ISSN 1533-9211

DOI 10.5281/zenodo.7500966

AN ANALYSIS OF MULTI-REPRESENTATION-BASED E-BOOK NEEDS ON BASIC PHYSICS MATERIALS, DEPARTMENT OF PHYSICS EDUCATION, MUSAMUS UNIVERSITY

RIKARDUS FERIBERTUS NIKAT[1], ALGIRANTO[1], PARLINDUNGAN SINAGA[2] and PARSAROAN SIAHAN[2]

[1]Education Physics, Musamus University, Merauke, Papua, Indonesia.
[2]Educatorn Physics, University of Education Indonesia, Bandung, West Java, Indonesia.
E-mail: nikat_fkip@unmus.ac.id, algiranto@unmus.ac.id, psinaga@upi.edu, parsaoransiahaan@upi.edu

Abstract

This Research aims to describe the analysis of development needs and produce a multi-representation-based e-book on the basic Physics course. This study uses a mixed methods explanatory sequential design model. This research is still limited to define, namely needs analysis before developing multi-representation-based e-books. The development of a multi-representation-based basic physics e-book is based on several aspects of student needs including aspects of the student basic physics lecture process, student difficulties in understanding basic physics material, learning resources used by students in studying basic physics material: student needs related to basic physics e-book needs integrated multi-representation in solving Physics problems. The subjects of this study were 76 students of the Department of Physics Education, Musamus University, and Merauke. The results of the analysis show that a total of 91.1% of students of the physics education department at the University of Musamus need multi-representation-based e-books in the basic physics learning process. This is supported by student response data. First, the majority of student learning processes are still learning using conventional methods in lectures, so they need interactive media to improve the quality of learning. Second, the majority of students only have access to learning resources in the form of textbooks in lectures. Third, the majority of students have difficulties in understanding physics concepts. Fourth, students need multi-representation-based e-books in Physics lectures. The results of the analysis show that a total of 91.1% of students of the physics education department at the University of Musamus need multi-representation-based e-books in the basic physics learning process. This is supported by student response data. First, the majority of student learning processes are still learning using conventional methods in lectures, so they need interactive media to improve the quality of learning. Second, the majority of students only have access to learning resources in the form of textbooks in lectures. Third, the majority of students have difficulties in understanding physics concepts. Fourth, students need multi-representation-based e-books in Physics lectures. The results of the analysis show that a total of 91.1% of students of the physics education department at the University of Musamus need multi-representation-based e-books in the basic physics learning process. This is supported by student response data. First, the majority of student learning processes are still learning using conventional methods in lectures, so they need interactive media to improve the quality of learning. Second, the majority of students only have access to learning resources in the form of textbooks in lectures. Third, the majority of students have difficulties in understanding physics concepts. Fourth, students need multi-representation-based e-books in Physics lectures. 1% of students in the physics education department at the university of Musamus need a multi-representation-based e-book in the process of learning basic physics. This is supported by student response data. First, the majority of student learning processes are still learning using conventional methods in lectures, so they need interactive media to improve the quality of learning. Second, the majority of students only have access to learning resources in the form of textbooks in lectures. Third, the majority of students have difficulties in understanding physics concepts. Fourth, students need multi-representation-based e-books in Physics lectures. 1% of students in the physics education department at the University of Musamus need a multi-representation-based e-book in the process of learning basic physics. This is supported by student response data. First, the majority of student learning processes are still learning using

The Seybold Report
ISSN 1533-9211
DOI 10.5281/zenodo.7500966

conventional methods in lectures, so they need interactive media to improve the quality of learning. Second, the majority of students only have access to learning resources in the form of textbooks in lectures. Third, the majority of students have difficulties in understanding physics concepts. Fourth, students need multi-representation-based e-books in Physics lectures. The majority of the student learning process is still learning using conventional methods in lectures so that it requires interactive media to improve the quality of learning. Second, the majority of students only have access to learning resources in the form of textbooks in lectures. Third, the majority of students have difficulties in understanding physics concepts. Fourth, students need multi-representation-based e-books in Physics lectures. The majority of the student learning process is still learning using conventional methods in lectures so that it requires interactive media to improve the quality of learning. Second, the majority of students only have access to learning resources in the form of textbooks in lectures. Third, the majority of students have difficulties in understanding physics concepts. Fourth, students need multi-representation-based e-books in Physics lectures.

Keywords: Needs Analysis, E-Book, Multirepresentation, Basic Physics

INTRODUCTION

Basic Physics material is one part of the field of natural science that describes natural phenomena, theories and concepts both abstract and real. The process of studying basic physics is very difficult for students to explore, both in the ability to analyze and in the context of understanding the concept of physics itself [1]. Some findings on the results of research on students. Students have the concept that physics content is considered difficult by several factors. One of the factors is the form of problem solving in the form of conceptual problem solving [2]. Solving conceptual problems is considered difficult because it is considered to be related to the individual's ability to analyze the construction of phenomenal physics problem solving [3]. Another factor is that the basic Physics material has a multidisciplinary scope of knowledge namely conceptual, factual, procedural and metacognitive knowledge [4]. Factual and conceptual knowledge are basic abilities that support higher order thinking skills (HOTS)[5]. These two abilities become fundamental knowledge for students in planning and finding solutions to Physics problems. While procedural and metacognitive knowledge are higher order thinking skills used to solve abstract physics problems. Students' learning difficulties in basic Physics lectures are quite complex, so a needs analysis related to appropriate innovative approaches, strategies and learning media is needed to support the achievement of optimizing lecture objectives. One of the basic needs is teaching materials. Physics teaching materials needed are innovative and can attract interest [6]and student learning independence[7]. Just ingredients Innovation has the meaning that it must be able to adapt to the development of science, including technological developments. The development of science and technology acts as a facilitator to provide convenience for learners and instructors in creating and innovating. One form is the use as an interactive medium. Interactive learning media is one form of packaging the learning process in the form of electronic media. Some examples are e-books, learning videos, virtual laboratories and simple animations. In the learning process, interactive media has the function of providing easy access to information in the form of utilizing the use of media in helping the implementation and achievement of learning. In terms of impact, interactive learning media can provide

