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# Validity and Practicality Electronic Pocketbook-Based Google Sites for High School Level

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**Abstract:** This research addresses the limitations of textbook-centered learning resources, which hinder students' understanding of complex concepts and equations, particularly in the topics of sound and light waves. The study aims to develop, validate, and assess the practicality of an electronic pocketbook based on Google Sites for high school-level materials on sound and light waves. Employing the Research and Development (R&D) method, this study follows the Alessi and Trollip development model, consisting of Planning, Design, and Development phases. Expert validators in the fields of content, media, and language, along with feedback from 24 students and three teachers from Senior High School 9 Banda Aceh, were utilized to assess the pocketbook. Results show that the electronic pocketbook successfully completed all development stages and achieved high validity, with material validation at 95.29%, media validation at 91.90%, and language validation at 93.06%, all categorized as "very feasible". Additionally, both student and teacher evaluations confirmed the practicality of the pocketbook, with a score of 94.17%, also categorized as "very practical". The electronic pocketbook is thus deemed a highly valid and practical supplementary learning tool for both classroom and extracurricular use.

**Keywords:** Electronic Pocketbook; Google Sites; Practicality; Sound and Light Waves; Validity.

## Introduction

Learning is the process of engaging in teaching and learning activities with planned objectives, materials, methods, environments, situations, and assessment (Rasyid, 2019). Learning becomes more meaningful when it can connect the concepts learned from learning resources, making it sufficiently absorbed and less prone to forgetting, resulting in a comprehensive understanding (M Jannah, 2019). Technology-based learning resources can serve as tools for teachers to communicate with students, ensuring that the presented material is clearer, more comprehensive, and engaging (Hasan, 2021). Therefore, the use of technology-based learning resources (Zayyadi, 2023) is also recognized as crucial for ensuring that the delivery of instruction in learning is carried out as planned.

The digital era has transformed the landscape of physics education, with information and communication technology becoming a crucial element (Rahmadita, 2021). Physics topics often perceived as complex and abstract can be simplified for understanding through the use of interactive and multimedia digital learning resources (Mariana, 2022). Therefore, to understand such comprehension and knowledge, one must have clear references or learning sources in studying it. One learning source that can be used is books. Books come in various types, such as reference books, supporting materials, textbooks, exercises, workbooks, notes, and readings. Pocket books, which are small and lightweight, are an example of supporting books that assist students in understanding physics materials (Umam et al., 2020). Its presence can enhance learning interest by presenting materials in an engaging manner and providing enjoyment in learning, which in turn can influence the achievement of learning objective (M Jannah, W Oviana, 2021).

Based on the survey analysis conducted at SMAN 9 Banda Aceh among 11th-grade students, the topics of sound and light waves are considered difficult to

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understand by 17.71% out of 23 respondents. Students find it challenging due to a lack of understanding of the properties of sound and light waves and their relationship with specific equations. To address this issue, the researcher plans to create engaging supplementary learning resources, such as electronic pocket books, to help students better understand the material and become more interested in learning. Interviews with physics teachers at SMAN 9 Banda Aceh revealed several issues in physics education. One of them is the lack of availability of supporting learning resources for students, such as additional reference books. Teachers only utilize the textbook provided, making it difficult for students to grasp concepts beyond its content. Therefore, there is a need for supporting books that can summarize learning materials and facilitate independent learning, such as electronic pocket books.

Based on the explanation above, physics education requires adequate learning resources and teaching materials to support the learning process (Nasir, M., Mawaddah, S., 2024). Technological advancements have opened opportunities to present physics materials interactively and multimedia, enabling students to understand complex physics concepts more easily (N hasanah, M Jannah, 2024). In this context, an electronic pocket book based on Google Sites developed for high school-level sound and light wave materials becomes one relevant solution.

