

Development of Web-Based Learning Media Using Google Sites in Vocational High School Informatics Subjects

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ABSTRACT

This study aims to create web-based instructional media with Google Sites and then assess the media's validity, practicability, and efficacy. This research used the R & D (Research and Development) technique with the 4-D development model (Four-D Model). Data collection used 3 types of questionnaires consisting of media, material, and language validation questionnaires. To test the effectiveness of the media, pretest and posttest questions were used, which had gone through a process of validation, reliability, discriminatory power and level of difficulty. The test results of all validations show that an average validity index of 0,919 in the Very Eligible criteria. Media practicality is in the Very Practical category, with an average practicality percentage of 84.91% across instructors and students. The media's effectiveness level is Effective Enough, with an average N-Gain score of 60.77% and a substantial T-Test value of 0.000, indicating that it may be utilized effectively in SMK Informatics learning. This study conducted trials on students who had just implemented the Merdeka curriculum. Web-based teaching media using Google Sites as a result of the development are expected to be used for Informatics learning to make it easy for students to understand the material presented.

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Introduction

In the teaching and learning process occurs, a form of communication between teachers and students (Masdul, 2018). The state of communication occurs when the delivery of messages (learning materials/topics) from learning resources (teachers, books, teaching media, and others) to students as recipients of the information. An effective communication process will facilitate the achievement of learning objectives. One of the successes of communication in learning is supported by the use of media as an intermediary for communication between teachers and students (Hamid et al., 2020). With the right media, students' cognitive mastery as part of hard skills will be obtained optimally.

Changes in perspectives and practices towards learning today have been influenced by technological developments (Azis, 2019). Learning can be done in various ways, not just sitting in the classroom, but can be done anywhere and anytime. Teachers must own the creativity and innovation in integrating digital technology into learning. The learning needs of students in the current era can be realized with learning concepts that make students active and innovative and provide comfort (Indarta et al., 2022). Therefore, mastery of current teacher pedagogical competencies must be able to model and carry out the learning process to achieve learning targets as attractively as possible.

Based on observations during Informatics class X TKJ and RPL at SMKN 4 Tanjungpinang, the learning media used during the lesson included presentation slides, textbooks, and WhatsApp. The school library provides textbooks for study. Students dig up information in textbooks to get information to understand the concept of material according to learning objectives. Available books can be used while learning takes place in class. Apart from using textbooks, the teacher also presents material using a projector in front of the class. The material presented is in the form of presentation slides. At that time, the activities carried out by students were carefully observing the material's presentation. In addition, WhatsApp social media is also used to share information and subject matter.

From the assessment results, for the Software Engineering expertise program, an average score of 71.32 was obtained from 73 total students. Meanwhile, for the Computer and Network Engineering expertise program, an average score of 62.39 was obtained for 76 students. This data shows that both skills programs have an average score below 75 as the Minimum Learning Mastery score. The percentage of completion of the Computer and Network Engineering Expertise Program is lower than the Software Engineering Expertise Program. This condition indicates that there are learning problems in Informatics subjects.

One component that concerns the initial observations is related to media and learning resources during learning. Learning will occur well and provide maximum results if you get the proper learning media support (Purba et al., 2020). Using printed books, presentation slides, and the WhatsApp application is not optimal for improving student learning outcomes. For this reason, efforts are needed to overcome learning problems, including developing learning media teachers. The teacher is expected to design an innovative and constructive learning process by using exciting learning resources and learning media (H. Tambunan et al., 2021). In addition to printed books, teachers can design learning media in digital formats by utilizing technology to make them more attractive to students. According to Kamsina (Kamsina, 2020), positive emotions in the learning process can be generated by applying technology. Learning media, such as learning videos and presentation slides made by teachers, must be appropriately managed to be easily accessible to teachers and students.

Currently, students' ownership and activity in using smartphones are pretty high. Students have easy access to connect to the internet network. This is one of the supporting factors for developing learning resources that can be accessed using a smartphone. Browser application support on smartphones will help students browse information relating to learning materials from various websites. With web-based teaching media that can be accessed via smartphones, it will involve students in using it during learning. This will optimize the use of smartphones for studying at school rather than their use for social media and entertainment alone. According to Pertiwi & Irfan (Pertiwi & Irfan, 2021), Yunita & Susanto (Yunita & Susanto, 2020), and Peprizal & Syah (Peprizal & Syah, 2020) in his research explained that web-based teaching media proved to be valid, practical and effectively applied as a support for learning. Web-based teaching media is also efficient in increasing the quality of student learning outcomes (Sari & Suswanto, 2017).

