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Analysis of Teaching Materials Needs for Digital Module Development in Physics Learning: Teachers Perception

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Abstract: This research aims to describe teachers' needs for developing teaching materials. Concept understanding is important for students so that teaching materials are needed to improve students' concept understanding. The type of research carried out is descriptive research with a quantitative and qualitative approaches. The data instruments are in the form of interview sheets and teacher needs analysis questionnaires. Questionnaires to find out the learning resources used by teachers, obstacles when learning physics, and learning resources needed by teachers to facilitate students. A total of nine physics teachers in high schools throughout the city of Padang were involved in this research. Based on the result data of analysis, it was found that 83% of teachers used printed teaching materials in learning. As many as 36% of teachers use teaching materials that they make themselves. As many as 86% of teachers have never used digital teaching materials, teachers are not sufficient as learning resources. As many as 83% supported the development of teaching materials on physics to improve students' understanding of concepts. It is hoped that the results of this research will become the basis for developing digital modules based on the POE model to improve understanding of concepts in kinematics.

Keywords: Analysis of teacher needs; Digital modules; Physics learning

Introduction

During the last two years of the Covid-19 pandemic, the government issued policies regarding the learning process which was carried out online, then blended and returned offline. As a result of this transition in learning, it has an impact on student learning outcomes and students' understanding of concepts (Sundari & Dewi, 2021). This can be seen from the declining student learning outcomes (Sarkity & Sundari, 2020). If students' level of understanding of physics concepts is low, it will affect student learning outcomes, such as When given daily tests, many students do not reach the minimum completeness criteria (KKM) (Gustiana & Firda, 2021).

Understanding concepts is an effort that must be made by students in recording and transferring back a certain amount of information from a particular subject matter that can be used in solving problems. Understanding the concepts is important for students and can affect increasing learning outcomes (Mayasari et al., 2022). Understanding the concept will have an impact on the continuity of his understanding of other concepts (Nasir, 2020). Understanding the concepts becomes the basis for understanding a material. Understanding concepts helps us identify objects around us and helps in learn something new (Rosyidah et al., 2020). If understanding the concepts is good, students can explain physical phenomena scientifically and apply the concept in a real and contextual way (Wulandari & Kurniawan, 2023).

In implementing science learning, students are expected to be active in searching for and discovering concepts, able to analyze a problem, active in discussions, brave enough to speak up and convey ideas, and able to write work results. In more detail, when studying physics, students must be able to achieve learning success (Gustiana & Firda, 2021). Physics learning is learning that constructs knowledge. Physics is a collection of knowledge consisting of facts,

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concepts, theories, principles, and models (Sujarwanto, 2019). Physics is one of the subjects that is considered difficult by students (Hardiyanti, 2018). Therefore, it is very necessary to understand good concepts to understand physics learning because with good concepts, students will have no difficulty understanding physics.

One of the physics materials that needs to be improved in conceptual understanding due to the transfer of learning is kinematics material. Kinematics is material that studies motion phenomena and is a basic concept for other topics such as parabolic motion, circular motion, Newton's Law, and rotational dynamics (Nasir, 2020). Apart from that, there is also the matter of impulse and momentum, energy work, and modern physics (Nikat et al., 2022). Kinematics is a basic science before studying dynamics because dynamics will be discussed in more detail, so the kinematics material must be understood well so that it can make it easier to study dynamics (Muzakki et al., 2022). In this material, students often experience conceptual errors based on research conducted by Hariyono et al., given a test of 63 students, only 4 people answered correctly regarding graphs of straight and irregular motion (Hariyono, 2021). Based on research conducted by Nurfainah et al. shows that there are still many students who misunderstand the concept of differences in speed and speed (Nurnaifah et al., 2022). Research conducted by Reza et al. shows that there are still many students who have difficulty determining position, distance, average acceleration, and position equations (Taqwa & Rivaldo, 2018) this needs to be addressed. Teachers play an important role in overcoming this problem so that students' mastery of concepts regarding kinematics material can increase so that their learning outcomes can also increase.

The way that teachers can enhance students' grasp of the concept of kinematics material is by choosing the right models and teaching materials. One model to use to improve understanding of the concept is the POE model. The POE model is the right model to use to improve them, existing concepts will not easily disappear from their memory so that understanding of the concepts is more meaningful (Muna, 2017). The POE model is effective in facilitating teachers and the research results of Liew and Treagust POE are effective in capturing various possible observations and predictions for students when they are arranged in an open format. The results imply that POE assignments can be used to design in-depth learning activities, to begin with the student's point of view rather than the teacher's or scientist's point of view. Findings also indicated that POE was effective in facilitating teachers and students in documenting student achievement and student progress profiles (Liew & Treagust, 1998).