The electronic pocket book contains summaries of physics materials, illustrations, examples, and exercises accessible both within and outside of learning sessions, facilitating understanding (Noviatika, 2019). For ease of access, the researcher designs the electronic pocket book as an application connected to a Google Sites website. Google Sites is a service provided by Google for creating websites without the need for programming or web design knowledge (Yushtika Muliana Pubian, 2022).

Several previous studies such as (Arumi, 2021), (Arumanadi, 2021), have developed electronic or print pocket books using platforms like Android. The results obtained from these three studies show that the pocket book designs are excellent and appealing, making them highly suitable for use in schools as supplementary learning resources.

The main difference between this study and previous research lies in the use of electronic media and the Google Sites platform. While previous studies focused more on developing physical print books, this research is geared towards creating electronic pocket books accessible through Android devices. This not only enhances accessibility but also allows for the addition of interactive features, such as links to additional resources or demonstration videos. Moreover, this study evaluates the design, validity, and practicality of the electronic pocket book, indicating a focus on different aspects in the development of physics education technology.

## Method

This study utilizes the Research and Development (R&D) research method (Sugiyono, 2015), referring to the Alessi and Trollip development model, which is a model for multimedia learning development. This model consists of three stages: Planning, Design, and Development (Trollip, 2001). The researcher chose this research model because it is suitable for multimedia development, easy to understand for novice developers, and applicable to various subjects (Caesaria, C.A., M Jannah, M Nasir., 2020). These stages are illustrated in the research flowchart in Figure 1.

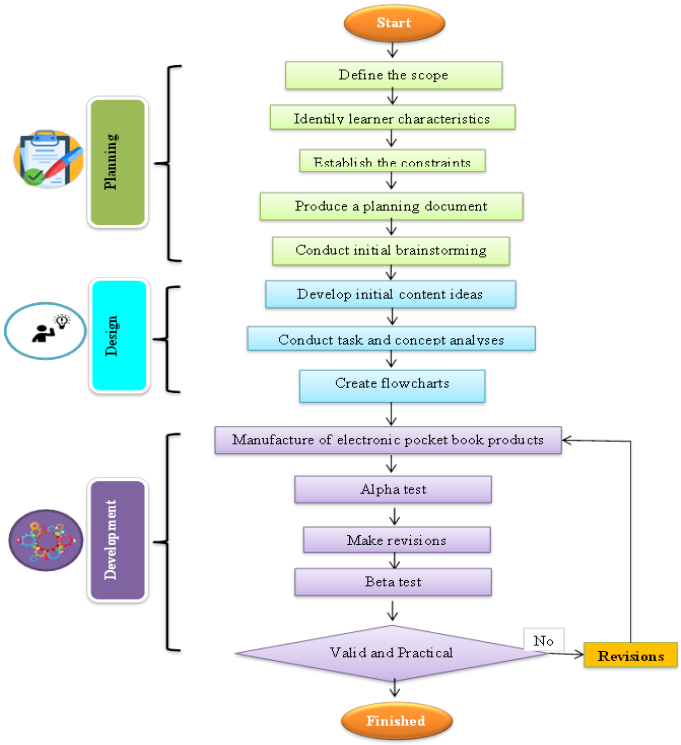



**Figure 1.** Research Flowchart

*Data Collection Instruments*

This research employs two types of instruments: validation sheets distributed to subject matter experts and media experts, and practicality questionnaires given to teachers and students. These instruments aim to gather data, critiques, suggestions, and feedback on the development of the electronic pocketbook. The results of this validation will assist the researcher in revising the instruments to make them more suitable for use. The data collection instruments used include validation sheets from media experts, subject matter experts, language experts, and practicality questionnaires.

*Data Analysis Technique*

The data obtained from the validation sheets consist of two types: quantitative data and qualitative data. In this development, the researcher utilizes a multi-point assessment scale in the analysis. This assessment scale ranges from 1 to 5, where each scale has the following score weights: 5 (very suitable/practical), 4 (suitable/practical), 3 (less suitable/practical), 2 (not suitable/practical), and 1 (not at all suitable/practical) (Riduwan and Kuncoro, 2011). To obtain the maximum value (Nm) from the analysis of media testing, material testing, and student practicality, it can be calculated using the Frmula 1.

$$N_m = A \times B \times C \quad (1)$$

With A representing the number of validators, B the maximum validation score, and C the number of items in the validation criteria.

