Development Multimedia Interactive "Menturi" Based on Autoplay to Improve IPAS Learning Outcomes

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Abstract: Based on the results of pre-research conducted at SD Negeri Semper Barat 03 Pagi, there are problems found in the lack of interesting, IT-based learning media and the low learning outcomes of students in IPAS subjects. This study aims to develop interactive multimedia 'menturi' based on autoplay by innovating by adding handouts at the end of learning material, testing the feasibility of interactive multimedia 'menturi' based on autoplay in IPAS learning to improve student learning outcomes, and knowing the effectiveness of using interactive multimedia 'menturi' based on autoplay in improving student learning outcomes. This research uses the Borg and Gall development model with only 8 stages. The sample of this research consisted of 31 students of class IV-C SD Negeri Semper Barat 03 Pagi Jakarta. The results showed that; autoplay-based 'menturi' interactive multimedia is feasible and effective for use in IPAS learning. It can be seen that the results of validity by material expert validators get a percentage of 93% with very feasible criteria, and media experts get a presentation of 83% with very feasible criteria; The effectiveness of the product can be seen from the results of student responses including small group trials and large group trials with pretest results in small group trials getting an average of 72 and post-test 86, and in large group trials getting an average pretest score of 70 and post-test 80. In the small group trial, the n-gain value was 0.53 with a moderate category, while in the large group trial, the n-gain value was 0.41 with a moderate category. Thus, the results showed that the interactive multimedia 'menturi' based on autoplay with the innovation of a handout at the end of the learning material is feasible and effective for use in IPAS learning to improve student learning outcomes.

Keywords: Autoplay; Interactive multimedia; IPAS; Menturi

Introduction

One of the impacts of the covid-19 pandemic is learning loss. This is reinforced by the opinion Zhou et al. (2024) and Hevia et al. (2022), that changes and developments in the academic field were seen during the covid-19 pandemic, where everyone, including educators, students, and even parents of students, had to understand technology with poor conditions but learning had to continue. During the covid-19 pandemic in the academic field, students experienced a very

drastic decline. To overcome this problem, the Ministry of Education, Culture and Research simplified the curriculum into the Merdeka Curriculum. In the development of the Independent Curriculum, there have been quite significant changes, one of which is that the subjects of Science and Social Studies have become the subjects of Social Sciences. Saragih et al. (2023) and Nur'ariyani et al. (2023) stated that science is a branch of knowledge that comes from the results of natural phenomena obtained through scientific observations and investigations by conducting scientific experiments.

Thus, it can be said that science is one of the branches compiled from observations and structured sharing of data. Learning media is a tool used during the learning process to present interesting learning material, thus creating a more effective and efficient learning atmosphere (Audia et al., 2021). By creating a pleasant learning atmosphere, learning becomes more interesting so learning media is needed in the learning process. This is in line with Exterman's opinion in his research, that the learning process needs to create an entertaining atmosphere so that learning becomes more interesting and learning outcomes become easier to achieve (Hutson et al., 2024). Autoplay-based tutorial interactive multimedia with handout innovation at the end of the material is the learning media that will be developed by researchers. Irfandi et al. (2020) and Darma et al. (2024) said that autoplay is an interactive multimedia that combines various types of media such as video, sound, and images into the learning process. Menturi is an abbreviation of the word Changing Forms of Energy. Researchers give the name menturi adjusted to the learning material that will be taught to students, namely changing the form of energy.

Autoplay-based 'menturi' interactive multimedia is a learning media that can attract students because it is designed in the form of animation by combining various features such as images, videos, sound effects and interesting quizzes to produce learning applications. With this, we can create interactive applications by combining text, animation, audio, and video, so it can be said that the selection of interactive multimedia applications based on autoplay media studio by utilizing various elements has a fairly good effect on the completeness of student learning outcomes (Bai et al., 2022). Based on the results of pre-research conducted through interviews, observations, and document data in February at SDN Semper Barat 03 Pagi, Cilincing District, North Jakarta in class IV IPAS learning, there are several problems found in science learning in class IV. In the interview process conducted with the fourth-grade teacher of SDN Semper Barat 03 Pagi, it was revealed that the learning outcomes of students on the material of changing the form of energy had not yet reached the criteria for achieving learning objectives (KKTP).

