

Development of Science E-modules on Solar System Materials Based on Android for Junior High School Students

Khaerani¹, Usman M², Nurmayanti³

^{1,2,3}Education Technology, Universitas Muhammadiyah Sidenreng Rappang,
Sidenreng Rappang, Indonesia

E-mail: ¹khaeranisudirman42801@gmail.com*, ²stkipusman@gmail.com, ³antiimaya57@gmail.com

*Corresponding Author

ABSTRACT

Solar System e-modules are electronic teaching materials that are packaged interactively to foster student motivation and enthusiasm for learning. This study aims to determine the validity and practicality of e-modules as science teaching materials for grade VII SMPN 1 Watang Pulu. The research method used is Research and Development (R&D) with the 4D research model; Define, Design, Develop, and Disseminate. Data analysis in this study is quantitative data analysis in the form of questionnaires for material and media validators and for teacher and student responses. The results showed that the use of the Solar System e-module was classified as very valid to use with an overall percentage of 89.1%. The acquisition in the field test showed that the e-module met the criteria of being very practical with a percentage value of 90.8%. This states that the Solar System e-module is declared valid and practical for use in learning.

Keywords: *Development, E-modul, Smart Apps Creator, Android, Solar System*

INTRODUCTION

A new development in the learning process is necessary to raise the caliber of education. Seeing the current condition of education that the creation and development of new works in the field of technology continue to run, there should be no more obstacles not to create and innovate. A learning innovation can be pursued by applying strategies, methods, and cutting-edge teaching tools to enable a more productive teaching and learning process (Firmadani, 2020).

Teaching materials are a set of teacher and student auxiliary materials to learn teaching materials are distinguished based on their form and how they work. Depending on the format of printed instructional materials, listening resources, and listening materials, teaching materials based on how they work are audio, video, and other teaching materials (Nurafni et al., 2019) in (Mukhlis et al., 2020). Currently, teaching materials are not only conventional but can be digital-based, easily accessed for learning (Komariah et al., 2022). The choice of appropriate teaching materials and maximal media usage is one of the crucial elements required to enhance the high standard of learning for students (Wiyono et al., 2021).

With the sudden emergence of the covid-19 epidemic, educational institutions must incorporate virtual education. The impact is that students' learning styles have changed to all online because they have to adapt to the distance learning system in the covid-19 situation. This condition is carried over to the present, where students tend to be tied to using smartphones in their daily activities, including in the learning process. Changes in students

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learning styles, in this case, the tendency of students to use smartphones, present being challenged to educators in carrying out instruction. So this makes teachers innovate more by making Android-based media (Khasanah et al., 2020). For educators to facilitate the learning process, there must be access to flexible and innovative technology (Ahmed et al., 2020). One form of solution is to present learning media that is easily accessible (practical) and creative (entertainment content themed on learning concepts) by students with Android-based media (Sari, 2019).

Learning media is a crucial component of the educational process and is used extensively in information and communication technologies (Yunus & Fransisca, 2020). Students can respond more readily to learning media when properly processed (Hasiru et al., 2021). Android-based media is one of the teaching tools that can keep up with the growth of information technology (Faqih, 2021). Due to students' propensity to use smartphones for a variety of daily activities, teachers need to provide access to Android-based media utilizing smartphones so that students can learn flexibly. Seeing these conditions, the process of distributing content in the context of e-modules to enhance student learning is demonstrated.

Electronic modules (e-modules) are electronic versions of learning tools designed using software according to student needs (Alpiani et al., 2022). E-modules are interactive and serve as online educational resources to aid in learning (Pramana et al., 2020). On a smartphone, it is simple to access the Solar System e-module. Regarding the research findings (Astalini et al., 2019) learner can easily learn about the topic when using e-modules compared to printed modules. The making of e-modules is expected to be a student handbook that provides easy access to material and a flexible learning process (Dewi & Lestari, 2020).

Smartphones are electronic devices that facilitate human communication (Isma et al., 2022). According to (Mahuda et al., 2021) smartphones are a modern learning medium that uses mobile devices that can offer the ability to innovate in various activities in their use. Learning using smartphones is a practical choice of learning tools because students are more inclined to use them. This can foster independent and practical learning for students (Usman et al., 2021). The effective smartphone usage in the classroom affects students' performance in learning (Syifa, 2020).

