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Development of Teaching Materials related Magnetic Field Based on the Google Sites Assisted Learning Cycle Model

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Abstract: The development of computer technology provides an opportunity for educators to innovate in the development of digital teaching materials. This development research aims to: 1) develop magnetic field teaching materials based on the Google Sites assisted learning cycle model for grade XII students of Madrasah Aliyah; 2) investigate the feasibility of magnetic field teaching materials developed; 3) investigate improvements in student learning outcomes by using teaching materials developed; and 4) investigate student responses to the use of teaching materials developed in physics learning. This development research refers to the 5 stages of the ADDIE development design, which include the analyze, design, develop, implementation, and evaluation stages. The validation of teaching material products involves material experts, media experts, and language experts, each of whom consists of three validators. The teaching material product was implemented by involving 20 students in grade XII at one of the Madrasah Aliyah in the city of Tidore Kepulauan. Data collection techniques used in this study were validation sheets, test instruments in the form of multiple-choice questions, and questionnaires. The results showed that teaching material products based on the Google Sites assisted learning cycle model were declared feasible for use in learning. Student learning outcomes have increased after participating in learning. Students also gave very good responses to the use of teaching materials developed in this study.

Keywords: Development, Teaching Materials, Learning Cycle Models, Google Sites

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INTRODUCTION

The development of science and technology has an impact on learning settings that are not limited by space and time. Students can not only study in the classroom during grade hours, but students can also study anywhere and anytime (Saprudin et al., 2023). It is very important for an educator to facilitate students so that students can learn independently more effectively (Haji et al., 2023; Marinda et al., 2023; Nurfitriah, 2023; Saprudin et al., 2022; Wahab et al., 2023). The development of website-based digital teaching materials is an alternative that can facilitate students to be able to study independently.

The fact shows that the majority of students have not been able to keep up with technological changes that are happening very fast. Internet and technology have not been fully utilized to develop their potential. In line with the observational findings, it shows that certain teachers are found to be still uncomfortable when they use laptops or computers, and are still unfamiliar with using smartphones and the internet (Tridiana in Nalasari et al., 2021).

Teachers can develop the learning process so that learning can accommodate students' learning needs. Providing website-based digital teaching materials is one of the efforts that can be made in order to increase the effectiveness of learning. A collection of written and unwritten resources that are cohesively and methodically arranged to foster a learning environment is known as teaching materials (Ministry of National Education in Sholihah, 2022). Teaching materials developed can be used independently by students as additional information or material for content studied at home or at school. Teachers can utilize a number of websites, such as the Google sites website, to develop digital teaching materials.

One of the media that can foster an attractive and supportive learning environment is Google sites (Yuniar et al., 2021). Google sites media can be used as a means of online publication, and allows presenting more varied information content in the form of text, video, music, photos and graphics. Some of the advantages of Google sites include being easier to distribute to students via links, subject matter can be stored safely from viruses, and students can complete assignments and practice questions directly on the web page (Suryanto in Fernando et al., 2022).

According to the findings of an interview with a physics teacher at a Madrasah Aliyah in the City of Tidore Kepulauan, it was found that the teacher only used student and teacher textbooks as the only source of learning. Teachers have not utilized various applications and websites, especially Google sites in their learning. The results of the analysis of the questionnaires distributed to students found that 80% of students at the research location

considered the magnetic field material difficult. Some of the causal factors identified were caused by learning that was less interesting, the teaching materials they used also seemed boring, and all students stated that they had never participated in learning using Google sites media both in physics learning and other learning.

The use of Google sites has been widely used in physics learning. The results of studies in previous research found that Google sites were used as a source of student learning (Mukti & Anggraeni, 2020; Putri et al., 2022; Rahmawati et al., 2022), aimed at increasing the ability to master concepts (Taufik & Doyan, 2022), improve learning outcomes (Akuba et al., 2023; Arrofi'uddin & Wulandari, 2022; Hasnaa & Sahronih, 2022; Wulandari et al., 2022), improve critical thinking (Rusli et al., 2022; Taufik & Doyan, 2022), increasing students' interest in learning (Bhagaskara et al., 2021), developing students' scientific attitude (Bhagaskara et al., 2021), as well as to improve students' problem-solving skills (Maryani et al., 2022).