The percentage of validity and practicality %K is obtained from the following percentage equation (Formula 2)

$$\%K = \left(\frac{N}{N_m}\right) \times 100\% \quad (2)$$

With N representing the total score obtained. To determine the validity of a learning media and material, it is measured through the criteria values as shown in Table 1 (Riduwan, 2011).

**Table 1.** Conversion of Validity/Practicality Scores

| Percentage Achievement | Score Scale | Interpretation |
|---|---|---|
| 81% ≤ score ≤ 100% | 5 | Very valid |
| 61% ≤ score ≤ 80% | 4 | Valid |
| 41% ≤ score ≤ 60% | 3 | Moderately valid |
| 21% ≤ score ≤ 40% | 2 | Less valid |
| 0% ≤ score ≤ 20% | 1 | Not valid |

## Result and Discussion

*Development Design of the Electronic Pocketbook*

This development research resulted in an electronic pocketbook product using Google Sites on the subject of sound and light waves for high school level. The development of this pocketbook followed the Alessi and Trollip multimedia development model, which consists of three main stages.

This model is very suitable for use in the development of educational multimedia because each step is systematically structured, and it can also be applied to various subjects (Mukramah, W. A. N., M Jannah, Wahid, M. A., 2020).

*Planning*

In the planning stage, the researcher follows five steps from the Alessi and Trollip planning stage, which are:

The first step is to define the scope, the researcher conducted an initial observation at SMA Negeri 9 Banda Aceh, including direct interviews with physics teachers and distributing questionnaires to analyze material difficulties to 11th-grade students. The questionnaire results showed that 17.71% of the 23 students found the material on sound and light waves complex. Interviews with physics teachers also revealed a lack of students' access to additional learning resources outside the textbooks used at school. Therefore, this study aims to develop an electronic pocketbook based on Google Sites, focusing on the material of sound and light waves.

Second, identify learner characteristics, Students were identified through direct interviews. The results showed that students were limited to the textbook material during physics lessons, with minimal use of additional learning media. They summarized the textbook content, and the teacher explained it, with little use of learning media. The sound and light waves material was considered difficult because students were unfamiliar with its scope and details. They felt the need for additional references for independent study, such as an electronic pocketbook.

Third is establish the constraints, the researcher limited the scope of the material to KD 3.10 and 4.10 on sound and light waves. The development of the electronic pocketbook utilized the Google Sites platform, which requires an internet connection.

Fourth is Produce a planning document, the researcher gathered all necessary references for development, including textbooks, supporting books, and Google applications. And the last is conduct initial brainstorming, the researcher collaborated with a physics teacher at SMA Negeri 9 Banda Aceh to find solutions to the physics learning issues in the 11th-grade science class. As a result, it was agreed to provide additional learning resources for students in the form of summary books, especially on sound and light waves. The researcher then developed an electronic pocketbook based on this material.

Based on the observation results and interviews with physics teachers, it was found that students experienced limited access to additional learning resources, especially supporting textbooks. This limitation resulted in difficulties in understanding physics material outside of class hours, as they relied solely on the textbooks provided. Therefore, the presence of supporting books that are easy to understand and accessible becomes crucial in supporting physics learning. Questionnaire analysis indicated that some students experienced difficulties in understanding the material on sound and light waves, indicating the need for the development of more effective learning methods and the provision of in-depth additional learning resources. Consequently, the researcher took the initiative to develop an electronic

pocketbook as a solution to enhance understanding and the quality of physics learning in the school.

These findings align with research results indicating that physics material, particularly sound and light waves, is a challenging topic for students to grasp (Teuku Ali, 2021) and (Hutabarat, 2022).

