Science Interactive E-Book Based Problem-Based Learning to Improve Creative Thinking Skills: Needs Analysis Based on Teacher Perception

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Abstract: The sophistication of technology today has been widely used by educators to teach and as a means for students to learn. The development of technology, especially in the field of education, then it requires teachers to have media and teaching materials that attract student's attention to learning. This study aims to analyze teachers' needs for interactive science e-books based on Problem-Based Learning (PBL) in learning. This research is qualitative research with a case study approach. Data collection uses observation and interview techniques. Interviews were conducted with two science teachers from SMP Negeri 3 Depok and one science teacher from SMP Negeri 11 Yogyakarta. The results of this study are aspects of the learning process of students tend to be passive with low creative thinking skills, the aspect of using teaching materials has never used interactive e-books for learning, the aspect of using teaching materials has never been integrated with the PBL learning model. Based on the results of data analysis, teachers need PBL-based science interactive e-books to improve students' creative thinking skills.

Keywords: Interactive e-book; Need analysis science; Problem based learning

Introduction

The rapid development of science today is inseparable from the role of existing 21st century technology (Fachrunnisa et al., 2023). Students must have several abilities needed in the 21st century, including critical thinking, problem-solving, communication and collaboration, innovation, and creativity (Zainudin & Istiyono, 2019). The same is true in science learning. Science is a subject that can be representative of the implementation of 21st-century learning. Science learning should emphasize students' activeness through knowledge-building activities and a series of activities during learning to create meaningful learning for students (Prabowo, 2015).

Creative thinking skills need to be applied in science learning (Trisnayanti et al., 2020; Turiman et al., 2012), because with creative thinking, students can apply imagination to generate ideas and hypothetical questions, experiment with alternatives to evaluate ideas final products, and processes on themselves or with their respective groups (Uloli, 2021). However, the fact is that students' creative thinking skills are still low. This is based on observations made by researchers at SMP Negeri 3 Depok and SMP Negeri 11 Yogyakarta. In answering the teacher's questions, students still lack the details of the ideas given. In addition, students also do not provide concepts or ideas that are different from existing ideas.

Based on the problems found in the field, a learning model is needed to develop students' creative thinking

skills. Problem-based learning (PBL) directs students to think scientifically to solve existing problems, and then students can improve their creative thinking skills (Astuti et al., 2023). PBL is a learning model resulting from the development of active learning (Kardoyo et al., 2020). PBL is a model that presents problems based on real life as the first step to gaining knowledge through problem-solving (Fakhriyah, 2014). Learning with the PBL model begins with a problem, and students are allowed to find information and develop strategies for problem-solving (Akinoğlu & Tandoğan, 2007).

In addition to using learning models, appropriate teaching materials are also needed to achieve learning success (Kusuma et al., 2022). Breakthroughs and creativity of educators in creating teaching materials are needed for the use of modern technology (Sari et al., 2021). Today, all technological sophistication has been widely used by educators to teach and as a means for students to learn. Technology development, especially in education, requires teachers to have media and teaching materials that attract students' attention to learning. One solution to overcome this problem is using digital learning resources in e-books (Susanto et al., 2022). Therefore, the Indonesian government, through the Ministry of Education and Culture, has provided e-books in PDF (Portable Display Format) format that can be accessed online and used by all levels of educational institutions. With e-books, users tend to be able to read quickly to get the main points. However, this has not been utilized fully because the message obtained is still limited, and the concept has not been conveyed entirely (Harjono, 2020). Various efforts are still needed to optimize the use of e-books in classroom learning. One of them can be the development of interactive e-books.

Interactive e-books are e-books contain multimedia objects (audio, video, and animation) and interaction (touch and drag). With the addition of multimedia, the book's content will be more complex, and student's participation in learning can increase (Ormancı & Çepni, 2020). According to Yanarti et al. (2023) interactive e-books are multimedia-based teaching materials that combine sounds, videos, images, graphics, animations, tables, and text that are arranged with the characteristics of an e-book. The interactive e-book products developed can be used directly by students via mobile phones so that students can be actively involved in the learning process. In this case, students must find learning resources and explore subject matter beyond what teachers have given at school, either from online sources or interactive learning media.

E-books can be combined with innovative learning models (Susanti et al., 2021). Interactive e-books integrated with the PBL learning model can be teaching materials in the classroom. PBL-based teaching materials make it easier for students to understand,

communicate, and solve problems with the information obtained. Learning using interesting media such as interactive e-books provides a new experience for students (Yanarti et al., 2023). The results of the study by Kusuma et al. (2022) revealed that teachers and students urgently need PBL-based interactive e-books to improve students' high-level thinking skills.

The novelty in this research is interactive e-book developed is based on the syntax of the PBL learning model. So that all learning references are based on PBL syntax, namely activities: orienting students to the problem; organizing students to learn; guiding investigations; developing and presenting results; analyzing and evaluating the problem-solving process. The content of the material in the e-book is the material of substances and their changes which are closely related to the daily lives of students so that it can encourage them in problem solving activities.

