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PRESENTATION AND COMMUNICATIVE ANALYSIS OF PHYSICS TEXTBOOKS BASED ON PBL (*PROBLEM-BASED LEARNING*) GLB AND GLBB MATERIALS

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Info Artikel

Kata Kunci:
Presentasi, komunikasi, buku fisika, PBL (Problem Based Learning), GLB, dan GLBB.

Abstrak

Pendidikan abad 21 menekankan pentingnya kemampuan siswa untuk mencari solusi dari berbagai sumber, merumuskan masalah, berpikir analitis, dan berkolaborasi. Oleh karena itu, model PBL (Problem Based Learning) merupakan metode yang cocok digunakan dalam pembelajaran karena model ini menuntut siswa untuk berpikir kritis dalam menghadapi masalah kontekstual. Penelitian ini bertujuan untuk mengevaluasi validitas buku ajar fisika berbasis PBL pada materi Gerak Lurus Beraturan (GLB) dan Gerak Lurus Berubah Beraturan (GLBB) dari dua aspek yaitu teknik penyajian dan efektivitas komunikatif. Metode yang digunakan dalam penelitian ini menggunakan metode Research and Development (R&D) yang terdiri dari lima tahapan yaitu analisis, desain, pengembangan, aplikasi, dan evaluasi. Namun yang digunakan hanya sampai tahap pengembangan. Untuk teknik analisis data ada tiga cara yaitu mencari rata-rata hasil penilaian masing-masing validator, menghitung validasi gabungan, dan menentukan kategori validasi perangkat pembelajaran. Hasil penelitian yang telah dilakukan diperoleh persentase validitas sebesar 87,5% untuk teknik Kikian dan 93,75% untuk proses komunikatif.

Keywords:
Presentation, communication, physics textbook, PBL (Problem Based Learning), GLB, and GLBB.

Abstract

Education in the 21st century emphasizes the importance of student's ability to find solutions from various sources, formulate problems, think analytically, and collaborate. Therefore, the PBL (Problem-Based Learning) model is a suitable method for use in learning because this model requires students to think critically in dealing with contextual problems. This study aims to evaluate the validity of PBL-based physics textbooks on Regular Straight Motion (GLB) and Regular Changing Straight Motion(GLBB) materials from two aspects, namely presentation techniques and communicative effectiveness. The method used in this study is using the Research and Development (R&D) method, which consists of five stages, namely analysis, design, development, application, and evaluation. But what is used is only up to the development stage. For data analysis techniques, there are three ways: finding the average assessment result of each validator, calculating combined validation, and determining learning tool validation categories. The results of the research that has been carried out obtained a percentage of validity of 87,5% for the Kikian technique and 93,75% for the communicative process.

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INTRODUCTION

The role of education units has a significant influence on determining the quality of education. With the quality of education, the quality of education can be improved through the use of effective and efficient learning methods (Permendikbud, 2013). Therefore, it is essential for each school to be ready and thorough in preparing and planning the learning process and always pay attention to the individual needs of each student in the school environment. Implementing the learning process that occurs every day must be integrated into using textbooks. In the field of education, readers have an essential role as one of the significant learning resources in the learning process. A good and practical reader must be able to present material communicatively so that the material can facilitate student understanding in the learning process (Khoiroh, 2019).

An example of a learning approach that can be used in preparing textbooks is the PBL (Problem-Based Learning) approach. This approach emphasizes the problem-based learning process. The Ministry of Education and Culture formulates that the educational paradigm in the 21st-century learning era emphasizes the importance of students' ability to find solutions from various sources of information, frame problems, think analytically, work together and collaborate in solving problems. One of the abilities needed in the 21st century is communication and cooperation. Communication skills involve the ability to convey ideas related to problem-solving, thus enabling the writing of existing solutions and participating in discussions that can improve the learning process in the classroom. Students need to improve their communication and problem-solving skills (Nurhayati et al., 2019).

With the PBL (Problem-Based Learning) approach, it is hoped that it can develop student reasoning, communication, and student connections in solving problems to increase intellectual potential. In this case, the PBL (Problem-Based Learning) model is suitable for learning because it requires students' critical thinking skills to solve contextual problems (Ramadanti et al., 2021). The PBL (Problem-Based Learning) approach allows students to learn to solve or solve real problems, taking into account the relevant real-world context. When viewed in the context of physics learning, PBL (Problem-Based Learning) can assist students in developing a better and more practical understanding of physics concepts and applying these concepts in realistic situations.