*Design*

In the design stage, the researcher undertakes three steps from the Alessi and Trollip design stage, which are:

Develop initial content ideas, the ideation process begins with organizing the material according to the basic competencies outlined in the Ministry of Education and Culture Regulation number 37 of 2018, specifically focusing on the topics of sound and light waves for 11th-grade odd semester. These basic competencies encompass knowledge aspect 3.10 and skill aspect 4.10. Subsequently, designing an electronic pocketbook by presenting a summary of physics concepts that are easily understandable for students. This involves designing assessment instruments to measure the quality of the electronic pocketbook being developed, including assessment criteria to evaluate its validity and practicality.

Then, conduct task and concept analyses, previously developed ideas are analyzed in-depth to assist in detailed design and program sequencing. Concept analysis is conducted to understand the information that students need to grasp, while task analysis involves understanding the material that needs to be learned, including attitude and skill aspects. Researchers analyze textbooks, exercises, online laboratories, media content, and other elements that encompass the material.

Finally, create flowcharts, flowcharts are diagrams that illustrate the steps or processes of how a program operates. In an electronic pocketbook based on Google Sites, flowcharts help visualize the navigation menu. Here is a flowchart diagram (Figure 2).

The design stage of the electronic pocketbook involves creating concepts for content and layout that align with the development objectives. The primary focus is on developing physics concepts needed by students, especially in effectively presenting summaries of sound and light wave materials. Furthermore, this stage also includes the systematic design of evaluation instruments to assess the quality of the electronic pocketbook. The creation of these evaluation instruments ensures that desired quality standards are met, making the research results reliable and interpretable according to the methodology used. Overall, this stage provides a solid foundation for developing an electronic pocketbook with appropriate physics concepts, effective material presentation, and meticulous evaluation instruments.

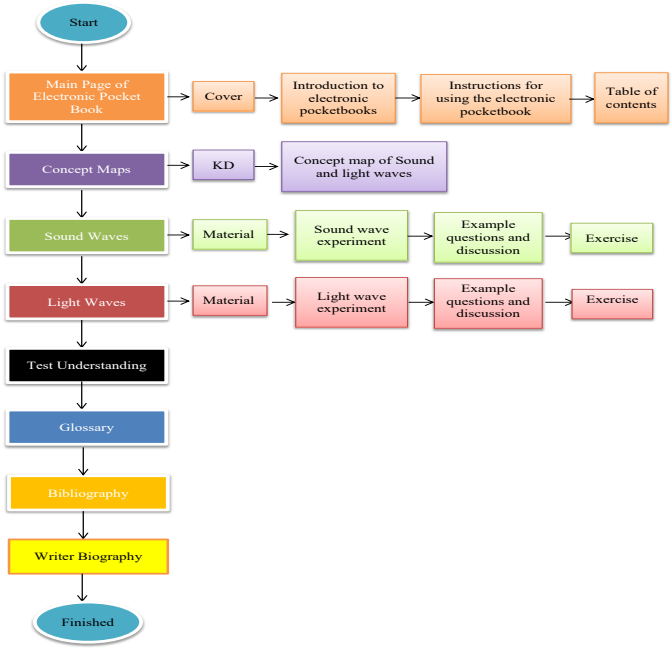



**Figure 2.** Navigation Menu Flowchart for Electronic Pocketbook

*Development*

In the development stage, the researcher undertakes six steps from the Alessi and Trollip development stage, which are:

First is preparing the text, preparing texts from various sources and summarizing them for inclusion in Google Sites facilitates efficient integration and content adjustment. Second is create the Graphics, by utilizing various graphic tools such as Canva, PixelLab, and Paint, they create interactive multimedia in the electronic pocketbook. In Google Sites, they leverage features like background editing, using images from Google, and other functions to enhance the content. Third is assemble the pieces, in this stage all designed elements are combined into one in creating the electronic pocketbook using Google Sites. All content is inserted according to the pre-prepared design.


