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The Development of an Interactive Learning Website Based on Google Sites on Photosynthesis Material

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Abstrak

Media pembelajaran membantu dalam meningkatkan pemahaman, memudahkan penafsiran materi pembelajaran, serta berperan dalam membangkitkan semangat dan minat belajar bagi peserta didik. Tujuan dari penelitian ini adalah untuk mengembangkan media pembelajaran website berbasis google sites, menguji validitas dan kepraktisan media yang telah dikembangkan. Website yang telah dikembangkan akan digunakan pada mata kuliah fisiologi tumbuhan pada materi fotosintesis. Penelitian dan pengembangan ini yang mengacu pada model pengembangan Thiagarajan 1974 yaitu 4D *(Define, Design, Develop, dan Disseminate)*. Hasil penelitian menunjukkan website pembelajaran interaktif berbasis *google sites* sangat valid digunakan dalam pembelajaran dengan persentase 96% dari ahli materi, 96% dari ahli media, praktisi pendidikan 97%. Adapun tingkat kepraktisan website pembelajaran interaktif berbasis *google sites* memiliki persentase 91% yang diperoleh dari respon mahasiswa. Hal ini berarti bahwa pengembangan website pembelajaran sangat valid dan layak digunakan.

Kata kunci: fisiologi tumbuhan, google sites, pendidikan biologi

Abstract

Learning media can help improve understanding and facilitate the interpretation of learning materials. They also play a role in generating enthusiasm and interest in learning among students. The purpose of this research is to develop a learning media website based on Google Sites and to test the validity and practicality of the media that has been developed. The developed website will be used in plant physiology courses on photosynthesis material. The research and development follows the 1974 Thiagarajan model of 4D (Define, Design, Develop and Disseminate). The results showed that the interactive learning website based on Google sites was highly valid for learning, with percentages of 96% from material experts, 96% from media experts and 97% from educational practitioners. The level of practicality of the websites was found to be 91%, as determined by student responses. This means that the learning website development is very valid and feasible to use.

Keywords: plant physiology, google sites, biology education

INTRODUCTION

Information and communication technology has had a significant impact on education at all levels, including higher education (Haerullah et al., 2025). Using technology as a learning medium is an attempt to make the learning process more effective, efficient and interesting (Arsyad, 2017). Selecting and using appropriate media in accordance with the characteristics of the subject matter, material accompanied by relevant learning methods, will result in good quality of education implementation (Yanto, 2019). Using learning media greatly improves the effectiveness of the learning process and the delivery of learning content. In addition, it can arouse students' interest and motivation. Learning media can help students to improve their understanding by presenting data in an interesting and reliable manner and facilitating data interpretation and information collection (Tarigan & Siagian, 2015).

Web-based learning is an example of technology being applied to learning. It allows various learning resources to be incorporated into one platform that can be accessed anytime, anywhere. Learning websites provide advantages in presenting teaching materials dynamically and interactively. This media is able to facilitate diverse student learning styles and allows learning to be carried out independently and collaboratively (Mayer, 2021). Google sites is one of the free platforms that can be utilized to build learning websites without the need for programming skills. This platform supports the integration of text, images, videos, quizzes, and various other interactive elements that can enrich students' learning experience (Kusuma & Permana, 2020).

Google sites media development has an important role in learning including allowing students to actively participate in the learning process, increasing creativity and collaboration. By utilizing google sites, educators can create interactive and visually appealing content that facilitates the acquisition of learning knowledge. Therefore, the utilization of google sites as learning media is suitable for modern educational environments according to the demands of 21st century skills (Agustina et al., 2023). . This is in line with what is conveyed by Sa'adah et al., (2023), that google sites improve learning by providing easily accessible, practical, and attractive resources, which support active learning, enable integration with various Google products, and facilitate independent study, making it effective for improving learning outcomes of students.

