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Digital-Based Physics Pocket Book Design with Short Counting Methods for Junior High School Students

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Abstract: This study aims to design a digital-based physics pocket book with a short calculation method for junior high school students. This type of research and development is used in this study. At the design stage, we selected the ADDIE model. The design phase includes: the analysis phase, the stage design, the stage of development. Research data obtained by reviewing the curriculum, interviews, and validation questionnaires. Class VII, VIII, IX students, as many as 9 people, became the subject of a limited trial in this study. Data analysis was carried out by reviewing curriculum content, descriptive interview results, and quantitative analysis for validation. The results showed that the design of a digital-based physics pocket book with a short calculation method was valid and could be used by Junior high school students.

Keywords: digital book, pocket book, short count method, physics learning.

Abstrak: *Penelitian ini bertujuan untuk merancang buku saku fisika berbasis digital disertai cara hitung singkat bagi siswa SMP. Jenis penelitian dan pengembangan digunakan dalam penelitian ini. Pada tahap perancangan, model ADDIE dipilih. Tahap perancangan meliputi: tahap analisis, tahap desain, tahap pengembangan. Data penelitian diperoleh dengan telaah kurikulum, wawancara, dan angket validasi. Siswa kelas VII, VIII, IX, sebanyak 9 orang, menjadi subyek uji coba terbatas dalam penelitian ini. Analisis data dilakukan dengan telaah isi kurikulum, deskriptif hasil wawancara, dan analisis kuantitatif untuk hasil validasi. Hasil penelitian menunjukkan bahwa hasil rancangan buku saku fisika berbasis digital disertai cara hitung singkat dinyatakan valid dan dapat digunakan siswa Junior high school.*

Kata kunci: *buku digital, buku saku, metode hitung pendek, pembelajaran fisika.*

▪ INTRODUCTION

The current pandemic era, with the change in the status of PPKM in different regions, has forced the government to issue other policies for implementing teaching and learning activities. Some are allowed to meet face-to-face in full by implementing strict health protocols, carry out teaching and learning activities with a combination of online and offline, or fully implement it online (Novika et al., 2021). Various subject teachers prepare to learn strategies so that learning continues to run effectively. Based on interviews with science teachers in junior high schools, they have prepared printed teaching materials as learning media. The teaching materials are complete with material descriptions and practice questions. The textbook page ranges from 315 pages. However, their interest in learning using the textbook was lacking based on interviews with students. It is because the textbook contains too much material, so it is difficult to understand, it is too thick, so it is difficult to carry it everywhere, and there is no w

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ay to solve the problems. Innovation that follows technological advances is urgently needed. Nowadays, students are very creative in using smartphones (Saputra et al., 2018). Students need books that contain short material that is easy to understand, equipped with examples of questions and their discussion, and easy to carry everywhere.

Learning is a process to help the development of thinking skills. Thinking skills are one aspect of life skills that need attention and be developed through the education process (Ratnasari, 2011). Science learning in junior high school combines physics, biology, and chemistry. However, physics is still considered the most difficult for students among these materials. Based on the results of the interviews, physics has many formulas and requires solving problems mathematically. Students often run out of time to answer questions because of the long way of solving questions. Students need a reference book on how to solve physics problems briefly. Types of books that students in learning can use include textbooks, reference books, and pocket books. Pocket books are books that are small in size and easy to carry everywhere (Muhammad et al., 2015). he advantages of a pocket book are: he information presented is clear and concise, it can be studied anytime and anywhere because it is easy to carry, it will be more interesting if it is equipped with pictures and colours.

Relevant research on pocket books has explained its benefits a lot. Pocket books can be an alternative learning media in increasing students' interest in learning (Larasyanti et al., 2020). In addition, pocket books as learning media have functions, namely: (1) attention function, (2) affective function, (3) cognitive function (4) compensatory function This function is beneficial for students in understanding the subject matter. Pocket books are very effective for middle school students (Muhammad et al., 2015). In addition, pocket books can improve knowledge and attitudes (Sofiana & Ayu, 2017). the development of augmented reality (AR) based pocket books on planetary motion can also improve student achievement (Suprapto et al., 2021).

Based on the research studies that have been carried out, the digital-based pocket book in this study will be designed by presenting a concept map, brief material, practice questions, answers to questions in sequence, and answers to questions briefly. The answer to this short question is expected to streamline the time for students to work on questions during the exam. The design of this pocket book starts from a printed draft. Then it is converted into digital form using an application. This digital pocket book can be accessed via a laptop or smartphone. The problem with digital books experienced by schools is that students are usually less active in independent learning because of limited internet quotas, and some students still do not have their gadgets (Sukenti, 2020).