Learning is a process that aims to achieve learning outcomes as much as possible (Winata, 2021). One of the breakthroughs in supporting learning is innovative aids. Such as e-modules can be packaged using the Smart Apps Creator (SAC) application, which has many exciting features that support the development of interactive teaching materials (Pebriani et al., 2022). SAC is software with output that can be used on laptops, smartphones, and tablets (Amalia, 2023). SAC is also supported by facilities that can load sound, images, videos, and even moving animations. E-modules using SAC can be accessed offline so that it does not cost much (Ilman Abi & Sujatmiko, 2022). Using e-modules packaged using SAC can foster student motivation and enthusiasm for learning because it is (Nurmayanti et al., 2021). Accordingly, using Android-based media within the learning process, particularly SAC, can boost students' engagement in learning (Suryaningtyas et al., 2020). The e-module developed with SAC is an application with economic value reflected in ease of use, so that it can be used indefinitely in terms of function and flexibility (Khasanah & Rusman, 2021).

The appearance of learning media created using SAC is similar to an entertainment application so that students no longer believe that science subjects are complicated, but rather become fun because it is based on mobile learning to learn and play (Rachmat Rizaldi et al., 2022). Students are expected to be able to use an Android-based e-module because of the simplicity of the SAC's criteria (Syahputra & Prisma, 2021).

METHODS

This research uses nd development (R&D) to developo develop The R&D model to be used is 4-D (Define, Design, Develop, Disseminate). It is predicted that this research will lead to the development of a straightforward, dependable, and practical android-based e-module for students to students to use as a t.

The subjects of this study were material expert validators and media experts, as well as 23 students of class VII A and the seventh-grade science teacher. The research was conducted at SMPN 1 Watang Pulu, located on Jl. Andi Pakkanna No.5 Uluale Village, Watang Pulu District, Sidrap Regency. Distribution of validation tools in the form of questionnaires to media expert validators and material experts is the method used to collect data and respondents consisting of seventh-grade science teachers and seventh-grade students A. Quantitative data analysis has been used Quantitative data analysis has been used to examine the validity and applicability of android-based e-modules.

To calculate the percentage of validity and practicality of e-modules, the following formula is used:

$$P = \frac{\sum x}{\sum x1} \times 100\%$$

Description: $\sum x$: Value of all respondents' answers, $\sum x1$: Value of all maximum answers (Sugiyono, 2015).

When the percentage score ranges from 85.01% to 100.00%, results of the validity of e-modules will be deemed to be very valid or suitable for usage without further review; 50% to 70% have lower validity or can be used but require significant adjustments; 01.00%-50.00% is invalid or should not be used, whereas 70.01%-85.00% indicates that it is still valid but could use some small modifications (Akbar, 2013).

The percentage score is 85.01%-100.00%, indicating extremely practical outcomes; 70.01%-85.00%, somewhat practical results; 50.01%-70.00%, less practical results; and 01.00%-50.00%, not practical results. (Akbar, 2013).

RESULT AND DISCUSSION

A. Define Stage

The defining stage is carried out by identifying problems and needs, so researchers found that: (1) the use of learning media that is less varied and constrained by the lack of school facilities that support learning results in students tending to be passive in the process of instructing and learning, (2) there is a change in students' learning styles after the covid-19 pandemic, namely students prefer to use digital devices, especially smartphones, (3) teachers need learning media that can compensate for students' tendency to smartphone activities as a solution due to reduced student enthusiasm for learning.

Researchers found the necessity to deliver learning media packed into e-modules as autonomous learning tools for students, notably at SMPN 1 Watang Pulu, after identifying issues through observations of teachers and students.

