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ARTICLE

Development of Android Application Module on Guided Inquiry On Chemical Bonding Topik For Class X SMA/MA

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ABSTRACT
Teaching materials are one of the supporting factors for achieving learning objectives. One of the teaching materials used is a module. With the development of technology, then developed an android application-based module that can be used by students and teachers that are valid and practical. This research is a development research conducted with the Plomp development model. The Plomp development model consists of three stages, namely the preliminary research stage, the development or prototyping stage, and the assessment stage. The research instrument used was a validity and practicality questionnaire. The research was conducted at SMAN 2 Lubuk Basung. The android application module was validated by material experts and media experts while the practicality test was carried out by 2 chemistry teachers and 13 students of class X SMAN 2 Lubuk Basung in a small group trial. The data from the validity and practicality test results were analyzed using the Aiken's V formula. The results showed that the developed android application module was categorized as valid (0.83 for the material and 0.89 for the media) and the results of the practicality test were very practical, each 90% for the test. teacher practicality, 90,3% for the small group test. Thus, it is concluded that the Guided inquiry-based android application module on the Chemical Bond material produced for SMA/MA students is valid and practical
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1. Introduction

Along with the rapid development of information technology in the 21st century, all aspects of life are also developing, one of which is in the field of education. Utilization of information technology in the process of implementing education consists of various forms [1]. In the 21st century, changes that occur are very important in learning activities that will be equally carried out by teachers and students. To develop 21st century learning, educators must be able to facilitate and inspire students' learning and creativity. including: (1) encouraging, supporting and modeling inventions and innovative creative thinking; (2) involving students in exploring real-world problems and solving authentic problems using digital tools and resources; (3) support student reflection with collaborative tools to demonstrate and clarify student understanding, thinking, conceptual design, and creative processes, and (4) enhance

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collaborative knowledge building by engaging in learning with students, colleagues, and others participating, either face-to-face. face-to-face activities - face-to-face or in a virtual environment[2].

All forms of technology use are felt to be able to improve the process of implementing education, which initially only lasted one way and was centered on the teacher to become a two-way education implementation so that students were more involved in the learning process. Many factors can support the realization of a quality learning process in an effort to achieve educational goals, one of which is the use or utilization of technology in the education and learning process [3].

Classroom learning can run well if the learning process also runs well. One of the learning components that have a major influence on the learning process is the learning media. The use of media in the learning process is one of the efforts to create more meaningful and quality learning [4]. With the changes contained in the 2013 curriculum, namely the integration of Information Technology (IT) into all subjects, IT no longer stands alone as a subject but acts as a means for all chemistry subjects.

The learning model that focuses on critical and analytical thinking processes in finding and answering problems directed at students (student centered approach) is the understanding of the guided inquiry learning model [5]. The guided inquiry learning model involves students in solving problems, thinking critically and being able to achieve understanding independently, with key questions that involve students being active in finding a concept and developing skills and emphasizing critical thinking in finding answers to a question and students as a subject of study in his discovery [6] Learning on chemical bonding material there are several, namely ionic bonds, covalent bonds, and metal bonds. Chemical bonding material in general has abstract characteristics, and requires understanding, so it is necessary to develop an inquiry-based module to make it easier for students to understand abstract material.

Based on the results of interviews with SMAN 2 Lubuk Basung teachers and filling out questionnaires by students of SMAN 2 Lubuk Basung, the results obtained (1) 78% of students still have difficulty understanding chemical bonding material at school, (2) teaching materials used by schools are worksheets : 46%, Printed books : 82%, Modules : 14%, Videos :18%, PPT : 57% (3) 58% of students feel they understand enough about the teaching materials used by teachers (4) limited time, tools and materials to carry out practicum. Based on observations made at SMAN 2 Lubuk Basung class X MIPA, 96% of students already have an Android-based Smartphone, and 4% are iOS-based. However, there is no learning media that utilizes smartphones, especially learning applications. Seeing this potential, the development of learning media by utilizing cell phones is to create an Android-based learning media that is intended for all Smartphones with the Android platform. Android which has unique characteristics, which can be used anywhere and anytime, supported by attractive visualizations, so that it can increase students' learning motivation. Based on the above background, the researcher is interested in carrying out a research entitled "Development of Guided Inquiry Based Android Application Module on Chemical Bonds for Class X SMA/MA".

