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Development of Android-Based Mobile Learning "Nanya Mia" for Learning Chemical Nomenclature at SMAN 1 Gondang

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Abstract: Many learning innovations have emerged to adapt to changing times and learning needs. One of them is mobile learning, supported by the widespread use of smartphones among students. This study aims to develop an Android-based learning media focused on the nomenclature of chemical compounds for class X to help students understand the material. The research uses the R&D (Research and Development) method, which develops new products, applying the ADDIE model consisting of five stages: Analysis, Design, Development, Implementation, and Evaluation. Data were collected through qualitative observations and quantitative product feasibility questionnaires. Test subjects included one material expert, one media expert, and 35 students divided into small and large groups. The results showed positive outcomes based on questionnaire data: (1) material expert trials obtained 100% with "very valid" criteria, (2) media expert trials also gained 100% with "very valid" criteria, (3) small group trials reached 90.4% with "very feasible" criteria, and (4) large group trials achieved 89% with "very feasible" criteria.

INTRODUCTION

Technology was created to facilitate human work and continues to evolve. In education, the development of information technology has a significant positive impact, such as the use of applications for communication between educators and students (Aspi & Syahrani, 2022). Learning continues to experience innovation to the demands of learn- ing and the times. One of the innovations that emerged as a result of technological developments is the use of mobile learning. With the increase in the internet and the use of smartphones in Indonesian society, an integrated mobile learning system called integrated mobile learning system was created. Mobile learning is important in to- day's learning era because it provides benefits and advantages, such as increased understanding of the material and flexibility of learning without the limitations of space and time (Surahman, 2019).

The application of this technology in the field of education can facilitate the learning

process for students, students, and advanced scientists. The choice of An- droid as the basis of the application is based on the growing number of users from various circles.

Chemistry in class X is one of the science subjects that is still new to students. They only know chemistry thor- oughly when they enter high school. However, many students face difficulties in understanding chemistry learning, so chemistry is considered a difficult subject and less desirable by high school students (Kartini & Setiawan, 2019). Based on the recap of grades at SMAN 1 Gondang, chemistry subjects are ranked 3rd lowest among all class X subjects. After making observations at SMA Negeri 1 Gondang, especially class X, it is known that all students use mobile phones with the Android operating system. Based on the results of initial observations with teachers of Chemistry subjects, it is known that in even semesters there is basic material on the nomenclature of chemical compounds. This material is an important basic competency in chemistry learning and is related to the next level of education. Therefore, it is necessary to develop *Mobile Learning* Media for Android-based Chemical Compound Nomenclature *that must be* applied at SMAN 1 Gondang to facilitate the learning process of students.

A. Learning Media

1) Understanding Learning Media

Learning media are all things that are used by information providers, namely educators to recipients of infor- mation, namely students to foster student learning motivation in following the learning process effectively.

2) Learning Media Criteria

The following are general criteria in choosing learning media, namely a) according to objectives, b) according to theory, c) according to student characteristics, d) according to student learning styles and adapting to environ- mental conditions, facilities, support, and time (Spiritual, 2019).

3) Learning Media Indicators

The following are indicators according to Rivai Sitti (2021) there are 5 indicators, namely: a) relevance or suitability, b) teacherability, c) ease of use, d) availability, and e) student benefit.

Then according to BSNP Krismasari (2016) suggests that good learning media can be seen from several aspects, namely:

a. Aspects of the feasibility of the content/material include a) accuracy of the material, b) increasing curiosity, c) updating the material, and d)conformity of the material with basic competencies.

b. Aspects of graphic feasibility include *a)* the learning media, b) the measurement of learning media, and c) the design of learning media

B. Mobile Learning

1) Understanding Mobile learning

Mobile learning is a learning process that utilizes tools as a source of information to achieve effective learning for students (Junita, 2019).

2) Mobile Learning Classification

Mobile learning has general classifications based on several indicators as follows (Darmawan, 2016):

a. The type of wireless communication utilized in accessing learning materials.

b. Types of *mobile* devices in the form of *smartphones, notebooks,* Personal *Computers*, and *Personal Digital Assistants*

c. Availability of internet access between users and *m-learning* systems

d. Support for synchronous and asynchronous education

e. Support for *e-learning* standards

f. Have access to learning materials and administrative services

3) Benefits of Mobile Learning

Mobile learning has various benefits, along with exposure to these benefits such as a) a device to find infor- mation, b) alternative learning, and c) a learning aid (Junita, 2019).