B. Design Stage

Creating the material is the initial step required during the design phase. The material analysis refers to the SMP / MTs grade VII semester 2 Natural Science student book published by the Center for Curriculum and Bookkeeping, Balitbang, Ministry of Education and Culture in

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2017. Next, compile a storyboard as an initial design and flowchart following the stages of the product to be developed using simple symbols into a product. The following is the Solar System e-module storyboard:

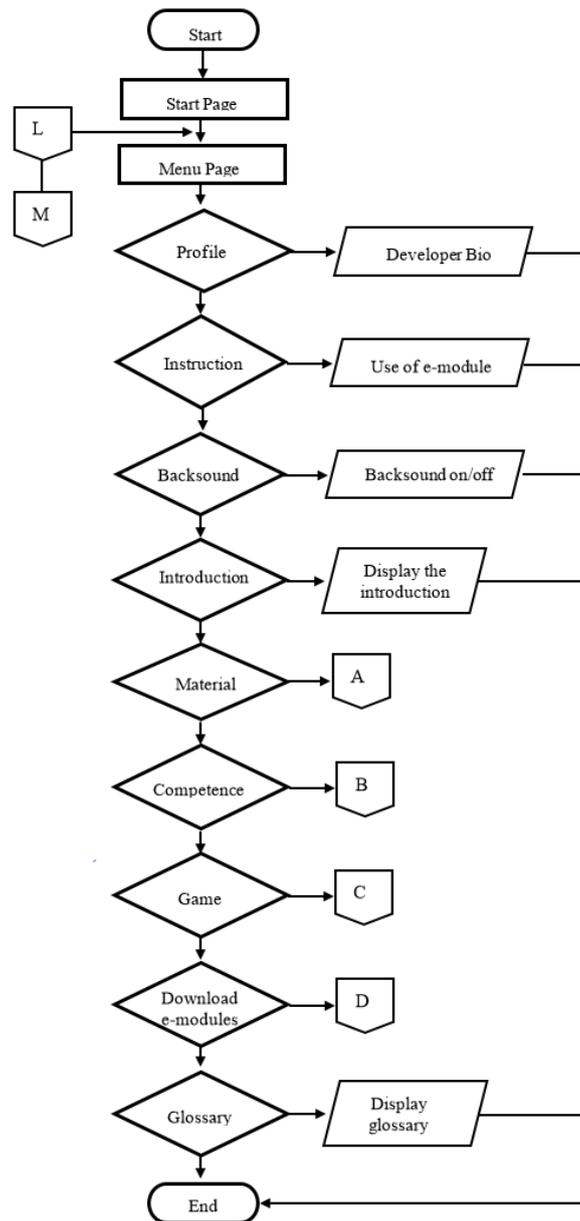


Figure 1. Main Flowchart of Solar System E-module

Below is the storyboard for the e-module:

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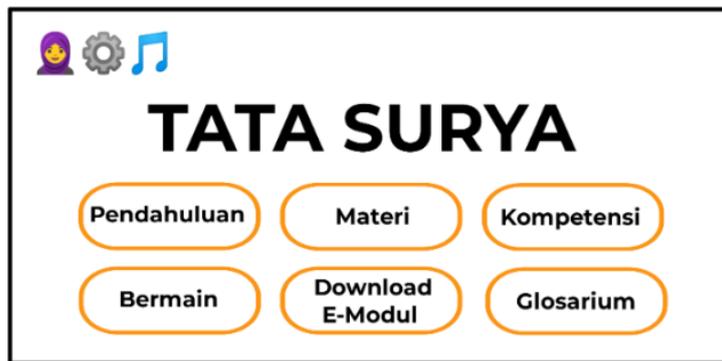


Figure 2. E-module Storyboard Main Menu Section

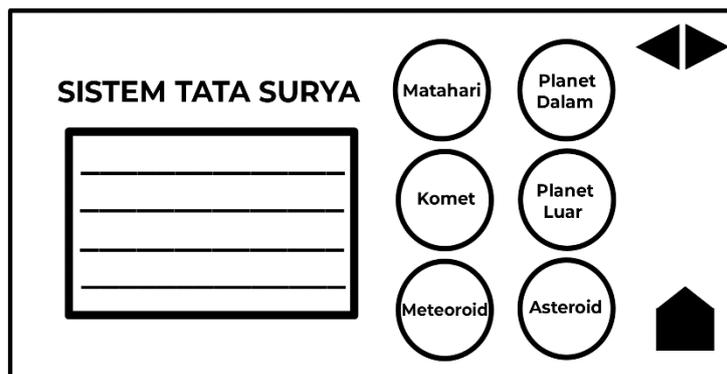


Figure 3. Storyboard of E-module Material Section



Figure 4. Storyboard of E-module Material Section

C. Development Stage

The e-module design that has been designed is then realized at the development stage into a product with the name "Solar System E-module". The developed e-module has the following appearance:

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Figure 4. Solar System E-module Start Display



Figure 5. E-Module Main Menu Display



Figure 6: Material Display of Solar System Section

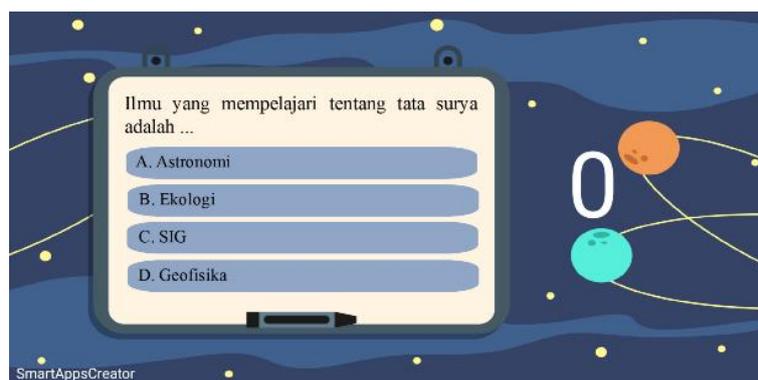


Figure 7: Display of Solar System E-Module Questions

The validity of the Solar System e-module development outcomes is then examined by material and media validators to ascertain the developed e-module's viability and make any adjustments. A Likert scale assessment questionnaire provided the quantitative data for this validity test. To create high-quality media, this procedure of validation and modification is used. The learning module's validity test yielded the following results:

Table 1. E-module Material Validation Results

No	Criteria	Percentage Score	Description
1	E-module Material/Content	87,5%	Highly Valid
2	E-module Language	100%	Highly Valid
	Overall Analysis	83,7%	Highly Valid

The E-module Material/Content criteria received a percentage score of 87.5%, while the E-module Language criteria received a percentage score of 100%, giving the overall analysis result of 83.7%, which was deemed to be in the "very valid" category.

Table 2. E-module Media Validation Results

No	Criteria	Percentage Score	Description
1	Utility and Functionality	93%	Highly Valid
2	Quality	96%	Highly Valid
	Overall Analysis	94,5%	Highly Valid

In this table, it can be seen that the criteria for the Utility and Functionality of e-modules obtained a percentage score of 93%, and the Quality of e-modules 96% obtained a percentage score of 100%, so the overall analysis result is 94.5% and is stated in the "very valid" category.

Percentage of Total Score of Each Validator

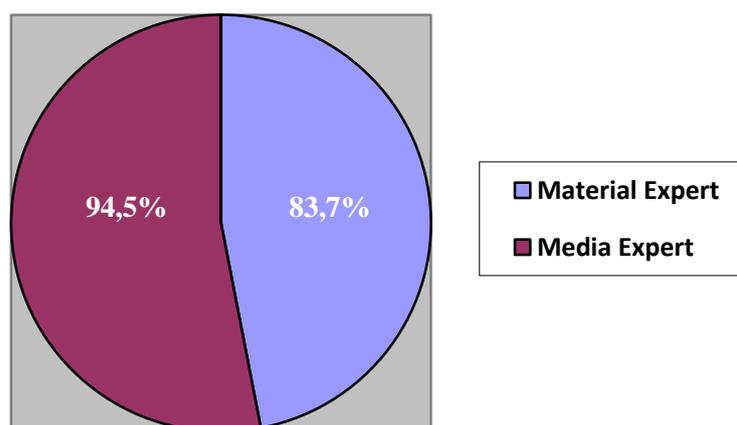


Figure 8: Percentage of the total score for each validator

Tables 1 and 2 show that the media portion of the total score is 94.5%, falling into the "very valid" category, whereas 83.7% of the material was validated, making the e-module usable in scientific classes on Solar System material after multiple adjustments, namely adjusting the order of material on the media, conditioning the back sound with video material, and updating the assessment menu to include job instructions.

The results of the e-module development, which were declared feasible, were then tested in small groups. The trial was conducted by the science teacher, who then continued the trial to 23 class VII IPA A SMPN 1 Watang Pulu students. Product trials are being conducted to evaluate the viability of e-modules from a practical standpoint.