2. ResearchMethodology

The type of research that will be conducted is research and development or Research and development (R&D). According to Sugiyono [7], Research and development is research that is used to produce certain products and test the effectiveness of these products. The subjects of this study were lecturers in the chemistry department of FMIPA UNP, lecturers in Engineering at UNP, high school chemistry teachers, and class X students of SMAN 2 Lubuk Basung. The object of this research is the Development of Guided Inquiry Based Android Application Module on Chemical Bonding Material for Class X SMA/MA. The development model used in this study is the Ploomp development model which consists of 3 stages, namely (1) preliminary research, (2) the prototype stage (prototyping stage), and (3) the assessment phase [8]. This research is limited to the stage of development or prototyping to practical

testing. In accordance with the development model used, the product development procedure is focused on two stages. These stages can be illustrated in table 1.

Table 1. Product Development Stage

Stage	Criteria	Activity Description
Preliminary research	Observation and interview activities, focus on the requirements and applications needed.	Problem analysis and literature study. The result of this stage is a connceptual framework based on the problems and constraints experienced by teachers and students.
Development or prototyping phase	Focus on product development and practical stage in small group trials (*small group*)	Development of a prototype that will be piloted and revised based on formative evaluation and Conduct practical stage to assess whether the product is practical

The instrument used in the research is a validation instrument in the form of a media expert validation questionnaire sheet and material expert validation for the assessment of ready-to-use android application modules. And the practical instrument in the form of a questionnaire presented in the form of a student response questionnaire and the teacher's response when assessing ease of use, time efficiency and the benefits of the android application module. Then the data obtained is used to see the level of validity of the android application module to be analyzed using the Aiken's V formula [9] and the practicality level using the percentage formula [10]. Data analysis techniques for each test are as follows:

1. Validity Analysis Techniques

On the validation sheet, the validator is given a statement and the validator will provide an assessment of the statement. The validator's assessment of each statement is analyzed using the Aiken's V formula. The formula proposed by Aiken is as follows:

$$V = \frac{\sum S}{[n(c-1)]}$$

Information:

V = Aiken's V Index

S = The score determined by the validator (r) minus the lowest score in the assessment category (l_0) or ($r - l_0$)

n = many raters (validators)

c = many categories in the assessment

Tabel 2.Aiken'V scale validity criteria

No	***Aiken's V Scale***	***Category***
1	$V \geq 0{,}80$	*Valid*

2	$V < 0{,}80$	*Not Valid*

2. Practical Analysis Techniques

The assessment of the practicality sheet was obtained from the provision of student response questionnaires which were analyzed using the following formula:

$$Practicality\ percentage = \frac{Total\ Value}{Maximum\ Value} \text{ x } 100\%$$

Table 3. Practicality assessment category

Achievement Level	Category
81 % - 100%	Very practical
61% - 80%	Practical
41% - 60%	Quite practical
21% - 40%	Less practical
0 – 20%	Impractical

Information:

p = final value

f = score

N = maximum score

3. Results and Discussion

This research has produced teaching materials in the form of an android application module based on Guided Inquiry on the material for Chemical Bonds for Class X SMA/MA. This research was developed by following the steps of the plomp development model which are described as follows.