In addition, the teacher revealed that the low interest in learning of students where students are more enthusiastic in the learning process by using interactive learning media. However, teachers rarely use IT-based interactive learning media in the learning process (Pulungan et al., 2024; Sailer et al., 2021). From these problems, it is necessary to use interesting and innovative learning media so that it can improve student learning outcomes. Interactive multimedia is the right solution to helping students understand the material,

compared to using textbooks. Interactive multimedia is a combination of various media in the form of text, images, graphics, animation, sound, video, interaction and so on that are put together in the form of digital files, used to convey messages (Dwivedi et al., 2021; Rahim et al., 2022). This is the background for researchers to develop autoplay-based interactive multimedia learning media as a learning medium to improve the learning outcomes of IPAS for grade IV students. Based on the problems above, interesting and innovative learning media innovation is needed, so that students are interested and play an active role in the learning process. This is in line with the opinion expressed by Soto et al. (2024), that in the learning process, the use of learning media has a psychological influence on students on the learning process, fosters interest and desire to learn, and fosters motivation and stimulation in the learning process.

Researchers want to develop a learning media to improve the learning outcomes of students, especially in the material of changing the form of energy. This product is in the form of interactive multimedia 'menturi' based on autoplay with the innovation displayed, namely the handout at the end of the material so that it can make it easier for students to understand and can provide guidance that can be used when outside learning. By the function of the handout, namely to facilitate students' understanding of the material contained in the handout in a focused and attractively arranged manner (Akhsan et al., 2021; Darling-Hammond et al., 2020). Before determining the learning media, researchers have carried out a series of actions starting from making plans, implementing, and evaluating. The results of the questionnaire on the needs of students and teachers on interactive multimedia 'menturi' based on autoplay on the material of changing the form of energy in class IV at SDN Semper Barat 03 Pagi Jakarta show that the learning media is by the needs of students. This is because the use of interactive learning media has not been applied to the learning process.

Learning media is one of the factors that support the success of the learning process because the function of learning media is to convey information from teachers to students (Marpanaji et al., 2018). The most important characteristic when using learning media is that students not only pay attention to learning materials, but students need to interact directly during the learning process (Goldberg et al., 2021). With the existence of interactive multimedia learning media 'menturi' based on autoplay on the material of changing the form of energy in class IV, it is hoped that it will be a solution for teachers and fourth-grade students of SDN Semper Barat 03 Pagi Jakarta. This research is based on the fact that there are learning difficulties experienced by

students in learning because the learning media used are less varied (Setiasih et al., 2023; Sari & Tyas, 2024). From the background of the problem and conditions in the field, the researcher intends to conduct research and development with the title Development of interactive multimedia menturi based on autoplay on the material of Changes in Energy Forms to improve the learning outcomes of science for class IV SDN Semper Barat 03 Pagi Jakarta.

Method

The type of research used in this study is Research and Development (R&D) with a model developed by Borg and Gall by creating a product and testing the effectiveness of the product systematically, revised, and evaluated (Saktilia & Wulandari, 2024). Development research has a function to validate and develop a product. Validating a product means that the product already exists so researchers only test the effectiveness of the product. Meanwhile, developing a product means updating existing products but being developed to be more practical and efficient. In this study, researchers will create a product with the latest innovations as a solution to solve problems at the research site. R&D research with a model developed by Borg and Gall consists of 10 steps including potential problems, data collection, product design, design validation, design revision, product trials, product revision, usage trials, product revision, and mass product manufacturing. In this research and development, researchers only reached the 8th step, namely to test the effectiveness and feasibility of the media. This was done due to cost and time constraints. The development model can be described as follows:
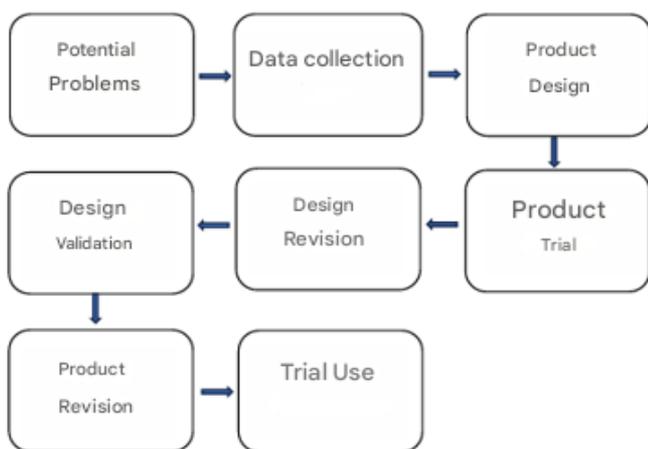

Figure 1. Schematic of the research flow

After the learning media design has been completed, the process carried out is validated by media experts and material experts to ensure the feasibility and

quality of interactive multimedia based on questionnaire scores and predetermined assessment criteria.