Apart from it is essential to use instructional resources that adapt to students' and teachers' needs for the material being studied. Teaching materials are a set of learning materials that are arranged systematically to create an atmosphere that can support learning for students (Irwandani et al., 2017). Many kinds of teaching materials can be used by teachers, for example by using modules, both printed modules and digital modules. Using digital modules has the advantage of being able to display interactive learning material. For example, the presence of learning videos in digital modules. It is expected that videos will make it easier for students to receive lessons and help students learn independently (Destrina & Muttaqiin, 2023). Modules are also called independent learning resources because they are equipped with instructions for self-study (Arafah & Palloan, 2023). In addition, the use of digital modules can also improve students' concept understanding. Modules play an important role in improving students' conceptual understanding, by using modules the learning process becomes more effective and efficient (Fauza et al., 2023).

The reality in the field is based on observations and interviews with teachers that have been conducted in seven secondary schools located in Padang City. The use of teaching materials and learning models is still not optimal. Most teachers use conventional instructional resources to deliver learning material. We do not blame the use of conventional instructional resources. However, physics learning cannot be separated from technological developments. The role of digital technology is needed to face the challenges of the 21st century, and to help facilitate human activities (Yulkifli et al., 2022). Almost all students at school have laptops and smartphones and it is easy to use the internet for learning. However, there are still many teachers who have not taken advantage of this, some teachers still use conventional teaching materials in delivering lesson material in delivering material.

Digital modules are made systematically and use simple language that students can easily comprehend when used to study independently at home without the help of a facilitator or teacher (Sari & Alarifin, 2016). Digital modules can contain material descriptions that are easy for students to understand and contain simple experiments that make students try these simple experiments. The digital module is equipped with virtual simulations, namely simulations that use computers or smartphones which can present natural phenomena that play a very important role in science learning (Suryani & Siahaan, 2023). The digital modules developed must be able to increase motivation and be

effective in achieving the excited competencies according to the level of complexity of the students. As well as providing feedback in digital modules so that it can help to improve students' concepts.

The objective of this research is to establish the analysis of teacher requirements for instructional resources in physics education and the use of appropriate models to increase understanding of concepts. This research is important to be done as a basis for development research, especially from teacher's perspective. This need analysis is the initial description of the problem that problems that arise. Related to the teacher's needs for modules or teaching materials for learning physics that needs to be developed.. It is hoped that the series of analyses in this research will provide an overview regarding the development of digital modules that can be recommended as additional teaching materials for teachers to help students improve their understanding of concepts.

Method

The method used in this research is a descriptive method with a quantitative and qualitative approach. Quantitative data was obtained by distributing questionnaires given to teachers. To strengthen answers related to quantitative data, qualitative data were collected from interviews with teachers to in depth. The questionnaire was given to nine physics teachers representing high schools in Padang who were involved in this study. The questionnaire distributed consisted of two indicators. The questionnaire and interview sheet used are validated by the validator. The validation results of valid questionnaires and interview sheets can be used to conduct a needs analysis

Needs analysis was carried out by collecting data related to teacher perceptions regarding the need to develop the following digital modules. There were two topics asked to the participants, namely first teaching materials commonly used by teachers in physics learning, second teachers' perceptions of the need to use digital modules with certain models in physics learning to enhance students' comprehension of physics principles.

Result and Discussion

The outcomes of the quantitative analysis are based on the two indicators contained in Table 1, The first indicator is related to the utilization of instructional resources, and the second indicator is related to the use of certain models in learning. The results of the needs analysis for digital module development are listed in Table 1.

