Need Analysis to Develop a Physics Module Integrated Natural Disaster and Mitigation

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Abstract: Physics is the study of phenomena, symptoms and interactions of objects that occur in nature. One of the phenomena that often occurs is natural disasters. Natural disasters are a series of events that occur naturally or non-naturally that can harm humans and anything in nature. Natural disasters can be prevented or reduced by doing mitigation. Mitigation is an effort carried out before a natural disaster occurs which aims to reduce or prevent the occurrence of natural disasters. In learning physics, natural disasters can be analyzed in physics concepts so that a teacher can make natural disaster phenomena a phenomenon that can increase students' knowledge in studying physics. Therefore, teachers need teaching materials that are integrated with natural disasters and mitigation to support learning to convey and analyze the role of physics in natural disaster phenomena and mitigation. The purpose of this study was to describe the teacher's need for the development of an integrated physics module for natural disasters and mitigation as teaching materials in physics learning. This research is qualitative research with the subject of research is physics teacher from several schools in Riau. Data collection was carried out using a non-test method by providing a questionnaire in the form of a google form. The results of the questionnaire show that most teachers need physics teaching materials in the form of an integrated physics module for natural disasters and mitigation

Keywords: Mitigation; Module; Natural disaster; Need analysis; Physics

Introduction

Education is one of the most important elements in the progress of a nation, because the quality of a nation can be seen from the quality of its education. Law No. 20 of 2003 defines education as 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, noble character, and skills needed by themselves, society, nation. and country (Syafira, 2022). The importance of education in Indonesia is also stated in the 1945 Constitution which is used as a goal to educate the nation's children. To realize this goal, it is necessary to have an education that runs well and optimally, so that it can improve the quality of Human Resources in the learning process.

Physics is a science that describes and analyzes all that exists in nature, such as the phenomena that occur in nature, phenomena that occur in nature, as well as the interaction of objects in nature physically and formulated mathematically (Ady, 2022). Learning Physics is a subject that is considered difficult and requires a high level of understanding (Basri et al., 2022). Physics is a material that is synonymous with calculation and it is difficult to understand its benefits in everyday life. Physics learning is a material whose implementation is in everyday life, one of which is natural disasters.

Natural disasters are a series of events that threaten and disrupt people's lives, both caused by natural and non-natural factors that result in casualties, environmental damage, property losses and psychological impacts (Niode et al., 2016). Natural

disasters include floods, landslides, earthquakes, tsunamis and many more (Hawa et al., 2023). Efforts can be made to reduce or prevent the occurrence of natural disasters, namely by doing mitigation. Mitigation is the initial stage of natural disaster management to reduce and minimize the impact of disasters. Mitigation is an activity before a disaster occurs. Law Number 24 of 2007 defines mitigation as a series of efforts to reduce disaster risk, both through physical development as well as awareness and capacity building in dealing with disaster threats (Hasbullah et al., 2022).

The learning process is a series of activities carried out by teachers and students in achieving educational goals by using aids in the form of learning devices as supporters in the learning process (Maharani, 2021). The learning process will run effectively if there are teaching materials that are easily understood by students, according to the current situation in the field, teachers still use printed books as teaching materials and there are no new innovations that are used as teaching materials in the learning process. Teaching material is a learning device that contains learning materials that must be prepared by the teacher to achieve learning objectives (Tárraga-Sánchez et al., 2023). It is also defined by Finch & Crunkilton that teaching materials are resources that can assist teachers in bringing about desired behavioral changes in individual learners (Bailenson et al., 2008). From these two definitions, it can be concluded that teaching materials are very important in the learning process.