(a) (b)

**Figure 3.** Electronic Pocketbook Display (a) cover (b) Content Display Section

Then is do an alpha test, the alpha test in this research is a validation process by subject matter experts, media experts, and language experts to assess the quality and suitability of the Google Sites-based

electronic pocketbook on sound and light waves in high school level. The validation results are used as a guide for revising the electronic pocketbook. After passing the validation stage, the electronic pocketbook is considered ready to be tested for its practicality by students.

Five is make revisions; after receiving the results of the alpha test, the researcher revises the electronic pocketbook based on feedback from the validators. The revisions are made by considering suggestions and inputs from media, subject matter, and language experts to enhance its quality. The main objective is to produce an electronic pocketbook that is effective as a learning media and self-learning resource. Finally, do a beta test, the beta test is a stage where the practicality of the electronic pocketbook is tested by students at school. The students are selected based on characteristics of end-users that align with the research target, which is the high school/MA education level. This product is intended to support independent learning and facilitate understanding of sound and light wave materials.

The development stage is the phase where the electronic pocketbook is realized through Google Sites according to the prepared design, with all content integrated into its structure. Various software such as Canva for designing covers, PixelLab for editing and combining images, and Paint for image editing are used in this process. Additionally, other Google applications are also utilized to support the creation of this product. After all elements are integrated, the electronic pocketbook undergoes alpha and beta testing. Research results indicate that the Google Sites-based electronic pocketbook for sound and light wave materials is considered suitable and practical as a supporting resource both during and outside of learning activities.

The findings of the above research are consistent with the study conducted by (Hutabarat, 2022), (Nurmala et al., 2019), and (Arumi, 2021) with the results of the electronic pocketbook development being highly suitable and practical for use in learning.

*Validity of the Electronic Pocketbook*

*Alpha Test*

The alpha test is obtained from the validation results of the electronic pocketbook's validity. The product's validity is determined through a feasibility test conducted by validating the electronic pocketbook with subject matter, media, and language experts.

*Subject Matter Expert Evaluation*

Subject matter experts evaluate the accuracy of information and the completeness of the content of the electronic pocketbook related to sound and light waves, in accordance with valid literature references. The subject matter validators consist of two lecturers specializing in the relevant field and one physics teacher. The validation results by the subject matter experts can be seen in the graph in Figure 4.

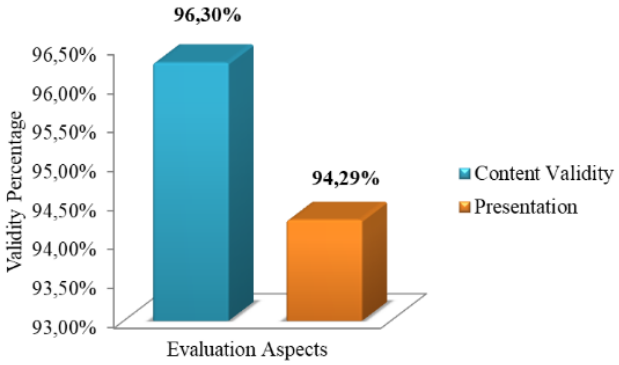



**Figure 4.** Subject Matter Expert Evaluation Graph

Based on the graph above, the subject matter experts' evaluation of the Google Sites-based electronic pocketbook on sound and light waves shows a positive assessment of the content and presentation feasibility. The content feasibility reached 96.30%, and the presentation feasibility reached 94.29%, both falling into the "very valid" criteria. The overall evaluation from the subject matter experts reached 95.29%, also categorized as "very valid." Therefore, based on the subject matter experts' evaluation, this electronic pocketbook can be considered a suitable supporting resource for students both inside and outside learning activities.

*Media Expert Evaluation*

Media experts evaluate the quality of the electronic pocketbook from a media perspective, particularly in the use of Google Sites. The media expert validators consist of two lecturers and an information technology teacher. The validation results by the media experts can be seen in the graph in Figure 5 below.