The Seybold Report
ISSN 1533-9211
DOI 10.5281/zenodo.7500966

Based on the results of interviews and preliminary observations on several students of the physics education department at Musamus University, they found several conditions in basic physics lectures. First, the average student only knows textbooks in paper form and electronic books in PDF format. The textbooks found have not been developed in the form of e-books with interactive simulations equipped with videos, animations, audio and pictures. Second, they do not yet have electronic teaching materials that can be accessed by students or lecturers with an integrated learning management system (LMS). This has an impact on the achievement of learning quality such as the low level of high-order thinking skills of students and students' technological literacy. The function and role of teaching materials in the lecture process can help the implementation of the learning process, namely in directing all activities taught to students during the learning process. The role of teaching materials for students as a source of independent learning in basic physics lectures, more specifically to help students broaden their horizons, understanding concepts and higher-order thinking skills. Rapid technological developments allow instructors to develop technology-based teaching materials. One of them is the development of an interactive electronic book (e-book). Interactive e-books are one of the innovative and adaptive teaching materials according to today's learning demands that integrate interactive learning media in one unified teaching material.[6]. E-books can also be viewed as an interactive learning resource, where messages or information can be presented in a more interesting and varied manner in the form of a combination of text, images, animation, sound and video.[8]. Along with the development of science and technology, the development of software is increasingly rapid and relatively easy to access both free and paid, so it is very possible for educators to be able to combine various online and offline media into one e-book package that is much more attractive and interactive. The basic physics eBook packaging is expanded with some interesting content such as videos, animations, audio and images. The integration of some interesting content into the e-book allows students to have many ways to solve Physics problems [9]. E-book content contains information that can be in the form of text, equations, graphics and animations and videos and can be accessed using a mobile phone or computer.

Ayu & Fauzi revealed several advantages of e-books as innovative learning media [10]. E-books are easily accessible using electronic devices anytime and anywhere. As a source of learning, e-books are a source of student self-study [11]. Independence in individual learning can be created through active learning activities that are driven by intentions and motives to master a competency in order to solve a problem. Students can study in any place and condition so that independent learning is more determined by the availability of appropriate learning facilities. The packaging of the basic physics e-book needs additional assistance in the form of some assistance packaged in the textbook, namely a multi-representation approach. The multi-representation approach is a method of delivering a concept through various means such as text, tables, diagrams, visual images, mathematical equations, computer simulations, and others.[12]. The form of physics concepts with different formats allows individuals to have different abilities in understanding concepts. A person will understand something better through words and pictures than just words. This is also in line with the results of research which shows that a person's memory of images (visuals) is better and lasts longer than writing

The Seybold Report
ISSN 1533-9211
DOI 10.5281/zenodo.7500966

[8], [13]. The integration of the multi-representation approach into the basic physics e-book is one of the innovations in developing physics learning media. Multi-representation integration into e-books is considered to provide opportunities for students to practice their higher-order thinking skills. Some representation features have their own path in solving physics problems in e-book content and evaluation. One example is the image representation can represent a problem that cannot be observed directly.

Based onn Wilda & Yusnaidar's research results on the development of multi-representation-based Physics teaching materials are in accordance with the characteristics of the learning process at the university level[14], [15]. One of the targets to achieve is produce competent students who have knowledge of Physics content, the ability to solve Physics problems and other higher-order thinking skills [16]. JamIt is also in the research that developing e-books can increase students' motivation, interest and quality of learning. In accordance with several descriptions of the advantages of e-books in learning physics, the authors are motivated to carry out a similar development, namely the development of multi-representation-based basic physics e-books. The results of the research become an initial study related to the needs of students in supporting product development. The purpose of the initial study is to find out the basic problems needed in the development of e-books. The multi-representation-based e-book development stage uses a 4D development model. There are several stages, the next for the e-book is a need assessment (needs analysis), which is an analysis that finds out what the initial needs are, the required literature, and the theoretical limitations that will be used. Therefore, in an effort to develop a Multi-representation-Based Interactive Basic Physics e-Book which first has a preliminary analysis? One of the preliminary analyzes that needs to be done in the development of this e-book is an analysis of E-book needs. The product to be developed is an E-book for the mitigation of the volcanic eruption disaster. The variable of this research is the need for a valid and reliable multi-representation-based interactive basic physics E-book used in learning