C. Android

1) Understanding Android

Android is an open-source operating system that anyone can develop, which is what makes the development of Android applications faster and grow (Robani et al., 2021).

2) Characteristics of Android

Android has four characteristics, namely a) an application that is done produces the same results, b) the devel- opment of applications can be done easily and in a narrow period, c) open, and d) solve problems in applications (Rasjid, 2018).

3) Android Development

According to (Gunawan & Ritonga, 2020) states that android development is described in Table 1 as follows:

Table 1. Verses Of Android

No.	Verses	Release Date
1	1.0 Apple Pie	September 23, 2008
2	1.1 Banana Bread	February 2009
3	1.5 Cupcake	April 27, 2009
4	1.6 Donut	September 5, 2009
5	Lightning	October 26, 2009
6	2.3-2.2.3 Froyo	May 20, 2010
7	Gingerbread	December 6, 2010
8	Honeycomb	February 22, 2011
9	Ice Cream Sandwich	October 19, 2011
10	Jelly Bean	June 27, 2012
11	4.4 KitKat	September 3, 2013
12	5.0 Lollipop	June 25, 2014
13	6.0 Marshmallow	May 28, 2015
14	7.0 Nougat	August 2016
15	8.0 Oreo	August 2017

D. Chemical Compound Nomenclature Material (Nanya Mia)

1) Competency Achievement Indicators

a. Presenting chemical formulas and names of chemical compounds related to the source and/or solution of global issues

b. Write down complete equations of chemical reactions equivalent to those relating to everyday natural phe- nomena or global issues

2) Learning Materials include a) understanding the nomenclature of compounds, b) understanding chemical reaction equations, and c)

analyzing equalization of chemical reaction equations.

E. Andromo

1) Understanding Andromo

Andromo is the most popular Android app maker platform (Dinihari, Sari, & Nazelliana, 2022).

2) Components, in this menu there are 6 menus, namely; popular, layout, media, monetization, buttons, exten- sions, and firebase activities.

3) Style, on this menu there are 4 menus, namely; color, activity card display, application bar, and drawer man.

4) Settings, on this menu there is 1 menu, namely; The base is divided into 4 types, namely application name, application version name, application code version, and package name.

5) Services, on this menu there is 1 menu, namely; Services are divided into 3 types, namely Analytics, Fire- base Auth, and SatuSignal.

6) E-commerce, on this menu there is 1 menu, namely; Services are divided into 2 types, namely analytics, and Firebase Auth.

RESEARCH METHODS

A. Research Model

The research method used by researchers is a type of research and development called R&D (*Research and Development*). *Research & development* is a series of processes aimed at developing new products. The product developed in this study is a chemical compound nomenclature learning mobile application using the ADDIE de- velopment model.

The stages of ADDIE model development are shown in Figure 1 below

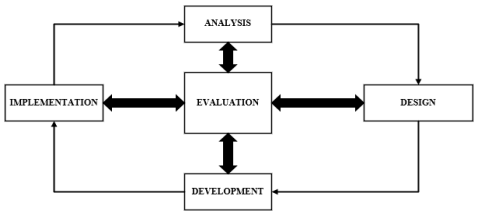

Figure 1. Addie Stages (Barokati & Annas, 2013).

B. Research Procedure

In this study, several procedures are adjusted to several stages in the ADDIE model in developing research prod- ucts. Several procedures consist of five stages of development, which are explained as follows:

1) Stages of Analysis

The initial stage in the ADDIE development model is to analyze product development needs. Researchers conduct observations and interviews with teachers to determine objects that are less attractive to students. The purpose of observation and interviews is to obtain a product overview that suits the needs of students and teachers.

2) Design Stages

The product display is designed simply and easy to use for users to operate it easily. A storyboard, which is a storyboard, is used to illustrate the visualization of an application under development.

3) Development Stages

In this research, the Andromo application was used to make the application according to the design on the storyboard. Once the product has been created and can be used by users, the next stage is validation. The initial stage involves testing by media experts and material experts. The media expert involved in this research is Nurna Listya Purnamasari, M.Pd, while the material expert involved is Tugas Enyke Yulianawati, S.Pd.

4) Implementation Stages

The stages of application are aimed at obtaining feedback on the developed product. The development of this application, application will be carried out on grade X students of SMA Negeri 1 Gondang. At this stage, students will provide feedback on the feasibility of the application as a learning medium through user response question- naires.

