

The development of optical devices learning book integrated with Pancasila practice values

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Abstract. This study aims to determine the feasibility and response of students to the optical devices learning book integrated with Pancasila practice values developed. The type of research used is Research and Development. The research steps are guided by the 4-D model. The subjects of this study were expert validators, practitioners, and class XI MAN 1 Yogyakarta students. Data collection in this study used a validation sheet and a questionnaire. Data collected were analyzed using descriptive analysis. The results of expert validation analysis, practitioner assessment, and student responses are included in the category between "Good" to "Very Good" so that the optical devices learning book integrated with Pancasila practice values is declared feasible and suitable for use in learning.

Keywords: *learning book, optical devices, Pancasila*

1. Introduction

Globalization has a positive impact on various fields such as economic, political, social, cultural and other fields [1]. One of the positive effects of globalization on the development of science and technology is the wide distribution of information [2]. Unfortunately, in addition to having a positive impact, globalization also has a negative impact. Globalization causes Indonesia to be in the middle of a cultural crisis or a crisis of national character values [3], [4]. This crisis is marked by the rampant actions and crimes that do not reflect the values of the nation's character [4]. Data from the central statistical agency shows that from 2011 to 2017 the number of crime incidents in Indonesia continued to fluctuate. The total crime in Indonesia in 2011 was 347.605 cases, decreased to 341.159 cases in 2012, increased to 342.084 cases in 2013, decreased to 325.317 cases in 2014, increased to 352.936 cases in 2015, increased to 357.197 cases in 2016 and decreased again to 336.652 cases in 2017 [5]. Acts and crimes that occur can be in the form of violence, corruption, sexual harassment, mass fights, and so on [6]. Events like this not only occur in the general community but also occur in the school environment. This is supported by the results of research on bullying in schools. The results of the study indicate that every day around 160.000 students get bullying (acts of violence) at school. Other results indicate that one in three respondents (students aged 18 years) have experienced bullying, 15-35% of students are victims of violence from cyber violence, and 75-80% of students have observed acts of violence [7].

One solution to overcome these problems is character education which is integrated through education [8]. This solution has been widely proposed as an alternative problem solving [9]. This is because character education can equip a person with basic abilities that can make life long learners one of the important characters for living in the global era. Character education can also equip a person to



have the ability to participate positively both as a person, as a family member, as a citizen, and as a global citizen [10]. Integrating character education through education can be done in various ways. One of them is by integrating into the learning process and student behavior every day. This is intended as an introduction to values so that students gain awareness of the importance of these values [11]. Another way that can be done is to integrate it into the subjects taught at school [12]. The integrated values can be in the form of Pancasila practice values. The integration of Pancasila practice values in subjects is intended as a form of character education. The values of Pancasila practice can be chosen to be integrated because Pancasila has a set of values, which are God, humanity, unity, society, and justice, where those values are universal and objective basic values, can be used and recognized throughout the world. Besides, as the identity and personality of the Indonesian nation, Pancasila is a source of inspiration, a code of conduct and a basis for truth, so that the activities, attitudes, and behavior of the Indonesian people must reflect on Pancasila [9]. Integration in these subjects is not only charged to specific subjects but must be integrated in all subjects including physics.

Physics is a branch of science that deals with the nature of matter and energy, so many topics can be used to build character. For example when students learn about heat transfer, then these students can also learn about justice, solidarity, interaction between rich and poor, and so on [12]. Integrating character education in physics learning will provide many benefits, besides developing cognitive abilities at the same time it can also develop character and attitude [13]. The values to be integrated can be selected and adjusted to the material being taught [14]. Related to this, the results of a study show that the institutional context of schools is still not optimally supporting the implementation of character education, value facilitation is not widely used, and the climate of character education is not yet fully conducive [15]. Based on various problems and realities, it is important to do an innovation in learning to integrate the values of the practice of Pancasila, so that it is expected to be able to instill values that will eventually form into a character.