As an educator, in developing teaching materials it is of course important to apply educational theories. The results of studies in previous research show that educational theories applied in the development of teaching materials assisted by Google sites include problem solving (Maryani et al., 2022), guided inquiry (Bhagaskara et al., 2021), higher order thinking skills (Rusli et al., 2022), interactive multimedia (Wulandari et al., 2022). In addition, physics content that is the target of developing teaching materials assisted by Google sites includes vibration, wave, and sound material (Akuba et al., 2023; Maryani et al., 2022), motion dynamics (Rahmawati et al., 2022), particle dynamics (Arrofi'uddin & Wulandari, 2022), work and energy (Wulandari et al., 2022), weather (Bhagaskara et al., 2021), Newton's law (Putri et al., 2022), force and motion (Rusli et al., 2022), static electricity (Mukti & Anggraeni, 2020), harmonic vibration (Taufik & Doyan, 2022).

Studies related to the development of teaching materials based on Google sites assisted learning cycle models on magnetic field material are still rare in previous studies. The magnetic field material was chosen because it was in accordance with the findings of observations at the research location that students had difficulty learning this material. The same problem was also found in previous research which showed students' difficulties in understanding the concept of the magnetic field (Caesaria et al., 2020; Hidayah & Prastowo, 2017; Yovan & Kholiq, 2022), students with low skills provided information that they still did not understand the formula used (Caesaria et al., 2020; Hati et al., 2018), besides that students have misconceptions when studying this material (Ramadhan et al., 2019; Setyaningsih et al., 2018).

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Based on the description above, it is important to develop teaching materials related magnetic field based on the Google sites assisted learning cycle model. The resulting teaching material products are expected to have an impact on improving student physics learning outcomes, especially in magnetic field material.

METHOD

This development research followed the ADDIE stages as shown in **Figure 1**. The types of data, data collection techniques, and instruments used in this study are shown in **Table 1**. The validation of teaching material products involved material experts, media experts and linguists, each of whom consisted of 3 validators. The teaching material product was implemented by involving 20 students grade XII at one of the State Madrasah Aliyah in the City of Tidore Kepulauan.