Table 1. Teachers' Responses toward Teaching Materials Used

Indicator	Statement	Percentage
The use of teaching material in school	Teachers use a variety of teaching materials during physics lessons	50%
	The educational resources utilized by instructors printed teaching materials	83%
	Teachers use teaching materials (modules/handouts) that they make themselves	36%
	Teachers have never used digital teaching materials (digital modules)	86%
	The teaching materials used by teachers are not sufficient as learning resources	86%
	Teachers support the development of digital teaching materials on physics material to broaden students' knowledge and improve their understanding of concepts	83%
	Teachers have developed digital teaching materials based on certain learning models	31%
	Teachers have developed digital teaching materials (digital modules) that students can use via smartphones/ computers	39%

Based on the Table 1, it can be seen the teaching materials used by teachers in learning physics. Based on quantitative results related to the use of instructional resources used by teachers in physics learning. It is known that 50% of teachers use a variety of instructional resources. Of the teaching materials used by teachers 83% of teachers use printed materials. Then 36% of teachers used open materials that they made themselves. As many 86% of teachers are not sufficient as learning resources. The use of open resources that are able to help enhance students' comprehension of concepts really needs to develop. This is accordance with the quantitative results of 83% of teachers supporting the development of digital teaching materials. The need to develop digital teaching materials means that 31% of teachers have developed teaching materials with certain learning models. Then 39% of teachers have developed digital teaching materials that can use via smartphone or computer. Then, teachers' responses in the implementation of learning model in physics learning can be seen in Table 2.

The results of the questionnaire in Table 2 about the implementation of educational approach in the study of physics. The results as many 75% of teachers provide chances for students to predict solutions to

problems given in physics learning. Based on the results 75% of teachers provide opportunities for students to carry out experiments or observations of problems given in physics learning. As many 75% of teachers provide opportunities for students to carry out experimental results from problems given in physics learning (Explain). Providing feedback during learning is very necessary to help improve students' enthusiasm and concept so this need to be done. Based on the results of filling out questionnaires carried out by teachers 39% of teachers provided feedback to students. Improving students' understanding concepts can be done by providing practice questions in the format of conceptual questions. Based on the quantitative results 39% of teachers gave assignments presenting conceptual questions to students. As many 83% teachers give students assignments involving computational questions.

Table 2. Teachers' Responses toward the Implementation of Leaning Model in Physics Learning

Indicator	Statement	Percentage
The implementation of learning Model in physics learning	Teacher already know the POE (Predict Observe Explain) learning model	44%
	Teachers provide opportunities for students to predict solutions to problems given in physics learning (Predict)	75%
	The teachers provide opportunities for students to carry out experiments / observations of the problems given in physics learning (Observe)	75%
	Teachers provide opportunities for students to carry out experimental results from problems given in physics learning (Explain)	75%
	Teachers provides feedback given at the conclusion of every physics class	39%
	The teachers give assignments to students in the form of conceptual question	33%
	The teachers give assignments to students in the form of calculation problems that require physics equations	83%

Derived from the findings of distributing questionnaires and interviews, teachers need teaching materials that are interesting, innovative, and easy teacher can develop new ideas and create instructional materials as needed. Developing teaching materials is part of the professional tasks and skills that must be owned and mastered by every teacher. This is because teaching materials aim to facilitate educators and students in learning activities at school and outside school. Available teaching materials one of the teachers developed is a digital module because the use of digital modules is still rarely used in schools.

The second indicator is related to the use of the right model which can also increase students' understanding of concepts and learning outcomes. In general, there are not many learning models that focus on students' initial understanding. The learning model commonly used by educators is the direct learning model (Direct Instruction). This model provides more concise and clear knowledge and is teacher-centered (Mufit, 2018). One model that has the potential to create a fun and quality learning atmosphere is the POE (Predict, Observe, Explain) model. The POE model can improve students' understanding of physics concepts (Akhfar & Nimung, 2022) and student learning outcomes (Safitri et al., 2019) compared to conventional models. The POE model can increase the enthusiasm and curiosity of students, make learning activities more interesting, and can stimulate students to be creative, especially at the prediction stage (Hasanah et al., 2021). The POE model is effective in facilitating teachers and students in documenting students' achievements and progress profiles (Anarky et al., 2016). Derived from scrutiny results, 44% of teachers are aware of the POE (Predict Observe Explain) model, but in practice, teachers still rarely use this model to improve their understanding of concepts.

The POE model is an effective model for acquiring and improving students' science concepts (Muna, 2017). Apart from using models that can improve the concept students by providing feedback from the teacher. Based on observation results, 39% of teachers provide feedback to students at the end of each lesson. In this category, it is said that teachers rarely provide feedback to students. Providing this feedback is very useful for students in improving their understanding of concepts. Providing lots of questions related to conceptual understanding, especially kinematics, is also necessary because based on observation 33% of teachers give assignments to students through conceptual inquiries. As many as 83% of teachers give assignments to students in the form of calculating problems that require physics equations to be solved.

