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Validation on Newton's Law E-book Integrated with Pancasila Values to Improve Critical Thinking Ability and Learning Independence

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Abstract

Abstract: This study aims to describe the Newton's Law e-book integrated with Pancasila values that is valid in improving critical thinking skills and learning independence of students. This research design is Research and Development (R&D) adapting the ADDIE model. ADDIE consists of five stages including analyse, design, develop, implement, and evaluate. The data from this study were in the form of validity test results which were analysed using mixed methods (quantitative and qualitative). Product validation was conducted by two expert lecturers and 4 physics teachers. The feasibility of e-books by material experts consists of three aspects. The first aspect, the suitability of the e-book with the Problem Based Learning model obtained a total average score of 17.83 with a very good category; the second aspect, the suitability of the material content obtained a total average score of 70.00 with a very good category; and the third aspect, the suitability of language and images obtained a total average score of 32.83 with a very good category. The feasibility of e-books by media and design experts consists of three aspects. The first aspect, the cover section obtained a total average score of 31.00 with a very good category; the second aspect, the content section obtained a total average score of 44.50 with a very good category; and the third aspect, the usage section obtained a total average score of 11.50 with a very good category. This is because the content validity shows that the e-book integrated with Pancasila values with the Problem Based Learning model can be applied in learning Class XI odd semester high school physics on Newton's Law material to improve students' critical thinking skills and learning independence.

Keywords: *E-Book; Critical Thinking Ability; Independent Learning; Pancasila*

Introduction

The development of science and technology in Indonesia is currently very important in facing the challenges of learning in the 21st Century. The independent curriculum is an educational innovation that aims to provide freedom to students in exploring their abilities and interests so that students can be more independent and creative. The implementation of the independent curriculum in learning at school is carried out through project creation by adding character values to students. Character education is currently very important to be implemented in students (Sari et al., 2020). However, in reality, cases of juvenile delinquency among students in secondary schools are still quite high, this is indicated by the fact that there are still many students who commit bad acts such as bullying (Effendi & Sahertian, 2022).

Therefore, it is necessary to improve the quality of education in Indonesia that prioritises character building.

One of the character values that needs special attention is learning independence (Sari et al., 2020). Learning independence is defined as a form of awareness that arises from within students to receive information, manage information, and connect information with other information (Arista & Kuswanto, 2018). The low learning independence of students is caused by poor learning habits, such as learning when going to take exams, cheating, and looking for leaked exam questions (Hill & Chin, 2018). Learning independence is the key to developing critical thinking skills and other abilities needed to achieve learning objectives (Jansen et al., 2019; Kesuma et al., 2021). Good critical reasoning skills have the courage to criticise, ask questions, or argue about phenomena in their environment that are based on scientific processes related to the physics ideas they have learned (Mutakinati et al., 2018; Viennot & Décamp, 2018). Low critical thinking skills are caused by several factors, including students' errors in understanding a concept. It is difficult for students to provide simple explanations, build basic skills, conclude, and provide further explanations (Rosyidah et al., 2021; Setiawan & Islami, 2020).

Students' critical thinking skills and learning independence can be trained by using the right learning model. One of the learning models that emphasises the independence of students when learning to solve problems, namely Problem Based Learning (Yusnidar et al., 2023). All of these abilities are related to the learning outcomes obtained by students during the learning process so as to obtain an understanding of concepts based on what has been learned (Gunawan et al., 2018). The low mastery of physics concepts in several subject matters, one of which is the material of Newton's Law II, is caused by several factors, one of which is the initial ability of students who are strongly embedded without further checking the truth, and all concept formulations are carried out using memorization (Sulman et al., 2020, 2021).

The rapid development of science and technology today presents the latest innovations that can support the learning process and make learning more interactive, one of which is an alternative that can be used to support the teaching and learning process is to use electronic books (e-books) to make the learning process more interesting (Damayanti et al., 2023). E-books are learning media in the form of books that contain electronic information containing text, animation, and images. Interactive ebooks allow teachers to present material in a more varied form and are easily understood by students through various components that can be integrated into the ebook (Wardani et al., 2021). However, learning has not been fully integrated with Pancasila values (Utami et al., 2019).

In addition, several previous studies in the last five years related to improving the learning process have produced several physics teaching materials including research conducted by (Suryaningtyas et al., 2020) which developed a Problem-Based Learning and Guided Discovery Learning-based Science E-Module to improve critical thinking and problem solving skills and research conducted by (Arifin & Ariswan, 2023) which developed an android physics flipbook integrated with Pancasila values on newton's Law material, research conducted by (Himawan & Ariswan, 2021) which developed an e-module of momentum and thrust integrated with the practice of Pancasila values. Therefore, it is important to conduct research to improve the quality of education and build the character of students by developing e-books using a model that includes activities that lead to problem solving in everyday life to stimulate students' critical thinking skills and learning independence. Based on this background, this study aims to describe an e-book integrated with Pancasila values on Newton's Law material to improve students' critical thinking skills and learning independence.