5) Evaluation Stages

The evaluation stage is used to correct product deficiencies to suit user needs, resulting in quality products that are worth using.

C. Product Trials

Here is a summary of the trials conducted by researchers:

1) Test Drive Design

Product trials will be conducted in three stages, namely individual trials, small group trials, and large group trials. The initial stage will involve individuals, such as material experts and media experts.

2) Test Subjects

The subjects involved in the trial of the chemical compound nomenclature mobile learning application con- sisted of individual tests conducted by (1) material experts were class X chemistry teachers of SMA Negeri 1 Gondang and (2) media experts were lecturers from Bhinneka PGRI University. The Small Group Trial involved 10 grade X learners as representatives of the study population. And the Large Group Trial was carried out in class X-1 of SMA Negeri 1 Gondang with a total of 35 students.

3) Data Type

In this study, there were three types of data collected, namely: a) Material Data: Material data was obtained through interviews with material experts, namely chemistry teachers at SMA Negeri 1 Gondang. b) Application Design Model Data: Application design model data is obtained from media experts, who are lecturers at Bhinneka PGRI Tulungagung University. c) Needs Conformity Data: Needs suitability data is obtained from ap- plication users, namely grade X students of SMA Negeri 1 Gondang.

4) Instrument and Data Collection Techniques

Data collection techniques used in this study include: a) Observation: observations were made on grade X stu- dents at SMA Negeri 1 Tulungagung to look for problems in learning activities. b) The interview is conducted by asking questions to the class subject teacher as a resource person. c) Documentation involves the analysis of data from documents that support the research. d) Questionnaires are used as a data collection technique by providing written questions to respondents.

5) Data Analysis Techniques

The results of the questionnaire data consisted of data from media experts, material experts, and class X students. Scoring criteria [14] media expert

questionnaires, material expert questionnaires, and students in this development research refer to Table 2.

Table 2. Scoring Criteria

Criterion	Valuation	Shoes
Excellent	VG	5
Good	G	4
Good enough	GE	3
Not Good	LG	2
Very Not Good	VLG	1

The following is for the formula used qualitative data analysis techniques based on sources from (Ernawati, 2017):

$$Results\ (\%) = \frac{Total\ score\ obtained}{Total\ Maximum\ score} \times 100\%$$

The percentage criteria Sari, Permata, dan Ningsih (2022) used in this study are shown in Table 3.

Table 3. Rating Scale Percentage Criteria

No	Score in Percent (%)	Qualification	Eligibility Criteria
1	0-25%	Invalid	Not Feasible
2	26-50%	Less than Valid	Less Feasible
3	51-75%	Valid	Fesible
4	76-100%	Very Valid	Very Feasible

RESULTS AND DISCUSSION

A. Data Presentation, Results of Problem, and Needs Analysis

1) Analysis

Problem identification data were obtained from observations and interviews at SMA Negeri 1 Gondang. The problems identified are the use of smartphones that are not optimal in supporting learning, as well as the learning process that still relies on conventional learning media.

B. Presentation of Data and Results of Product Development Analysis

1) Design

At the design stage, the display of pages and objects in learning media

products is carried out using the Canva application. To build the product, the Andromo application is used. Figure 2 shows the product display design.

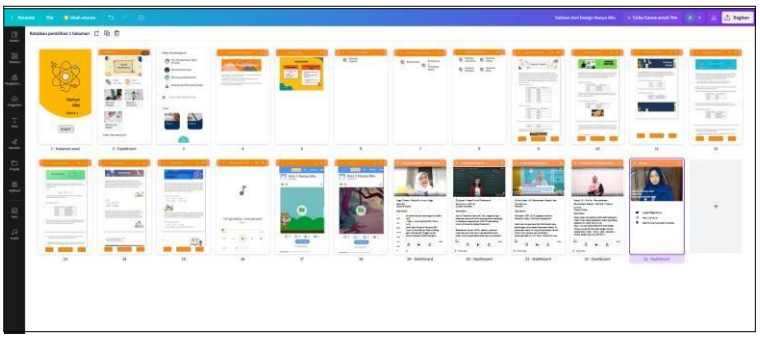

Figure 2. Screen View on Canva

a. *Test results Media Expert*

The media expert validation test was conducted by Mrs. Nurna Listya Purnamasari, M.Pd as a lecturer in Tech- nology and Information Education at Bhinneka PGRI University. The results obtained from the media expert questionnaire are shown in Table 4.