The advantage of website-based learning media is its ability to make it easier for students to access learning materials, because the content is widely available and can be reached from all corners of the world that have an internet connection. The selection of learning media that is in accordance with the needs and learning objectives greatly affects the learning outcomes obtained by students (Rahmawati, 2018). Thus, materials that are abstract and complex, require the use of learning media that can visualize concepts more clearly (Taiz et al., 2015). In this research, google sites will be implemented in plant physiology courses that demand a deeper understanding of matters related to all activities that occur in plants in physiology. This is what makes the need for an innovative learning media that is more interactive and adaptive. The development of a learning website based on google sites can be the right solution to support plant physiology lectures. This website can be filled with multimedia-based materials, animations of physiological processes, interactive exercises, and discussion forums. With this approach, it is expected that students not only understand the material conceptually, but also motivated to learn independently and actively.

METHODS

This research was conducted at Campus I of Khairun University, Akehuda, North Ternate, from October to December 2024. This type of research is development research, by developing an interactive learning website based on google sites in the Plant Physiology course. This research refers to the Thiagarajan development model (4D), namely Define, Design, Develop, and Disseminate. Research subjects were 20, 5th semester undergraduate students in the Biology Education Study Program, FKIP, Unkhair.

The data obtained from the results are in the form of qualitative and quantitative data which are then analyzed and concluded. The qualitative data is in the form of suggestions and comments given by validators and test subjects based on the results of trials and validation of the products that have been produced. While quantitative data is obtained from the validation sheet of material experts, media, educational practitioners and questionnaires from practicality tests by students. Quantitative analysis is used to process the data obtained in the form of percentages. Each score obtained is converted into a percentage with the following formula:

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$$P = \frac{\sum x}{\sum xi} \; x \; 100\%$$

P = percentage
$\sum x$ = number of answer scores for each item
$\sum x_i$ = total maximum score of each item
100% = constant

To calculate the percentage of all aspects of the assessment, the formula is used:

$$P = \frac{\sum p}{n}$$

$\sum p$ = total percentage of all assessment aspects
N = number of components

The results of the data analysis are then interpreted and concluded based on the assessment qualification criteria obtained. Product validity criteria in terms of material and media refer to Sudjana, (2021) listed in Table 1. while the validity criteria from educational practitioners refer to Akbar, (2013), and listed in Tabel 2.

The validation result data was converted with Likert scale criteria as shown in the following table:

Table 1. Media and material validity assessment

No	Score %	Validity Level	Description
1	90 – 99	Very suitable for use	Very suitable for use
2	80 – 89	Feasible to use	Feasible to use
3	70 – 79	Feasible enough to use	Feasible enough to use
4	60 – 69	Not suitable for use	Not suitable for use
5	<60	Not suitable for use	Not suitable for use

(Adapted from Sudjana, 2014)

Table 2. Educational practitioner validity assessment

No	Score %	Validity Level	Description
1	85.01 – 100	Very valid	Very suitable to use without revisions
2	70.01 – 85	Fairly valid	Feasible to use with minor revisions
3	50.01 – 70	Less valid	Not suitable for use because it needs to be major revisions
4	0.1 – 50	Not valid	Not suitable for use

(Adapted from Akbar, 2013)

The product was validated by material experts, media and educational practitioners, the developed website also obtained an assessment from students as test subjects. This aims to determine the practicality of using the website during learning, responses from students and the readability of the product. The assessment from students refers to the criteria put forward by Akbar (2013) yang listed in table 3.

Table 3. Practicality test assessment criteria

No	Score %	Validity Level	Description
1	81 – 100	Very Practical	Can be used without revision
2	61 – 80	Practical enough	Usable with minor revisions
3	41 – 60	Less practical	Not recommended for use because needs major revision
4	21 – 40	Not pratcical	Not to be used
5	0 – 20	Very impractical	Not to be used

(Adapted from Akbar, 2013)

RESULTS AND DISCUSSION

1. Define

In the defining stage, a needs analysis was carried out through interview techniques using instruments to several students related to the learning media used so far, especially in plant physiology lectures on photosynthesis material. Photosynthesis material is one of the materials that requires a learning media that shows every process that occurs in plants, for example the process of photosynthesis. Learning media is very important in delivering material in the classroom, this is so that the material presented is not abstract and more meaningful to students. Learning that does not use maximum media cannot provide an interesting experience for students. As a result, only a small part of the learning material can be received properly. Thus, learning media is needed that combines several media such as videos, images, animations and evaluations that can strengthen student understanding. Furthermore, from the results of the interview it is known that there is no website-based learning media in the biology education study program so that this can be a learning media that can be used as a reference.