2. Research method

2.1. Types of research

This research is research and development. The development procedure is guided by the 4D model. This model consists of four stages, namely define, design, development, and disseminate [16]. The procedure for developing the optical devices learning book integrated with Pancasila practice values, in this study was modified into three stages, namely:

2.1.1. Define stage. Initial analysis, task analysis, concept analysis, and analysis of learning objectives are activities carried out at this stage. The aim is to obtain various information related to the problems that form the basis of product development and alternative solutions. Besides, this stage is also useful to obtain various information needed to develop products. Analysis is done through observation and interviews. The results of the analysis are then used to formulate learning objectives which are the final objectives of product development.

2.1.2. Design stage. Preparation of tests, media selection, format selection and making the initial design of the product to be developed are the activities carried out at this stage. The initial design of the product is based on the results of the analysis at the define stage.

2.1.3. Development stage. Product development is an activity carried out at this stage. This stage includes two activities, namely expert validation and product trials. The initial product design that has been produced at the design stage is then validated. Validation is carried out by media experts, material experts, and practitioners. The validation is used to obtain a feasibility assessment, as well as comments and suggestions for product improvement. Material experts and media experts are selected from lecturers at Yogyakarta State University, while practitioners are physics subject teachers at MAN 1 Yogyakarta. After being revised based on the results of the validation, the optical devices learning book integrated

with Pancasila practice values was trialed. The trial was conducted in class X MAN 1 Yogyakarta. The aim is to determine students' responses to the developed book. The product revision at this stage is the final product developed.

2.2. Research instrument

The assessment instruments used at this stage included expert validation sheets, practitioner assessment sheets, and student response questionnaires. Expert validation sheets and practitioner assessment sheets are used to collect data related to product feasibility. Student response questionnaire is used to collect data on student responses to the product being developed.

2.3. Analysis data

The data analysis technique used in this study is descriptive analysis. The analysis is done by calculating the percentage score of the validation results and student responses. The percentage score of the results of validation and student responses is calculated by the formula (1) [17].

$$P = \frac{\text{Score obtained}}{\text{Maximum score}} \times 100\% \quad (1)$$

The level of feasibility and response of students to product development research results are identified by the percentage score. The greater the percentage of the validation result score, the better the level of product feasibility of the results of research development. The greater the percentage of student response scores, the better the student response to the product being developed. The decision-making criteria in this study are shown in table 1 [17].

Table 1. Feasibility Criteria

Percentage (%)	Category
80.00 -100	Very Good
60.00 - 79.99	Good
50.00 - 59.99	Less Good
00.00 - 49.99	Not Good

3. Results and Discussion

3.1. Define stage

The results of observations and interviews conducted at this stage show a variety of facts and problems. The facts and problems include the teacher has mastered the class well, but learning is still centered on the teacher, the use of media and learning resources are still less varied, the delivery of material is only done by lecture and practicum methods. Other problems are shown from the lack of interest and enthusiasm of students when learning physics, even students seem to still have difficulty in arguing and answering questions given by the teacher, students ask for the help of other students to answer the questions given. Students also exhibit bad behavior or characters such as chatting alone while learning is taking place, disrupting the concentration of other students, and even bullying other students by way of ignorance.

These problems are the basis for the development of optical devices learning book integrated with Pancasila practice values as an alternative problem-solving. Other analysis results show that one of the material that can be integrated with the values of Pancasila is optical material. Core Competencies, Basic Competencies, and learning objectives at this stage are formulated following the applicable curriculum, the revised 2013 curriculum.

3.2. Design stage

There are two results obtained at this stage. These results include a storyboard and the initial product design of a learning book that was developed. Storyboard is made as a guideline for developing learning books. The initial design of the product is then compiled based on these guidelines. The initial product

design of optical devices learning book integrated with Pancasila Practice values has components including 1) cover, 2) foreword, 3) table of contents, 4) description of basic competencies, indicators and learning objectives, 5) instructions for use, 6) concept maps, 7) material description, 8) practice questions, and 9) bibliography.