Table 4. Results of Product Validation Test Questionnaire Scores by Media Experts

No	Aspects	Question Aspect	Score	Max Score
1	**LEARNING MEDIA**	Learning media applications can be installed smoothly	5	5
2		Learning media applications can be operated	5	5
3		The buttons on the learning media application work well	5	5
4		Learning media applications contain teaching materials	5	5
5		Learning media applications contain teaching resources	5	5
6		Learning media applications are easy to carry anywhere and practical	5	5
7	**MULTIMEDIA**	The font on the learning media application used is easy to read	5	5
8		There is text on the learning media application	5	5
9		The text in the learning media application contains mate- rial on the nomenclature of chemical compounds	5	5
10		There are images of learning media applications	5	5
11		The images contained in the learning media application can be seen clearly	5	5
12		There is audio in the learning media	5	5

		application		
13		Audio in learning media applications can be heard clearly	5	5
14		There are videos on learning media applications	5	5
15		Videos on learning media applications can be played smoothly	5	5
16		Videos in learning media applications contain material on the nomenclature of chemical compounds	5	5
17	**DISTRIBUTION**	The application format is. *.apk*	5	5
		Total	85	85

$$Results\ (\%) = \frac{Total\ score\ obtained}{Total\ Maximum\ score} \times 100\%$$

$$= \frac{50}{50} \times 100\%$$

$$= 100\%$$

Based on the percentage calculation above, 100% is obtained with the criteria of "Very Valid" as a learning medium for students.

2) Material expert test results

Product material experts were carried out by Mrs. Tugas Enyke Yulianawati, S. Pd. as a teacher of class X chemistry subjects at SMA Negeri 1 Gondang. The results obtained from the material test are shown in Table 5.

Table 5. Results of Product Validation Test Questionnaire Scores by Material Experts

No	ASPECTS	QUESTION ASPECT	SCORE	MAX SCORE
1	**MATERIAL**	The material presented is by the flow of learning objectives number 10.13 and 10.14	5	5
2		The material presented is according to learning outcomes	5	5
3		In the application, there is material about organic compounds	5	5
4		In the application, there is material about inorganic compounds	5	5
5		In the application, there is material about Reaction equations	5	5
6		The material presented is easy to understand	5	5
7		The topic of the material presented is clear	5	5
8	**EVALUATION**	In the application, there are quizzes/practice questions	5	5

9		In the application, there is a quiz that can be read clearly	5	5
10		In the application there is feedback	5	5
		Total	50	50

$$Results\ (\%) = \frac{Total\ score\ obtained}{Total\ Maximum\ score} \times 100\%$$

$$= \frac{50}{50} \times 100\%$$

$$= 100\%$$

Based on the percentage calculation above, 100% is obtained with the criteria of "Very Valid" as a learning medium for students.

C. Data Presentation and Product Trial Analysis

1) Implementation

a. Small group test results

In one class X-1, trials were carried out on 10 students before being tested on large groups. The results of the small group trial are presented in Table 6.

Table 6. Small Group Trial Questionnaire Score Results

No	ASPECTS	QUESTION ASPECT	SCORE	MAX SCORE
1	**MATERIAL**	The material presented is by the flow of learning objec-tives number 10.13 and 10.14	44	50
2		The material presented is according to learning outcomes	46	50
3		In the application, there is material about organic com-pounds	46	50
4		In the application, there is material about inorganic com-pounds	47	50
5		In the application, there is material about Reaction equa-tions	44	50
6		The material presented is easy to understand	44	50
7		The topic of the material presented is clear	46	50
8	**EVALUATION**	In the application, there are quizzes/practice questions	45	50
9		In the application, there is a quiz that can be read clearly	44	50