In learning physics, teachers can use natural disaster phenomena as examples of the role of physics in nature. In this case, a teacher needs teaching materials that can support the physics learning process, namely modules. Modules are teaching materials that are systematically arranged using language that is easily understood by students according to their level of ability so that students can more easily understand and learn independently. The module is also defined as one of the printed teaching materials that is presented systematically, so that it is easily understood by teachers and students (Harta et al., 2014). In the module there are usually several well-coordinated series of activities related to materials and media as well as evaluation. Modules play an important role in improving students' conceptual understanding, by using modules the learning process becomes more effective and efficient. The module that can be developed by teachers that integrates natural disasters and mitigation is a physics module that integrates natural disasters and mitigation in which there are several physics materials that integrate natural disasters and mitigation that can be used by teachers and students in the physics learning process. The physics module is integrated in natural disasters through instructional design (Cremen et al.,

2023). Through the preparation of instructional designs the development of physics learning indicators (Fauza et al., 2021). Therefore, it is necessary to analyze the needs of teachers to find out the actual.

Method

This research is a qualitative research. The data was obtained by providing a teacher needs analysis questionnaire. The subjects of this study were high school physics teachers in Riau, consisting of 20 physics teachers from 20 schools in Riau who filled out the teacher needs analysis questionnaire. First, observations are made on the phenomena that often occur around, the learning process and the needs of the teacher, then a questionnaire of needs is given to the teacher. The questionnaire given is in the form of a google form with "yes" or "no" answer options for each question. The results of the questionnaire are presented in the form of a percentage of teachers answering yes or no to each question, then analyzed to determine the teacher's needs for the integrated physics module for natural disasters and mitigation that they want to develop.

Result and Discussion

The questions are structured to describe the needs of teachers in developing an integrated physics module for natural disasters and mitigation. The distribution of questionnaires to teachers is the initial stage of a series of developments to determine the needs of teachers in supporting the learning process in the classroom. The results of this needs questionnaire are then used as the basis for developing learning resources in the form of modules. The module here acts as a teaching material for each student to reach the final stage in the process of discovering the concept of the material being studied. These questions relate to teaching materials, natural disasters and mitigation. the design of the integrated natural disaster physics module is shown in the Figure 1.
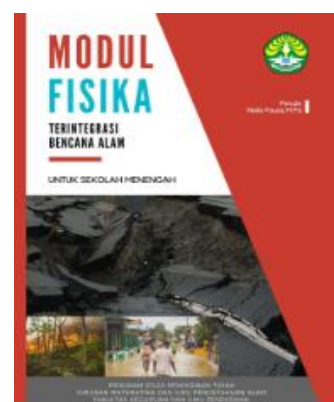

Figure 1. Desain module's cover

Before the design stage, several focus group discussion activities to develop a needs analysis questionnaire are shown in the figure 2.

Figure 2. Fokus discusion grup

The first question asked about the teaching materials used by the teacher, 45% of teachers used worksheets, 40% used modules, 10% used handouts, and 5% used quizzes. In the second question, teachers have difficulty in teaching physics material to students, and as many as 80% of teachers need teaching materials in the process. This is also supported by the results of research conducted by Muhammad Ali et al in 2022 where it can be concluded that teachers really need teaching materials to be able to deliver the material presented so that students easily understand the material presented (Ali et al., 2022).
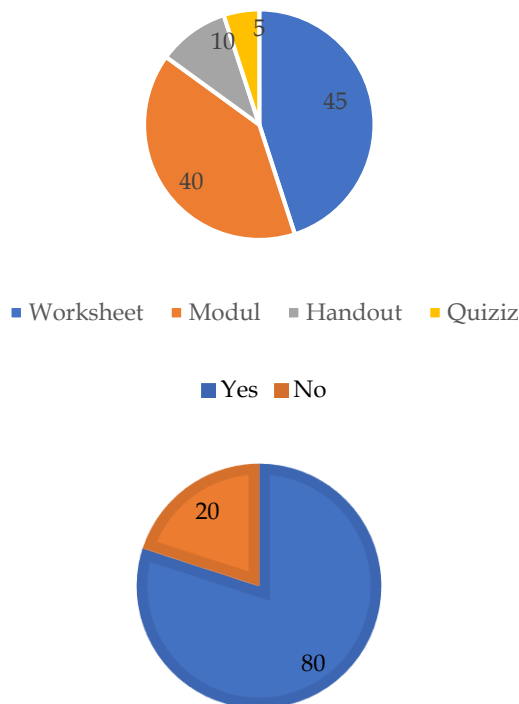
Activities learning in a module, activities will potentially be implemented in a lesson (Nesri et al., 2020). Module as a study guide for students independently (Utami et al., 2018). Giving modules in learning can improve learning outcomes cognitive students, because the material presented in the module is described according to the level student understanding (Lewar et al., 2023). Learning modules should be conveyed clearly so that students can follow all the learning processes in the module (Nurlatifah et al., 2021). Development of modules based on natural disasters and suitable mitigation supports about local wisdom not only to foster an attitude of caring for the environment to create students character (Wati et al., 2020).

