CHEMISTRY SMART
ISSN 2830-6198
https://journals.ki-pi.org/index.php/kim-smart/index

ARTICLE

Development of Android-Based Differentiated Learning Media on Phase E Atomic Structure Material

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ABSTRACT

The research entitled "Development of Android-based differentiated learning media on phase E atomic structure material", has been carried out using the type of research Research and Development (R&D) and plomp model. The use of Android technology in learning allows students to study with high flexibility and provides simulations and effective learning activities to understand complex concepts such as atomic structure. With personalization features, Android can be tailored to students' learning styles and helps teachers track individual progress, making learning more effective. The aim of this research is to develop a differentiated Android-based learning medium that is well-tested for use. Android-based differentiated learning media on the material of the atomic structure is tested for validation by expert validators (material and material) as well as teachers and pupils SMAN 1 Luhak Nan Duo. The instruments in this research are validation tests by experts validator (materials and media) and practicality tests by teachers & pupils. The results of the data analysis showed that the validity of the material was 0.96 and the media validity was 0.91 with the valid category, whereas for the practicality of the teacher was 94% and the student was 93% with the very practical category. Based on the data obtained, it can be concluded that Android-based learning media differentiates on material valid atomic structure and is very practical to use.

ARTICLE HISTORY

Submission: August 22, 2024

Receveid:October01, 2024

Accepted: October 10, 2024

Citation:
Aksa. Sella Wati and Zainul. Rahadian, "Development of Android-Based Differentiated Learning Media on Phase E Atomic Structure Material", *Chemistry SMART*, vol,no.2.pp.129-136

Keywords: Android; Atomic Stucture; Development; Learning Media; Learning Styles.

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1. Introduction

Life is always undergoing a dynamic and sustainable development, every development is aimed at achieving better progress. Developments include education that is an important component in the progress of a country[1]. Rapid developments in technology, in the field of information and communication technology, have resulted in significant changes in various sectors[2]. In the field of education, technological evolution can be exploited to advance distance learning that focuses primarily on the needs of students[3], and close interaction between students[4]. Increasingly advanced technology requires educators to be able to sharpen skills in the use of technology and learning media.

Integrating media into the learning process is an important step in creating a more meaningful and quality learning experience[5]. Therefore, it is important to use learning media to support the learning process and increase the motivation and desire of students to learn through illustration of actual situations[6]. The material can be easily understood by using a learning medium that simplifies the complexity of the material to the student[7]. The more interactive and engaging the media the teacher develops, the higher the learning outcomes and motivation of the students. The selection of learning media should be properly determined in order to facilitate the achievement of learning goals, for example android.

Android is defined as the art of using portable electronic platforms[8] or devices in enhancing the learning experience now and everywhere[9]. A learning approach that utilizes android technology is considered superior in learning because it can improve the motivation of pupils [10]. Not all students will fully understand the lessons taught by the teacher in class, so alternative approaches and strategies are needed to guide students through modules and online media provided in Android-based learning[11]. Android devices also help students share ideas, collaborate with friends through learning platforms[12]. Moreover, in the context of education, android offers a high degree of flexibility and accessibility[13], because students can access learning materials whenever they want and wherever they are [14]. In addition, with the application of android technology, teachers have the ability to monitor the learning process in person and apply learning in a differentiated way[15].

Differential learning is a method designed to meet the different needs, interests, and learning styles of students[16]. In practice, teachers can change methods, material, and assessments according to individual differences in the classroom[17]. This includes learning styles, each student can receive the learning that best suits their own style in increasing their engagement and understanding[18]. Differentiated learning by applying a learning style can create a more inclusive and effective learning environment for all students. Applying a learning style will greatly help students in processing learning and responding to academic tasks[19]. Learning and communicating can be done in three ways. The first is a visual learning style, which requires understanding through seeing things, using images, colors and so on[20]. The second is an auditorium learning style that requires comprehension through listening senses, such as methods of oral material, dialogue, discussion and lectures[21]. And the third is kinesthetic learning, which demands direct involvement and physical activity to understand the material optimally[22]. It will be useful in the learning process especially learning Chemistry.