2. Design

The activities carried out at this stage are more focused on the results obtained at the initial investigation stage, by designing products in the form of developing interactive learning websites based on google sites that are tailored to users so that they are attractive and can be used easily. The website that will be designed will contain photosynthesis material, relevant videos, images, supporting books, and quizzes that are included in the website. This is in accordance with research conducted by Islamiah, (2021) that google sites provide convenience in designing learning materials and assignments. In addition, the learning materials provided are not only text, but images, videos, and even practicum simulations so that educators can vary them.

3. Develop

At the development stage, google sites learning media is evaluated by validators. This validation stage is carried out by material expert validators, media experts, educational practitioners and responses from students who use the media. The validators and respondents provide input and criticism related to the developed media, so that at this stage several revisions are made so that the media becomes better and feasible to use in the teaching and learning process id class.

The following is the initial design and final design of the interactive learning website based on google sites based on input from validators, both in terms of media and material:

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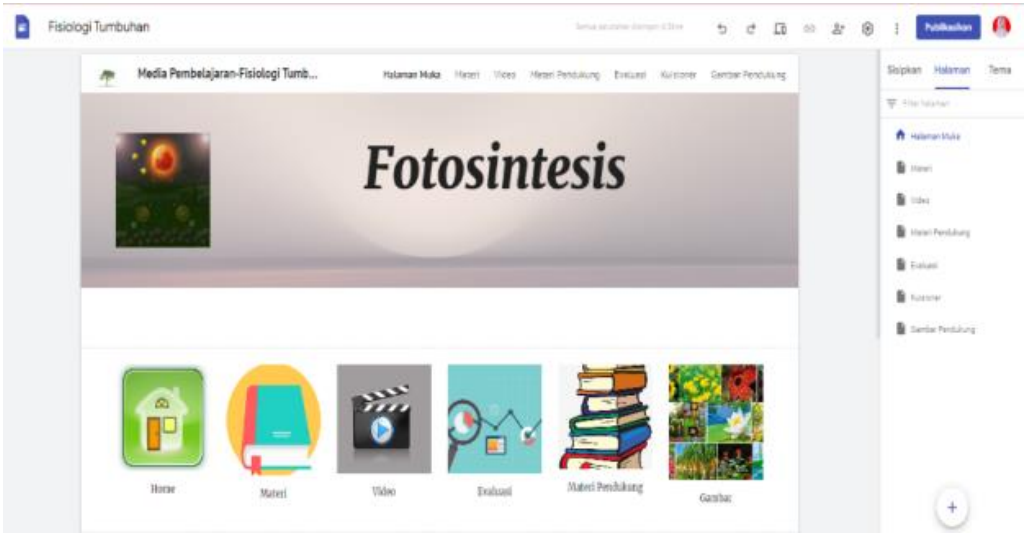
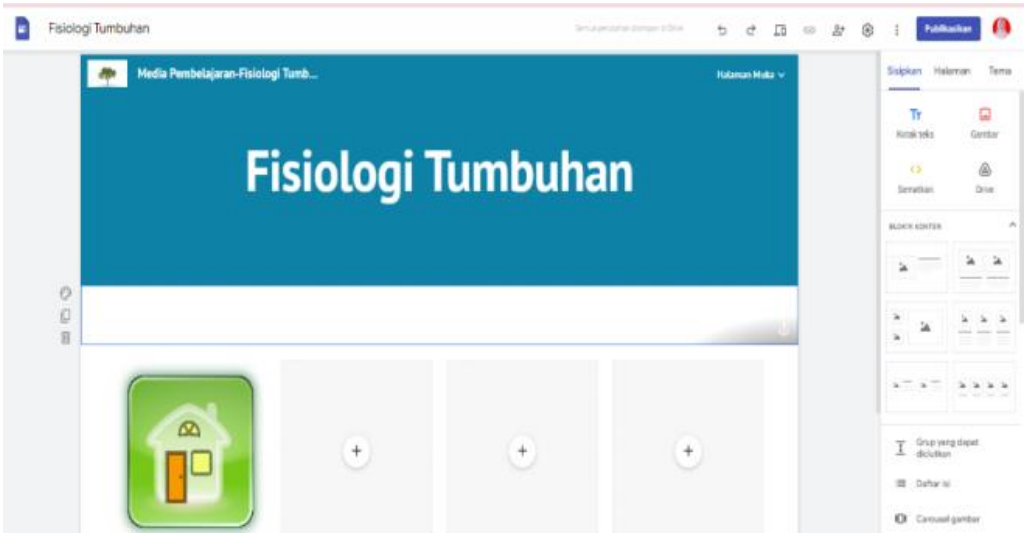
a. Intitial Design





