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Development of Physics Pocketbook Mobile on Android (Phy-pockemon) to Address Scientific Literacy on Energy Source Concepts

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Abstract

This study aimed to determine the feasibility of developing a physics pocketbook mobile on Android (Phy-pockemon) to address scientific literacy skills in energy source material. The research method used is Research and Development (R&D) with the ADDIE development model (Analysis, Design, Development, Implementation, Evaluation). The result of the developed media is the Phy-Pckemon application. Through expert validation referring to the educational information and communication technology center, subject matter expert validation carried out by three validators obtained a percentage value of 95% with a very feasible category. Media expert validation received a percentage value of 94% with a possible category, while based on trials limited to the Technological Acceptance Model (TAM) evaluation, which was conducted on 20 class XII students at one of the Islamic senior high school in Indonesia, an average response percentage of 93% was obtained with a very decent category. The results show that using Phy-Pockemon to address scientific literacy skills in energy sources is appropriate for use in learning.

Keywords: Energy Sources Concept, Mobile Pocket Book, Scientific Literacy

INTRODUCTION

21st-century skills are a demand for skills in understanding every aspect of global life in today's modern era. In 21st-century education, there has been an integration of literacy, cognition, skills, and knowledge, as well as a focus on technology. The rapid development of technology in the 21st century also indicates that science and technology are essential factors in developing a nation. (OECD, 2021).

According to Liliasari (2014), Indonesia's young generation needs literacy skills to develop in society and compete at the ASEAN level. Then, the International Council of Associations for Science Education (ICASE) said that students must have sufficient scientific literacy to be productive and have the highest quality of life, which is the goal of science education. Science is essential in various fields of life, so it must be studied so that all Indonesian people have scientific literacy while maintaining their national character (Pujiastuti & Haryadi, 2023). Indonesia obtained an average score of 371 in the PISA 2018 and was ranked 72 out of 78 participating countries (OECD, 2019). If you look at these results, it indicates that Indonesia's skills are still very far behind.

Advances in technology and educational innovation are two factors that impact curriculum progress in each country (Khunaeni et al., 2020). Physics learning media is increasing according to the times (Haryadi & Pujiastuti, 2022), especially in material physics, namely energy sources that explain natural phenomena and their occurrence. So, in this case, a

tool is needed in the form of learning media because only printed books cannot maximize students' understanding of physics material, especially energy source material (Fahmi Saifudin & Wedi, 2020).

Based on these problems, we need tools in the form of learning media that allow students to get an education wherever and whenever they choose and can address their scientific literacy skills so that they become literate students. Until now, many physics learning media have been developed as digital pocketbooks that are effective in the learning process, including Android-based mobile pocketbooks using Adobe Flash on temperature and heat material (Sari et al., 2019). The validity of e-assisted physics learning devices science literacy book on dynamic fluid material (Khoiriah & Kholiq, 2020), Pocketbook based on android: physics learning practice media in the 21st century (Bakri et al., 2021), Development of a physics mobile pocket book as an android-based learning medium on material momentum and impulse (Khumaidi & Sucahyo, 2018) .

Based on this research, it can be concluded that the development of physics learning media has been carried out a lot, including regarding the mobile pocketbook, which has a high success rate and can help students learn independently. Based on the background of the problem along with the explanation of the solutions that have been presented and there has been no research on Android-based digital pocketbooks on energy sources to address scientific literacy, so, the aims of the study is to develop a Physic pocket book mobile on android (Phy-pockemon) to address scientific literacy on energy source concepts.

METHOD

This research used a research and development (R&D), which is a method that then produces a certain product to be tested for its effectiveness (Sugiyono, 2013). The design used in this study is the development of the ADDIE model, which includes 5 stages: analysis, design, development, implementation, and evaluation. The resulting product is the Phy-pockemon application, namely Physic pocketbook mobile on Android, to address scientific literacy on energy resource concepts.

The test subjects in this study were material expert validators and media experts, and the trial was limited to 20 class XII students at one of the Islamic senior high schools in Indonesia. The instrument used in this research is in the form of assessment sheets from experts, namely media and material experts, on the development of Phy-pockemon learning media based on the reference of the Center for Educational Information and Communication Technology of the Ministry of Education and Culture (Chaeruman, 2019) as well as student respondent sheets to obtain user response data using the Technology Acceptance Model (TAM) instrument (Cabero-

Almenara et al., 2019) by conducting a limited trial of the Phy-pockemon learning media to 20 class XII students in an Islamic senior high school in Indonesia. The assessment instruments for material experts, media experts, and user responses are listed in the following table.