Table 1. Media Expert and Material Expert Validation Scores

Alternative Answer	Score
Very Good (VG)	4
Good (G)	3
Enough (E)	2
Less (L)	1

Table 2. Media and Material Eligibility Criteria

Percentage Score	Eligibility Criteria
81- 100	Very Worth It
60- 80	Worthy
41-60	Not Worth it
21- 40	Not feasible
0- 20	Totally Not Worth It

A validity test is a step to measure the accuracy of the instrument in research. This is in line with Sugiono's opinion that the validity test is a step to test the data from an instrument to measure the accuracy of the instrument used in the study. The reliability test aims to determine the level of consistency of an instrument (Saktilia & Wulandari, 2024). Meanwhile, the difficulty index aims to determine how difficult a question item is. The item can be said to be good if it has a moderate level of item difficulty, or is not too easy and not too difficult (Friatma & Anhar, 2019). The differentiating power of a question aims to distinguish between students who have achieved learning objectives (Haelermans, 2022). Researchers have conducted a test of questions, with the results obtained by the validity test, reliability, difficulty index, and differentiating power getting 25 items that are suitable for use as pre-test and post-test questions. The scores on the pre-test and post-test were then tested for normality, the t-test will then be tested for N-Gain to find out the final data from the study. The formula used to find N-Gain:

$$G = \frac{post-test\ score\ -pre-test\ score}{maximum\ score-pre-test\ score} \tag{1}$$

After obtaining the N-Gain results, we then analyze the normalized assessment standard whether it is high, medium, or low.

Table 3. Interpretation of N-Gain Index

N-Gain Score	Criteria
N-Gain ≥ 0.70	High
0.30 < N-Gain < 0.70	Medium
N-Gain ≤ 0.30	Low

Result and Discussion

Based on the results of research conducted at SD Negeri Semper Barat 03 Pagi, researchers developed an interactive multimedia product 'menturi' based on autoplay to improve IPAS learning outcomes on the material of changing energy forms. The results of the questionnaires that have been distributed by researchers at the beginning of the study, namely the teacher needs questionnaire and the needs of students, are the earliest things that must be considered in the criteria for selecting learning media (Ayu et al., 2020; Mahartika et al., 2023). The learning media developed by researchers has the latest innovation by adding handouts at the end of the learning material so that it will be different from autoplay-based interactive multimedia in general. Suggestions and input provided by supervisors, media experts and material experts helped researchers in producing autoplay-based interactive multimedia 'menturi'. The Autoplay Media Studio 8 application is an application that can interact directly through its content. This application can combine various types of media such as text, images, sound, animation and video (Abdulrahaman et al., 2020; Wang & He, 2021). The following is the display of autoplay-based interactive multimedia learning media developed by researchers.

Figure 2. Front view

Figure 3. Main menu display

After designing and developing the product, the next step is to test the feasibility of the product with material experts and media experts. Testing is carried out using a validation questionnaire instrument sheet with a rating scale and a product that has been developed. This validation test is useful to determine the feasibility and suitability of the media that has been designed by researchers (Afifah et al., 2022). Media validation consists of 4 aspects, including material; display and media; program; and interactivity (Marisda et al., 2022). Material validation consists of 3 aspects: content feasibility; language feasibility; and presentation feasibility. The results of the validators in the form of suggestions and input were used by researchers to improve the developed media.

Figure 4. Hand-out view

Table 4. Validation Results from Material Experts and Media Experts

Aspect	Score (%)	Criteria
Material	93	Very Worth it
Media	83	Very Worth it

The results of the recapitulation of the material expert assessment based on 3 aspects of the assessment, namely content feasibility; language feasibility; and presentation feasibility show that the overall percentage of the autoplay-based 'menturi' interactive multimedia assessment gets a score of 93% with very feasible criteria to be tested. Meanwhile, the recapitulation of the media expert's assessment based on 4 aspects, namely material; display and media; program; and interactivity shows that the overall percentage gets a score of 83% with very feasible criteria. It can be said that the interactive multimedia learning media 'menturi' can be used to research because it meets the eligibility score. Furthermore, a small group product trial was conducted to test the effectiveness of the autoplay-based 'menturi' interactive multimedia learning media on the material of changing the form of energy. The small group trial involved 6 students from class IV-B. The sequence of product trial activities begins with the opening of the teaching process, then students take a pretest to