Based on the description of the problem above, the purpose of this study is to assess the needs of teachers for PBL-based interactive e-books. Some aspects analyzed by teachers include teaching and learning activities, using media and interactive teaching materials, and integrating PBL learning models in e-books. The analysis is divided into problems, contexts, and needs for PBL-based interactive e-books.

Method

This qualitative research uses a case study approach with observation to investigate certain conditions so that it can explain how an event occurs (Hodgetts & Stolte, 2012). Qualitative research is an approach to explore and understand the meaning of individuals and groups to problems in the social environment. This study aims to determine teachers' needs for science interactive e-books. The research design in this study is shown in Figure 1.
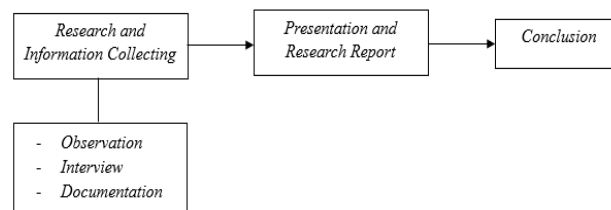

Figure 1. Chart research design

Participants in this study consisted of two science teachers of SMP Negeri 3 Depok who has taught for six years and 15 years, and one science teacher of SMP Negeri 11 Yogyakarta who has taught for six years. The data collection techniques used are observation and interviews. Observation was carried out to see firsthand

teaching and learning activities, while interviews were conducted to explore the problems that occurred. The interview guidelines and instruments in this study are based on a field-based investigation that includes three main focuses of the research: problem, context, and need (McKenney & Reeves, 2014). The interview guidelines used in this study are shown in Table 1.

Table 1. Interview guidelines

Aspects	Number of question items
The process of teaching and learning activities	6
Use of interactive media and teaching materials (*interactive e-books*)	7
Integration of the PBL learning model in interactive teaching materials	4

The data analysis uses Milles and Huberman analysis techniques. Data reduction, data presentation, and conclusion drawing/verification are used to conduct data analysis.

Result and Discussion

The results of the analysis of teacher needs in the science interactive e-book for learning are divided into three aspects: the teaching and learning activities process, the use of interactive media and teaching materials, and the integration of the PBL learning model in the e-book.

Table 2. Results of interviews with teachers on aspects of the teaching and learning process

Question	First Teacher	Second Teacher	Third Teacher
What are some of the obstacles you experience when teaching in the classroom?	Learners tend to be passive and silent during learning	Students are heterogeneous, and students do not have the initiative to learn on their own	Students are less active, and students are less serious in answering teachers' questions
What material is considered difficult by students? Why is this material considered difficult?	Matter has many formulas and calculation, such as Matter and its changes, Temperature, and Waves	Usually, science material with a Chemistry and Physics based	Materials that require thought/calculation
What do you do to overcome students' learning	By providing a lot of practice questions	With individual or group guidance and peer tutors	By providing learning based on problems experienced

Question	First Teacher	Second Teacher	Third Teacher
difficulties in the material that is considered difficult?	and discussions	who already understand	directly by students
What learning models do you often apply when learning science?	There are PBL, PjBL, and Inquiry models	Model Discovery Learning, PBL	I often use *the Discovery model*, the PBL model, and PjBL on certain materials
Have 21st-century competencies (e.g., creative thinking skills) been measured in science learning?	Never	Never, because there is no instrument used to measure students' creative thinking skills	Never
Has the ability to think creatively been achieved during the science learning process?	Not yet	Not yet	Still not if the material that has been considered difficult by students

The results of teacher interviews on aspects of teaching and learning activities found several problems. This is based on the results of the observation carried out by the author. Students who tend to be passive and silent, do not have the initiative to learn, and are not serious about answering questions become obstacles for educators in teaching. This can be anticipated with the use of interactive e-books. The presentation of teaching materials in electronic form will certainly become more interesting and provide convenience in supporting and complementing the role of teachers as a source of information for students (Rahman et al., 2022).

The PBL model is commonly used by educators in science learning. PBL is suitable to be applied because it involves thinking activities to solve existing problems. Through the PBL model, students' learning outcomes in the form of knowledge, understanding, and thinking skills can increase significantly (Erdogan & Senemoglu, 2014).

Students' creative thinking ability has never been measured in science learning. This is because no instrument measures the ability to think creatively. As a result, students' creative thinking skills have not been achieved in science learning. Students have already considered that certain material is difficult to understand. This can be overcome by using interactive

e-book teaching materials. The teaching materials presented in the interactive e-book are easier to understand because they integrate multimedia items such as pictures, audio explanations, video learning, and quizzes that can be accessed online. Using audio in interactive e-books can also improve learners' comprehension (Putri & Wijayati, 2022). In addition, interactive e-books can be integrated with virtual laboratories to be an alternative for schools that do not yet have laboratories (Adam & Suprapto, 2019). The application of interactive e-books is very easy at all levels of education (Janawati et al., 2021).