In developing web-based teaching media, one of the tools that can be utilized is Google Sites. Google Sites provides preview options for publication for Smartphones, Tablets, and PC/Laptop devices. Through this media, teachers can prepare simple sites that can be designed, implemented, and managed by themselves to facilitate learning. Google Sites offers easy access because it is connected with other Google features for free (Hasna et al., 2021). To access the site pages created by the teacher, there is no need to install special hardware and software because everything can be accessed through the default site opener application on a computer or smartphone device. According to research by Sevtia et al. (Sevtia et al., 2022), teaching media using Google Sites increases students' conceptual knowledge and critical thinking skills. Research by Cahyo Nugroho & Hendrastomo (Cahyo Nugroho & Hendrastomo, 2021), Salsabila & Aslam (Salsabila & Aslam, 2022), and Ismawati et al. (Ismawati et al., 2021) stated that Google Sites teaching media is very

suitable to be applied to teaching and learning activities.

The phenomenon described is the background for researchers to conduct development research entitled "Development of Web-Based Learning Media Using Google Sites in Vocational High School Informatics Subjects". This research is intended to contribute to realizing an innovative, interactive, and attractive learning system so students' hard skill competencies related to knowledge can be obtained more optimally.

Teaching media are all tools that can support smooth learning to strengthen understanding of the meaning of the messages described so that learning outcomes are fulfilled (Kustandi & Darmawan, 2020). Teaching media has 3 functions: supplement, complement, and substitution (Zenab & Sukawati, 2022). A supplement is an additional tool teachers use to achieve goals pre-existing devices have yet to achieve. Complements in learning is a medium used to complement, enrich, and strengthen the material the teacher provides conventionally. Substitution in learning means using media as a substitute for models of learning activities. These three media functions can be fully implemented when face-to-face learning, a combination of face-to-face and in-network, or entirely online.

The web can be accessed via a web browser in the form of page links containing multimedia content such as videos, images, text, and audio, which are collected in a domain (Ridwan & Panjaitan, 2022). Each web page forms a series interconnected through links between pages (M. A. Tambunan & Siagian, 2022). The web is one of the best efforts to publish and deliver messages to many people worldwide (Oktaviani & Ayu, 2021). Teaching media with the web is an educational service using a website that can realize edutainment by utilizing internet media (Robbani, A., 2021). Web-based teaching media has several advantages (Kuswanto, 2018), namely: a) Flexible means that everyone can learn something any time and in any place; b) students can adjust their respective learning styles because this media can realize learning independently; c) links can be made so that material is from various sources accessible to students; d) Has the potential as a learning tool for participants students with limited study time; e) increase the activeness and independence of student learning. Weaknesses of Web-based teaching media are a) the independence and motivation of students is the key to the success of web-based learning activities; b) there are obstacles in accessing learning using the web; c) if the equipment and bandwidth have limitations, then can lead to boredom and boredom if participants students cannot access information; d) need guidelines for learners to find appropriate information amidst the diversity of information There is; e) learners who do not have devices sometimes will feel isolated.

Google Sites can help the learning process by creating a web page that makes it easy for users (user friendly) (Kadafi, 2021). The utilization of Google Sites deeply integrates technology into

learning. Learning can be more exciting and attractive when assisted by using technology as learning media (Arifin et al., 2018). Users with Google accounts will easily access Google Sites through tablets, Personal Computers, and smartphones (Ismawati et al., 2021). According to Rosiyana (Rosiyana, 2021), there are benefits to Google Sites to learning (1) Google Sites have attractiveness and fun for students; (2) students can download course material on the Google Site anywhere every time; (3) the teacher can present the material in full from initial meeting to final meeting on Google Sites, so students can review material uploaded by teacher because the material is stored automatically; (4) participant assignments students can be uploaded directly to the place of assignment that has been provided; (5) Google Sites can be a medium for submit announcements or information regarding assignments specific and other things.

Method

This study applies the R & D (Research and Development) method approach. The development model applied is the 4-D model (Four-D Model). Thiagarajan developed a 4-D model research step, including defining, designing, Developing, and disseminating (Sugiyono, 2017). The Define stage is to formulate the requirements needed to implement learning. This stage will provide an overview of the problems that occur in learning so that it becomes a consideration for developing a learning product. The Design Stage intends to design Web-based teaching media with Google Sites that can be applied in Informatics learning.