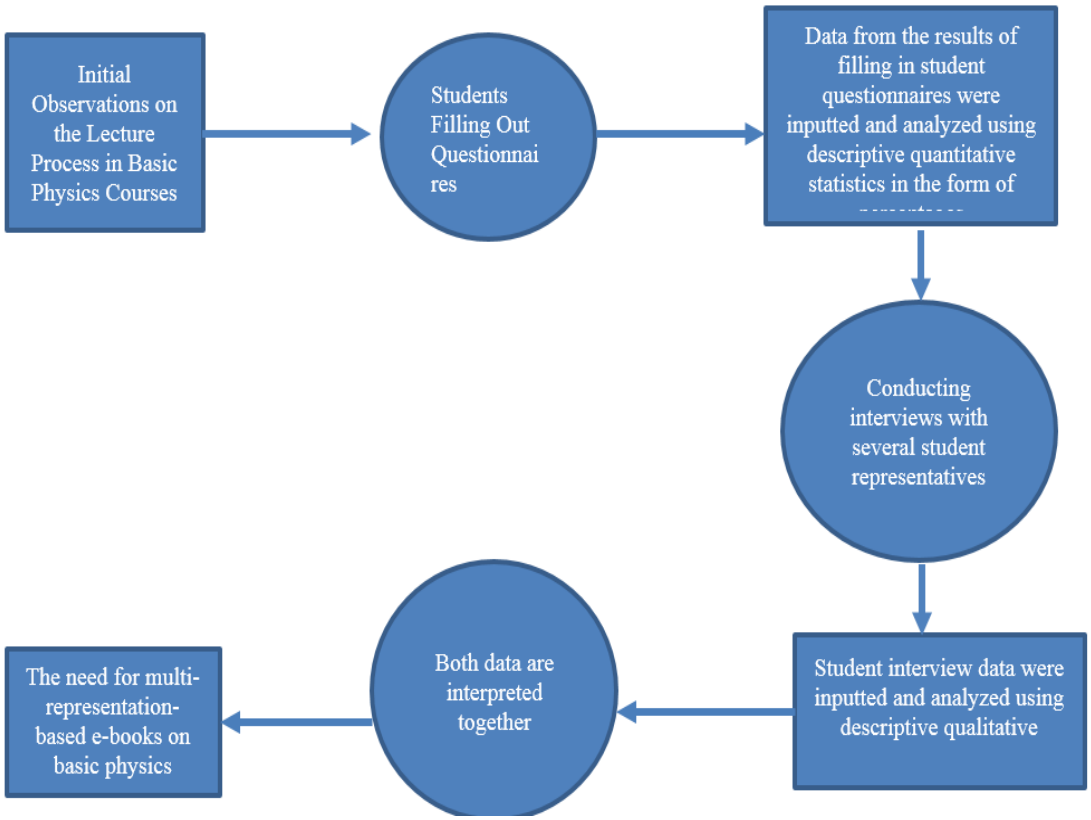
RESEARCH METHODS

Method of this research uses a mixed research approach (quantitative and qualitative) type of explanatory sequential design (Cresswell, 2014). Approach this study aims to analyze the need for an interactive, multi-representation-based e-book of basic physics. Mix Method Research is a research model that specifically examines the description of research results through several testing or observation techniques that need to be tested in terms of outputs and processes, in the form of quantitative and qualitative data descriptions that are interpreted simultaneously. This research is limited to quantitative and qualitative analysis related to the need for multi-representation-based e-books derived from initial observations in the field (Needs assessment) based on several indications. There are several indicators that serve as benchmarks for obtaining this needs analysis data, namely: (1) the basic physics learning process for students. The learning process is more about the method or platform used by lecturers in basic physics lectures. (2) Students' difficulties in understanding the basic physics material. Several indicators are used as benchmarks, namely understanding concepts, ability to solve mathematical problems, ability to analyze graphs, ability to interpret physical phenomena

The Seybold Report
ISSN 1533-9211
DOI 10.5281/zenodo.7500966

in the form of sketches or drawings and ability to understand and analyze tables (3) Learning resources used by basic physics students. It aims to determine the learning media used by students during learning. (4) Student needs related to the integration of some basic physics e-book features that need to be integrated in solving Physics problems. Figure 1 is the flow of the research method

Figure 1: Research Flow



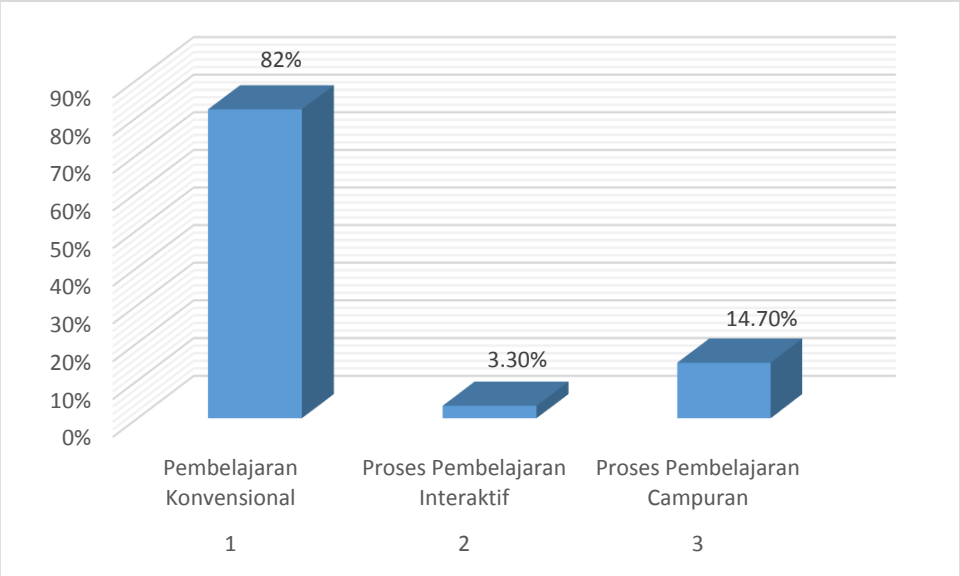
Research data in the form of initial development needs' this is a multi-representation based interactive e-book. The subjects of this study involved 76 students of the Department of Physics Education, Musamus University, and Merauke. Data collection was carried out by involving students to provide responses to the four aspects needed by researchers in analyzing the needs of e-books. The four indicators are summarized in several points of 12 questions and statements. Data collection techniques in this study used survey techniques in the field using instruments in the form of questionnaires and student response interviews. Questionnaires were used to find out student opinions regarding the need for developing a multi-representation-based Basic Physics e-book and structured interviews were conducted to find out in detail the needs of students in improving the quality of physics lectures. The data analysis technique uses several methods, namely data reduction (data reduction), data presentation (data display) and conclusions, drawing or verification (conclusion Drawing/Verification). The validity of the data used a validity test using the source triangulation method.