Chemistry as a part of natural science that studies the properties of materials, structures, laws, changes of matter, principles that describe observed changes, as well as concepts and related theories [23]. Chemistry, as a science, contains elements, values, which can be applied contextually [24] and real in everyday life[25]. This is because learning chemistry basically understands on symbolic and abstract concepts [26], for example matter of atomic structure. Atomic structure materials study chemicals used on a daily basis, understand structures, periodic tables, atomic elements, and filling periodic table [27]. A good understanding of the structure of atoms enables students to understand various important concepts in chemists, such as the properties of elements, chemical bonds, Chemical reactions, and much more[28]. No student has ever witnessed atoms before, so it is clear that the idea of atoms, protons, electrons, and ions is an abstract concept that is quite difficult for them to understand[29].

Based on the results of observations with phase E pupils in some high schools in the Western district of Pasaman (SMAN 1 Luhak Nan Duo and SMAN 2 Pasaman) found: 45% of students said they understood, the media / materials used by students 86% still use teaching modules (textbooks), using power point 10%, and 4% more manuals on the board. Then each student's learning style was 60% visual, 20% audio and another 20% kinesthetic. Based on the results of interviews with teachers at both schools, it has been allowed to use android in teaching, but it has not been used effectively.

Based on the above explanation, the researchers are interested in conducting a study entitled "Development of Android-based differentiated learning media on phase E atomic structure material".

2. Experimental

This research utilizes a Research and Development (R&D) methodology. The development model employed is the Plomp model, which is widely used in creating and developing educational products such as teaching modules, learning media, and instructional approaches. The Plomp development model consists of three phases: Preliminary Research, Development or Prototyping Phase, and Assessment Phase[30]. The data analysis techniques in this research involve validity analysis and practicality analysis. In the validity questionnaire, validators evaluate the items (questionnaire). The evaluation results provided by expert validators for the items will be analyzed using Aiken's V formula. Meanwhile, the practicality of the differentiated Android-based learning application is assessed by collecting data from students and teachers on SMAN 1 Luhak Nan Duo, through questionnaires regarding the application's performance, user satisfaction, and other relevant factors. The practicality score is then measured using a practicality percentage formula.