The Develop stage intends to make the final design of the media after going through the revision stage according to the instructions of experts/practitioners and the trial results data. The media validation process involves 1 lecturer and 1 teacher. Likewise, material validation involves 1 lecturer and 1 teacher. Meanwhile, the language validation involved 1 Indonesian teacher. The Disseminate stage intends to investigate the use of the product that has been developed and test the level of effectiveness of its use during the learning process. This media was tested on test subjects, namely students in class X TKJ 2 SMKN 4 Tanjungpinang totalling 38 people.

In this study, there were two types of data collected, namely qualitative and quantitative data. Qualitative data is obtained from respondents' criticisms and suggestions during product validation and testing. This data comes from media experts, material experts, teachers, and students. Quantitative data is the primary research data in the form of assessment data about web-based teaching media with Google Sites. This data consists of validation data from media, material, and language experts through filling out questionnaires. The researcher obtained product practicality data from filling out the questionnaire by the teacher and students. Data from students' pretest and post-test results are used to measure product effectiveness.

The data collection instruments in this research consisted of validation questionnaires,

practicality questionnaires, and learning outcomes assessment instruments. The data analysis technique used was descriptive qualitative analysis using criticism and suggestions from media, material, and language validators. Validity and practicality test data use a Likert scale with 5 alternative answers. For the need for quantitative analysis, each alternative answer can be given a score, as shown in Table 1.

Table 1. Score Alternative Answers Likert Scale

<i>Alternative Answers</i>	<i>Score</i>
Strongly agree	5
Agree	4
Doubtful	3
Don't agree	2
Strongly Disagree	1

To calculate product validity, Aiken's V formula is used (Irman & Waskito, 2020). The score obtained from the validator is analyzed using formula 1. Validity criteria shown in Table 2.

$$V = \frac{\sum s}{n(c - 1)} \dots \dots \dots (1)$$

Information:

- V = Validity Index
- s = the score set by the respondent minus the lowest score (s = r-1)
- r = selected category score on the respondent
- n = number of respondents
- c = number of choice categories filled by respondents

Table 2. Validity Criteria

<i>Average Score</i>	<i>Criteria</i>
0.8 < V ≤ 1.0	Very Eligible
0.4 < V ≤ 0.8	Decent Enough
0.0 < V ≤ 0.4	Less Eligible

The percentage value of validity and practicality is calculated using formula 2 (Chairudin & Dewi, 2021).

$$P = \frac{n}{N} \times 100\% \dots \dots \dots (2)$$

Information:

- P : Mark percentage
- n : Score acquisition
- N : Score maximum

Quantitative descriptive analysis was carried out on the collected data. Furthermore, the data is poured into the distribution of scores and percentages to determine the category with a predetermined rating scale. The percentage criteria for the feasibility assessment are listed in Table 3.

Table 3. Validation Criteria and Practicality

Percentage (P) (%)	Criteria
81 to 100	Very Practical
61 to 80	Practical
41 to 60	Less Practical
21 to 40	Not Practical
0 to 20	Very Impractical

This study applies the Pretest-Post-test Control Group Design. The Pretest-Post-test Control Group Design research design is shown in Table 4.

Table 4. Research Design Pretest-Post-test Control Group Design

Group	Pre- test	Treatment	Post-test
Experiment	O1	X1	O2
Control	O3	X2	O4

The effectiveness of using web-based teaching media is carried out by carrying out several types of tests, including:

Normality test to see whether or not the distribution of the analyzed data is normal. The SPSS application in this case helps test the normality test. The normality test used in this study was the Shapiro-Wilk normality test due to the small size of the study subjects. Data is included in the normal distribution in the test if the significance value obtained is greater than 0.05 (sig. > 0.05).

The homogeneity test was used to determine the homogeneity of the post-test data in the two groups using the SPSS application. If the significance value (p) obtained is more than or equal to 0.05, the research data group comes from a population with the same (homogeneous) variance..

The N-gain score test in research using the experimental and control classes was used to see a significant difference between the average post-test scores of the experimental class and the average post-test scores of the control class. Formula 3 is used to calculate the N-Gain Score.

$$N - Gain = \frac{S_{post} - S_{pre}}{S_{max} - S_{pre}} \dots \dots \dots (3)$$

Information:

- N-Gain : N-Gain Score
- Spost : Post-test value
- Spre : Pretest Value
- Smax : Mark Maximum

The division of the N-Gain Score category is presented in table 5. Furthermore, the percentage results from the N-Gain Score are used to interpret the effectiveness category of web-based teaching media as presented in table 6.