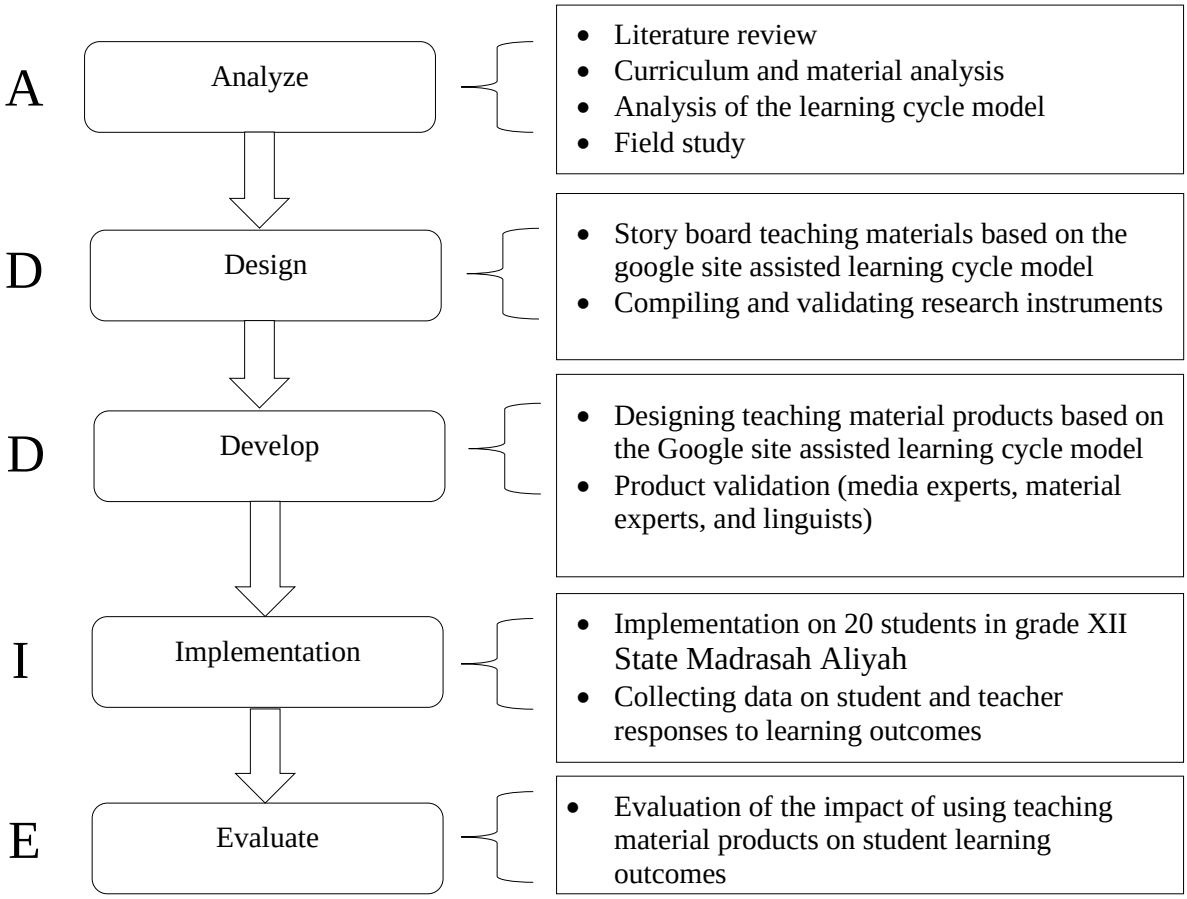

Figure 1. Research flow

Data validation results and results of student questionnaires were analyzed descriptively quantitatively. Meanwhile, data on increasing student learning outcomes were analyzed by determining the normalized gain.

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$$<g> = \frac{\%<S_f> - \%<S_i>}{100 - \%<S_i>} \qquad (1)$$

Where <g> is the normalized gain, S_f is the average posttest score, S_i is the average pretest score. The interpretation of the <g> value is categorized as high if (<g> $\geq$ 0.70), moderate category if (0.70 > <g> $\geq$ 0.30) and categorized as low if (<g> < 0.30).

Table 1. Types of data, data collection techniques and research instruments

Types of Data	Data Collection Techniques	Types of Instruments
Teaching material product validation data	Non test	Validation sheet
Data on student learning outcomes	Test	Multiple choice questions
Student response	Non test	Questionnaire

FINDING AND DISCUSSION

Findings in the Analyze Phase

Basic Competency 3.3, in the curriculum was found related to the scope of magnetic field material covered in the odd semester of grade XII, including magnetic field material, magnetic induction, and magnetic force in various technical items presented in three meetings. Because magnetic field material is abstract, it is a challenge for students to understand it. Therefore, teachers need to choose appropriate learning models and media.

The results of the literature review show that teaching materials for magnetic field material based on the learning cycle model are still rarely found in previous studies. In addition, the need for this research is supported by the results of field observations at the research location. The results of observations at one of the Madrasah Aliyah in the City of Tidore Kepulauan found:

1. The physics material which is considered very difficult for students is the magnetic field material.
2. The learning resources used are printed books for physics learning.
3. The learning paradigm still relies on traditional lecture and question and answer formats without using learning support materials.
4. When studying physics, students are less interested and do not pay attention to what is being explained by the teacher. The lack of learning resources and non-innovative learning models causes students to become bored quickly in class and pay less attention when learning takes place.

Findings at the Design Stage

At this stage, a product storyboard of magnetic field material based on the Google sites assisted learning cycle model was designed. This teaching material product is designed by following the syntax of the abductive empirical learning cycle model which includes phases; 1) exploration, 2) concept introduction, 3) concept application. The Google sites-assisted teaching material product design displays the main menu (instructions for use, prologue words, table of contents, basic competencies, and objectives), as well as the materials menu. Teaching material products based on the Google-assisted learning cycle model of magnetic field materials, are designed by combining a number of different elements, such as text in PDF form, PDF uploaded on Google Drive, quizzes in the form of Google forms and videos. In addition, at this stage validation instruments were produced for media experts, material experts and linguists.