The developed learning book is also designed with its advantages. The advantage is the integration of Pancasila values in it. The practice of Pancasila is integrated in the practice of the first and fifth precepts. Some of these practices include: 1) The Indonesian people believe in and fear of God Almighty, 2) Fostering harmony among fellow religious people and belief in God Almighty, 3) Loving humanitarian activities, 4) Promoting association for unity and unity national unity, 5) as citizens and citizens, every Indonesian human being has the same position, rights, and obligations, 6) Deliberation to reach consensus is encompassed by a family spirit, and 7) Likes to give help to others so that they can stand alone. Integration is done in the description of the material and practice questions.

3.3. Development stage

The results obtained at this stage are the final products of the learning books developed. The final product display from optical devices learning book integrated with Pancasila practice values is shown in figure 1. The integration of Pancasila practice values is contained in the material description as shown in figure 2, and the exercises as shown in figure 3.



Figure 1. Final display of optical devices learning book integrated with Pancasila practice values.

C. Cacat Mata dan Kacamata

(Gemar melakukan kegiatan kemamusiaan)

Ilham sering membantu orang tuanya dalam melakukan aktivitas karena mata kedua orang tua sudah tidak berfungsi normal. Mata kedua orang tuanya tidak dapat melihat dengan jelas pada jarak yang jauh maupun jarak baca mata normal. Hal ini karena daya akomodasinya sudah lemah akibat bertambahnya usia atau biasa disebut cacat mata presbiopi (mata tua). Oleh karena itu, kedua orang tua Ilham menggunakan kacamata bifokal (kacamata berfokus dua, yaitu positif dan negatif) sebagai alat bantu penglihatan. Kacamata bifokal terdiri dari lensa cekung pada bagian atas untuk melihat benda jauh dan lensa cembung pada bagian bawah untuk melihat benda-benda dekat. Ilham juga memiliki teman sekolah bernama Thomas yang juga menggunakan kacamata. Dulu, Thomas mengeluh karena tidak bisa melihat dengan jelas pada jarak jauh. Oleh karena itu, Ilham selalu siap sedia membantu Thomas ketika dia kesulitan membaca tulisan di papan tulis.

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Figure 2. Integration of Pancasila practicing values in material explanation.

LATIHAN SOAL

1. Jarak maksimum yang dapat dilihat dengan jelas oleh Susi adalah 5 meter. Untuk dapat melihat dengan normal Susi memerlukan kacamata. Sebagai warga negara yang baik, bantulah untuk memilih kekuatan dan jenis lensa kacamata yang diperlukan agar dapat melihat dengan normal!
2. Pada suatu penyelidikan seorang aparat penegak hukum memerlukan alat bantu berupa lup. Ketika mata tak berakomodasi, bagaimana hubungan antara perbesaran angular lup (M), dengan titik dekat mata (PP) dan jarak fokus (f) pada lup?

Figure 3. Integration of Pancasila practicing values in practice questions.

This display is the result of a revision of the initial product design after it has been validated and tested. Validation results, improvement results, comments, and suggestions from experts and practitioners' assessments, and the results of student responses are explained in the next sub-section.

3.3.1. Validation of optical devices learning book integrated with pancasila practice values by material expert and media expert. The results of the research development in the form of optical devices learning book integrated with Pancasila practice values were validated through expert judgment. Assessment by material experts includes three aspects of assessment, namely; (1) content feasibility, (2) language and images, and (3) presentation. Whereas the evaluation by media experts includes one aspect of assessment, namely the graphic aspect. Each aspect includes several assessment indicators. The results of the validation of each component are converted into an average score. The results of the validation by material experts and media experts are presented in table 2.

Table 2. The validation results of optical devices learning book integrated with pancasila practice values by material expert and media expert.