Table 5. Category N-Gain Score

<i>N-Gain Value</i>	<i>Category</i>
$g > 0.7$	High
$0.3 \leq g \leq 0.7$	Medium
$g < 0.3$	Low

Table 6. Category Percentage of N-Gain Score

<i>Percentage (%)</i>	<i>Interpretation</i>
> 76	Effective
56-75	Effective enough
40 - 55	Less effective
< 40	Ineffective

Testing T Test Independent refers to the significance value (2-tailed), which calculates whether there is variation in the average post-test results between the experimental and control groups. If the significance value (2-tailed) obtained < 0.05 reveals that there is an average difference between research subjects, the use of web-based teaching media is effective in Informatics learning.

Result and Discussion

In media validation, there are 3 aspects to be assessed: Presentation Aspects, Effectiveness, and Graphics. The Presentation Aspect has 6 indicators, the Effectiveness Aspect consists of 3 indicators, and the Graphic Aspect has 6 indicators. Three media experts carried out media validation. Based on the final validation value results, the average value of Aiken's validity index is 0.956 with the criteria of "Very Eligible".

The following validation is material validation, where 3 aspects are assessed: Content, Language, and Learning and Learning Outcomes Aspects. The Content Aspect has 10 indicators, Language Aspect consists of 4 indicators, and the Learning Aspect and Learning Outcomes have 4 indicators. Material validation involved 3 material experts. Based on the final validation value results, an average validity index value of 0.894 was obtained in the "Very Eligible" criteria.

The following validation is language validation, where there are 8 indicators. Three experts, namely Indonesian teachers, carried out language validation. Based on filling out the validation questionnaire, an average validity index value of 0.906 was obtained with the "Very Eligible" criteria.

Of the 3 types of validation that have been carried out, a recapitulation of the average value of the validity index is obtained in table 7.

The average value of the product validity index is 0.919 in the "Very Eligible" criteria. The results of the final practicality score by teacher I obtained data with 88.00% and teacher II, with a percentage of 93.33%. These two teachers obtained an average percentage score of 90.67% in the "Very Practical" category. Meanwhile, practicality by students obtained a percentage value of

79.14% in the "Practical" category. Thus the final practicality score of 84.91% is obtained in the "Very Practical" category. Practical results are presented Figure 1.

Table 7. Media Product Validation Recapitulation

No.	Types of Validation	Validity Index	Criteria
1	Media	0,956	Very Eligible
2	Material	0,894	Very Eligible
3	Language	0,906	Very Eligible
Average value of the validity index		0,919	Very Eligible

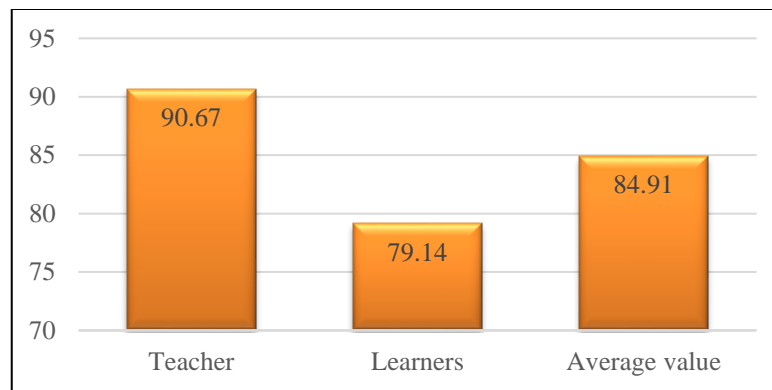


Figure 1. Percentage Value of Media Practicality

The data processing results using the SPSS application show that the homogeneity significance value is 0.967. Hence, the Post-test average value comes from groups with the same variance (homogeneous) because the significance value is more significant than 0.05.

Based on the average N-Gain value, the control class has an average N-Gain value of 0.464, and that of the experimental class is 0.607. Both classes have an average value of N-gain in the "Medium" category. Meanwhile, the N-Gain percentage shows that for the Control class, the percentage value is 46.44% in the "Less Effective" category, and the Experiment class has an N-Gain percentage value of 60.77% in the "Effective Enough" category. N-Gain recapitulation can be seen in Table 8.

Table 8. Average N-Gain Value

Class	Control	Experiment
Average N-Gain Value	0.464	0.607
Category	Medium	Medium
Percentage (%)	46,44	60,77
Category	Less effective	Effective enough

Based on the test results using the SPSS application, a significant value of 0.000 was obtained. This value is less than 0.05, so web-based teaching media is quite effective in Informatics learning.

