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Research Article

Preparing of chemical bonding learning media based android using smart apps creator program

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Keywords

Android based
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Abstract

The aim of this research is to obtain Android-based chemical bond learning media using the smart apps creator program that is feasible and eligible to use. To achieve the goal, development research has been carried out which refers to the 4 D model with the stages define, design, develop and disseminate. The research was conducted at SMA Negeri 5 Medan involving teachers and students of class X MIA. The research instruments used are non-test instruments including needs analysis instruments, feasibility test instruments and student response instruments. The research results are: (1). An Android-based chemical bond learning media has been obtained using a smart apps creator program with features main view, main menu, learning material, evaluation, summary and references. (2). The Android-based chemical bond learning media obtained was deemed suitable for use in learning with a feasibility level of 85.0% with very worthy category. (3). The students give good eligibility responded (82.6%) for the Android-based chemical bond learning media obtained with meets the requirements for use as learning media.

Introduction

Education is important and essential for building student character through the teaching and learning process. People will find it simpler to have a stable future, land the ideal job with ease, and have a good career and job by having a good level of education. People will therefore be able to govern the future intelligently with education. Particularly at this time, available employment opportunities will select candidates based on the schooling to date (Murtihapsari et al., 2021).

Education is the term of the concept of education in English; its Latin etymological source is Eductum, which signifies development from the inside out, and Duco, which means to develop, make up the word "eductum." Therefore, etymologically speaking, education is the process of honing one's own skills and personal assets (Silaban and Sianturi, 2021).

Learning is a human process that helps people develop various competencies, skills, and attitudes. The ability to learn is a key feature that distinguishes humans from other living things. Learning can also be interpreted as an effort to gain intelligence or knowledge. Changes in behavior (changes in behavior) characterize learning (Donasari and Silaban, 2021). The learning process is a communication activity in which ideas, ideas, and subject matter are delivered between teachers and students so that mutual interaction occurs. Learning media that can assist students in learning activities and educators in learning and carrying out their duties are required to achieve a good learning process. Chemistry is one of the subjects taught in high school (Silaban and Sianturi, 2021). Learning media is one of the developments in information technology that has an impact on the world of education. As a result, the education sector must be able to use technology to create multimedia-based learning media that are more appealing, interactive, and comprehensive.

Chemistry is one of the sciences that evolves in parallel with technological advancement. Chemistry is abstract, interconnected, and demands excellent thinking skills in its application. Chemistry is difficult for students to understand because it is subject that has facts, procedures, and concepts, and Chemistry is more than just solving problems; student must also learn descriptions such as chemical facts, chemical rules, and the material studied in chemistry is extensive (Silaban et al., 2023a). Chemistry subjects have a goal where students have the ability to understand chemical concepts, principles, laws, and theories as well as their application and solving related problems in everyday life and technology (Silaban et al., 2022)

One of the sciences that is expanding quickly in tandem with the advancement of technology and its use in daily life is chemistry. Students' understanding of the ideas, principles, laws, and theories of chemistry, as well as how they relate to one another and how to use them to solve issues in technology and daily life, is the goal of the chemistry lessons taught in SMA/MA. Chemistry is a subject where most of the concepts are abstract and demand a high degree of reasoning to comprehend. In addition, chemical concepts frequently relate to one another, which can be challenging for some students to understand (Donasari and Silaban, 2021).

Based on learning observations at SMAN 5 Medan, there are still issues with low student interest in learning that impede student achievement in chemical bonding material. The teacher's ability to use learning media and the level of difficulty of the material are two factors that contribute to students' disinterest in learning. Teachers' learning media are still traditional, making the learning process monotonous and boring for students. Furthermore, many students are already using smartphones for purposes unrelated to the learning process, such as social media (Facebook, Instagram, Line, and WA) and gaming. This will disrupt students' learning concentration and decrease their interest in viewing textbooks. Students will prefer to stare at their smartphone screens, causing them to focus more on their smartphones, leading to addiction (Samodro, 2019).

Researchers can provide alternative solutions to the following problems by developing learning media that are easy to use, informative, interactive, and interesting for students. E-modules, websites, and android-based applications are examples of learning media. Currently, researchers will use Smart Apps Creator software to create android-based learning media. The researcher chose Smart Apps Creator because it is simple to use and allows for the correction of mistakes in media preparation. Furthermore, the application can be used offline, so students do not require a data package to use it. With the advancement of technology in Gen Z in modern times, this android application-based learning media is becoming more popular.