The Seybold Report
ISSN 1533-9211
DOI 10.5281/zenodo.7500966

RESULT AND DISCUSSION

Based on the analysis test results the need to create an interactive multi-representation-based Basic Physics E-book. The lecturers of the Physics education department at the University of Musamus Merauke stated that they needed digital teaching materials as one of the learning media in the lecture process. These results are supported by the results of the analysis on four aspects of supporting analysis, namely aspects of the recovery process, aspects of access to learning resources, difficulties in learning physics and the need for multi-representation-based e-books. The researcher presents several planned questions and is followed by structured interviews to obtain student responses regarding these needs. The number of respondents was 76 students of the Department of Physics Education, Musamus University. The results of the analysis of the needs of students are contained in several aspects as follows:

Figure 2: Student responses regarding the Basic Physics Learning Process



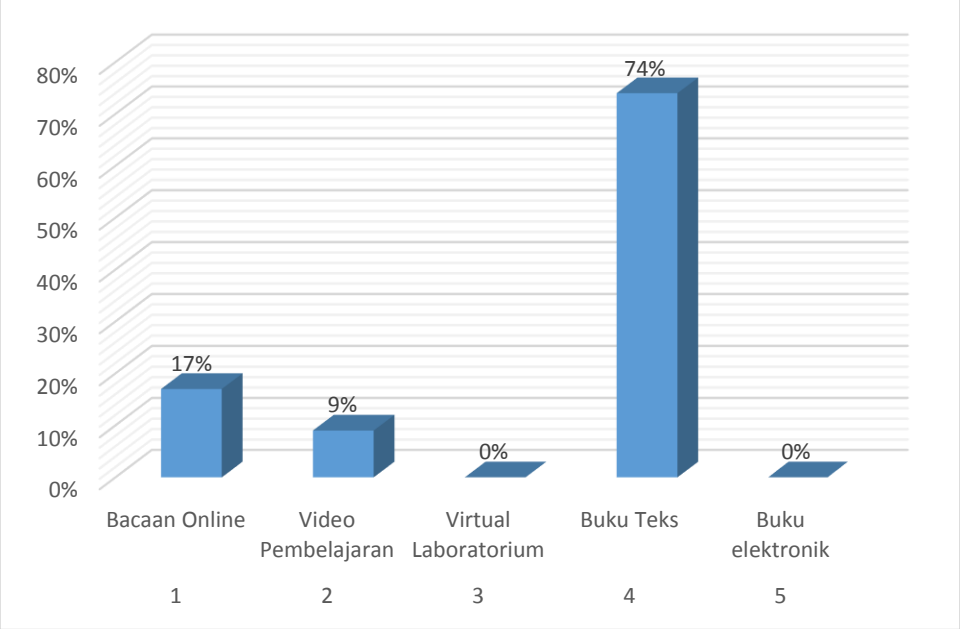
Based on Figure 2 obtained data related to the learning process that has been carried out in basic physics lectures. There are three groupings of the basic physics learning process based on student responses, namely as follows: 1) The first number graph illustrates that the basic physics lecture process uses conventional learning techniques. Conventional learning means that Physics learning is carried out without using interactive media or interactive learning models. Student responses show more than 82% of the conventional-based learning process. They said that conventional learning is difficult to develop their creativity, thinking quality and thinking ability. 2) The second graph illustrates that some basic physics lectures use interactive learning techniques. Interactive learning means that the Physics learning process is carried out using some media assistance or innovative learning models. Student responses showed only 3.3% of the learning process based on innovative learning. The interactive learning used is an assessment based on the quizzes game application. 3) The third graph illustrates that some basic physics lectures have used mixed learning techniques. Interactive learning means that the

ISSN 1533-9211

DOI 10.5281/zenodo.7500966

Physics learning process is carried out using some innovative assistance. Student responses show less than 14.7% of the learning process based on innovative learning. A quality learning process will definitely be supported by quality learning facilities. Based on the student responses above, that it is necessary to improve the quality of learning by maximizing interactive learning media in lectures. Therefore, in the basic Physics lecture process, there must be an innovative learning process that supports the competence of students in the era of society 5.0