The next question states that only 65% of teachers have developed modules and another 35% have never developed a module and 75% of teachers have never developed an integrated module for natural disasters and mitigation and the rest have never made such a module. This is also supported by research that has been carried out by Danita and Anatri in 2022 where teaching materials in the form of modules are needed in the learning process because they are considered easier to understand and more practical so that learning can run effectively and optimally (Permatasari et al., 2022).
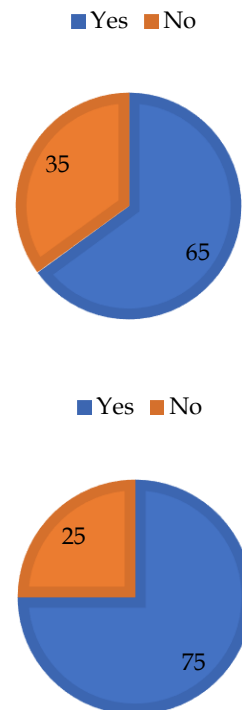

Figure 4. Questionnaire results 3-4

Figure 3. Questionnaire results 1-2

Teachers and students need teaching materials as learning resources (Malina et al., 2021). The teaching

materials needed are teaching materials that have the characteristics of supporting physics material (Matsun et al., 2018). Physics deals with nature and the events that affect it (Cahyono et al., 2017; Wati et al., 2020). The next question relates to the development of an integrated physics module for natural disasters and mitigation. As many as 75% of teachers want to develop an integrated physics module for natural disasters and mitigation and 95% of teachers agree to develop an integrated physics module for natural disasters and mitigation.
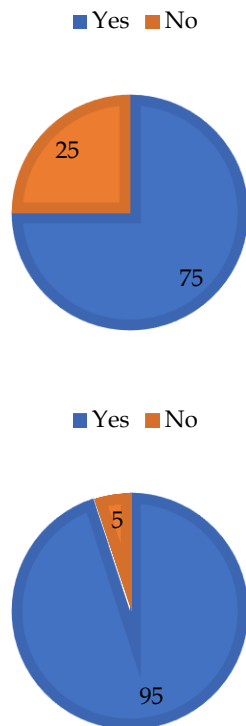

Figure 5. Questionnaire results 4-5

In fact, teaching materials are not yet contextual to improve students' abilities and preparedness for natural disasters and mitigation (Suharini & Baharsyah, 2020). In addition, external factors, namely students think that disaster and the environment are unattractive topics so that students do not care about the environment (Susanto et al., 2021). Through the integrated natural disaster and mitigation physics module, there is an increase in the attitude of caring for the environment. Riau Province is an area prone to natural disasters (Oktora et al., 2022).

Conclusion

Based on the data obtained, it can be concluded that the development of the module as a teaching material is feasible to be developed if you look at the results of the data analysis above. The module developed is an integrated physics module for natural disasters and mitigation in which there are several physics materials that are integrated with natural disasters such as floods, landslides, smog and others as well as disaster mitigation. The suggestion given is that the module can be strengthened again for the integrity of natural disasters and their mitigation in the applicable physics concepts.

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