Development of Google Sites-Assisted Learning Devices on Vibrations and Waves Material

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Abstract: Website-assisted learning in science learning can make it easier for students to increase their understanding of knowledge concepts and construct their knowledge based on problems encountered in everyday life to improve learning outcomes. One application that is quite well-known and can be used as a website-assisted learning site is the Google Sites site. Google Sites is a structured application that can easily create websites. Google Sites is an online application launched by Google for creating classes, schools, or other websites. This study aims to determine the quality (validity, practicality, and effectiveness) of the Google Sites Assisted Learning Device on Vibration, Waves, and Sound material. This type of development research refers to the 4-D Model development research consisting of four stages of development, namely Define, Design, Development, and Dissemination. After being validated by two validators, a limited trial was carried out by 58 students consisting of 29 class VIII-A students and 29 class VIII-B at SMP Negeri 1 Kwandang, then the most comprehensive test was carried out by 30 class VIII students at SMP Negeri 2 Kwandang. Data collection techniques in this study used expert validation sheets, student response questionnaires, and student learning outcomes tests. The results of this study indicate that the validation of Google Sites assisted learning devices is included in the "Valid" category. The practicality of Google Sites helped learning devices is seen from the results of the implementation of learning in class and the student's responses from both trials showing the "Good" category. The Google Sites assisted learning device developed meets the valid, practical, and effective criteria to be suitable for use in science learning in schools.

Keywords: Google sites; Learning devices; Vibration and wave

Introduction

Education is essential in family life, society, nation, and state. Therefore, the progress of a country and form can be determined by the quality of education (Tabroni et al., 2022; Baig et al., 2022). The purpose of education has been explained in the opening paragraph of the fourth paragraph of the 1945 Constitution, namely to educate the life of the Indonesian nation. The purpose of education is then spelled out in Law No. 20 of 2003 concerning the National Education System Article 1 Paragraph 1, which explains that "Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious, spiritual strength, self-control, personality, intelligence, morals noble character, as well as the skills needed by himself, the community, the nation, and the state" (Depdiknas, 2003).

Learning is a process or activity that is systematic and systemic, which is interactive and communicative between educators and students, learning resources, and the environment to create a condition that allows student learning actions to occur, both in class and outside the classroom, attended by the teacher physically or not, to master the specified competencies

(Zhong, 2022; Archambault et al., 2022; Elihami et al., 2022). From this definition, the quality of the learning process is primarily determined by the learning devices made by the teacher. Learning devices will facilitate the learning process in achieving learning objectives. Learning devices can be in the form of information presented in various types of media that can assist students in improving the learning outcomes to be achieved (Sudarsana et al., 2019; Lukito, 2019; Fitriani et al., 2020).

Various possibilities are offered by information and communication technology to improve the quality of learning in the classroom, including improving and developing the professional abilities of teachers, as a source of knowledge in education, as a device for learning interaction, and as a place for learning, including changes in the learning paradigm caused by the use of information and communication technology in education (Riyany et al., 2020; Abdjul et al., 2017; Lorensius et al., 2022). One of the new paradigms in the current education system is learning that is done online, both learning that is done online as a whole and learning that is done by combining online and face-to-face learning. Online learning is often called website-based/assisted learning (Bali et al., 2018; Lukito, 2019; Lazarevic et al., 2021).

Website-assisted learning in science learning can make it easier for students to increase their understanding of knowledge concepts and construct their knowledge based on problems encountered in everyday life to improve learning outcomes (Joko, 2018; Darmawan et al., 2021; Ntobuo et al., 2023; Amali et al., 2023). It provides structure and specific guidelines to ensure teachers focus on student learning and inquiry processes to understand science concepts. At the same time, it teaches students good investigative skills, such as asking questions and seeking information needed to make decisions (Payu et al., 2023; Lutfia et al., 2019; Abdjul et al., 2023; Hermanto et al., 2023; Setiawan et al., 2023).