Figure 3: Student responses regarding access to learning resources



Based onn Figure 3 obtained data related to student responses to access to learning resources in basic physics lectures. There are five learning resources found based on student responses, namely as follows: 1) the first number graph describes student responses related to utilizing online reading resources in supporting Physics learning. The results show that 17% of students have used online reading such as opinions, articles, blogs, articles, journals and other reading sources. This indicates that students' interest in using online reading sources is still low. Several factors caused this to happen because they did not understand the contents of the reading source. The language displayed is difficult to understand in terms of meaning. In addition, it is difficult to access paid reading resources. 2) The second graph depicts student responses related to utilizing learning video sources through the YouTube platform. The results show that only less than 9% of students use the YouTube platform as a learning resource. This indicates that students' interest in using YouTube as a learning resource is still low. Several factors identified that the majority of students access YouTube in the form of learning videos and mathematical problem solving. Another factor is the financial considerations of students to buy internet packages to access YouTube. 3) The third graph describes the process of basic physics lectures using a virtual laboratory as a tool. The results showed that students had never used a virtual

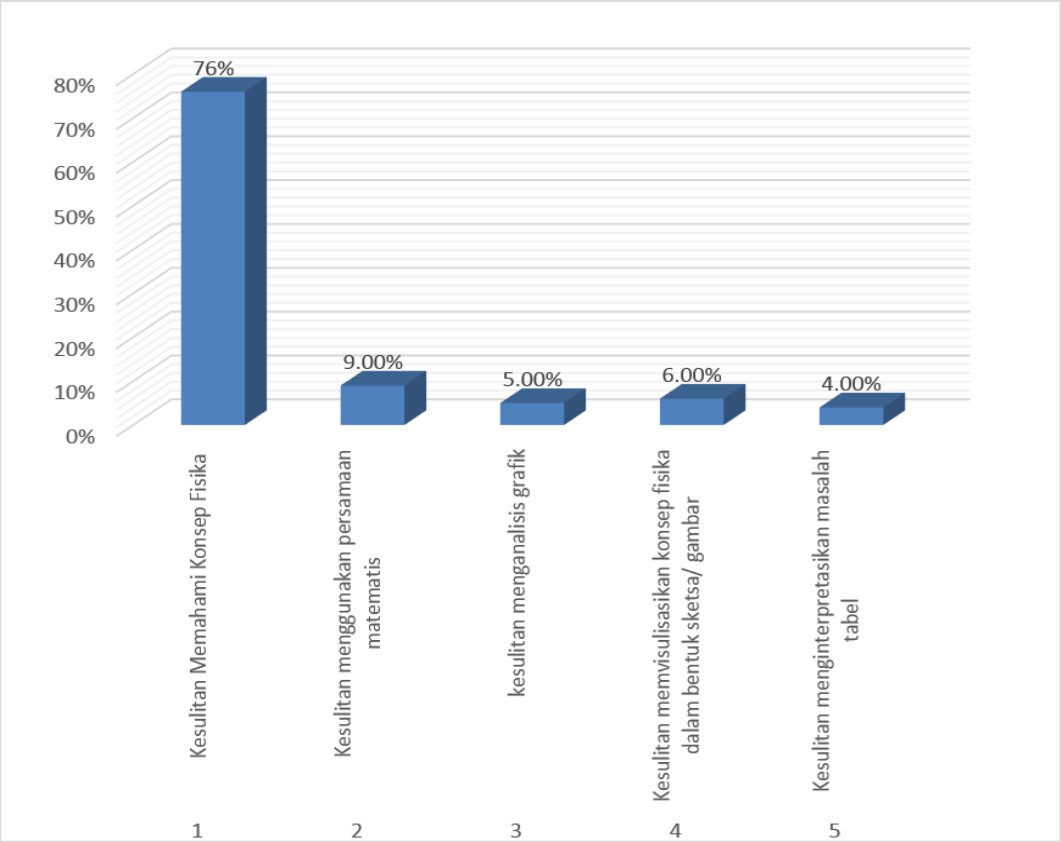
DOI 10.5281/zenodo.7500966

laboratory in basic physics lectures. Students tend to carry out practicals in real laboratories. This is considered by the inability of students to access and use virtual laboratories. 4) The fourth graph illustrates that in the basic physics lecture process, students are more dominant in using textbooks as learning resources. This is supported by student response data showing more than 74% using textbooks as a source of learning basic physics. They said that Indonesian textbooks were easier to understand than English textbooks. However, another thing was found that the average student did not understand the concept even though he had read various kinds of text books. This is because the content of the textbook does not comprehensively contain the aids used to describe the concepts of physics. Therefore we need the right tools to describe the concept of physics clearly. 5) The fifth graph illustrates that in the process of basic physics lectures, students have never used electronic books. This is supported by student response data showing that more than 75% use textbooks as a source of learning basic physics. They said that Indonesian textbooks were easier to understand than English textbooks. However, another thing was found that the average student did not understand the concept after reading the textbook. This is because the content of the textbook does not comprehensively contain the aids used to describe the concepts of physics. 5) The fifth graph illustrates that in the process of basic physics lectures, students have never used electronic books. This is supported by student response data showing that more than 75% use textbooks as a source of learning basic physics. They said that Indonesian textbooks were easier to understand than English textbooks. However, another thing was found that the average student did not understand the concept after reading the textbook. This is because the content of the textbook does not comprehensively contain the aids used to describe the concepts of physics. 5) The fifth graph illustrates that in the process of basic physics lectures, students have never used electronic books. This is supported by student response data showing that more than 75% use textbooks as a source of learning basic physics. They said that Indonesian textbooks were easier to understand than English textbooks. However, another thing was found that the average student did not understand the concept after reading the textbook. This is because the content of the textbook does not comprehensively contain the aids used to describe the concepts of physics. They said that Indonesian textbooks were easier to understand than English textbooks. However, another thing was found that the average student did not understand the concept after reading the textbook. This is because the content of the textbook does not comprehensively contain the aids used to describe the concepts of physics. They said that Indonesian textbooks were easier to understand than English textbooks. However, another thing was found that the average student did not understand the concept after reading the textbook. This is because the content of the textbook does not comprehensively contain the aids used to describe the concepts of physics.