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b. Final Design

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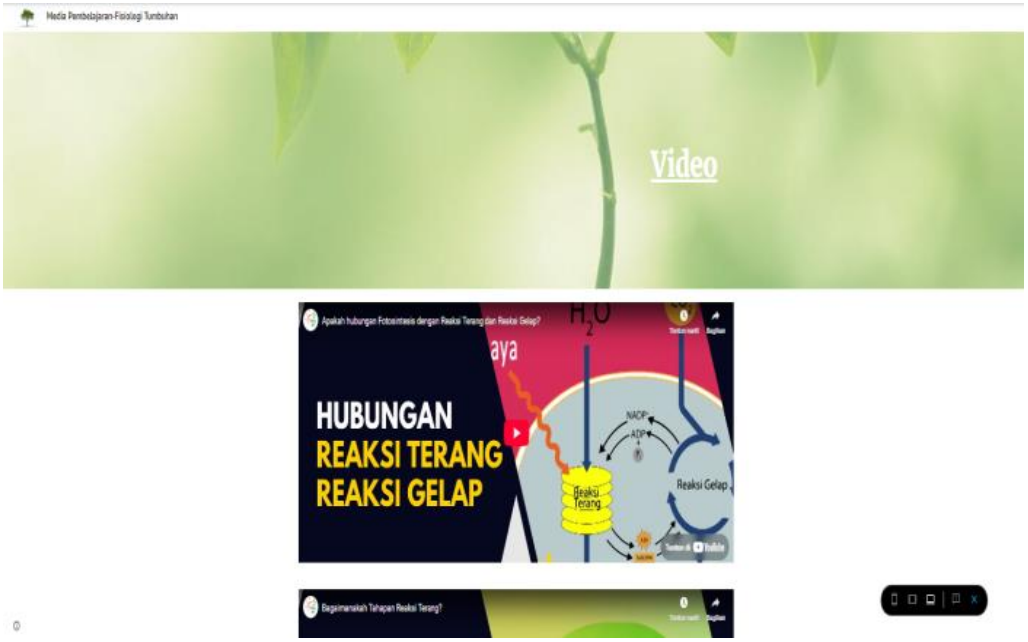

Here is the link to the interactive learning website based on google sites: https://sites.google.com/view/fistumb-fotosintesis-magfirah/halaman-muka.

The results of the validation carried out by material expert validators, media experts, educational practitioners, among others:

Table 4. Summary of results and analysis of validation by material experts

No.	Aspects	Number of Indicators	Maximum Score	Validation Score	NV (%)	Validity Level	Qualification
1.	Content Feasibility	14	70	65	93	Very High	Very suitable for use
2.	Language	5	25	24	96	Very High	Very suitable for use
3.	Presentation	3	15	15	100	Very High	Very suitable for use digunakan
4.	Graphics	4	20	19	95	Very High	Very suitable for use
5.	Benefits	4	20	19	95	Very High	Very suitable for use
	Total	**30**	**150**	**142**	**96**	**Very High**	**Very suitable for use**

Based on table 4. obtained information that the website as a learning media that has been developed is included in the category very feasible to use with a percentage of 96% material expert validators with a very high level of validity. This shows that the interactive website is very feasible to use in the learning process in the classroom. This is in accordance with research conducted by Islanda & Darmawan, (2023), implementation of google sites learning media shows a positive impact on the achievement of student learning outcomes and some students experience a significant increase in learning outcomes. In another study, the application of google sites media also obtained information that the use of google sites-based media in the learning process in the current era of technological advances can improve student learning outcomes, because the media offers an attractive display in the form of colored text,

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images, videos and audio, getting students interested in the learning process(Sapulete et al., 2023). Based on this research, it is obtained that there is an effect of google sites media on improving student learning outcomes.