In the context of physics learning, there is GLB and GLBB material. This material is a fundamental part of physics learning, covering the concepts of object motion in a straight trajectory. GLB and GLBB materials teach basic principles about the movement of objects and how to measure and analyze the activity. In this case, it is crucial for physics textbooks focusing on GLB and GLBB material to present the material in an enjoyable, compelling, and communicative way. Practical and exciting books not only provide comprehensive information. But are also able to communicate explicit and exciting material to readers. Therefore, the presentation and communication of PBL (Problem-Based Learning) based physics textbooks on GLB and GLBB materials must be analyzed in depth.

Analysis of the presentation of PBL (Problem-Based Learning) based physics textbooks on GLB and GLBB material aims to evaluate the validity of books with two specific reviews, namely production techniques and communicative techniques. Analysis of the production in this coursebook is related to how the coursebook is organized and presented to students. The factor in question is the clarity of concepts, the sequence of material, the use of appropriate images and illustration, and explanations that are easy to understand is the main things that must be analyzed and evaluated. In addition, there are communicative aspects that need to be considered. In this aspect, the textbook can facilitate communication between teachers and students and students with students during the learning process. A communicative coursebook will build good interactions between students and the coursebook. By using a communicative presentation of information, students will more easily understand physics concepts related to the material of Regular Straight Motion (GLB) and Regularly Changing Straight Motion (GLBB).

RESEARCH METHODS

The purpose of this research is to test the validity of PBL-based physics textbooks that focus on presentation techniques and communicative techniques using the Research and Development (R&D) method. This research involves five main stages, namely the analysis stage (analyze), the design stage (design), the development stage (develop), the implementation stage (implement), and the evaluation stage (evaluate), but for this study, it is limited to the development stage on the grounds to see the level of validity of the textbooks that have been developed. This coursebook was validated by two validators using a validation sheet. This validation sheet contains presentation techniques and communicative techniques with validation sheet scores and data analysis techniques as follows.

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p-ISSN: 2963 – 2498

Table 1. Validation sheet score

1	Very less	SK
2	Less	K
3	Good	B
4	Very good	SB

Data analysis technique

Finding the Average Results of Each Validator's Assessment

The data analysis technique for the average results of each validator's assessment can use the following formula:

$$Va_n = \frac{TS_e}{TS_h} x100\%$$

Calculating Combined Validity

After the value of each validation test result is known, researchers can calculate the combined validity of the analysis results into the following formula:

$$V = \frac{Va_n}{n} \ldots . \%$$

Determining Learning Device Validity Categories

After the average results are obtained, the criteria for the validity level listed in the table below are determined:

Table 2. Criteria for Validity Level

No	Validity Criteria	Validity Level
1	85,01 % - 100,00 %	Very valid, can be used without revision
2	70,01 % - 85,00 %	Fairly valid, and can be used with minor revisions
3	50,01 % - 70,00 %	Less valid, not recommended for use as it needs major revisions
4	01,00 % - 50,00 %	Invalid, should not be used

RESULTS AND DISCUSSION

Research Results

Analysis stage

In the analysis stage, various kinds of literature are used to identify problems that occur due to the need for more effective textbooks. According to research conducted by Shobrina and her colleagues in 2019, readers have an essential role in helping educators to optimize learning time. This textbook serves as a teaching guide consisting of a unit of concepts presented in printed form (1). Another study conducted by Tanti and her colleagues (2020) also showed that the development of PBL-based physics teaching materials emerged as a solution to the problem of the lack of teaching materials that can improve problem-solving skills. Students' critical thinking skills in solving physics problems are not caused by the lack of teaching materials focusing on specific cases or the lack of PBL-based teaching materials (2). Based on the two opinions above, the conclusion that can be drawn is that PBL-based physics textbooks have benefits in improving students' ability in problem-solving and helping educators in optimizing learning time.

