggi, sehingga dinyatakan efektif. Dengan demikian media pembelajaran fisika menggunakan sparkol videoscribe berbantuan simulasi PhET dalam penelitian ini dinyatakan valid, praktis, dan efektif sehingga layak digunakan untuk meningkatkan kemampuan analisis siswa.

Kata kunci: *Media pembelajaran, Sparkol videoscribes, PhET, Kemampuan Analisis*

1. Introduction

In the 21st century, educators and students are required to have learning abilities such as the ability to work together, high-order thinking skills, be creative, be able to understand various cultures and have communication skills and be able to learn all the time [1]. Some of the demands above, the ability to think at a high level or HOTS (Higher Order Thinking Skills) is a skill that must be mastered. According to Bloom's Taxonomy which has been revised, higher order thinking skills include analyzing, evaluating, and creating [2]. The ability to analyze is the basic ability of students to be able to think higher order thinking skills and one of the main abilities that must be developed. Analyzing is solving a problem by separating each of these parts and finding out how the relationship can cause a problem [3]. Indicators to measure analytical skills include cognitive processes of distinguishing, organizing, and attributing [4]. One of the lessons that require analytical skills is physics.

In learning physics, students do not only count, but it is hoped that students can use formulas in solving problems in everyday life [5]. The analytical ability of students is still low. This is evidenced in a 2018 study by the Program For International Student Assessment (PISA), which showed that Indonesia was ranked 70th out of 78 countries from the mapping of scientific abilities. One of the factors that cause low scientific ability is the lack of mastery of students' analytical skills that require reasoning and problem-solving. For this reason, students' analytical skills need to be improved. One of the causes of the lack of students' analytical skills in physics lessons is the use of learning media that does not contain analytical skills; for this reason, it is necessary to develop learning media with material containing analyses so that students are guided and required to be analytical [6].

Meanwhile, the spread of the Covid-19 pandemic (Coronavirus disease) has presented by own challenges for educational institutions in Indonesia. Based on the circular letter of the Minister of Education and Culture Number 4 of 2020 concerning the implementation of education policies in the emergency period of the spread of Covid-19, which resulted in the education sector such as schools and universities stopping the face-to-face learning process, so that the learning process was carried out online [7]. This is a challenge for teachers to be more creative and innovative in developing online learning media. Learning media that can be easily accepted are media that can convey five forms of information in the form of images, lines, symbols, movements, and sounds. The media that contains the five forms of information are live images (film) and television (video) [8]. Not all types of television and films can convey all kinds of information. Many software has been developed to create learning media to improve analytical skills. One of them is Sparkol Videoscribe.

Sparkol Videoscribe is one of the software with multimedia nuances that can present learning content by combining text, images, animation, sound, graphics, music, and attractive designs so that students can understand the material presented [9]. Based on the results of previous research conducted by [10], the advantages of this software are that it can be used to create effective and interesting physics learning media so that physics learning is easier to understand and allows students to learn independently, efficiently, and can improve student learning outcomes. However, there are weaknesses in this media, namely the media in the form of videos, so it cannot be interactive [11]. This is in line with research conducted by [12] regarding the development of learning tools using Sparkol Videoscribe to improve student learning outcomes and critical thinking skills. This is supported by research conducted by [13] that the potential effect of using media can be seen from the result of pretest and posttest of the use of the learning media-based of the Sparkol Videoscribe at the field trial stage, that is an increase in the *N-gain* value of 0.81 which is included in the high category. This shows that the learning media using Sparkol Videoscribe has been successfully implemented and is valid, and has an impact on effectiveness.

The novelty of this research is that previous studies only discussed learning media using Sparkol Videoscribe to improve student learning outcomes; in this study, researchers collaborated on using sparkol videoscribe with the help of PhET simulation to improve students' analytical skills. Based on the observations of researchers and interviews with physics teachers in Cilacap, information was obtained that the online learning applied was still not effective; students were only given materials and assignments through Google Classroom. In addition, the teaching materials used are still using worksheets, textbooks, and powerpoints that have not directed students to be able to think analytically. On the other hand, the lack of complete practicum facilities in schools also hampers the practical learning process. Therefore, it is necessary to apply interactive learning media assisted by PhET simulation. PhET (Physics Educations Technology) simulation is an interesting and discovery-based interactive simulation media that can display natural phenomena and is equipped with simple experiments that can help users understand abstract physics concepts [14]. Based on this description, Accordingly, the researcher examined the development of physics learning media using Sparkol Videoscribe assisted by PhET simulation to improve analytical skills