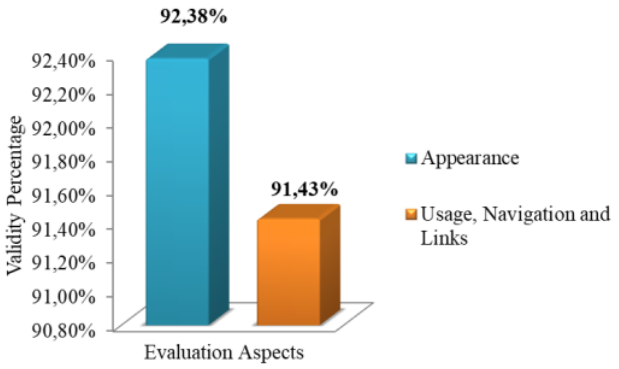



**Figure 5.** Media Expert Evaluation Graph

The graph shows a positive evaluation by media experts of the Google Sites-based electronic pocketbook on sound and light wave materials. In terms of appearance, the electronic pocketbook received a score

of 92.38%, and for usage, navigation, and links, it received 91.43%. The overall evaluation from the media experts reached 91.90%, which also falls into the "very valid" criteria. Therefore, this electronic pocketbook is considered suitable as a supporting learning resource for students. This evaluation indicates that the electronic pocketbook meets quality standards in terms of appearance and usage, contributing positively to the learning process.

*Language Expert Evaluation*

Language experts evaluate the quality of the electronic pocketbook in terms of language use, particularly in the development of physics material that has been summarized to facilitate correct understanding. The language expert validators consist of two lecturers and an Indonesian language teacher. The validation results by the language experts can be seen in the graph in Figure 6.

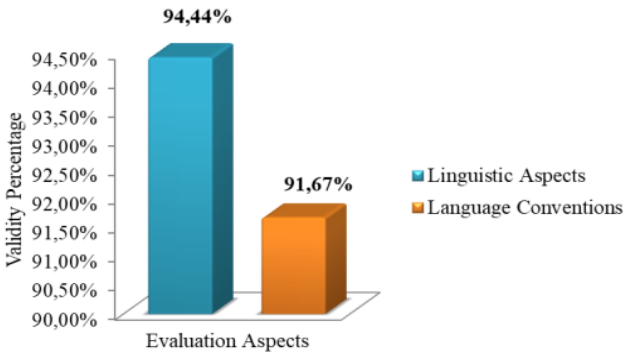



**Figure 6.** Language Expert Evaluation Graph

The graph shows a positive evaluation by language experts of the Google Sites-based electronic pocketbook on sound and light wave materials for high school level. In terms of linguistic aspects, the electronic pocketbook received a score of 94.44%, while for language conventions, it received 91.67%. The overall evaluation from the language experts reached 93.06%, which falls into the "very feasible/valid" criteria. Therefore, this electronic pocketbook is considered a suitable supporting learning resource for students. The emphasis on linguistic aspects and language conventions confirms that the electronic pocketbook has adhered to good language standards, ensuring it effectively supports students' understanding of sound and light wave materials. Below are the average scores from the validator percentage data.

**Table 2.** Validator Assessment

| Validator | Percentage | Criteria |
|---|---|---|
| Subject Matter | 95.29% | Very Valid |
| Media | 91.90% | Very Valid |
| Language | 93.06% | Very Valid |
| Average Total Score | 93.40% | Very Valid |