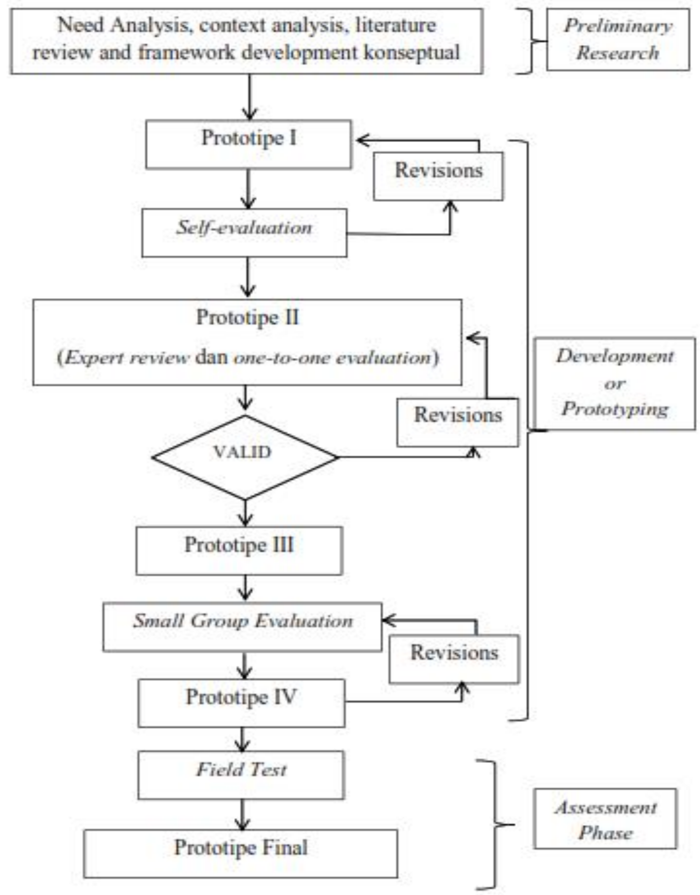

Figure 1. Plomp Stage

3. Results and discussion

3.1 Validity

The validity analysis of materials and media was carried out with five experts namely one FMIPA UNP chemistry lecturer and two SMAN 1 Luhak Nan Duo teachers as validators of materials experts, then two UNP FMIPA chemistries lecturers as media expert validators. The results of the evaluation given by the validator on the item of the question will be analyzed using the formula Aiken's v. The result of the data obtained with material validation and media validation of choice must get a big score of 0.8 to obtain a valid category. For material validation, it includes four components, namely, the content composite, the functional component, the presentation component and the graphics component. For media validation it includes three components: media efficiency, button function and presentation components. The validity results by material and media experts can be seen in the table 1 and 2:

 ISSN 2830-6198

a. The validity results by material can be seen in the table 1:

Table 1. Validity of Material

Aspects assessed	v	Category
Content	0.94	Valid
Language	0.95	Valid
Presentation	0.97	Valid
Graphics	0.98	Valid
v Average Validity of material	0.96	Valid

b. The validity results by media can be seen in the table 2:

Table 2. Validity of Media

Aspects assessed	v	Category
Media Efficiency	0.90	Valid
Button Function	0.90	Valid
Presentation Component	0.93	Valid
v Averages Validity of media	0.91	Valid

The content component gets a value of 0.94, the language component 0.95, the presentation component 0,97 and the graphical component 0.98, which is the four components on the material validation in the valid category. As for the media efficiency with the value 0.90, the fusion of buttons 0.90 and the presentation composition with the value 0.93, the validation category are valid. The average score from the material validation and media validation is 0.94, which is categorized as valid [31], meaning it has been assessed as appropriate and suitable for use in learning based on the validation questionnaire above.

3.2 Practicality

After the validity test, a practicality test is conducted to measure the practicality of the product. The product's practicality will be assessed based on questionnaires filled out by teachers and students of SMAN 1 Luhak Nan Duo, who have studied atomic structure in Phase E. The questionnaire consists of theree categories of options. The components in the questionnaire include ease of use, time efficiency, and benefits. The overall practicality results can be seen in the following table 3:

a. Practicality results of the teachears respon can be seen in the table 3:

Table 3. Assessment Results from Teachers

Aspects assessed	%	Category
Ease of Use	90%	Very Practical
Time Efficiency	97%	Very Practical
Benefits	95%	Very Practical
Average Teacher’s Practicality	94%	Very Practical

b. Practicality results of the students respon can be seen in the table 4:

Table 4. Assessment Results from Students

Aspects assessed	%	Category
Ease of Use	92%	Very Practical
Time Efficiency	94%	Very Practical
Benefits	92%	Very Practical
Average Students Practicality	93%	Very Practical

The ease of use of this differentiated Android-based learning media received a score of 90% from teachers and 92% from students, indicating that the product is easy to use. For time efficiency, the product scored 97% from teachers and 94% from students. This is because the product can be used anytime and anywhere, making learning time more efficient. As for the benefits component, it scored 94% from teachers and 92% from students [32]. This high score is attributed to the product's features, which include instructional videos, quizzes, learning guides, and the ability for students to choose their preferred learning style, making it highly beneficial for students with different learning styles. The practicality scores from teachers and students at SMAN 1 Luhak Nan Duo are 94% and 93%, respectively, indicating that the differentiated Android-based learning media is practical to use.

4. Conclusion

The research conducted on the differentiated Android-based learning media for atomic structure material can be concluded to be both valid and practical. The validity test results from material experts showed a score of 0.96, which is categorized as valid, while the media validity test by media experts resulted in a score of 0.93, also categorized as valid. The meaning it has been assessed as appropriate and suitable for use in learning based on the material validation and media validation. And then, the practicality test results showed a score of 94% from teachers, categorized as very practical, and 93% from students, also categorized as very practical. The practicality test results indicate that the differentiated Android-based learning media for atomic structure material in Phase E is easy to use, efficient, and beneficial in the learning process.

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