Design stage

At this stage, researchers must determine what teaching materials are used for 10th-grade high school students with material from physics lessons. Make a mapping of the design to be tested, material content experts, learning experts, mastery test experts, and teaching material design experts and innovations that make it different from teaching materials in general. At this stage, the following activities were carried out:

Design and Preparation of Teaching Material Framework

After determining the type of teaching materials and materials used, next, a simple design is made that contains an outline of the core content of the teaching material and considers it before applying it directly. After analyzing, the following action is to design the learning materials to be created.

Expert Consultation

After the design is made and applied to the coursebook framework, the next step is to consult the coursebook framework. The coursebook is checked as a whole by experts and supervisors to determine where mistakes or inaccuracies in a coursebook will be made. Consultation is significant because the coursebook must then pass the validity stage to be tested for feasibility as a suitable coursebook.

Editing of Teaching Materials

Textbooks that have been consulted with experts or supervisors will be improved or edited as a whole while still considering the innovation and content of the textbook material. After the coursebook has

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been enhanced based on consultation from experts or supervisors and other minor improvements that have been made, a validity sheet is then made to test its validity.

Development stage

Research on the making of a Physics Teaching Book based on Problem-Based Learning (PBL) with the subject matter of GLB and GLBB for class X SMA which has been validated by two validators with two special studies, namely presentation and communicative techniques. The feasibility of presentation techniques has two indicators in it and can be seen in the following table

Table 3. Presentation technique feasibility validation results

Aspects assessed	Validator/score		Percentage(%)	Criteria
	Validator 1	Validator 2		
Order of presentation	3	4	87,5	Very valid
Typing accuracy	3	4	87,5	Very valid
Average			87,5	Very valid

Based on the table above, the average percentage of the feasibility of coursebook presentation techniques reaches 87.5%. This indicates that the textbooks have an excellent presentation sequence and high typing accuracy. A good presentation sequence ensures that information is presented in a structured manner and is easily understood by readers. Meanwhile, high typing accuracy shows care in writing and avoiding errors that can obscure meaning or cause misunderstanding. This gives a professional impression and increases the effectiveness of the coursebook.

Table 4. Communicative feasibility validation

Aspects assessed	Validator/score		Percentage(%)	Criteria
	Validator 1	Validator 2		
Clarity of language use	4	4	100	Very valid
Readability of the message or information	3	4	87,5	Very valid
Average			93,75	Very valid

From the table above, the average percentage of communicative feasibility of coursebooks reached 93.75%. The high clarity of language use indicates clear, precise, and exciting language in conveying information. This helps increase reader engagement and interest in learning the material. In addition, the high readability of messages or information reduces the risk of misunderstanding. Using precise words, unambiguous sentences, and detailed explanations ensures readers understand the news well.

Discussion

At the analysis stage, referring to the cited literature, several problems are related to the need for more effectiveness of textbooks used in physics learning. Research conducted by Shobrina et al. (2019) highlighted the importance of textbooks as a teaching guide to help educators optimize learning time. This textbook is prepared by packaging a unit of concept in printed form, providing a clear structure and direction for educators and students. In addition, research by Tanti (2020) shows that one of the challenges faced in the physics learning process is the low ability of students in problem-solving and critical thinking. This is due to the need for teaching materials focusing on specific cases and the need for teaching materials based on Problem-Based Learning (PBL). PBL is a learning approach emphasizing problem-solving, where students will be actively involved in dealing with real problems and applying physics concepts to find solutions. In this context, PBL-based physics textbooks are the proposed solution. Using this approach, textbooks can be developed specifically to improve students' ability to solve physics problems and think critically. PBL-based textbooks present problem situations relevant to real contexts, allowing students to practice problem-solving skills, analyze data, and apply learned physics concepts. In addition, PBL-based coursebooks also encourage collaboration between students and teachers, strengthening communication and teamwork skills.

The next stage of the ADDIE development model for textbooks is design. At this stage, the researcher designs the coursebook by the plan that has been agreed upon and formed previously. The following are the stages of the textbook design process carried out by researchers in designing textbook designs. Teaching materials in the form of interactive textbooks designed and developed in this study were tested for validity by experts consisting of two lecturers who each acted as media expert validators and material experts. The following are some teaching book displays made considering many factors, especially consultation from media expert validators.