Method

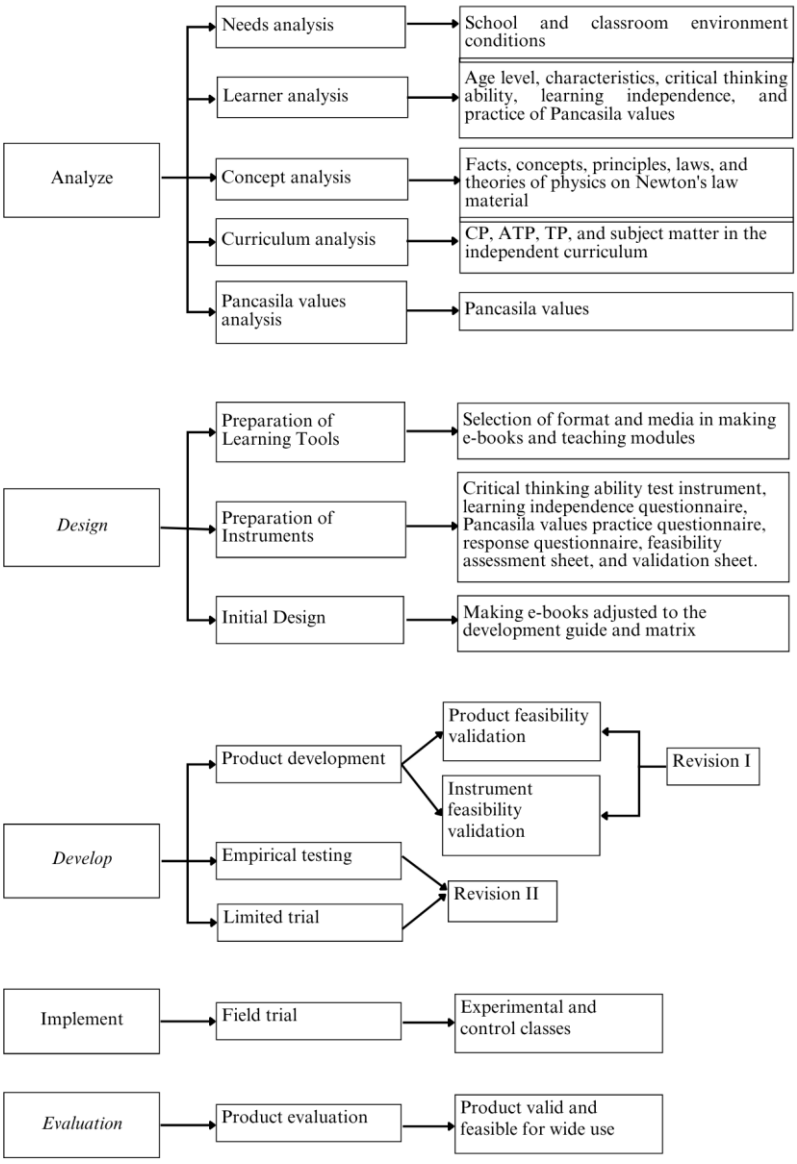

Figure 1. Research Flowchart

This study used the Research and Development (R&D) method by adapting the ADDIE model (Analyze, Design, Develop, Implement, and evaluate) developed by (Branch, 2009). The stages involved in product development are detailed in the research flow chart in Figure 1.

The development stage is the product development stage in the form of Newton's Law e-book integrated with Pancasila values to improve students' critical thinking skills and learning independence. The e-book that has been made is then validated, tested for practicality, and tested for effectiveness, but in this article only focuses on product validation. The validation carried out includes product validation by

material and media and design experts conducted by six validators consisting of two lecturers and four physics teachers. The object of this research is the e-book of Newton's Law integrated with Pancasila values using the Problem Based Learning model to improve critical thinking skills and learning independence. The data analysis technique used to validate the product is based on the average ideal score and the Ideal Standard Deviation (Sbi) score. The data analysis techniques are described in the table below.

The Average Score is calculated by dividing the total score by the number of raters.

a. Calculating the average $(\bar{X})$ of product assessments by dividing the total number of scores $(\sum X)$ by the number of scores (n).

$$\bar{X} = \frac{\Sigma X}{n}$$

b. Comparing the average score against the quality categories listed in Table 1.