determine their level of initial knowledge of students before getting material to change the form of energy using interactive multimedia 'menturi' based on autoplay, then researchers provide material to change the form of energy using interactive multimedia 'menturi' based on autoplay, and at the end of learning students take a post-test to determine the level of understanding of students after getting material using interactive multimedia 'menturi' based on autoplay (Festiyed et al., 2023; Widiasanti et al., 2023). The following is the average pretest and post-test results of the small group trial.
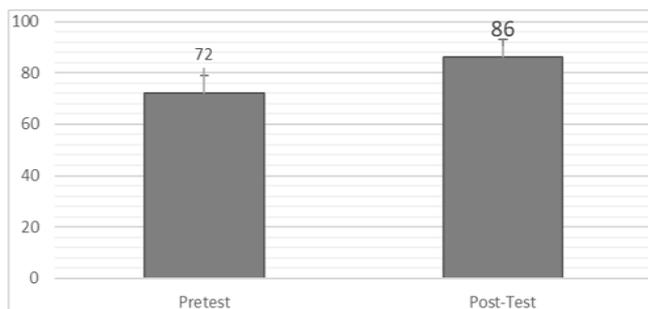

Figure 5. Average results of small group pretest and post-test

Based on the pretest results in the small group product trial, the average score was 72, while the post-test results in the small group trial obtained an average score of 86. It can be seen in the table image above that the average pretest and post-test scores of product trials in small groups have increased. The data is then processed to determine whether the autoplay-based interactive multimedia learning media 'menturi' is effective or not. To determine the effectiveness of the learning media, it is necessary to conduct a normality test, t-test, and average increase test (N-gain).

Table 5. Small Group Normality Test Results

	Statistics	df	Sig
Pre-test	.963	6	.846
Post-test	.841	6	.133

The normality test was conducted to test the pretest learning outcomes conducted before using learning media and post-test, which is after using learning media. The normality test has the aim of knowing whether the data is normally distributed or not (Khatun, 2021; Knief & Forstmeier, 2021). The results of the small group normality test analysis with a sig value of 0.846 and 0.133 or greater than 0.05, so it can be said that the data from the pretest and post-test are normally distributed.

Table 6. Small Group t-Test Results

	Average	Average differences
Pre-test	72	14
Post-test	86	

The t-test or paired sample t-test test is conducted to determine the difference in student learning outcomes before and after using learning media (Retnaningrum & Pamungkas, 2024; Novitasari et al., 2023). Based on the above data obtained from tests conducted before and after learning using interactive multimedia learning media 'menturi' based on autoplay on the material of changing the form of energy, it shows that the average pretest score is 72 and the average post-test score is 86, so there is an average increase of 14.

Table 7. Small Group N-Gain Test Results

Average difference	N-gain	Criteria
14	0.53	Medium

After going through the normality test and t-test stages, the next step is to conduct a normalized-gain score test or n-gain score test. The n-gain score test is used to measure the effect of the intervention. The n-gain score test is used if there is a significant difference in the pretest and post-test values (Pradnyani et al., 2024; Pathoni et al., 2023). Based on the table above, it can be seen that the n-gain value or the average increase from the pretest and post-test results in the small group trial was 0.53 so it was included in the medium criteria. These results indicate that there is an increase in student learning outcomes that have been carried out in learning using interactive multimedia learning media 'menturi' based on autoplay in class IV SD Negeri Semper Barat 03 Pagi Jakarta. However, there are shortcomings, such as limited time in operating learning media, because its use is carried out alternately with others. This causes the use of learning media to be less than optimal, which is indicated by the N-Gain results with moderate criteria. The next step that researchers will take is a large group trial. In the large group of research targets, namely 1 class, as many as 31 IV-C class students at SD Negeri Semper Barat 03 Pagi Jakarta. Researchers will conduct a normality test on pretest and post-test scores, t-test, and normalized-gain score test or n-gain score test.
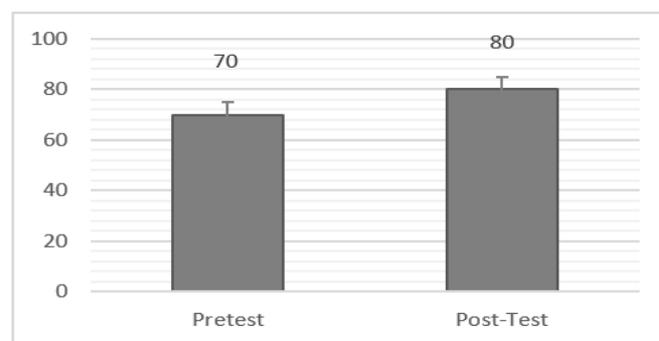