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Figure 1. Cover display or textbook cover



Figure 2. Display of essential competencies and achievement indicators



Figure 3. Display of learning material content



Figure 4. Problem learning-based student worksheet display



Figure 5. Display of practice questions

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p-ISSN: 2963 – 2498

After the design stage has been completed, the next stage is development or development. At the development stage, coursebooks that have been declared feasible with their design will be developed using the rules that apply to coursebooks with the innovations applied. The structure of the coursebook outline contains the opening section, the core section, and the closing section. The opening section contains quite complex parts: Cover, author composition, Preface, Basic competencies and indicators, coursebook guidelines, coursebook outline, and concept map and material position. The core part contains the material taken, namely GLB and GLBB, LKPD, and practice questions. And the closing part is the answer key and bibliography. The coursebook's innovation is LKPD, a student worksheet based on problem learning (PBL).

In this study, two validators carried out expert validation focusing on analyzing the presentation and communicativeness of coursebooks. The first aspect evaluated was the feasibility of presentation techniques. The two leading indicators assessed in this analysis are the presentation sequence and typing accuracy. The validation results by the first validator showed that the presentation technique obtained a score of 3, and the typing accuracy obtained a score of 3. Meanwhile, the second validator gave a score of 4 for both indicators. Using the predetermined percentage formula, the presentation technique feasibility percentage was obtained at 87.5%.

From the results of this validation, it can be concluded that the validity of PBL-based Physics textbooks on GLB and GLBB material has a very valid presentation technique. The structured presentation sequence and careful typing accuracy provide a better learning experience for students. Information presented clearly and accurately will undoubtedly increase the potential for students' understanding of the concepts of GLB and GLBB better.

Furthermore, the communicative feasibility of the coursebook was analyzed. In this analysis, the two indicators evaluated were the clarity of language use and the readability of the message or information. The validation results by the first validator showed a score of 4 for the clarity of language use and a score of 3 for the readability of the message or information. The second validator gave a score of 4 for both indicators. Using the percentage formula, the percentage of communicative feasibility is obtained at 93.75%. Based on the validation value, the PBL-based Physics textbook on GLB and GLBB material has excellent communicative quality.

The use of clear and exciting language, and easy-to-read messages or information, provides a practical learning experience for learners. Clarifying language use helps maintain learners' attention and facilitates a good understanding of the material. In the context of making textbooks that focus on Physics material, precisely on GLB and GLBB material based on PBL, several characteristics make it suitable for use by students. First, this textbook is equipped with LKPD (Learner Worksheet) and various problem-based exercises. This helps learners to understand the concepts in GLB and GLBB better. Using a problem-based approach, learners are invited to actively think, apply concepts in real situations, and develop problem-solving skills.

In addition, this textbook also presents information with a well-organized structure. Each topic or concept is presented systematically, from introduction, theory explanation, and application examples to practice questions. The organized system helps learners follow the learning flow more easily and understand the concepts more purposefully and efficiently. In addition, this PBL-based Physics textbook also prioritizes the clarity of language use. In this textbook, the language used in the book must be easily understood by learners without using too complicated vocabulary or ambiguous sentences. Sharp and clear explanations help learners do the questions encountered in the test more dexterously. In addition, the readability of the message or information in the textbook is also an essential factor. The letter or notification must be easy for learners to read and understand. Using appropriate words, sentences that are short enough, and suitable layout arrangements help improve the readability of coursebooks. With good readability, learners will better understand and implement the material taught more efficiently.

In the context of learning Physics, a good textbook comprehensively presents information and provides opportunities for students to participate in the learning process actively. Through the PBL approach, students are invited to think critically by identifying and solving problems related to GLB and GLBB with critical and creative thinking. Thus, this textbook not only acts as a source of information but also as a tool that supports the development of the skills and abilities of students. With this, it can be ensured that the continuous progress of GLB and GLBB material with its relationship to other materials in the physics scope is faster without misconceptions.

CONCLUSION

Based on the research that has been done, it can be concluded that the physics textbook based on PBL (problem-based learning) GLB and GLBB material in the presentation and communicative aspects are classified as a valid category with the average obtained of 87.5% and 93.75%. These results can be

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interpreted that this textbook can facilitate good interaction between students and make it easier for students to understand physics concepts related to GLB and GLBB material..

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