Findings at the Develop Stage

The resulting teaching material products are validated by media experts, material physics experts and language experts. Product validation results are shown in **Table 2**, **Table 3** and **Table 4**.

Table 2. Media expert validation data

Aspect	Component	Percentage
Graphics	size of teaching materials assisted by Google sites	90%
	teaching material cover design	83%
	teaching material design	88%
Google sites assisted teaching materials	display design	84%
	interactive convenience	80%
	accessibility	80%
	compliance standards	80%
Average		**84%**

Table 3. Material expert validation data

Aspect	Component	Percentage
Appropriateness	suitability of the material description	87%
	material accuracy	85%
	material up-to-date	87%
Presentation eligibility	presentation technique	83%
	presentation support	85%
Average		**85%**

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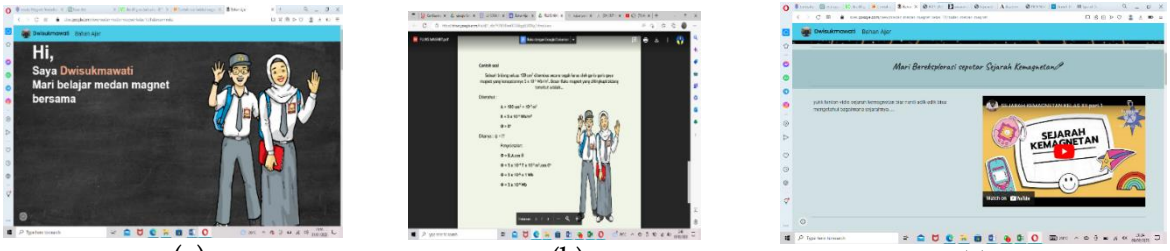
Table 4. Data validation results of linguists

Aspect	Component	Percentage
Language feasibility	The accuracy of the use of language	98%
	Communicative	93%
	Suitability with the development of students	97%
	Average	**96%**

Table 2, **Table 3** and **Table 4** show that teaching material products based on the Google sites assisted learning cycle model were declared feasible, both by media experts, material experts and linguists. The developed teaching material products can be accessed on the website https://sites.google.com/view/medan-medan-magnet-kelas-12/halaman-muka.



(a) (b) (c)

Figure 2. Display of teaching materials based on the Google sites assisted learning cycle model: (a) Home page, (b) sample questions and (c) learning videos

Guest at the Implementation Stage

At the implementation stage, teaching material products based on the Google sites-assisted learning cycle model were implemented in physics learning involving 20 grade XII students at one of the Madrasah Aliyah in the City of Tidore kepulauan. At this stage the measurement of learning outcomes and distribution of student response questionnaires was carried out.

Figure 3. Implementation of teaching material products in physics learning

Findings in the Evaluate Stage

The results of the pretest, posttest, and the amount of normalized gain are shown in **Figure 3**. Student learning outcomes are shown to increase from one series to the next which are categorized in the high category. To increase student learning outcomes for each sub subject is shown in **Figure 4**.