2. Method

This research method refers to the steps of the ADDIE development model, which include: analysis, design, development, implementation, evaluation [15]. The subjects in this study were MA Syamsul Huda Kedungreja students. The data collection carried out in this study used several methods, namely: 1) the observation method, used to determine the implementation of learning in the classroom using the developed media, 2) the questionnaire method was used to determine the students' responses to the developed media, 3) the validation method used to determine the feasibility from the developed media, and 4) the test method is used to obtain an initial picture and learning outcomes after using the developed learning media on students' analytical skills.

Data analysis is used to obtain a quantitative picture of the resulting data. The data analysis techniques used in this study are as follows:

2.1. Validity Data Analysis Techniques

The data analysis technique for the feasibility of the physics learning media validation sheet using Sparkol Videoscribe assisted by PhET simulation is carried out by collecting data from the validator, then converting it into a qualitative criterion scale with references as shown in Table 1.

Table 1. Reference for changes in four scale values

Score Interval	Interpretation
0.00 – 1.69	Not good
1.70 – 2.59	Not good enough
2.60 – 3.50	Good enough
3.51 – 4.00	Well

To make it easier to compare scores, it is necessary to convert them into percentages using equation 1 [16].

$$NP = \frac{R}{SM} \; x \; 100\% \tag{1}$$

description:

NP : percent value

R : raw score

SM : maximum score

2.2. Practical Data Analysis Techniques

Practical data analysis in terms of student response questionnaires and observations of learning implementation. The step of analyzing student response data is done by recapitulating student response questionnaire data, then converting it into percentage form in equation (1), then converting it into qualitative criteria scale with reference values as in Table 2.

Table 2. Criteria for assessment guidelines

Percentage Rate (%)	Predicate
86% - 100%	Very good
76% - 85%	Well
60% - 75%	Enough
55% - 59%	Less
≤ 54%	Very less

Analysis of the observation of the implementation of learning was obtained by recapitulating the response data from the two observers, then calculating the *Percentage Agreement* (PA). PA is used to calculate the reliability of the results of the assessment of the implementation of learning. PA can be calculated by using the equation 2 according to Borich [17].

$$PA = \left(1 - \frac{A-B}{A+B}\right) \times 100\% \tag{2}$$

description:

PA : Percentage Agreement

A : high score from observer

B : low score from observer

A and B are the values given by the first and second observers with A > B. The instrument is said to be reliable if the PA value > 1 or PA = 75% [11]. Then it is converted using the reference PA criteria as in Table 3.

Table 3. Reference to PA Criteria

Value Range (%)	Category
76 – 100	Reliable
51 – 75	Reliable enough
26 – 50	Less Reliable
0 – 25	Unreliable

2.3. Effectiveness Data Analysis Techniques

Analysis of pretest and posttest data was used to determine the improvement of students' analytical skills. Indicators of analytical ability are: (1) focus, (2) differentiate, (3) finding coherence, (4) outlining, (5) integrate, (6) deconstruct [18]. Effectiveness data analysis was carried out by recapitulating the score acquisition data obtained from the pretest and posttest of analytical skills, then calculating *N-gain* using equation 3 [19].

$$g = \frac{s_f - s_i}{100 - s_i} \qquad\qquad (3)$$

description:
g :n gain,
S_f : post-test score,
S_i : pre-test score

The results of the *N-gain* calculation are converted into the *N-gain* classification with the criteria as shown in Table 4 [14].

Table 4. *N-gain* criteria

Criteria	Classification
g ≥ 0,7	High
0.3 ≥ g > 0.7	Currently
g < 0.3	Low

3. Result and Discussion

The results of this development research are in the form of the feasibility of physics learning media using sparkol videoscribe assisted by PhET simulation to improve students' analytical skills. This research using of the ADDIE development model which is obtained the following data.

3.1. Validity Results

This assessment is carried out by asking the validator to view the video that has been made to provide an assessment, criticism and suggestion regarding physics learning media using sparkol videoscribe assisted by PhET simulation. The data from the material expert validation is presented in Table 6 and the data from the media expert validation is presented in Table 5 and Table 6.