Figure 6. Average results of pre-test and post-test of large group

According to the results of the trial conducted in a large group with 31 students, the average pretest score was 70, while the average post-test score in the large group trial was 80. The pretest and post-test results in the large group trial were then tested for normality with the following data.

Table 8. Large Group Normality Test Results

	Statistics	df	Sig
Pre-test	.943	31	.102
Post-test	.935	31	.062

According to the data above, the normality test using the *Shapiro-Wilk* test in the large group shows that the normality test results on the pretest have a significance of 0.102 and the post-test normality test has a significance of 0.062. So, it can be said that the results of the normality test on the pretest and post-test values of the large group are normally distributed because the significance value of the pretest and post-test values in the large group is greater than 0.05.

Table 9. Large Group t-Test Results

	Average	Average difference
Pre-test	70	10
Post-test	80	

The t-test or paired sample t-test is used to determine the difference in learning outcomes before and after students use interactive multimedia learning media 'menturi' based on autoplay on the material of changing the form of energy. Based on the table above, the average difference in the pretest and post-test scores of the large group is 10, where the pretest value carried out before using the autoplay-based 'menturi' interactive multimedia learning media on the material of changing the form of energy is 70, while the post-test value carried out after using the autoplay-based 'menturi' interactive multimedia learning media is 80, so there is an average difference of 10.

Table 10. Large Group N-gain Test Results

Average difference	N-gain	Criteria
10	0.41	Medium

In testing the effectiveness of learning media, the n-gain test is needed (Susanti et al., 2022; Nurkhojin et al., 2022). The N-gain test or large group trial was conducted to determine the increase in learning outcomes after using the autoplay-based 'menturi' interactive multimedia learning media. Based on the data above, it is known that the average increase in pretest and post-test scores in large groups was 0.41 with moderate criteria. These results indicate that there is an average increase in pretest and posttest scores that have been carried out in learning using interactive multimedia learning media 'menturi' based on autoplay in class IV SD Negeri Semper Barat 03 Pagi Jakarta. However, there are some shortcomings such as class conditions that are less conducive, and limited time in operating learning media, because its use is carried out alternately with others. This causes the utilization of learning media to be less than optimal, which is indicated by the N-Gain results with moderate criteria.

Conclusion

Researchers have developed an interactive multimedia 'menturi' based on autoplay on IPAS subjects in the material of changing the form of energy in class IV SD Negeri Semper Barat 03 Pagi with an attractive appearance including, the main menu consisting of, an instructions menu on how to use learning media; learning achievement menu; material menu that presents material about various kinds of energy and energy transformation, quiz menu; handout menu as a summary to make it easier for students to understand the lesson material; the closing menu contains references in compiling material changing the form of energy and developer profile. Interactive multimedia 'menturi' based on autoplay is feasible to use this is supported based on the results of material expert validation getting a score of 93% with very feasible criteria, while media expert validation gets 83% with very feasible criteria. The use of interactive multimedia 'menturi' based on autoplay can improve the learning outcomes of students in the IPAS subject matter of changing the form of energy in class IV SD Negeri Semper Barat 03 Pagi. Where the average pretest value in the large group trial got a value of 70, while the post-test value in the product trial got an average of 80. The N-gain value obtained in the large group was 0.41 in the medium category. So it can be concluded that there is an increase in student learning outcomes using interactive multimedia learning media 'menturi' based on autoplay in IPAS subjects on the material of changing the form of energy class IV at SD Negeri Semper Barat 03 Pagi. From this research, it is hoped that it can help students in understanding the material of changing the form of energy, and become a solution for elementary schools in making learning media.

Author Contributions
Collectiong data, analyzing data, writing original drafts, methodology, data curation, visualization, NA; review writing, SS.

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