Validator	Aspects of Assessment	Percentage (%)	Category
Material Expert	Content Feasibility	93.75	Very Good
	Language and Image	77.78	Good
	Presentation	75.00	Good
Media Expert	Graphics	88.89	Very Good

The validation results show that the content feasibility aspect gets the highest percentage rating, and the presentation aspect gets the lowest percentage rating. The low percentage on the presentation aspect may be due to a lack of the learning book component developed. These deficiencies are necessary and have been corrected by expert advice. Improvements made include: (1) changing the writing of learning objectives that are less appropriate to the ABCD format (Audience, Behavior, Condition, Degree) to be more in line with the format; (2) changing the practice questions that are less in accordance with the indicators to be more in line with the indicators; and (3) adding more Pancasila practice values to the developed learning textbook.

The results of this validation also show that the aspects of content feasibility and graphics are included in the "very good" category, while the aspects of language and images and presentation are included in the "good" category. Based on the results of the validation and the results of previous studies [18], [19], the optical devices learning book integrated with Pancasila practice values are declared feasible for use in learning.

3.3.2. Practitioners' assessment of optical devices learning book integrated with Pancasila practice values. The results of the research development in the form of optical devices learning book integrated with Pancasila practice values were assessed by practitioners. Assessment by practitioners includes four aspects of assessment, namely; (1) content feasibility, (2) language and images, (3) presentation, and (4) graphics. Each aspect includes several assessment indicators. The assessment results of each component are converted into an average score. The results of the assessment by practitioners are presented in table 3.

Table 3. Results of practitioners' assesment of the optical devices learning book integrated with Pancasila practice values.

Aspects of Assessment	Percentage (%)	Category
Content feasibility	87.50	Very good
Language and Image	88.89	Very good
Presentation	75.00	Good
Graphics	83.33	Very good

The results of validation or assessment by practitioners showed that the language and image aspects received the highest percentage rating, and the presentation aspect received the lowest percentage rating. The low percentage on the presentation aspect may be due to a lack of the learning book component developed. These deficiencies are necessary and have been corrected by practitioners' suggested improvements. Improvements made, namely improving the cases and presentation of material that is less by the daily lives of students to be more by the daily lives of students.

The results of this assessment also showed that the aspects of content feasibility and graphics were included in the "very good" category, while the aspects of language and images and presentation were included in the "good" category. Based on the results of the validation and the results of previous studies [18], [19], the optical devices learning book integrated with Pancasila practice values are declared feasible for use in learning.

3.3.3. *Student responses to the optical device learning book integrated with Pancasila practice values.* The results of the research and development were tested on students. The aim is to find out students' responses to the learning books developed. Student responses are given through six components of assessment, namely; (1) cover page, (2) student learning instructions, (3) table of contents, (4) opening chapter, (5) learning objectives, and (6) book content. The results of students' responses to the learning books developed are shown in table 4.

Table 4. Student responses to the optical device learning book integrated with Pancasila practice values.

Components of assessment	Percentage (%)	Category
Cover page	96.55	Very good
Student learning instructions	79.31	Good
Table of Contents	86.21	Very good
Opening chapter	89.66	Very good
Learning objectives	79.31	Good
Book content	90.95	Very good

The results of students' responses showed that the two assessment components (cover pages and book content) obtained the highest percentage. The two assessment components get a percentage of more than 90%. Other results show that the two assessment components (student learning instructions and learning objectives) obtain the lowest percentage. Nevertheless, the six components of the assessment are still included in the category of "good" to "very good". Students also give positive responses, and comments to the learning books developed. Based on these results and the results of previous studies [20], the optical devices learning book integrated with Pancasila practice values were declared suitable and received positive responses for use in learning.

4. Conclusions

Based on the results of expert validation and practitioners' assessment of the four aspects of assessment, the optical device learning book integrated with Pancasila practice values was declared feasible for use in learning. This book obtained ratings that fall under the category of "good" to "very good". This book also gets a positive response from students. The response is given through an assessment of the six components of the assessment. The percentage generated is included in the category from "good" to "very good", so that the optical device learning book integrated with Pancasila practice values is also declared suitable for learning.

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