ISSN 1533-9211

DOI 10.5281/zenodo.7500966

Figure 4: Student responses regarding students' learning difficulties in Basic Physics



Based on Figure 4 obtained data related to student responses to their difficulties in understanding basic physics in the lecture process. There are 5 categories of student difficulties in understanding basic physics, which are as follows: 1) the first number graph describes student responses related to student difficulties in understanding physics concepts. The results show that more than 76% of students have misconceptions and do not understand the concept. Difficulty understanding physics concepts means the individual's ability to translate physical phenomena into physics problem solving. In addition, misconceptions are errors in translating physics concepts. This is caused by several factors, one of which is the textbook used in lectures. Some students said that reading sources were less interesting and language had multiple interpretations. Making it difficult for them to understand the concept of physics. They expect innovative textbooks that can accommodate all tools or aids that can visualize physics concepts so as not to cause misconceptions. 2) The second graph describes student responses related to student learning difficulties in using mathematical equations in solving physics problems. The results show that only less than 5% of students have difficulty using mathematical equations in solving physics problems. This indicates that mathematical equations are no longer the main problem in solving physics problems. One of the supporting factors is that students are familiar with the practice of formulas and equations in Mathematics

The Seybold Report
ISSN 1533-9211
DOI 10.5281/zenodo.7500966

I course. On average, they have no problems related to solving physics problems with the help of mathematical equations. 3) The third graph shows the students' responses to their understanding of graphs. The results show that students have difficulty analyzing physics concept problems through graphs. Students have never solved physics problems in graphic form. In addition, students do not understand how to analyze the relationship between variables on the graph. This shows that the ability of students to analyze and evaluate the truth of physics concepts correctly is still low. 4) Graph number four illustrates student learning difficulties in terms of applying drawing diagrams or sketches in solving physics problems. This is supported by data that 78% of student responses have not been able to describe physical phenomena through picture diagrams. One of the main reasons the teaching materials used do not contain examples of solving physics using diagrams. The ability to visualize physical phenomena through diagrams is one of the main steps in solving physics problems. Therefore, drawing diagrams or sketches need to be added to the content and evaluation tools of textbooks. 5) The fifth graph describes student responses to student learning difficulties in interpreting and analyzing physics problems in tabular form. The results obtained indicate that students have difficulty making tables to analyze the experimental results. This is caused by the textbooks that are used as reference materials have not accommodated the practicum content and analytical techniques into teaching materials. Table 1 below is a student response regarding several features that will be integrated into the basic physics e-book.

Table 1.Student responses to the need for multi-representation-based e-books in basic physics learning

No	Statement	Percentage of Student Agree Response
1	The need for digital teaching materials in the form of e-books in basic physics lectures	100%
2	Online or offline-based learning videos need to be integrated in basic physics lectures	86%
3	Several multi-representation features such as images, animations and video tutorials need to be added to the e-book	94%
4	The quiz link needs to be added to the e-book	100%
5	Virtual laboratories need to be integrated into e-books	76%
6	E-books need to be equipped with problem solving-based content	82%
7	E-book for basic physics lectures using easy-to-understand language	100%
Average		91.1%

The Seybold Report
ISSN 1533-9211
DOI 10.5281/zenodo.7500966

Based on the average student response to the need for e-books, it shows that 91.1% they agree to develop multi-representation-based e-books in learning basic physics. This description is supported by data from the analysis of deficiencies obtained based on the learning process, availability of access to learning resources, student learning difficulties and current student needs. The results of the analysis on the learning process found that the learning process still uses conventional methods. Conventional learning methods are not in accordance with the demands of the era of society 5.0. Learning society 5.0 era to be able to implement a distance learning system through LMS. Saprudin, et al, stated that e-books can be a medium in distance learning and LMS-based learning [17] in that era, students were required to be technologically literate which was adapted to the information technology-based learning process. The results of the analysis on the availability of access to learning indicate that students still use printed books as the main reference in lectures. The weakness of printed books is that the material content is only in the form of reading and printed images without being equipped with videos or interactive animations so that readers get bored easily. Packaging of teaching materials in the form of interesting and innovative e-books can motivate students to take part in the lecture process. This is in line with the results of research by Anggreini & Permadi which states that teachers need to use interesting teaching materials in order to motivate students to learn.[18]. The existence of motivation for students can be a driving factor for students in increasing interest in learning. Interest in learning in a person is determined by several factors, namely: learning media, learning environment, teaching materials and instructor actions. The development of e-books in the teaching and learning process of physics is one component of teaching materials that can improve some problem solving skills, critical thinking, creative thinking [19]. In addition, several other considerations in the development of electronic teaching materials are the needs of students so that there is no misunderstanding of concepts and misconceptions. The current need is to overcome the problem of not understanding concepts in students of the physics education department at the Musamus University. These efforts can be applied by integrating a multi-representation approach into digital teaching materials. The use of teaching materials using a multi-representation approach, someone will become more active and creative in the learning process [20]. This is because they are easier to understand physics material and can access textbooks using mobile phones, anytime and anywhere. They can construct their own knowledge before attending lectures. A multi-representation-based e-book becomes an innovative and adaptive book as a source of student self-study without teacher guidance [21]. The presentation of e-books with varied representations such as videos, pictures and animations in such a way, especially with a multi-representation approach, makes students interested in learning them. Students feel that multi-representation-based e-books are useful and make it easier for them to understand physics concepts visualized with other models. In accordance with the results of Ayu & Fauzi's research which found that multi-representation-based teaching materials were declared feasible in terms of quality, attractiveness, readability and usefulness for improving student learning outcomes.[22]. Therefore, the development of this e-book needs to consider several criteria so that the resulting product is of high quality.