Table 5. Material expert validation results data

No.	Aspect	Average Score	Percentage	Category
1.	Contents	3.86	96.43%	Very Good
2.	Language	3.83	95.83%	Very Good
	Average score	3.84	96.13%	Very Good

Table 6. Media expert validation result data

No.	Aspect	Average Score	Percentage	Category
1.	Design	3.90	97.50%	Very Good
2.	Cohesiveness	3.83	95.83%	Very Good
3.	Balance	3.83	95.83%	Very Good
	Average score	3.85	96.39%	Very Good

Based on the results of the analysis of material expert validation data, the average score for all aspects was 3.84 in the very good category, and the percentage of all aspects got an average score of 96.13% in the very good category. Thus, in terms of material, it can be concluded that the physics learning media using sparkol videosribe assisted by PhET simulation is worthy of being used as a physics learning medium on the subject of business and energy to improve students' analytical skills. While the results of the validation data analysis of media experts showed that the average score of all aspects obtained a value of 3.85 with a percentage of 96.39% which was included in the "very good" category. Thus, from a media perspective, it can be concluded that the Sparkol Videosribe-based physics learning media assisted by PhET simulation attracts students to learn physics and is worthy of being used as a physics learning medium on the subject of business and energy. This is similar to the research conducted by [20] the validation results show that the Sparkol Videoscribe-based learning media that have been developed already has good enough quality and is feasible to use, this is based on the validation results of material experts, including in the fairly good category and according to media experts in the good category. The results of other similar studies conducted by [21] the results of the material expert's assessment of learning videos using Sparkol Videoscribe were included in the "valid" category with an average value of 3.37 and the media expert's assessment got an average score of 3.56 included in the "valid" category.

3.2. Practical Results

The data on the practical results of the physics learning media using sparkol videoscribe assisted by PhET simulation in terms of the data from the student response questionnaires and the data from the results of the implementation of learning. Student response questionnaire data was obtained after learning using the developed media. The data on the results of the student response are presented in Table 8 and the data on the results of the implementation of learning are presented in Table 7.

Table 7. Student response results data

No.	Aspect	Score	Percentage%	Category
1.	Use	124	86.11	Very Good
2.	Content Eligibility	247	85.76	Good
3.	Language	126	87.5	Very Good
4.	Design	124	86.11	Very Good
	Average		86.37	Very Good

Based on the data on the results of student responses in Table 7, an average score of 155.25 aspects was obtained in the very good category, and the percentage of all aspects received an average score of 86.37% which was included in the very good category. The results of student responses stated that the media developed was easy to use, easy to understand language, and made it easier for students to understand physics material. In addition to student responses, practicality is also assessed from the observation of the implementation of learning. Learning with physics learning videos using sparkol videoscribe assisted by PhET simulation obtained a PA of 99%. Based on Table 3. Reference to PA Criteria, these values are included in the reliable category. This is because the value is more than 75%, and the learning carried out is by following per under the syntax. The results of this study are similar to the research conducted by [20]. The results of students' responses to the Sparkol Videoscribe-based media that were developed showed a percentage of 82.93% which was included in the "good" category and received a positive response from students. The results of other similar studies conducted by [9] the results of the students' responses to the developed sparkol videoscribe media obtained an average value of 22.56 with a percentage of 84.74% in the very good category.

3.3. Effectiveness Results

Learning media can be said to be effective if the use of media can achieve the expected goals. The expected goal of this research is to increase students' analytical skills. The effectiveness of the sparkol videoscribe media on students' analytical skills can be seen from the results of the pretest and posttest analytical skills presented in Table 8.

Table 8. Description of pretest and posttest results

Aspect	Indicator	Average		*Gain*	Category
		Pretest	*Posttest*		
Differentiate	Focus	65.56	92.59	0.78	High
	Differentiate	71.85	98.15	0.93	High
	Finding coherence	58.33	93.06	0.83	High
Organize	Outlining	34.72	69.44	0.53	Currently
	Integrate	37.41	96.30	0.94	High
Attribute	Deconstruct	23.33	59.63	0.47	Currently
Average		**48.53**	**84.86**	**0.71**	**High**