One application that is quite well-known and can be used as a website-assisted learning site is the Google Sites site. Google Sites is a structured application that can easily create websites. Google Sites is an online application launched by Google for creating classes, schools, or other websites (Susilowati et al., 2022; Sulasmianti, 2021; Karlin et al., 2016).

The features available on Google Sites make it easy for users to build their websites without having skills and mastery of coding languages. This is because Google Sites can be designed efficiently, starting from menus, headers, footers, tables of contents, and other features needed on a website (Vecchione et al., 2016; Zainal et al., 2021). Some of the advantages of Google Sites include

free, easy to make, there are facilities for users to collaborate in its utilization, the availability of 100 MB of free online storage for personal Google account users and even unlimited storage for learning account users, and searchable (can be searched) using the Google search engine (Sulasmianti, 2021; Rahman et al., 2018; Deeken et al., 2020).

Another advantage of Google Sites is that it is easy to quickly access the information you want because you can add attached files and other Google information such as Google Docs, sheets, from, slides, calendars, awesome tables, videos from YouTube, and others (Fitriani, 2023; Megawati et al., 2022; Bariya et al., 2021). Previous research obtained the results of learning media and teaching materials assisted by the Google Sites website, which were developed to be of good quality and suitable for use because they fulfill the aspects of validity, practicality, and effectiveness (Rasiban et al., 2020; Nalasari et al., 2021; Islapirna et al., 2023).

Based on the initial observations of researchers at SMP Negeri 1 Kwandang and SMP Negeri 2 Kwandang, class VIII students still have difficulties understanding Vibrations and Waves learning through face-to-face learning and online learning (during a pandemic) using Google Meet, Google Form, and Whatsapp. Currently, learning at the both of schools are carried out face-to-face. The teacher explains the material at school, gives homework, and encourages students to read and repeat learning material at home. Learning like this still does not support students in mastering the studied material. Students need learning resources that are varied, interesting, and easy to obtain.

Therefore, new website-assisted learning resources are needed, such as Google Sites-assisted learning devices for students to support face-to-face learning at school, considering that this school has never used a website designed based on student characteristics in face-to-face education and this school also has the facilities and the available infrastructure is adequate in the technology category.

Method

The product trials in this study were carried out at SMP Negeri 1 Kwandang with a total of 58 students for limited tests and at SMP Negeri 2 Kwandang with a total of 30 students. SMP Negeri 1 Kwandang students were divided into two classes, namely Class VIII-A with 29 students and Class VIII-B 29 students. This research was conducted in the even semester of the 2022/2023 school year.

This research is a type of development research (Research and Development). In this research, what was developed was the Google Sites Assisted Learning

Device. This research refers to the 4-D model development research by Buhungo et al. (2023), which consists of four stages of development: Define, Design, Develop and Disseminate. The research flowchart of 4-D model can be seen in Figure 1.

Based on Figure 1 following the 4-D development model, the research procedure includes four stages, namely: (1) Defining stage includes front-end analysis, student analysis, concept analysis, task analysis, and formulation of learning objectives; (2) to make initial designs of the products (learning devices) to be developed in the form of lesson plans, teaching materials, student worksheets and learning outcomes tests. This design stage is carried out through the stages of preparing tests, selecting media, and selecting formats to produce an initial design of learning devices; (3) The development stage aims to create learning devices that

have been validated. This stage includes: Validation by initial device experts/Draft 1 to produce Draft two, which has been used, conducted a limited test in small classes with a sample of 30 students, and the results of the trial were analyzed, then based on the results of the analysis, improvements were made to the learning device so that it was produced draft two was then carried out with an expanded trial with a sample of 2 classes, in the end, it became an effective learning device constructed according to the 2013 curriculum standards; (4) Stage of Dissemination (disseminate). At this stage, information on product development results, such as learning devices, is promoted or disseminated. In this case, the deployment was carried out at SMP Negeri 1 Kwandang and at SMP Negeri 2 Kwandang as a widespread trial.
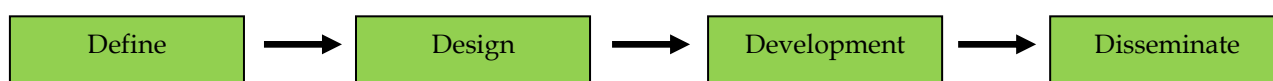

Figure 1. The research flowchart

The collection of research data includes several aspects, including aspects of the validity of learning devices, elements of the practicality of learning devices, and parts of the effectiveness of learning devices.