The development of a multi-representation-based basic physics e-book must have good quality from several criteria. First, the criteria in terms of content, basic physics e-books in terms of

The Seybold Report
ISSN 1533-9211
DOI 10.5281/zenodo.7500966

presentation content. Things to consider in the presentation, namely, first, the e-book includes the learning outcomes of the subject, the material concept map diagram, the content of the material and the instructions for using the e-book. Second, the criteria for presenting multi-representation-based basic physics material must be accompanied by picture illustrations or explanations with various forms of representation. Third, evaluation criteria must be available such as strategy problem solving exercises, facts, interesting information in the e-book and the existence of evaluation questions in the e-book. Next in terms of learning media criteria. Image presentation quality, videos and animations in the E-book must be full colour HD quality and the topics displayed are related to sub-topics on basic physics. Fourth, the criteria in terms of language use. The use of language in e-books must be in accordance with the characteristics of students' abilities which can make it easier for them to understand the material and provide attractiveness for students in learning. The language used does not cause ambiguous meanings, misconceptions and errors in physics concepts. The use of language that is in accordance with the development of students will certainly make it easier for students to understand the material. Fifth, the criteria in terms of graphic design, e-books have graphics like the appearance of a real book with A4 size paper with full color display mode. The letters used in the e-book are adjusted to the standard rules in writing teaching materials. Besides that, several other components of teaching materials such as objectives, instructions, facts, interesting information, quizzes and summaries need to be added. This has the aim that the evaluation feature has the aim of evaluating their learning abilities through several evaluation features that are in accordance with their abilities (Yanti, 2018). In addition, evaluation is used in learning to obtain accurate information about the level of achievement of learning objectives so that it can be used as evaluation material and can be followed up (Moh Soheh, 2019).

CONCLUSION

Based on the results of the research conducted, it can be concluded that students of the physics education department at Musmaus University need an interactive basic physics e-book. They stated that 91.1% agreed that they needed the development of an interactive basic physics E-book as one of the innovative learning media to support the lecture process. In addition, they said that e-books have benefits in improving critical thinking skills. Based on the needs analysis, there are several considerations related to the development objectives, namely 1) an interactive basic physics e-book can be developed so that it can be used as reference material for students in taking online lectures through LMS. 2) In the aspect of e-book content, it is necessary to add some additional content such as videos, quiz links, virtual laboratories, and simple animation 3) in the language aspect, it is necessary to use language that is easy to understand and does not cause misconceptions and does not understand concepts in physics material. 4) In the aspect of graphic design, e-books can be developed with full color display with various images and additional content through E-book designs such as magazines with A4 size.

The Seybold Report
ISSN 1533-9211
DOI 10.5281/zenodo.7500966

Acknowledgment

The authors would like to thank several parties who have supported this research. First, thank you to the Directorate General of Higher Education, Research and Technology of the Ministry of Education and Culture, Research and Technology for funding assistance in the form of research. Cooperation between universities between Musamus University and the Indonesian University of Education. Second, thank you to the entire academic community of the Department of Physics Education, Musamus University for their cooperation in completing this research.