The stages carried out are by distributing questionnaires containing instruments to science teachers and seventh-grade students with questionnaire criteria consisting of learning design, operational, and visual communication, each of which consists of several items. The findings of the teacher's questionnaire assessment are listed below.

Table 3. Results of the Teacher Response Questionnaire

No	Criteria	Percentage Score	Description
1	Learning Design	93%	Highly Practical
2	Operational	93%	Highly Practical
3	Visual Communication	95%	Highly Practical
	Overall Analysis	93,6%	Highly Practical

It is evident from Table 3 that the Learning Design criteria obtained a percentage score of 93%, E-module Operations obtained a percentage score of 93%, and visual communication obtained a percentage score of 95%. So that the results of the overall analysis assessment of 93.6% are included in the "very practical" category.

Additionally, 23 students in class VII A received questionnaires with instruments to see how they felt about the Solar System e-module. The evaluation of the student survey findings, which are shown in the form of a diagram, are as follows:

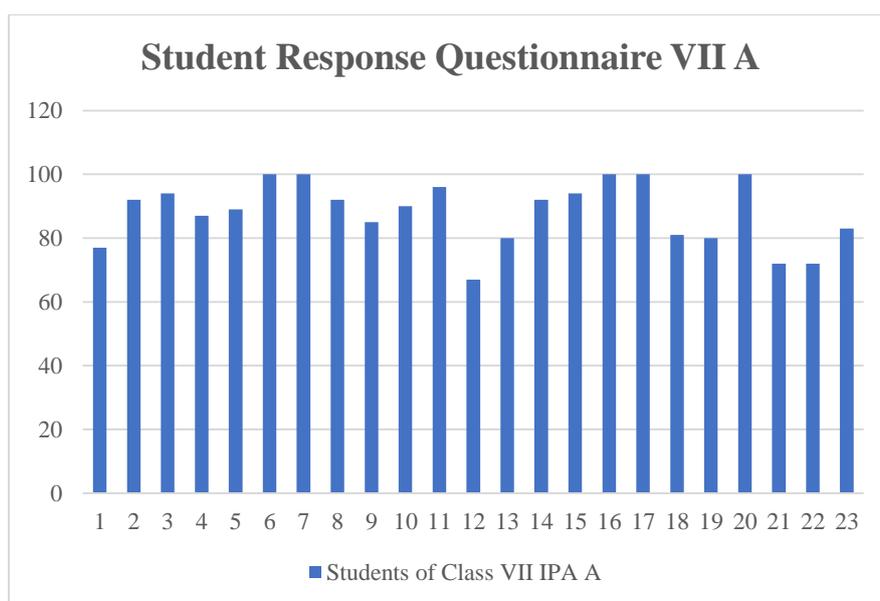


Figure 9. Student Response Questionnaire VII A

Figure 9 is the percentage score of the acquisition of student response questionnaires in class VII A using the Solar System e-module obtained from each student. The typical percentage of student survey results is 88% and belongs to the beneficial category. The

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outcomes of purchasing the Solar System e-module's utility value when the outputs from the student response assessments and the teacher response assessment findings are combined, the average percentage is 90.8%. This falls under the "very practical" classification and can be applied to education.

D. Disseminate Stage

After the science learning e-module had been revised and received a good assessment, the VII IPA instructor and VII A students of SMPN 1 Watang Pulu received it from the researchers.

CONCLUSION

Utilizing Smart Apps Creator, an android-based e-module is being developed is carried out in 4 stages, namely, (1) Defining, carried out by analyzing needs and problems, (2) Designing, designing by formulating material and making designs in the form of flowcharts and storyboards, (3) Development, the process of checking the product's suitability for usage based on validators' and respondents' evaluations, (4) Dissemination, distributed e-modules for being used during the instructional procedure.

This study's Solar System E-module is appropriate for use. Based on the validity and practicality study findings, this is believed to be true. The validity analysis's results that has been assessed by material and media expert validators obtained a score of 94.5% with the criteria "very valid". However, the outcomes of practicality analysis that has been assessed by the science teacher and students of class VII A obtained a score of 90.8% with the criteria "very practical". It is concluded that the e-module received an excellent assessment to be used in learning.

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