Learning Device Validation is determined through professional opinion. Namely, a team of experts in the instrument review process for each equipment item and all devices made is validated by experts who are assessed covering aspects of construction, content, language, readability, and appearance for each learning device instrument using a learning device validation sheet. The results of the reviews from the experts (validators) are used as input and material for revising the developed learning devices.

The practicality of Google sites-assisted learning devices on vibration and wave material is seen from the implementation of learning and student responses. The performance of the learning process steps was observed by observers using the observation sheet of the implementation of learning based on the reference from the learning implementation plans that was made. Meanwhile, students' responses regarding the learning process using the developed learning devices were analyzed using a Likert Scale through questionnaires or student response questionnaires.

The effectiveness of learning devices is obtained from activity observation data using student activity observation sheets during the learning process using developed learning devices and student learning outcomes carried out through pretest and posttest.

Result and Discussion

Result

Development of Google Sites-assisted Learning Devices for vibration and wave material developed includes learning implementation plans, student worksheets, teaching materials, and student learning outcomes tests.

Learning Device Validation Results

The assessment of experts (validators) on the development of google sites assisted learning devices for vibration and wave material is based on evaluations of the format, content, and language contained in the syllabus validation sheet instruments, lesson plans, teaching materials, student worksheets, and student learning outcomes tests. The validation process is through an assessment carried out by two validators. The several of validation results from validators can be seen in Table 1 to Table 4.

Table 1. Validation of Learning Implementation Plans

Validators	Validation Results	Criteria
Validator I	3.6	Valid
Validator II	3.6	Valid
Average	3.6	Valid

Table 2. Validation Results of Teaching Material

Validators	Validation Results	Criteria
Validator I	3.5	Valid
Validator 2	3.57	Valid
Average	3.53	Valid

Table 3. Validation Results of Student Worksheets

Validators	Validation Results	Criteria
Validator I	3.2	Valid
Validator 2	3.2	Valid
Average	3.2	Valid

Table 4. Validation of Learning Outcomes Tests

Validators	Validation Results	Criteria
Validator I	3.3	Valid
Validator 2	3.3	Valid
Average	3.3	Valid

Learning implementation plans validation is done by looking at several aspects. The aspects considered are aspects of formulating learning objectives and the content presented. Table 1. shows that the average value of lesson plan validation is 3.6 and is in the valid category ($2.6 \leq P < 3.5$). The assessment results of the two validators show that the developed lesson plans are good and can be used with minor revisions.

Teaching Material Validation is carried out by looking at several aspects, namely the suitability of the material with core competencies/basic competencies, material accuracy, material depth, encouraging curiosity, and presentation of material. Table 2 shows that the average validation value is 3.53 and is in the valid category ($2.6 \leq P < 3.5$). The assessment results of the two validators show that the teaching materials developed are good and can be used with minor revisions.

Validation of student worksheets is carried out by looking at several aspects: Construction, Content, Readability, and Appearance. Table 3 shows that the average validation value is 3.2 and is in the valid category ($2.6 \leq P < 3.5$). The assessment results of the two validators show that the Google Sites-assisted student worksheets is well-developed and can be used with minor revisions.

Table 4 shows that the average validation value of the student learning outcomes test is 3.3 and is in the valid category ($2.6 \leq P < 3.5$). The assessment results of the two validators show that the learning outcomes developed are good and can be used with a little revision.

Results of the Practicality of Learning Devices

The practicality of Google sites-assisted learning devices for vibration and wave material can be obtained from the data analysis of the implementation of learning and student responses (see table 5 and 6).