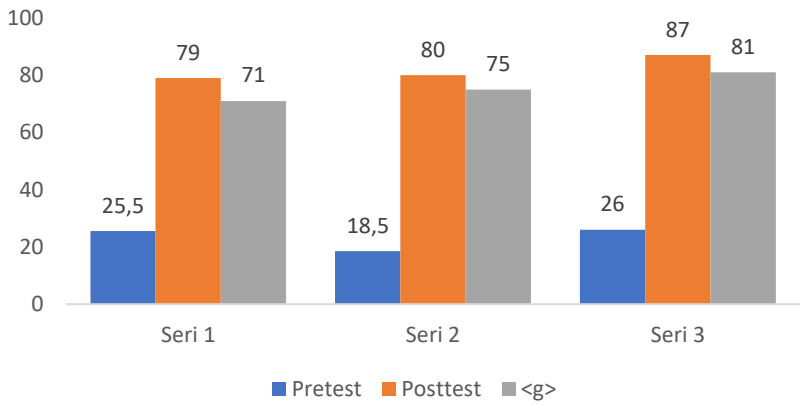


Figure 4. Average pretest, posttest, percentage Normalized gain

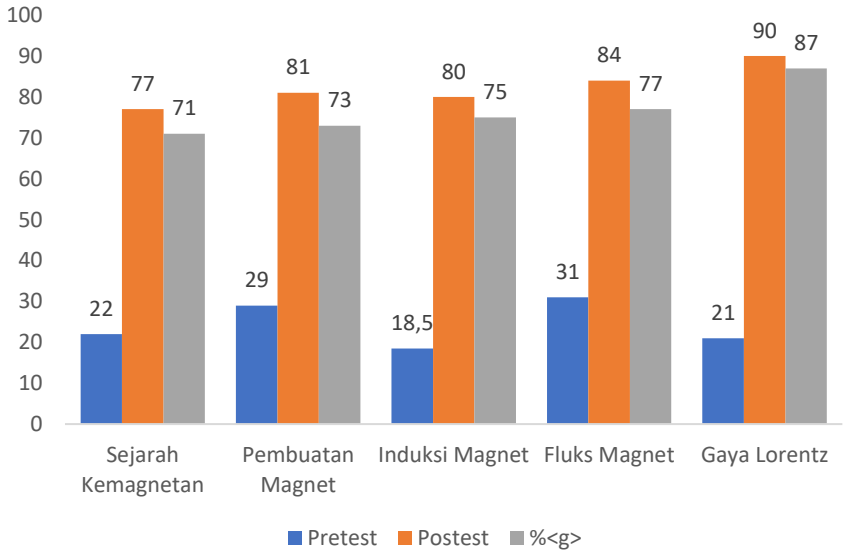


Figure 5. Increasing student learning outcomes in each sub the subject of magnetic fields

After the lesson, students were given a survey to complete after the session to investigate their responses to the use of the instructional material products developed in this research. The results of the student questionnaire are shown in **Table 5** which shows that

students gave very good responses to the use of teaching material products based on the Google sites assisted learning cycle model on magnetic field material.

Table 5. Results of student responses

Question	Percentage (%)	Criteria
The text or writing on these Google sites-assisted teaching materials is easy to read and understand	94%	Very good
The pictures and videos presented are clearly accompanied by information that supports the explanation	91%	Very good
Pictures and videos help me understand magnetic field material	97%	Very good
After reading this teaching material, I am motivated to have discussions related to the material presented in teaching materials assisted by Google sites	98%	Very good
I can easily understand the sentences contained in the teaching materials	96%	Very good
It is easier for me to understand magnetic field material using teaching materials assisted by Google sites than using printed books	99%	Very good
I am very interested in using these Google sites-assisted teaching materials	94%	Very good
The evaluations and videos in this teaching material are interactive so that it makes me interested in studying the material in more depth	91%	Very good

The results of student responses showed that students gave very good responses (95.75%). Student learning outcomes have increased in each series. The magnitude of the increase in student learning outcomes can be categorized as high.

The teaching material products developed have drawbacks, namely that these teaching materials can be accessed using the internet network because they use a website and there are interactive quizzes and several visual media that require an internet network, and also still need to be completed with student worksheets. The advantages of the teaching material products developed in this study are that they can assist students in supporting independent learning resources, and can be used using mobile phones, laptops, or computers so that it makes it easier for students to learn. In addition, the teaching material products developed have magnetic field information/material presentations in a more varied and interactive form of presentation.

CONCLUSION

Product teaching material magnetic field based on the Google sites assisted learning cycle model has been successfully developed in this study. This teaching material product is suitable for use in physics learning at the senior high school level. The use of magnetic field

teaching materials based on the Google sites assisted learning cycle model has been empirically proven to improve student learning outcomes. Students gave very good responses to the use of teaching material products produced in learning physics at school.

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