Table 1. Material Expert Instruments

Number	Assesment Aspect
1	The truth of the content of the material
2	Free from conceptual errors
3	Current and up-to-date materials
4	Coverage and depth of the material
5	Adequacy of reference (reference)

Table 2. Instruments of Media Experts

Number	Assessment Aspect
1	The suitability of the media delivery strategy with the characteristics of the relevant audience
2	The accuracy of the media delivery strategy to enable ease and speed of understanding and mastery of material, concepts, or skills
3	The level of possibility of facilitating students' scientific literacy skills
4	The level of contextuality with application/application in real life according to the characteristics of the relevant audience
5	The accuracy of media selection compared to other media

Table 3. User Instruments with TAM

Aspect	Number of Questions
Perceived usefulness	1-4
Perceived ease of use	5-7
Perceived enjoyment	8-10
Attitude towards use	11-13
Intention to use	14-15

Quantitative data analysis techniques in this study use descriptive statistics. They will be converted into quantitative data based on a Likert scale with a rating scale of 1-7, ranging from strongly disagree to agree strongly. The data processing techniques used are:

$$NP = \frac{n}{N} \times 100\%$$

Information:

NP = Feasibility percentage value (%)

n = Total score obtained on each aspect

N = Total score in each aspect

100 = Fixed number

RESULTS AND DISCUSSION

The feasibility of the Phy-Pockemon application to address scientific literacy skills in energy source materials was carried out by 2 physics teachers and a physics education lecturer at Untirta as validators using expert validation sheets. The scale used is a Likert scale with 7 rating scales from strongly disagree to agree strongly. The following are the results of the data analysis presented in Table 4 and Table 5.

Table 4. Assessment Expert Assessment Results

Number	Assessment Aspect	Rating Scale					Percentage
		Expert 1	Expert 2	Expert 3	Total Score	Score Max	
1	Truth content	7	7	7	21	21	100%
2	Free from concept errors	7	7	7	21	21	100%
3	Current and up-to-date material	6	6	7	19	21	90%
4	Coverage and depth of material	6	6	7	19	21	90%
5	Adequate reference used	6	7	7	19	21	95%
Total					100	105	95%

Based on Table 4, the feasibility of the material can be determined by using the feasibility percentage calculation as follows:

$$NP = \frac{n}{N} \times 100\%$$

$$NP = \frac{100}{105} \times 100\%$$

$$NP = 95\%$$

Based on the calculation of the feasibility percentage, it shows that the results of the material expert's assessment obtained 95%. Then, these results are interpreted to see whether it is feasible based on the interpretation of the due diligence criteria. Based on the table, it is analyzed that with a value of 95%, it can be concluded that the results of the due diligence by material experts obtained a score of "Very Eligible."

Table 5. Media Expert Assessment Results

No	Assessment Aspect	Rating Scale					Percentage
		Expert 1	Expert 2	Expert 3	Total Score	Score Max	
1	Suitability of media delivery strategy with student characteristics	6	7	7	20	21	95%
2	The accuracy of the media delivery strategy to enable ease and speed of understanding and mastery of material, concepts, or skills	6	7	7	20	21	95%
3	Likelihood level of facilitating scientific literacy skills	7	6	7	20	21	95%
4	The level of contextuality with application/application in real life according to the characteristics of students	7	6	7	20	21	95%
5	Accuracy of media selection compared to other media	6	6	7	19	21	90%
6	Clarity of design and suitability of language and communication styles with student characteristics	7	6	7	20	21	95%
7	The accuracy of the selection of media with the purpose and content of the material	6	7	7	20	21	95%
Total					139	147	94%

Based on Table 5, the feasibility of the material can be determined by using the feasibility percentage calculation as follows:

$$NP = \frac{n}{N} \times 100\%$$

$$NP = \frac{139}{147} \times 100\%$$

$$NP = 94\%$$

Based on the calculation of the feasibility percentage, it shows that the media expert's assessment results obtained 94%. Then, these results are interpreted to see whether it is feasible or not feasible based on the interpretation of the due diligence criteria. Based on the table, it is analyzed that with a value of 94%, it can be concluded that the results of the due diligence by material experts obtained a score of "Very Eligible."

The limited trial was conducted on 20 students of one of the Islamic senior high school in Indonesia by providing student respondent sheets referring to the Technological Acceptance Model (TAM) evaluation. The following is the result of the student respondent data analysis presented in Table 6.

Table 6. User Rating Results

No	Assessment Aspect	Assessment Score		
		Total Score	Score max	Percentage
	Perceived usefulness			
1	Using Phy-pockemon will improve my learning and performance in this energy source material physics course	136	140	97%
2	Using Phy-pockemon during class will address my understanding of concepts	131	140	93%
3	I believe that Phy-pokemon is useful when one is studying	134	140	95%
4	My motivation will increase by using Phy-pockemon	131	140	93%
	Perceived ease of use			
5	I think Phy-pockemon is easy to use	140	140	100%
6	Learning how to use Phy-pockemon is not a problem for me	135	140	96%
7	Learning how to use Phy-pockemon is clear and understandable 130 140 92%	130	140	92%
	Perceived enjoyment			
8	Using Phy-pockemon is fun	129	140	92%
9	I had fun using Phy-pockemon	119	140	85%
10	I think Phy-pockemon allows us to learn while playing	124	140	88%
	Attitude towards use			
11	Using Phy-Pockemon makes learning more interesting	137	140	97%