Based on the results of the data analysis above, the *N-gain* 0.71 with high criteria, because the value of *N-gain* ≥ 0.7 listed in Table 4. Thus it can be concluded that all aspects of students' analytical abilities have increased at posttest. There are three aspects that get *N-gain* with high category indicators, namely: focusing, differentiating, finding coherence, and integrating. While the indicators that get a medium *N-gain* are the indicators of describing and deconstructing. The bar chart of the results of increasing students' analytical skills is presented in Figure 1.
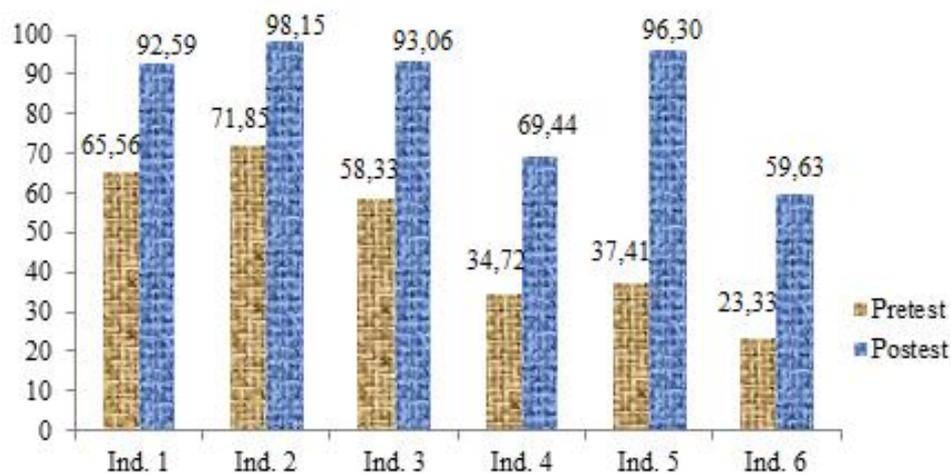
Figure 1. Analysis ability test results

Based on the data from the student's analytical ability test results in Figure 1, it can be seen that the analytical ability on indicators focusing on deconstructing has increased as seen from the results of the pretest and posttest. The average obtained on the focusing indicator experienced a high increase after being given treatment. This is evidenced in the case of an inclined plane. Almost 83% of students answered correctly because the material was explained in detail regarding the question. In addition, by using the PhET simulation, students become more aware of the concept of business on an inclined plane that has been practiced. In the aspect of describing and deconstructing, there has been an increase in the medium category, but this change still allows for an increase in students' analytical skills. With simulations using PhET that have been practiced, students can analyze the forces acting on objects and can conclude the amount of potential energy and kinetic energy of objects at different heights. This is in line with research conducted by [22] and [23] that student learning outcomes increase in cognitive and psychomotor aspects after using PhET simulation media.

In the indicators of distinguishing, finding coherence, and integrating also experienced a high increase, this proves that there is an increase in students' analytical skills and understanding of business concepts by learning through developed videos and simulations using PhET. The results of other similar studies conducted by [24] and [25] namely an increase in student learning outcomes after being given learning through video-based Sparkol Videoscribe and simulations using PhET. This is in line with the research conducted by [13] that the potential effect of using media can be seen from the result of pretest and posttest of the use of the learning media-based of the Sparkol Videoscribe. There was an increase of 45.3% with an *N-gain* value of 0.81 which was included in the high category. This shows that the learning media using the Sparkol Videoscribe program has been successfully implemented and has a valid value and has an impact on effectiveness. This is in line with the results of this research conducted by researchers regarding increasing students' analytical skills due to the influence of the use of Sparkol Videoscribe learning media assisted by PhET simulation which scores all aspects of students' analytical abilities increasing with the *N-gain* value obtained of 0.71, including in high category. It can be said that the learning media Sparkol Videoscribe assisted by PhET simulation can improve students' analytical skills.

4. Conclusion

The research concludes that the physics learning media using Sparkol Videoscribe assisted by PhET simulation is valid, practical, and effective so that it is feasible to improve students' analytical skills. The conclusion is based on several things as follows: (1) physics learning media using Sparkol Videoscribe assisted by PhET simulation which was developed to get the results of the validity of material experts and media experts in the "very good" category, thus meeting the valid criteria, (2) physics learning media using Sparkol Videoscribe assisted by PhET simulation which was developed by testing the responses of students to the use of media developed in the "very good" category. While the data from the observation of the implementation of learning shows a reliable category, so that it meets the practical criteria and (3) physics learning media using Sparkol Videoscribe assisted by PhET simulation which was developed obtained pretest and posttest scores for analytical skills with *N-gain* which are included in the "high" category, so that meet the criteria for effectiveness.
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Acknowledgement

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