3.1 Preliminary Research

In the preliminary research stage, four stages were carried out, namely needs analysis, context analysis, literature study and conceptual framework development. The results of each stage that have been carried out in the initial research are described as follows.

a. Needs Analysis

The needs analysis phase aims to identify the perceptions of teachers and students about the conditions in the field. At the needs analysis stage, interviews with 2 high school chemistry teachers in Lubuk Basung (SMAN 2 Lubuk Basung) and questionnaires were distributed to 120 students of SMAN 2 Lubuk Basung. At this stage the results obtained that the teaching materials used in the learning process on the Chemical Bond material are textbooks and power points. The results of the interview also show that the teaching materials used are not equipped with Android-based technology that can be used anytime and anywhere, and not all of the teaching materials used use learning models such as Guided Inquiry.

b. Context Analysis

The context analysis that has been carried out is an analysis of the curriculum and syllabus. Based on the curriculum analysis, it was found that the 2013 Revised 2018

Curriculum states that learning must be student-centered, think critically, and be active in finding concepts. This is realized through the application of a scientific approach in the learning process.

c. Literature study

The literature study aims to find references related to research activities related to the results of needs analysis and context analysis.

d. Concept analysis

Based on the concept analysis, it was found that the main concepts that must be mastered by students include: ionic bonds, ionic compounds, covalent bonds, single covalent bonds, double covalent bonds, triple covalent bonds, coordinating covalent bonds, polar covalent bonds, covalent bonds. non-polar and metallic bonds.

3.2 Prototyping stage

a. Prototype I

Prototype I is a prototype resulting from the design and realization of the initial research (pleminary research). The design of prototype I in the form of a guided inquiry-based android application module on chemical bonding materials was designed using Microsoft 2010, PowerPoint 2010, Canva and the resulting application using the Android studio application.

b. Prototype II

At this stage, a formative evaluation is carried out in the form of a self-evaluation of the prototype I that has been produced. Self-evaluation is done by using a checklist of the characteristics or specifications of the resulting product.

c. Prototype III

At this stage a formative evaluation is carried out in the form of a one-to-one evaluation (One-to-one evaluation) and an expert review (expert review) to obtain the validity value of the android application module developed against prototype II.

1) One-to-one evaluation

One to one formative evaluation was conducted on three students with different ability levels. Based on the results of the formative evaluation, it can be seen that the android application module that has been made is attractive with a blue color that makes students interested in using this android application module.

2) Expert review

At this stage, validation of the results of prototype II was carried out by 5 material expert validators and three media expert validators.

a) Material expert validation results

Table 4. Validity assessment results by material expert validators

No	Category	V Average	Category Validity
1	Eligibility content	0,84	Valid
2	Presentation/construction	0,85	Valid
3	Language	0,80	Valid

4	Graphics	0,81	Valid
	Average	0,83	Valid

Based on the table of material expert validation results on the android application module, the analysis with the Aiken's V application is valid with a valid validity category. Although the validity of the android application is very high, there are still some components that need to be improved.

b) Media expert validation results

Table 5. Validation results by media expert validator

No	Category	V Average	Category Validity
1	Linguistic eligibility	0,88	Valid
2	presentation	0,91	Valid
3	Application effect on learning strategy	0,87	Valid
4	Overall view eligibility	0,89	Valid
	Average	0,89	Valid

Based on the table of media expert validation results on the android application module, the analysis with the Aiken's V application is valid with a valid validity category. Although the validity of the android application is very high, there are still some components that need to be improved.

d. Prototype IV

At this stage, a formative evaluation is carried out in the form of a small group evaluation of the prototype III that has been produced. The small group test and teacher response aims to see the practicality of the android application module that has been produced in prototype III. The results of the small group test practicum and the teacher response android application on all components are presented in Table 6 below

Tabel 6.Practicality test

Practicality Data	Practicilatity Precentag	Categories of Practicality
Teacher	90 %	Very Practical
Student	90,3 %	Very Practical

Based on the analysis of the practicality table of the small group test and the teacher's response to the android application module of all components in prototype III, it was found that prototype III had a practicality percentage that was categorized as very practical. So that the guided inquiry-based android application module on chemical bonding material for class X SMA/MA can be used in the learning process.

4. Conclusion

Based on the research that has been done, it can be concluded that the guided inquiry-based android application module on chemical bonding material for class X SMA/MA has been produced with a valid and practical ploom development model. The resulting android application module has a very high level of validity and practicality.

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