The weaknesses of pocket books are: (1) the time needed in the manufacturing process is quite long, (2) printed materials will be boring and reduce students' interest in reading them, (3) if the volume and paper are wrong, the printed material will be easily damaged and torn (Anjelita et al., 2018). The weakness of printed pocket books can be minimized by using digital pocket books that will not be damaged or torn, are easy to carry everywhere, and have no need to wait to take turns reading with colleagues. Junior high school students have the implication of a sensitive and unstable emotional state, causing a fluctuating enthusiasm for learning. (Hastutiningtyas et al., 2021). They will quickly get bored when studying thick textbooks. They are also required to be able to

solve the problem at the time determined by the teacher. Inappropriate learning media will worsen their situation by increasing their interest in learning science (Armelia et al., 2019; Bestari & Yulianti, 2014).

The results of the relevant research state that students are very interested in Ethnomathematics-Based Digital Pocket Books (Herawati et al., 2020; Sulastri et al., 2020). This pocket book is efficient to use, and the material is easy to learn. The development of comic-based pocket books, can improve students' understanding (Winarto et al., 2018). In addition, student learning outcomes increase after learning using the Android-Based Pocket Book of Physics (Larasyanti et al., 2020). Based on the problem description, the researcher will design a Digital-Based Physics Pocket Book with a Short Counting Method for Junior High School Students.

▪ METHOD

Research Design

This research is research and development. At the design stage, the ADDIE model was selected (Branch, 2009). The design stages include analysis, design, and development. Analysis (Analysis) At the analysis stage, the activities to be carried out are identifying problems in using books as learning resources. Next, a needs analysis was carried out on the design of a digital-based physics pocket book with a short calculation method for junior high school students. At this analysis stage, three activities are carried out: a) problem analysis, b) needs analysis and c) analysis of target characteristics.

At this stage, it is done to determine the components of the contents of the pocket book, design physics material with a short calculation method, choose digital media, and design a validation instrument to assess the book to be developed. The results of the design stage are still conceptual. At this stage of development, the existing conceptual framework is realized into a product ready to be implemented. The product is a digital-based physics pocket book with a short calculation method for junior high school students. Activities at the development stage also validate the experts about the developed pocket book. The validation results were then revised and tested on a small scale on junior high school students to assess book readability.

Participants

The research subjects consisted of junior high school students in grades VII, VIII, and IX in the city of Bengkulu, as many as 9 people, became the subject of a limited trial in this study.

Instrument

Research data were obtained by reviewing the curriculum, interviews, and validation questionnaires. A curriculum review was conducted to map junior high school physics material from grades VII, VIII, and IX. Interviews are used to identify student characteristics, which will be the basis for designing digital-based pocket books. In contrast, the validation questionnaire was used to assess the material, media, and readability. The material, media, and readability questionnaires are explained in table 1.

Table 2. Grid of material, media, and readability questionnaire

No	Component	Aspect/statement

1	Theory	Content Eligibility
		Serving Eligibility
		Language Eligibility
2	Media	Digital Pocket Book Cover Design Graphics
		Digital Pocket Book Content Design Graphics
		Eligibility Ease of Use
3	Legibility	The writing on the pocket book can be read clearly
		The completeness of the pictures in the pocket book is still lacking
		Pocket books help understand the subject matter
		The pocket book is interesting
		The language used is easy to understand

Data analysis

Data analysis was conducted by reviewing the curriculum content and descriptive interview results. The determination of the criteria for the validity results is grouped into valid, moderately valid, less valid, and invalid.

▪ RESULT AND DISSCUSSION

At this analysis stage, three activities are carried out: 1) Problem analysis, 2) Needs analysis, and 3) Analysis of target characteristics. Based on interviews with science teachers in junior high schools, they have prepared printed teaching materials as learning media. The teaching materials are complete with material descriptions and practice questions. The textbook page ranges from 315 pages. Meanwhile, based on interviews with students, their interest in learning using the textbook is lacking. The textbook contains too much material that is difficult to understand and too thick, so it is difficult to carry everywhere, and there is no way to solve the problems. Students need books that contain short material that is easy to understand, equipped with examples of questions and their discussion, and easy to carry everywhere. They also mention that physics has many formulas and requires solving problems mathematically. Students often run out of time to answer questions because of the long way of solving questions. Students need a supporting book on how to solve physics problems briefly.