Web-based teaching media using Google Sites was developed to assist teachers in delivering

material to students. This media is very suitable for the current conditions of technological development amid the increasing use of smartphones/laptops and the internet. This media has undergone the testing stages of validity, practicality, and effectiveness to meet the eligibility to be applied in Informatics learning at SMKN 4 Tanjungpinang.

The validity of the learning media developed in terms of presentation, effectiveness, and graphical aspects shows that this media is very suitable for use in learning, with a validity index is 0,956. This media is considered flexible to use anytime and anywhere, equipped with a choice of learning activity menus and instructions to overcome student confusion when using the media. Graphically, this media has a clear display of images and writing that is easy to read.

The material presented in this media is also considered very feasible regarding content, language, learning, and learning outcomes, with a validity index of 0,894. The material's content in the media is by the learning outcomes in the independent curriculum of the Informatics subject, elements of Computer Systems. Appropriate picture illustrations support the material to support students' mastery of knowledge about Logic Gates material. Using language to describe the material in the media is feasible, with a validity index of 0,906. This is assessed using spelling, punctuation, terms, and ease of understanding sentences.

Testing the practicality of the media obtained data from teachers and students. From the assessment of teachers and students, a practical value of 84.91% was produced in the "Very Practical" category. The results of this assessment indicate that web-based media, from the aspects of formulation of learning objectives, presentation, effectiveness, and graphics, are considered very practical for use in learning. Meanwhile, according to students, several aspects of web-based teaching media are considered very practical with a percentage above 80%, including easily accessible teaching media, attractive colour composition and images used, video/animation compatibility, makes it easier to understand the material, teaching media can help active learning, media adds insight into knowledge about logic gates. This is in line with the opinion of Kuswanto (Kuswanto, 2018), who describes some of the advantages of web-based teaching media and is relevant to the findings of this study.

Validity, practicality, and effectiveness are a must for a media to be used in learning. The research results show that this web-based teaching media is proven valid, practical, and effective. This aligns with previous research conducted by Pertiwi & Irfan (Pertiwi & Irfan, 2021), which shows that web-based teaching media is proven valid, practical, and effective as a learning tool.

From the results of processing students' post-test scores, it was found that the use of web-based teaching media was quite effectively applied during learning activities for the experimental class. This is evidenced by the percentage of N-Gain of 60.77%. Meanwhile, the N-Gain control

class, which uses printed books when learning, has a percentage of 46.44% in the less effective category. This condition aligns with the observations of research conducted by Alamin et al. (Alamin et al., 2020) that students have difficulty understanding logic gate material only with printed books. Therefore through the development of web-based teaching media, students can observe how logic gates work in the form of animation/simulation.

The N-Gain percentage results for the control and experimental classes showed a significant difference. The experimental class has a greater percentage of N-Gain in the High category than the control class. This means that more students in the experimental class experienced an increase in scores in the high category, namely 31.58%, while the control class was only 7.89%. In contrast, in the control class there were more students who had a low increase in value, namely 18.42%, when compared to the experimental class of 7.89%. These data indicate that the use of web-based teaching media in the experimental class contributed positively to improving students' post-test results. This is in line with research conducted by Rachmawati et al. (2020), where in his research found that web-assisted learning media can significantly improve students' post-test results.

Conclusion

The development of web-based teaching media using Google Sites in the Vocational High School Informatics subject is carried out using the R & D (Research and Development) method and with the 4-D model (Define, Design, Develop, Disseminate).

The process of validating web-based teaching media using Google Sites in the Vocational High School Informatics subject is carried out in 3 types: media, material, and language validation. The media validation results show that the media is in the Very Eligible category with a validity index is 0,956. Meanwhile, the validation of media material was 0,894 in the Very Eligible category. The language validator also stated that the media was in the Very Eligible category with a validity index of 0,906. These three validations obtained an average validity index of 0,919 in the Very Eligible criteria. The practicality of teaching media is in the Very Practical category, with an average percentage of practicality from teachers and students of 84.91%. The effectiveness level of the media is Effective Enough with an average N-Gain score of 60.77% and a significant T-Test value of 0.000, so it is quite effective in learning Vocational Informatics.

Web-based teaching media using Google Sites as a result of the development are expected to be used for Informatics learning to make it easy for students to understand the material presented. This media has provided benefits for learning, so it is recommended that teachers develop this product with a broader scope or in other materials, even in other subjects in the future. It is necessary to develop web-based learning media further using Google Sites to improve the media's quality.

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