The results of the qualitative analysis are based on interviews with nine teachers which were conducted by asking several questions and recorded. The research results show that first that only several teachers use digital teaching materials in physics learning and if there are any it is rarely used, second some teachers do not know the POE (Predict Observe Explain) model which can increase understanding of the concept. Teachers know the learning models contained in the

curriculum, namely Inquiry Learning, Discovery Learning, Problem-Based Learning, Project Based Learning models. Providing feedback is not yet optimal for students, third increasing students' understanding of concepts can be improved with the help of certain models that are appropriate in digital module worksheets. Some teachers have never developed digital teaching materials and the instructional resources usually used in schools printed instructional material and rarely use digital teaching materials. The detailed interview script is written as follows.

The first question related to the teaching materials used in learning physics. Some teachers usually use textbooks, books from the library, worksheets, teaching aids, and printed modules. Some teachers already use a variety of digital teaching materials in physics learning. They also have integrated technology into teaching material, like using Canva and PowerPoint presentations, but for using digital teaching material is rarely used in education. Most teachers find it rare to develop digital teaching materials. Teachers have used learning model so far to assist students in grasping the principles of physics material, not for a specific model, but trying to combine several methods, it is still the basic method. Teacher experienced in using a jigsaw model or something else, but they find it difficult to apply to the class. Because each class has different abilities and learning styles are also different.

Based on the results of interviews that have been conducted, teachers still rarely use digital teaching materials. Teachers more often use teaching materials such as books from the library, worksheets in printed form the library, and worksheets in printed form. From the results of the questionnaire and interview results, the analysis of teachers' needs for digital teaching materials, especially digital modules, is needed to increase students' conceptual understanding of the POE model in kinematics.

In general, this research was conducted to identify potential teacher needs regarding digital modules in physics learning. Based on the findings 83% of teachers support the development of digital teaching materials on physics material to broaden insight and improve students' understanding of concepts. The use of certain models to improve students' understanding of concepts has never been done. For example, by using the POE (Predict Observe Explain) model where this model is an alternative that educators can use to create a fun and quality learning atmosphere. Learning with the POE model is efficient for acquiring and improving students' science concepts, as well as generating students' ideas or suggestions (Rahmawati et al., 2019). Aligned with the findings from the research conducted by Purdhiyah et al., stated that learning using the POE (Predict Observe Explain) model is very good to apply in the study of physics where it can increase students' interest in learning (Purdhiyah et al., 2022). From the results of observations made, teachers rarely give conceptual questions and mostly give questions in the form of physics equations. Meanwhile, understanding the concept is very important for every student. Students' physics concepts can be obtained through direct experience (independently) interacting with natural phenomena around them or from classroom learning.

From the research results, teachers need digital teaching materials in the form of digital modules that can enhance students' comprehension of concepts in physics learning. Understanding concepts is very important for students. So that further learning can simplify it for students because if the initial concept is wrong it will have an impact on the subsequent material. Aligned with the findings from the research conducted by Hasanak et al., it shows that 82.4% of students enjoy learning physics using digital modules (Hasanah et al., 2021). Apart from that, the use of digital teaching materials (digital modules) can help students learn independently. Digital modules have the advantage of being able to occur in life so that they can make students more interested in learning.

Conclusion

Based on the results of the need analysis of the needs analysis of teacher perceptions that have been carried out, it can be concluded from the quantitative analysis that 83% of teachers use printed teaching materials. As many as 31% of teachers have developed digital teaching materials based on certain models. Up to 83% of teachers support the development of digital teaching materials for physics material that can broaden students' insight and improve their understanding of concepts. As many as 83% of teachers give calculation problems that require physics equations to solve. As many as 33% of teachers gave task comprising conceptual inquiries to students and 39% of teachers provided feedback to students. Even 75% of teachers do not know about the POE model which can increase students' understanding of concepts. These results are strengthened by qualitative analysis, namely the results of interviews stating that not many teachers use digital instructional resources in the study of physics. The teacher does not yet know that the POE (Predict Observe Explain) model can increase participants' understanding of concepts. Teacher needs to developed POE based digital modules with *computer-assisted feedback.* So, it can be used as a reference for future researchers who want to develop

digital modules based on the POE model accompanied by computer-assisted feedback to improve high school students' understanding of concepts in kinematics material.

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P.D.S and H.H have contribution to the development of research instruments. S.Y.S validated the research instrument, and E.B.A contributed in conducting research.

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Conflicts of Interest
There is no conflict of interest.

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