10		In the application there is feedback	45	50
11	**LEARNING MEDIA**	Learning media applications can be installed smoothly	45	50
12		Learning media applications can be operated	47	50
13		The buttons on the learning media application work well	43	50
14		Learning media applications contain teaching materials	46	50
15		Learning media applications contain teaching resources	45	50
16		Learning media applications are easy to carry anywhere and practical	46	50
17	**MULTIMEDIA**	The font on the learning media application used is easy to read	43	50
18		There is text on the learning media application	46	50
19		The text in the learning media application contains mate- rial on the nomenclature of chemical compounds	47	50
20		There are images of learning media applications	44	50
21		The images contained in the learning media application can be seen clearly	44	50
22		There is audio in the learning media application	47	50
23		Audio in learning media applications can be heard clearly	46	50
24		There are videos on learning media applications	45	50
25		Videos on learning media applications can be played smoothly	45	50
26		Videos in learning media applications contain material on the nomenclature of chemical compounds	47	50
27	**DISTRIBUTION**	The application format is. *.apk*	44	50
		Total	1221	1350

$$Results\ (\%) = \frac{Total\ score\ obtained}{Total\ Maximum\ score} \times 100\%$$

$$\frac{1221}{} \times 100\%$$

$$= 90{,}4\%$$

Based on the calculation of the small group trial questionnaire, the feasibility percentage results were obtained at 90.4%. With these results, the product is "Very Feasible "

b. Large group test results

Large group trials were conducted for all students in class X-1 with the number of students. The following are the test results from the group shown in Table 7.

Table 7. Large Group Trial Result Score Results

No	ASPECTS	QUESTION ASPECT	SHOES	MAX SCORE
1	**MATERIAL**	The material presented is by the flow of learning objec- tives number 10.13 and 10.14	156	175
2		The material presented is according to learning outcomes	153	175
3		In the application, there is material about organic com- pounds	160	175
4		In the application, there is material about inorganic com- pounds	158	175
5		In the application, there is material about Reaction equa- tions	156	175
6		The material presented is easy to understand	158	175
7		The topic of the material presented is clear	153	175
8	**EVALUATION**	In the application, there are quizzes/practice questions	157	175
9		In the application, there is a quiz that can be read clearly	160	175
10		In the application there is feedback	159	175
11	**LEARNING MEDIA**	Learning media applications can be installed smoothly	154	175
12		Learning media applications can be operated	157	175
13		The buttons on the learning media application work well	162	175
14		Learning media applications contain teaching materials	157	175
15		Learning media applications contain teaching resources	157	175
16		Learning media applications are easy to carry anywhere and practical	160	175

17	**MULTIMEDIA**	The font on the learning media application used is easy to read	155	175
18		There is text on the learning media application	161	175
19		The text in the learning media application contains mate- rial on the nomenclature of chemical compounds	157	175
20		There are images of learning media applications	156	175
21		The images contained in the learning media application can be seen clearly	161	175
22		There is audio in the learning media application	165	175
23		Audio in learning media applications can be heard clearly	152	175
24		There are videos on learning media applications	157	175
25		Videos on learning media applications can be played smoothly	157	175
26		Videos in learning media applications contain material on the nomenclature of chemical compounds	154	175
27	**DISTRIBUTION**	The application format is. *.apk*	158	175
		Total	4250	4725

$$Results\ (\%) = \frac{Total\ score\ obtained}{Total\ Maximum\ score} \times 100\%$$

$$\frac{4250}{} \times 100\%$$

$$= 89\%$$

Based on the calculation of the small group trial questionnaire, the feasibility percentage results were obtained at 89%. With these results, the product is "Very Feasible"

CONCLUSIONS AND RECOMMENDATIONS

A. Conclusion

After conducting development research for 5 months, researchers succeeded in developing a mobile learning media called Nanya Mia, for grade X students at SMA Negeri 1 Gondang. This product is developed using the Andromo application. The development model used is ADDIE, which consists of 5 stages, namely *Analysis, De- sign, Development, Implementation, and*

Evaluation. This product has been declared suitable for use after going through validation by media experts, material experts, and trials with students. The validation results of material experts and media experts reached 100% with the criteria of "very valid". In small group trials, the product ob- tained a result of 90.4% with the criteria "very feasible". While in large group trials, the product obtained results of 89% with the criteria of "very feasible".

B. Suggestion

Based on the results of this study, researchers provide several suggestions to various parties, including:

1) For other researchers who conduct similar research, it is advisable to look for the main problem that is the basis of the research and find the right solution. If you want to use the Andromo application, it is recom- mended to learn about the various menus, features, disadvantages, and advantages of the application.
2) For students, it is recommended to take advantage of the application of mobile learning media nomenclature of chemical compounds as an additional learning resource.
3) For teachers, the application of mobile learning media nomenclature of chemical compounds can be used as a tool in chemistry learning activities.
4) For the school, the researcher suggested that the school can develop and produce similar applications that suit learning needs.

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