Table 3. Results of interviews with teachers on aspects of the use of interactive media and teaching materials (interactive e-book)

Question	First teacher	Second teacher	Third teacher
What teaching materials do you use in learning science?	Teacher's book, science package book	Worksheet, science package book	Student book, worksheet
Have the concepts presented in the teaching materials helped students achieve their learning goals?	Yes, but some materials / concepts are difficult to find in books.	Yes, but you still have to look for additional material from the internet	Yes,
Are the teaching materials packaged in an attractive, easy-to-understand, and illustrated manner?	Yes, the material from the science package book is made into a PowerPoint	I use the potluck available in the science package book	Yes, the Worksheet is made attractive to increase students' interest
What learning media did you use during the study?	Mobile, Video, PowerPoint	Mobile Phone, Power Point, Laboratory	HP, Worksheet, e-book, PowerPoint
What is the most influential medium to use in learning?	Mobile Phone, Books	Book, Worksheet	Book, Worksheet, PowerPoint
Have you used interactive teaching materials in learning? Are interactive teaching materials	Not all materials, only some materials. This is important because students	Not yet. This is important because children will be happy and more independent	Sometimes, for some materials. It is quite important because it makes it

Question	First teacher	Second teacher	Third teacher
important in the learning process?	immediately know the learning results		easier to learn
Will the use of interactive *e-books* make learning more enjoyable?	Yes	Maybe yes	Yes, because it can provide a new experience for students

Table 4. Results of interviews with teachers on the aspects of integrating the PBL learning model in interactive teaching materials

Question	First teacher	Second teacher	Third teacher
Have you ever used teaching materials in the form of PBL-based interactive e-books?	Not yet	Not yet	Not yet
Do you agree with the existence of PBL-based interactive e-book innovations?	Agree, as long as it can facilitate learning outcomes and objectives	Agree	Agreed, as long as it conforms to the curriculum
What materials do you think are suitable for PBL-based interactive e-books?	Materials that are closely related to daily life	Materials that are directly related to learners, such as substances and their changes, vibrations, and waves	Almost all science materials are suitable for teaching with PBL
Is developing an interactive e-book based on PBL in science learning necessary?	Yes	Yes	Yes

The teaching materials used in learning have been attractively packaged. The average response of educators to interactive e-books is at a very good criterion so that interactive e-books become teaching materials that can be used in science learning. According to Sinaga et al. (2022), the material in the interactive e-book is designed interactively by providing evaluation questions and feedback, as well as certain topics that are equipped with evaluations. The concepts related to the discussion of the material are presented using a combination of verbal representation (text and audio) and visual representation (e.g., images, graphs, tables,

pictorial diagrams, mathematical equations, videos, simulations, and animations) (Sinaga et al., 2022). The dominant learning resources educators use are still in the form of textbooks and worksheets that schools provide. The teaching materials have been packaged attractively, but students' creativity is still relatively low. Cell phones, videos, power points, and e-books have been used as learning media, but educators have not used interactive teaching materials such as interactive e-books. This is in line with Kusuma et al. (2022) educators only using Electronic Books (BSE) that are not interactive during learning. Thus, there is room for improvement in utilizing technology for scientific purposes that can significantly increase students' learning experience.

In the aspect of integrating science materials with the PBL learning model in Table 3, it was found that no interactive science e-book is integrated with the PBL learning model. Educators agree that the learning model integrated with e-books can be better adapted to the learning outcomes and objectives of the curriculum. Materials related to or close to students' lives are suitable for science interactive e-books. Based on the research conducted by Susanto et al. (2022) shows that PBL-based e-books can improve critical thinking skills in science learning through digital media innovations, narratives, videos, and practice questions. The same thing was also expressed by Nurhidayati et al. (2018), who stated an increase and difference in student learning outcomes using the e-module-assisted PBL model compared to PBL assisted by printed teaching materials.

Interactive e-books with digital applications have the characteristics of creating fun learning, increasing learning motivation, and active and contextual learning. They contain a menu of information, perceptions, materials, virtual laboratories, games, quizzes, and instructions for use (Yanarti et al., 2023).

Conclusion

Based on the results of the study, it can be concluded that it is necessary to develop an interactive science e-book based on PBL. This is based on the context of assessing teachers' needs for PBL-based science interactive e-book teaching materials reviewed from the aspect of teaching and learning activities; the use of media teaching materials and interactive teaching materials; and the integration of PBL learning models in e-books, which can hone students' creative thinking skills. Developing interactive science e-books can help teachers in the classroom teaching process. Integrating problem-based learning will bring student learning closer to the real-life context. Therefore, it is necessary to develop PBL-based science interactive e-books in learning to improve students' creative thinking skills.

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