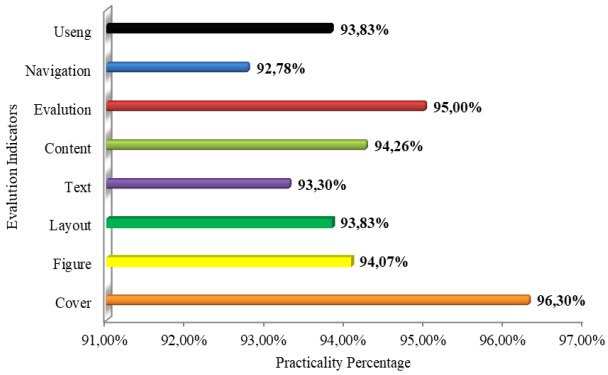
Based on the validity test analysis above, the Google Sites-based electronic pocketbook for high schools has been deemed valid for use in learning activities. The content expert's assessment is 95.29%, the media expert's assessment is 91.90%, and the language expert's assessment is 93.06%, with an overall average percentage from validators reaching 93.40%, meeting the criteria for being highly valid.

This is in line with the conducted research (Muskholifah, 2022) with the research results showing that the developed picture story pocketbook meets the criteria for being highly suitable, therefore, this pocketbook can be used as an effective learning medium. Other research has also been conducted by (Umam et al., 2020) in conclusion based on the validity testing conducted, in the alpha-testing according to the Media Expert, this application is considered highly suitable in the field of instructional media engineering.

*The Practicality of the Electronic Pocketbook*

*Beta Test*

Beta testing involves analyzing the practicality questionnaire results regarding the electronic pocketbook. Product practicality evaluation was conducted by 24 students from class XI MIPA 1 and 3 physics teachers from SMA Negeri 9 Banda Aceh for the academic year 2023/2024. The questionnaire aims to evaluate the quality of the Google Sites-based electronic pocketbook on the topics of sound and light waves from the perspective of its practical usability. The assessment data from students and physics teachers can be seen in the graph in Figure 7.




**Gambar 7.** Practicality Graph by Students and Teachers

Based on the graph, the assessment of the practicality of the Google Sites electronic pocketbook on the topics of sound and light waves by students and physics teachers shows positive results. The aspect of the cover has the highest practicality percentage, at 96.3%, effectively capturing users' attention. This is followed by content (95%), images (94.07%), and layout (93.83%), which are also rated as highly practical in enhancing understanding of the material. Although slightly lower,

other indicators such as text (93.3%) and navigation (92.78%) still exhibit a very good level of practicality. Overall, this electronic pocketbook achieves a high level of suitability, with an average percentage of 94.17%. This indicates that the electronic pocketbook is suitable for use by students both inside and outside the learning activities, and it contributes positively to improving the effectiveness of learning about sound and light waves.

This is in line with the research by (Marzuki, 2021) which indicates that students' responses regarding the Pocket Book of Physics-based learning media received a percentage of 80.52%, classified as very good, effective, and practical. Other studies such as those by (Arumi, 2021) and (Arumanadi, 2021) also show that the practical use of pocketbooks has a positive impact on students' learning outcomes in understanding physics material.

## Conclusion

Based on the development of the Google Sites-based electronic pocketbook for high school-level sound and light wave topics, it can be concluded that the design of this pocketbook follows the Alessi and Trollip development model, consisting of the planning, design, and development stages. The validity assessment by content experts (95.29%), media experts (91.90%), and language experts (93.06%) confirms that this pocketbook is highly suitable/valid for use as a supporting source in learning activities. Additionally, the practicality assessment by students and physics teachers with a score of 94.17% indicates that this pocketbook is highly practical for use both within and outside of learning activities

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**Author Contributions**
Conceptualization, M.R. and M.J.; methodology, M.R. and M.N.; software, M.R. and M.J.; validation, M.R., M.J., and M.N.; formal analysis, M.J. and M.N.; investigation, M.R. and M.J.; resources, M.J. and M.N.; data curation, M.R. and M.N.; writing—original draft preparation, M.R. and M.J.; writing—review and editing, M.J. and M.N.; visualization, M.R. and M.J.; supervision, M.J. and M.N.; project administration, M.R. and M.N.; funding acquisition, M.J. and M.N. All authors have read and agreed to the published version of the manuscript.

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