Based on the analysis results, it is stated that in science learning, most students enjoy reading books that explain short and explicit material and short and sequential problem-solving. Books are easy to learn anytime and anywhere. The teacher also mentioned needing a digital-based physics pocket book to support students' physics learning. The analysis of target/student characteristics stated that most students brought science textbooks only during class hours (Mundilarto, 2006). They also consistently use smartphones to look for additional study materials online because the school allows students to get smartphones. Students also revealed that most of them like individual learning with textbooks that contain not too much material, there are practice questions, and prefer digital books over printed books. At this stage, it is done to determine the components of the contents of the pocket book, design physics material with a short calculation method, choose digital media, and design a validation instrument to assess the book to be developed.

The content components of the developed digital-based pocket book include a cover page, introduction, table of contents, book advantages, a video collection of

physics science quick formulas, materials, questions, and solutions concisely and concisely, and a bibliography. Physics material is designed by considering and choosing material whose problem solving can be done sequentially and shortly. Based on these considerations, six basic materials were produced in a digital-based pocket book: temperature and heat, straight motion, force, vibration and waves, geometry optics, and dynamic electricity.

Digital media is chosen by considering user convenience and ease of access through various electronic devices such as PCs/smartphones. Based on these considerations, https://online.anyflip.com/ was chosen as a digital media converter for physics pocket books. The pocket book validation instrument was designed with a feasibility assessment by material experts and media experts. The feasibility of the material consists of 3 aspects, including (1) the content feasibility aspect consists of 3 points, (2) the presentation feasibility aspect consists of 1 point, (3) the language feasibility aspect consists of 2 points, while the media feasibility includes: (1) The visual aspect of the digital pocket book cover design consists of 3 points, (2) the visual aspect of the digital pocket book content design consists of 3 points, (3) the feasibility aspect of ease of use consists of 1 point.

At this stage of development, the existing conceptual framework is realized into a product ready to be implemented. The product is a digital-based physics pocket book with a short calculation method for junior high school students. The product developed is as shown in Figure 1.

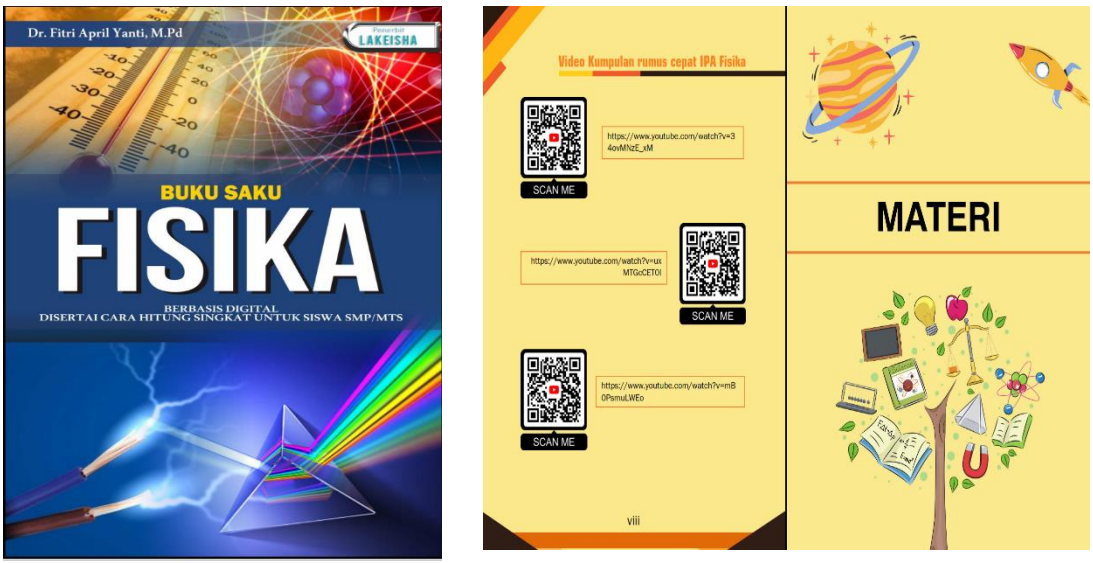

Figure 1. Digital-based physics pocket book with short counting methods for junior high school students

The validation results of the physics pocket book obtained scores from the validator of 100 and 90 from a maximum score of 100. Based on these results, the feasibility of the pocket book material is declared valid. It was obtained from 3 aspects of the feasibility of the material, including (1) the content feasibility aspect consisting of 3 points, (2) the presentation feasibility aspect consisting of 1 point, and (3) the

language feasibility aspect consisting of 2 points. The physics pocket book validation results obtained a score of validation from the validator of 100 and 91 from a maximum score of 100. Based on these results, the feasibility of the pocket book media was declared valid. Scores were obtained from 3 aspects of media feasibility, including (1) the graphic aspect of the digital pocket book cover design consisting of 3 points, (2) the graphic aspect of the digital pocket book content design consisting of 3 points, (3) the ease-of-use feasibility aspect consisting of 1 point. Other studies also reveal that rectangular and triangular pocket books are well received, valid according to media experts and material experts (Fajriana et al., 2022).