Table 5. Data of Limited Test Learning Implementation

Meetings	Percentage (%)	Criteria
1	80.65	Good
2	81.00	Good
Average	81.30	Good

Table 6. Data of Extensive Test Learning Implementation

Class	Meetings	Percentage (%)	Average (%)	Criteria
A	1	84	84	Good
	2	84		
B	1	80	82	Good
	2	84		
Average			83	Good

Based on the Table 5 shows the results of the analysis of the percentage achievement of the implementation of learning in a limited trial of 30 students during two meetings at SMP Negeri 2 Kwandang, namely 81.30% in the "Good" category. Furthermore, Table 6 shows the results of the analysis of the percentage achievement of the implementation of learning in the expanded trial of 58 students during two meetings at SMP Negeri 2 Kwandang in class VIII-A and VIII-B, the percentage obtained was 83% in the "Good" category.

Practicality can also be seen from students' responses to Google Sites-assisted learning devices which are given after learning is finished with two meetings. The limited trial at SMP Negeri 2 Kwandang found that the average achievement of student responses to the development and use of Google Sites-assisted learning devices in class was 81.03%, as shown in Table 7.

In the extended test phase, filling out student response questionnaires was carried out at SMP Negeri 1 Kwandang by 58 students who were divided into two classes, namely, 29 students in class VIII-A and 29 students in class VIII-B. Google Sites assisted learning in class is 81.10% as shown in Table 8.

Table 7. Data on the Percentage of Responses of Limited Test Students

Indicators	Category (%)			
	Strongly disagree	Disagree	Agree	Strongly agree
Opinions of students using student worksheets assisted by Google sites in face-to-face learning.	0.3	13.07	59.58	27.05
Effective use of student worksheets assisted by Google Sites.	0.0	2.69	67.78	29.53
Student learning outcomes after participating in learning using student worksheets assisted by Google sites.	0.0	3.39	59.32	37.29
Average Percentage of Student Response.				81.03

Table 8. Data on the Percentage of Student Responses to the Widespread Test

Indicators	Category (%)			
	Strongly disagree	Disagree	Agree	Strongly agree
Opinions of students using student worksheets assisted by Google sites in face-to-face learning.	0.0	13.60	67.13	19.26
Effective use of student worksheets assisted by Google Sites.	0.0	2.41	67.58	30.00
Student learning outcomes after participating in learning using student worksheets assisted by Google sites.	0.0	4.31	58.62	37.06
Average Percentage of Student Response.				81.10

Results of the Effectiveness of Learning Devices

To see the effectiveness of learning devices obtained from the analysis of student activity data and the analysis of learning outcomes tests can be seen in Table 9 and Table 10.

Table 9. Study Activities of Limited Test Students

Meetings	Percentage (%)	Criteria
1	82.43	Good
2	84.93	Good
Average	83.68	Good

Table 10. Study Activities of Extensive Test Students

Class	Meetings	Percentage (%)	Average (%)	Criteria
A	1	84.70	84.48	Good
	2	84.27		
B	1	84.91	84.69	Good
	2	84.48		
Average			84.58	Good

Based on Table 9, the average percentage achievement of student activities at SMP Negeri 2 Kwandang in a limited trial for two meetings was 83.68% in the "Good" category. Furthermore, in the Table 10 stated that the average score for achieving the percentage of activity students in SMP Negeri 1 Kwandang with a total of 29 students for class VIII-A is 84.48% and 29 students for class VIII-B 84.69% with a total percentage of average results of 84.58% indicating that these results are included in the criteria "Good".

The criteria for the effectiveness of learning devices can be seen in Table 11 and Table 12.

Table 11. N-Gain of Limited Trial Learning Outcomes

Pretest (%)	Posttest (%)	N-Gain	Category
33	94	0.50	Medium

Table 12. N-Gain of Extensive Trial Learning Outcomes

Class	Pretest (%)	Posttest (%)	N-Gain	Category
A	34	94	0.50	Medium
B	34	94	0.50	Medium

The criteria for the effectiveness of learning devices are also seen in students' learning outcomes. The limited trial's learning outcomes test was conducted in class VIII at SMP Negeri 2 Kwandang with 30 students in 2 meetings. Then, the extended test was given to students at SMP Negeri 1 Kwandang with a total of 58 students, class VIII-A totaling 29 students, and course VIII-B totaling 29 students, carried out in 2 meetings. Table 11 shows that the achievement of the N-Gain score at SMP Negeri 2 Kwandang as many as 30 students before learning (Pretest) obtained a score of 33%. In contrast, the data obtained after learning was carried out was 94% with an N-Gain result of 0.50 with the medium category.