Table 5. Summary of results and analysis of validation by media experts

No.	Aspects	Number of Indicators	Maximum Score	Validation Score	NV (%)	Validity Level	Qualification
1.	Media Design and Facilities	9	45	100	100	Very High	Very suitable for use
2.	Usability	7	35	100	100	Very High	Very suitable for use
3.	Visual Communication	8	40	38	95	Very High	Very suitable for use
4.	Graphics	3	15	13	87	Very High	Very suitable for use
	Total	**27**	**135**	**251**	**96**	**Very High**	**Very suitable for use**

Based on table 5. obtained information that the website as a learning media that has been developed is included in the category very feasible to use with a percentage of 96% media expert validators with a very high category. This shows that the interactive website is very feasible to use in the learning process in the classroom. This is in accordance with research conducted by (Adzkiya & Suryaman, 2021) that google site-based learning media displays material in the form of colored text, pictorial material, video and audio. By uniting various forms of media, students are comfortable and interested in the material presented using google site-based learning media. So that the use of google site-based media can make learning more qualified which can provide an increase in student learning outcomes. *Google sites* learning media improves students' critical and creative thinking skills, provides an interesting and interactive learning experience, and meets high feasibility criteria based on student assessment, which ultimately helps teachers provide effective educational resources for better lesson understanding (Hidayati, 2024).

Table 6. Summary of results and analysis of validation by educational practitioners

No.	Aspects	Number of Indicators	Maximum Score	Validation Score	NV (%)	Validity Level	Qualification
1.	Language	5	25	24	97	Very valid	Very suitable for use
2.	Readability	2	10	9	97	Very valid	Very suitable for use
3.	Presentation	3	15	14	98	Very valid	Very suitable for use
4.	View	5	25	24	98	Very valid	Very suitable for use
5.	Benefits	5	25	23	96		
	Total	**20**	**100**	**96**	**97**	**Very valid**	**Very suitable for use**

Based on table 6. obtained information that the website as a learning media that has been developed is included in the category very feasible to use with a percentage of 97% educational practitioners, which means that the interactive website is very feasible to use in the learning process in the classroom. According to Nengsih et al., (2022), web-based learning is one of the flexible delivery systems to be developed, especially to create student learning independence. The advantage of utilizing web-based learning media lies in its

flexibility, which can connect educators and students in a learning space both face-to-face and virtually. The platform encourages students to engage with the content actively, improving understanding of the material and problem-solving skills (Agustina et al., 2023). In addition, the platform serves as a learning management system, enabling effective communication and collaboration between educators and students (Paksi & Supriyono, 2023).

4. Disseminate

Disseminate is carried out on a small scale, namely 5th semester undergraduate students in the Plant Physiology course, Biology Education Study Program, FKIP, Unkhair. The results of this practicality are obtained from the responses given by students based on the questionnaire given after using google sites in learning. Based on these results, a percentage of 91% was obtained which was included in the very practical category and could be used without revision. This is in accordance with research conducted by Ningsih et al,. (2023), that the development of web-based learning media google sites is effective and practical in improving student learning outcomes. The results of the analysis of student response questionnaires to interactive learning websites can be seen in Table 7.

Tabel 7. Summary of results and analysis of student response

No.	Aspects	Number of Indicators	Maximum Score	Validation Score	NV (%)	Validity Level	Qualification
1.	Language	5	25	22	90	Very Practical	Can be used without revision
2.	Readability	3	15	14	91	Very Practical	Can be used without revision
3.	View	10	50	46	91	Very Practical	Can be used without revision
4.	Benefits	6	30	28	93	Very Practical	Can be used without revision
5.	Manfaat	7	35	32	92		
	Total	**31**	**155**	**142**	**91**	**Very Practical**	**Can be used without revision**

CONCLUSIONS

Interactive learning websites based on Google sites are very feasible to use in the learning process, based on the results of validation by validators of material, media, and educational practitioners. The percentage of validity of media experts is 96%, material 96%, educational practitioners 97%. The results of the students' practicality test show that the developed Google site-based learning media is in the very practical category with a percentage of 91%, which shows that the learning website is very practical. Google sites are one of the practical learning media because they are able to integrate videos, pictures, animations and quizzes, so that the information presented is more than conventional books.

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