No	Assessment Aspect	Assessment Score		
		Total Score	Score max	Percentage
12	I don't feel bored using Phy-pockemon	124	140	88%
13	I think it's a good idea to use Phy-pockemon in class	132	140	94%
	Intention to use			
14	I would like to use Phy-pockemon in the future if I have the chance	125	140	89%
15	I want to use Phy-pockemon to study energy, as well as other subjects	132	140	94%
	Total	1959	2100	93%

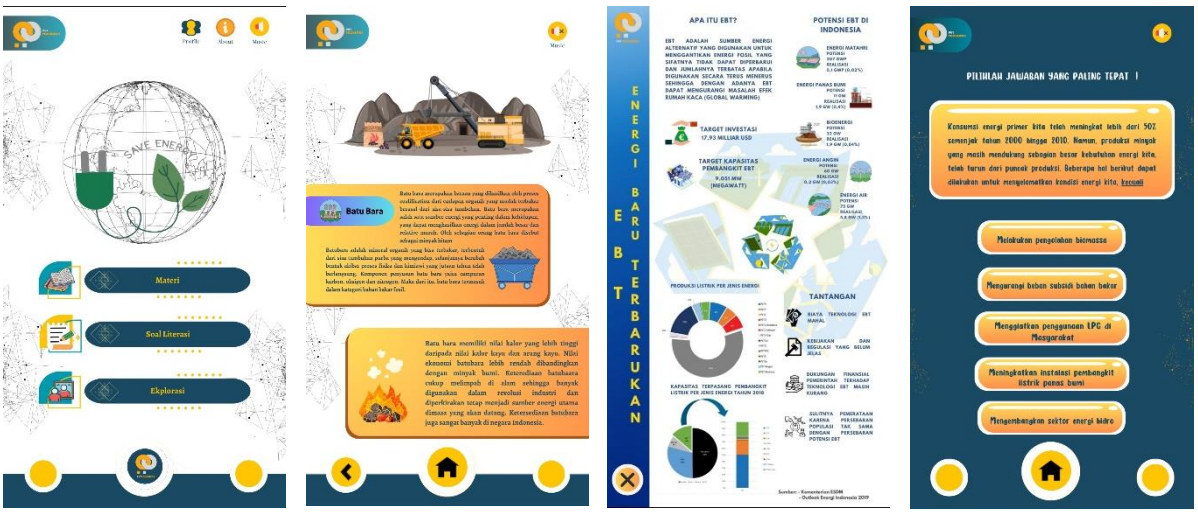
Based on Table 6, it can be determined the feasibility of the Phy-pockemon application to address scientific literacy skills in energy source concepts using the following feasibility percentage calculation:

$$NP = \frac{n}{N} \times 100\%$$

$$NP = \frac{1959}{2100} \times 100\%$$

$$NP = 93\%$$

Based on the calculation of the feasibility percentage, it shows that the results of student respondent sheets obtained 93%. Then, these results are interpreted to see whether it is feasible based on the interpretation of the due diligence criteria. Based on the table, it was analyzed that with a value of 93%, it can be concluded that the results of the limited test by students obtained a score of "Very Eligible." As stated by (Damayanti et.al, 2018), pocketbook mobile learning media is an exciting learning media with a concise and practical presentation of material to be read at any time and taken anywhere. Here are some views of the Phy-pockemon application that was developed in Figure 1.



(a) (b) (c) (d)

Figure 1. (a) main menu, (b) materials, (c) posters, (d) questions

CONCLUSION

Based on the research that has been carried out, it can be concluded that the characteristics of the Physics pocket book mobile on Android (Phy-pockemon) learning media to address scientific literacy on energy source concepts are as physics learning media in energy source material, packaged in the form of the Phy-Pockemon application which can be accessed offline and has 3 main menus of material, literacy and exploration questions.

Then, the results of the due diligence by material experts on the developed Phy-pockemon learning media obtained a percentage value of 95% with the very feasible category, and the results of the due diligence by media experts on the developed Phy-pockemon learning media obtained a percentage value of 94% with the very feasible category. Thus, the Phy-pockemon learning media is declared very feasible to address scientific literacy on energy source concepts.

Furthermore, the results of the students' limited test responses to the Phy-pockemon learning media on energy sources obtained a score percentage of 93% in the very feasible category. Thus, the Phy-pockemon learning media is declared very feasible to use as a learning medium to address scientific literacy on energy source concepts.

SUGGESTIONS

Based on the results of the development of Physics pocket book mobile on Android (Phy-pockemon) to address science literacy on energy source concepts, the suggestions put forward by the developer include the need for further research on Phy-pockemon on energy source concepts, so as to enrich the feasibility test results in order to determine the effectiveness of Phy-pockemon media in facilitating scientific literacy skills. Furthermore, the Phy-pockemon media on energy source concepts needs to be developed continuously in terms of material renewal, so that the energy source concepts contained is always up to date and produces better media. Finally, there needs to be further development regarding Phy-pockemon media on energy source concepts so that it can be accessed not only on Android but also on IOS.

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