Furthermore, in Table 12 for the comprehensive test data conducted at SMP Negeri 1 Kwandang, 58 students, with 29 students in class VIII-A before learning (Pretest), obtained a score of 34%. At the same time, the data obtained after education was 94%, with an N-Gain result of 0.50 in the "Medium" category. Then for class VIII-B, as many as 29 students before learning (Pretest) obtained a value of 34% while the data obtained after learning was carried out, which was 94% with an N-Gain result that was equal to 0.50 with the "Medium" category.

Discussion
Learning Device Validity

The validity of a student worksheet developed is based on the results of validation by two validators using the validation instruments provided by the researcher, which consist of content construction, readability, language, and content. Furthermore, the results of some of these validations state that the Google Sites-assisted student worksheets are suitable for use with minor revisions.

Good data is obtained and declared valid based on the results of validation by experts. This refers to the average value of learning device validation obtained.

Based on the input and suggestions provided by the validator on lesson plans, teaching materials, student worksheets, and learning outcomes tests, they will become a revision guide for researchers for further improvements. Thus, the developed learning devices are ready to be tested extensively.

The Practicality of Learning Devices

The practicality of learning devices can be seen from the implementation of learning and student responses. The results of observing the implementation of activities can be seen from the activities in the student

worksheets during the learning process using the problem-based learning model. Based on the data in Table 5 for the limited test conducted at SMP Negeri 2 Kwandang class VIII, at the first meeting, it reached 80.65% but still needs to be implemented by 19.35%.

Furthermore, for the second meeting, 81.00% was not implemented by 19.00%, so the average percentage achievement was obtained, namely 81.30% in the "Good" category, then for the expanded test data in Table 6, which was carried out at SMP Negeri 1 Kwandang for class VIII-A the first meeting reached 84% was not implemented by 16%, then for the second meeting it got 84% it was not implemented by 16%. In comparison, for class VIII-B at the first meeting, it reached 80%, it was not implemented by 20%, then for the second meeting, it reached 84%, it was not implemented by 16%, so the total average percentage achievement is 83% in the "Good" category. There is a difference in the percentages of the two trials, with an increase in achievement scores in the widespread trial. Based on the data described, the implementation of learning is more significant than that which is not implemented.

Based on the results of the percentage analysis, the Google Sites Assisted Learning Device Development developed can be interpreted in the practical category. This aligns with research conducted by Purboningsih (2015), stating that learning devices are suitable if teachers and students consider learning devices to be easy to use and by the researchers' plans.

Practicality can also be seen from students' responses to Google Sites-assisted learning devices which are given after learning is finished with two meetings. Student responses to Google Sites assisted learning devices consist of indicators that contain 20 statement items by delivering each statement a score using a Likert scale. For the first indicator, there are 11 statement items, then for the second indicator, it contains 5 statement items, and for the third indicator, it contains 4 statement items, each containing positive and negative statements.

Based on the data for the limited test in Table 7 conducted at SMP Negeri 2 Kwandang, the percentage achievement was 81.03%. Furthermore, for the comprehensive test data in Table 8, carried out at SMP Negeri 1 Kwandang, namely 81.10%. It can be seen that there is a difference in the percentages of the two trials, with an increase in achievement scores in the widest trial. It can be seen that the developed Google Sites Assisted learning device received a positive response, which can be seen from the average percentage that can be said to be practical and included in the criteria good and can be applied in the classroom in terms of student response questionnaires.