The media validator rated the overall appearance of the cover design graphic, the content design graphic, and the feasibility of the ease of use as excellent. While the material validator provides suggestions about sentences that lack letters, calculation errors in solving problems, and suggests replacing questions that are less relevant to the material. Another study also revealed that pocket books based on the results of research on antimicrobial medicinal plants from the Muko-muko and Serawai tribes as complementary teaching materials for high school students are valid as complementary teaching materials in biology learning for senior high school students. (Zukmadini et al., 2018).

Limited trials were carried out on junior high school students in grades VII, VIII, and IX. This limited trial aims to see the readability and response of students to a digital-based physics pocket book accompanied by a short count method (Haerawati, 2016). The students involved in the preparation consisted of 9 students. The results of legibility by 9 students stated that the writing in the pocket book can be read clearly, the pictures in the pocket book are presented in full, the pocket book helps understand the subject matter, the pocket book is very interesting, and the language used is easy to understand. The effect of a wider pocket book can increase students' learning motivation (Siwi & Desindi, 2021).

▪ CONCLUSION

Design a digital-based physics pocket book with a short calculation method as teaching materials to support science physics subjects for Junior high school grades VII, VIII, and IX. The results showed that the design of a digital-based physics pocket book with a short calculation method was valid and could be used by Junior high school students. A digital-based physics pocket book with a short calculation method becomes a supporting textbook for students in learning physics. However, this study has limitations, namely the effectiveness of using the pocket book has not been tested. So that the results of the extensive trial of the use of physics pocket books are not presented in the results of this study.

▪ REFERENCES

Anjelita, R., Syamswisna, & Ariyati, E. (2018). Pembuatan Buku Saku sebagai Media Pembelajaran Pada Materi Jamur Kelas X SMA [Making Pocket Books as Learning Media for Class X High School Mushroom Materials]. DoubleClick: Journal of Equatorial Education and Learning, 7, 2–3.

Armelia, D., Prihatin, I., & Susiaty, U. D. (2019). Pengembangan Media Pocket Book Berbasis Discovery Learning terhadap Kemampuan Pemahaman Matematis

[Development of Discovery Learning-Based Pocket Book Media on Mathematical Comprehension Ability]. DoubleClick: EAS (Educational Article Structure), 3(3). https://doi.org/10.30998/sap.v3i3.3586

Bestari , D. Yulianti, P. D. (2014). Pembelajaran Fisika Menggunakan Sea Berbantuan Games Untuk Mengembangkan Karakter Siswa SMP [Learning Physics Using Game-Assisted Sea to Develop Characters for Junior High School Students]. DoubleClick: Unnes Physics Education Journal, 3(3), 77–83.

Fajriana, Mursalin, & Fitriani, A. (2022). Development of Square and Triangle Surface Area Pocket Books as Learning Media for Junior High Schools. Internatioanl Journal of Trends in Mathematics Education Research, 5(1), 111–118.

Haerawati. (2016). Upaya Meningkatkan Hasil Belajar Melalui Strategi Pembelajaran Interaktif Siswa Kelas IX-1 SMP Negeri 24 Makassar [Efforts to Improve Learning Outcomes Through Interactive Learning Strategies for Class IX-1 Students of SMP Negeri 24 Makassar]. DoubleClick: Journal of Sciences and Physics Education, 4(1), 1–23.

Hastutiningtyas, W. R., Maemunah, N., & Lakar, R. N. (2021). Gambaran Karakteristik Siswa Sekolah Menengah Pertama (SMP) Dalam Mengontrol Emosi Di Kota Malang [Characteristics of Junior High School Students in Controlling Emotions in Malang City]. DoubleClick: Nursing News: Scientific Journal of Nursing, 5(1), 38–44.