References

1. I.Wilujeng and HAC Wibowo, "Scientific Reasoning for Prospective Physics Teacher Students in Online Learning," Edu Cendikia: Scientific Journal of Education, vol. 1, no. 2, Aug. 2021, doi:1047709/educendikia.v1i2.1025.
2. A.Ulfa Yana, S. Koes Handayanto, T. Wuryanti, and A. Ulfa Yana Physics Education, "Exploration of the Scientific Reasoning Ability of High School Students' Newton Law." [On line]. Available: http://journal.um.ac.id/index.php/jptpp/
3. R. Yanti, C. Author, and H. Article, "AnalysisLearning Difficulties of PGSD Students at Cokroaminoto Palopo University in Basic Physics Courses," CJPE: Cokroaminoto Journal of Primary Education, vol. 2, no. 2, 2019, [Online]. Available: https://e-journal.my.id/cjpe
4. Yusuf and SWWidyaningsih, "HOTS profile of physics education students in STEM-based classes using PhET media," in Journal of Physics: Conference Series, Mar. 2019, vol. 1157, no. 3. Doi: 10.1088/1742-6596/1157/3/032021.
5. M. Erfan and T. Ratu, "Achievement of HOTS (Higher Order Thinking Skills) Students of the Physics Education Study Program FKIP Samawa University," Journal of Physics and Technology Education, vol. 4, no. 2, pp. 208–212, Nov. 2018, doi:10.29303/jpft.v4i2.831.
6. MFT Nirmala, DAGebze, AMR Tumanggor, M. Lengkong, and I. Wilujeng, "Physics Learning with E-Book Using Problem Based Learning (PBL) Model to Improve Image Representation Ability of High School Students on Optical Materials," Proceedings of the 7th International Conference on Research, Implementation, and Education of Mathematics and Sciences (ICRIEMS 2020), vol. 528, no. Icriems 2020, pp. 547–554, 2021, doi: 10.2991/assehr.k.210305.080.
7. W. Sari, danHaerul Pathoni, and D. Physics Education Study Program, "Development of 3D Professional Pageflip-Based Electronic Module on Basic Concepts of Core Physics and Core Structure of Atomic and Core Physics Courses for Undergraduate Students of Physics Education Study Program, Jambi University 2)3)," vol . 02, no. 01, 2017, [Online]. Available: http://nugraha167.blogspot.com
8. MMMirzatullah, A. Halim, and A. Hamid, "The Comparison of Multi Representation Based Module and Text Books on Black Principle Material in Physics Learning Reviewed from Student Retention," Asian Journal of Science Education, vol. 2, no. 1, pp. 33–40, 2020, doi:10.24815/ajse.v2i1.14796.
9. P. Sinaga,Amsor, and FD Cahyanti, "Effectiveness of the new generation e-book application for mobile phones in improving the conceptual mastery of kinematics," International Journal of Mobile Learning and Organization, vol. 13, no. 2, pp. 217–232, 2019, doi:10.1504/IJMLO.2019.098192.
10. F. Ayu and A. Fauzi, "The Effectiveness of the Development of Discovery Learning-Based Physics E-Books on Earthquake Themes to Improve Students' Competency in Resilient Attitudes," JOURNAL OF EKSAKTA EDUCATION (JEP), vol. 5, no. 1, pp. 8–16, May 2021, doi:10.24036/jep/vol5-iss1/567.
11. D.Mulhayatiah, P. Sinaga, and R. Hidayatulloh, "NEED ANALYSIS OF MULTI REPRESENTATION-BASED TEACHING MATERIALS DEVELOPMENT TO IMPROVE PHYSICS TEACHER COMPETENCE," SPEKTRA: Journal of Science Education Studies, vol. 8, no. 1, p. 64, May 2022, doi:10.32699/spektra.v8i1.229.

The Seybold Report
ISSN 1533-9211
DOI 10.5281/zenodo.7500966

12. [12]I.Kusumawati, S. Sumarli, S. Sutopo, and S. Kusairi, "Effectiveness of HOTS-Based Multiple Representation Learning Model in Circular Motion Materials," JIPF (Journal of Physics Education), vol. 5, no. 1, p. 23, Jan. 2020, doi:10.26737/jipf.v5i1.1112.
13. N.Haryanti, I. Wilujeng, and S. Sundari, "Problem based learning instruction assisted by e-book to improve mathematical representation ability and curiosity attitudes on optical devices," J Phys Conf Ser, vol. 1440, no. 1, 2020, doi:10.1088/1742-6596/1440/1/012045.
14. A.Suhandi and FC Wibowo, "Multirepresentational Approaches in Energy-Effort Learning and the Impact on Students' Concept Understanding," Indonesian Journal of Physics Education, vol. 8, no. 1, pp. 1–7, 2012, doi:10.15294/jpfi.v8i1.1988.
15. W.Syahri, "Development of Ideal Gas Material Based on Multiple Representations Using 3D Pageflip E-Book Development of Ideal Gas Material Based on Multiple Representations Using 3D Pageflip", doi: 10.22437/jisic.v14i1.16506.
16. N.Aprillia and H. Pathoni, "Development of an E-Book on Basic Physics Based on a Scientific Approach on Work, Energy, Impulse and Momentum Materials," 2021.
17. S.Saprudin, NA Rahman, D. Amiroh, and F. Hamid, "Literature Studies: Analysis of the Use of e-Books in Learning Physics," Titian Ilmu: Multi Sciences Scientific Journal, vol. 13, no. 2, pp. 20–26, Oct. 2021, doi:10.30599/jti.v13i2.1144.
18. A.Anggreini and D. Permadi, "Needs Analysis of E-Module Development Containing Learning Videos on Distance Education for Prospective Physics Teachers," JOURNAL OF EKSAKTA EDUCATION (JEP), vol. 5, no. 2, pp. 164–173, Nov. 2021, doi:10.24036/jep/vol5-iss2/617.
19. DK Wati, E.Supriana, and S. Sulur, "Development of a Multi-Representation-Based Physics E-Book with Corrective Feedback on Straight Motion Materials for Class X SMA/MA," Journal of Physics Education Research, vol. 4, no. 1, pp. 34–41, 2020.
20. M.Ramadayanty, S. Sutarno, and E. Risdianto, "Development of Multiple Representation-Based Physics E-Modules to Practice Students' Problem Solving Skills," Jurnal Kumparan Physics, vol. 4, no. 1, pp. 17–24, 2021, doi: 10.33369/jkf.4.1.17-24.
21. IKAAJ Putra, IMSuarsana, and IGP Suharta, "Development of Fractional Interactive Teaching Materials for Deaf Special Junior High School Students with a Multi-Representational Approach."
22. F. Ayu and A. Fauzi, "Edmodo-Assisted Physics Book Based on Discovery Learning in Physics Learning Process Practicality Development Of Edmodo-Assisted Physics E-Book Based On Discovery Learning In The Pysics Learning Process," Journal of Educational and Science Innovation, vol. 1, no. 3, pp. 66–71, 2020.