In line with research conducted by Nurmanita (2022), which states that it turns out that learning with Google Sites as an interactive learning medium can improve learning outcomes by fulfilling learning completeness during the learning process which has been carried out by educators and students. Student worksheets, with the help of Google Sites, is practically used in learning. This can be seen related to the student response questionnaire, which shows the average student questionnaire with the very practical criteria.

The Effectiveness of Learning Devices

The effectiveness of the developed Google Sites Assisted Learning Device can be seen in student activities and learning outcomes during two meetings. According to Mustaming et al. (2015) state that in development research in the field of learning, indicators to state that the implementation of learning devices in this research is said to be effective, for example, seen from the components of student activity and student learning outcomes. In the observation results, the assessment of student activity is carried out by observers when learning takes place in the classroom by filling out observation sheets of student activity by observing what happens in the class, including the activity of students in groups (Nalasari et al., 2021).

Based on the data for the limited trial in Table 9, which was conducted at SMP Negeri 2 Kwandang, the percentage achievement was 83.68% in the "Good" category, then Table 10 for the expanded test data shown at SMP Negeri 1 Kwandang, namely 84.58% in the "Good" category. Based on the percentage gain, it can be seen that there is a difference in the percentages of the two trials with an increase in achievement scores in the extended trial, so it can be concluded that learning using the Google Sites Assisted learning device developed is classified as effective when viewed in terms of student activity during the learning process.

The effectiveness criteria of Google Sites Assisted learning device development are also reviewed from the learning outcomes tests, based on the data obtained from the distribution of essay tests that had been carried out for limited trials at SMP Negeri 2 Kwandang, as many as 30 students before learning (Pretest) obtained a score of 33%. In contrast, the data obtained after learning amounted to 94%, with the result The N-Gain is 0.50 in the "Medium" category. Then for the expanded test data conducted at SMP Negeri 1 Kwandang, as many as 56 students, with 29 students in class VIII-A before learning (Pretest), obtained a score of 34 %. At the same time, the data obtained after education is equal to 94% with the N-Gain result, which is similar to 0.50 with the "Medium" category. Then for class VIII-B as many as 29 students, before learning (Pretest), obtained a value of 34% while

the data obtained after learning was carried out, which was 94% with an N-Gain result that was equal to 0.50 in the "Medium" category.

In the classroom learning process, the teacher uses the help of Google Sites, where the teacher will send student worksheets. As for students, they can see student worksheets and can upload/send back the experimental results listed in the student worksheets.

Based on the percentage gain, there is a difference in the percentages of the two trials, with an increase in achievement scores in the extended trial. There is an increased understanding of Vibrations, Waves, and Sound material with the Google Sites Assisted Learning Device that was developed to be effective. This aligns with research conducted that a learning device is said to be effective if there is a change in learning outcomes and student abilities (Lutfia et al., 2019). Referring to the use of Google Sites, Nurmanita (2022) stated that it is easier for students to study and analyze the material in Google Sites so that students' thinking skills are more directed and focused on existing material.

The advantages and disadvantages of using Google Sites-assisted Learning Devices are that they can be accessed at any time and can be used easily by teachers in uploading learning materials, giving assignments, and being able to monitor student assignments. Furthermore, the need for Google sites assisted learning devices is that they must use a good internet network.

Conclusion

The Google Sites Assisted Learning Device meets the qualities of Valid, Practical, and Effective. The validity of Google Sites Assisted Learning Device and the learning outcomes test developed are declared valid after going through the validation and revision stages to be feasible and applied in learning. The practicality of Google Sites Assisted Learning Devices regarding learning implementation and student responses. The results of the performance of the trial study expanded by 83.68% with the "Good" criteria. The results of the student questionnaire obtained a positive response. The researcher concluded that the Google Sites Assisted Learning Device that was developed met the Practical criteria. The effectiveness of Google Sites Assisted Learning Devices in terms of student activity observation sheets and learning outcomes tests. The results of student activity sheets in the tryout expanded by 84.58% with the "Good" criteria, and the learning outcomes tests obtained an N-Gain of 0.50 in the "Medium" category. The researcher concluded that the developed Google Sites Assisted Learning Device met the effective criteria.

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