Herawati, I., Putra, F. G., Masykur, R., & Anwar, C. (2020). Pocket Book Digital Berbasis Etnomatematika Sebagai Bahan Ajar Sekolah Menengah Pertama [Ethnomathematics-Based Digital Pocket Book for Junior High School Teaching Materials]. DoubleClick: Journal of Mathematics Education and Science, 3(1), 29–37. https://doi.org/10.32665/james.v3i1.132

Larasyanti, K. L., Fatmaryanti, S. D., & Al Hakim, Y. (2020). Pengembangan Pocket Book Of Physics (PBOP) Berbasis Android Sebagai Media Pembelajaran Fisika [Development of an Android-based Pocket Book of Physics (PBOP) as a Physics Learning Media]. DoubleClick: Journal of Science Education Innovation, 1(2), 68–72.

Muhammad, N. N., Taiyeb, A. M., & Azis, A. A. (2015). Pengembangan Buku Saku Pada Materi Sistem Respirasi untuk SMA Kelas XI [Development of a Pocket Book on the Materials of the Respiratory System for Class XI SMA SMA]. DoubleClick: Journal of Research Results, 162–167.

Mundilarto. (2006). Penerapan Penilaian Otentik dalam Mata Pelajaran Fisika di SMP dengan Strategi Fikir [Application of Authentic Assessment in Physics Subjects in Junior High School with Thinking Strategy]. DoubleClick: Educational Journal, 1.

Novika, S., Harahap, R. H., & Rahmadany, E. (2021). Media Pembelajaran dan Minat Belajar Fisika Siswa SMP Dalam Pembelajaran Jarak Jauh [Learning Media and Interest in Learning Physics of Middle School Students in Distance Learning]. DoubleClick: Educational: Journal of Educational Science, 3(5), 3123–3130.

Ratnasari, Y. (2011). Penerapan Strategi SQ3R Dan Peta Konsep Dalam Pembelajaran Fisika Ditinjau Dari Kemampuan Memori Siswa [Application of SQ3R Strategy and Concept Maps in Learning Physics in terms of Students' Memory Ability]. DoubleClick: Reflection on Education: Scientific Journal of Education, 1, 126.

Saputra, M., Abidin, T. F., Ansari, B. I., & Hidayat, M. (2018). The feasibility of an Android-based pocketbook as mathematics learning media in senior high school. Journal of Physics: Conference Series, 1088. https://doi.org/10.1088/1742-6596/1088/1/012056

Siwi, M. K., & Desindi, F. (2021). Android-Based Pocket Book Development as an Effort to Increase Learning Motivation in Tax Administration Subject. Advance in Economic, Business and Management Research, 192, 257–263.

Sofiana, L., & Ayu, S. M. (2017). Pocket Book to Enhance Knowledge and Attitude Regarding Prevention of Soil-transmitted Helmint. International Journal of Evaluation and Research in Education (IJERE), 6(3), 252. https://doi.org/10.11591/ijere.v6i3.9065

Sukenti, E. (2020). Pengembangan Buku Saku Materi Mamalia Di Taman Margasatwa Ragunan Untuk Meningkatkan Penguasaan Konsep Siswa [Development of Pocket Book on Mammals in Ragunan Wildlife Park to Improve Students' Concept Mastery]. DoubleClick: Pedagogical: Scientific Journal of Education, 04, 26–29.

Sulastri, E., Sunarsih, E., & Utama, E. G. (2020). Pengembangan Buku Saku Digital Berbasis Etnosains di Sekolah Dasar Kota Singkawang [Development of Ethnoscience-Based Digital Pocket Book at Singkawang City Elementary School]. DoubleClick: Journal of Education: Journal of Research Results and Literature Studies in the Field of Education, Teaching and Learning, 6(3), 522–531.

Suprapto, N., Ibisono, H. S., & Mubarok, H. (2021). the Use of Physics Pocketbook Based on Augmented Reality on Planetary Motion To Improve Students' Learning Achievement. Journal of Technology and Science Education, 11(2), 526–540. https://doi.org/10.3926/jotse.1167

Winarto, Khiyarusoleh, U., Ardiyansyah, A., Wilujeng, I., & Sukardiyono. (2018). Pocket Book Based on Comic to Improve Conceptual. International Journal of Instruction, 11(4), 889–900.

Zukmadini, A. Y., Jumiarni, D., & Kasrina, K. (2018). Developing antimicrobial medicinal plants pocketbook based on local wisdom of Muko-Muko and Serawai ethnics. Jurnal Pendidikan Biologi Indonesia, 4(2), 95–104. https://doi.org/10.22219/jpbi.v4i2.5436