Table 1. Quality Categories

Score Range	Category
$\bar{X} \geq \bar{X}_i + 1{,}8SB_i$	Sangat Baik/Very good
$\bar{X}_i + 0{,}6SB_i < \bar{X} \leq \bar{X}_i + 1{,}8SB_i$	Baik/ good
$\bar{X}_i - 0{,}6SB_i < \bar{X} \leq \bar{X}_i + 0{,}6SB_i$	Cukup/Fair
$\bar{X}_i - 1{,}8SB_i < \bar{X} \leq \bar{X}_i - 0{,}6SB_i$	Kurang/ Less
$\bar{X} \leq \bar{X}_i - 1{,}8SB_i$	Sangat Kurang/ Very poor

(Widoyoko, 2012: 238)

Description:

X_i = Avarage ideal score

$\bar{X}$ = Avarage score

SB_i = Ideal standard deviation

$X_i = \frac{1}{2}(\text{maximum score} + \text{minimum score})$

$SB_i = \frac{1}{6}(\text{maximum score} - \text{minimum score})$

Ideal maximum score = $\Sigma(\text{criteria items x highest score})$

Ideal minimum score = $\Sigma(\text{criteria item x lowest score})$

Results and Discussion

This research produced an e-book of Newton's Law integrated with Pancasila values to improve critical thinking skills and learning independence. The resulting e-book integrated with Pancasila values adapted to the Problem Based Learning model is presented in Figure 2. The validation results are obtained from the assessment conducted by six validators who are experts in material as well as media and design, then converted into an average as a result of quantitative data and categorised in qualitative form. The detailed validation results can be seen in Table 2 and Table 3.

Figure 2. E-book Cover Page and Main Menu Display

Table 2: Results of E-book Feasibility of Material Experts

Aspects	Total Average Score	Category
Suitability of e-book with Problem Based Learning model	17,83	Very Good
Suitability of material content	70,00	Very Good
Appropriateness of language and images	32,83	Very Good

The results of the material expert's e-book feasibility were validated based on three aspects of the assessment, namely aspects of the suitability of the e-book with the Problem Based Learning model, aspects of the suitability of the material content, and aspects of the suitability of language and images. The aspect of e-book suitability with the Problem Based Learning model obtained a total average score of 17.83 with a very good category, the aspect of material content suitability obtained an average score of 70.00 with a very good category, and the aspect of language and image suitability obtained an average score of 32.83 with a very good category.

Table 3. E-book Feasibility Results of Media and Design Experts

Aspects	Total Average Score	Category
Cover section	31,00	Very Good
Content section	44,50	Very Good
Usage section	11,50	Very Good

The results of the feasibility of e-books of media and design experts are validated based on three aspects of the assessment, namely aspects of the cover, content, and usage. The cover aspect obtained a

total average score of 31.00 with a very good category, the content aspect obtained an average score of 44.50 with a very good category, and the usage aspect obtained an average score of 11.50 with a very good category.

Based on product validation obtained from the assessment conducted by six validators, namely two lecturers of Master of Physics Education and four high school physics teachers. Expert validation was chosen because the instrument developed can be considered reliable if the experts state that the instrument is suitable for measuring the research variables used (Rahmawati et al., 2018). The developed e-book contains cover, CP, ATP, learning objectives, physics phenomena related to Newton's Law integrated with Pancasila values in the form of stories, learning activities (materials, Learner Worksheets, and practice questions), references, glossary, and developer profile. The e-book contains illustrations that contain images and videos then packaged in the form of a flipbook so that it can be accessed online. These features aim to improve students' learning experience through a deeper and more effective understanding of concepts. The advantages of interactive flipbooks lie in their ease of navigation and flexibility of use (Emilia et al., 2018; Rahayu et al., 2021). This provides opportunities for students to be more independent in accessing information, understanding the physics material presented, and stimulating students to think critically (Andini et al., 2018; Marisda et al., 2024; Susanto & Lestari, 2020). In addition, the interactive features available in the e-book allow students not only to read the theory presented but also to interact directly with physics concepts through simulations or other activities that require analysis and application (Marisda & Arsyad, 2025). The results of e-book validation based on material and media and design experts obtained a very good category. These criteria were obtained because the e-book developed included the suitability of the e-book with the Problem Based Learning model; clarity of CP, ATP, and learning objectives; suitability of the material presented; completeness of the material; availability of practice questions; clarity of learning activities; suitability of language use; simplicity of sentences; suitability of illustrations; suitability of titles, fonts, and colours; suitability of layout and functionality of navigation; sharpness of images and videos; and smooth operation of the e-book. Therefore, the developed e-book is declared valid and can be used during the field trial.

Conclusion

The Newton's Law e-book integrated with Pancasila values to improve students' critical thinking skills and learning independence was declared valid with a very high category based on the assessment of material experts and media and design experts. This finding contributes to the practice of designing teaching materials integrated with Pancasila values that can improve critical thinking skills and learning independence. This research provides evidence that integrating Pancasila values in physics learning can improve students‘ critical thinking skills and learning independence, and can also shape students’ character in accordance with Pancasila values.

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