Related research on the development of android application-based media can be found in the research of Lubis and Ikhsan (2015), who concluded that the android-based chemistry learning media materials in buffer solution and hydrolysis materials that have been developed are suitable for use in learning in terms of material assessment aspects including good criteria, media assessment aspects including very good criteria, and student test results are included (Lubis and Ikhsan, 2015). Related research can be found that in the chemistry learning process, teachers never use android-based learning media. As a result, Android-based interactive media is required in the learning process to improve students' comprehension.

Method

Population and Sample

This research is classified as Development Research based on the goals an objectives with the goal of discovering, developing, and validating a product. The population of this study were all students of class X MIPA at SMA Negeri 5 Medan. In this study, the sample was taken using a purposive sampling technique, where the teacher directly determined the sample to be studied, because all class X MIA are considered homogeneous. Based on the technique used, the sample to be taken is 1 class, namely class X MIPA 4.

Research Procedure

In this study, research and development techniques were combined with 4-D research methods those are Define, Design, Develop and Disseminate. This research and development design seeks to create products that will help students learn more effectively. The 4-D model was chosen for development because it is the recommended model for developing learning tools. The following stage of 4D model shown in Fig.-1.

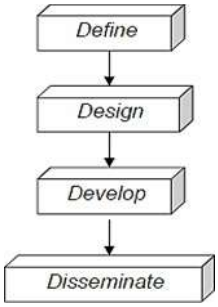


Fig.-1. The of 4D Model for preparing chemical bonding android based learning media (Silaban et al, 2023b)

Define stage. This stage is called the needs analysis stage, where the media needs needed by students to study chemical bonds will be defined. The students used as respondents were class X MIA students who had studied chemical bonding material. **Design stage**. At this stage, Android-based chemical bond learning media is designed using the Smart Apps Creator program along with features that are in accordance with the description of the teaching material. **Development stage**. At this stage, the Android-based chemical bond learning media that has been designed is tested for its feasibility by 4 validators. **Disseminate stage**. At this stage, Android-based chemical bond learning media using smart apps creator is assessed by students regarding interest, adequacy of teaching materials, appropriateness of language, accuracy of software and efficiency.

The Non-tes instrument were used to collect data in this study. The purpose of non test instrument in this study used to analyse the feasibility of android based media and determine student interest learning. Non-test instrument included: (1) Interview, this interview with the chemistry teacher aims to observe learning in the classroom including the applicable curriculum, student characteristics, school facilities, learning methods and media used. (2) Questionnaire, the distribution of this questionnaire was carried out to see students' interest in learning before and after using android application-based learning media in chemistry subjects, especially in chemical bonding material and carried out to see the students' responses to the developed learning media.

Data Analysis

The data analysis technique used in this research is qualitative. Qualitative data consisting of a media feasibility assessment sheet by a validator, a student learning interest questionnaire sheet and a student response questionnaire sheet for learning media. Data were obtained before and after going to the field to apply learning media at the product distribution stage. All information is analyzed according to portions and used as a reference for improving learning media. Feedback and criticism will be used as guidelines for improving or revising the developed learning media.

Results and Discussion

This research and development led in the creation of a product in the form of Android-based learning media on the topic of chemical bonding, dubbed Ikatan Kimia. In this study, the Research and Development (R&D) technique and the 4D development model are applied. The 4D development paradigm employed in this study is separated into four stages: (1) define, (2) design, (3) develop, and (4) disseminate. However, in writing this article, the researcher only incorporated the study results that had been published up to the design stage so that it could be clearly explained how the process of creating Android-based Ikatan Kimia learning media was carried out with the help of the Smart Apps Creator.

Define Stage to Need Assement

At this stage, analysis is done in the forms of needs analysis, analysis of the learning materials, and analysis of the environment. Needs analysis, which seeks to determine which end product will best meet the needs. The researcher conducted a face-to-face interview with a teacher Chemistry at SMA Negeri 5 Medan, and asked her 11 questions on needs analysis. Table 1 displays a study of the evolution of educational media that was done after speaking with chemistry teachers.

Based on Table 1 data it can be seen that students' interest in learning about chemical bonding teaching material is still low, which may be due to the learning media applied by teachers still not being appropriate. The teacher notices that the learning media used in learning process only used textbook. Similar results were

also shown by previous research on providing Android-based learning media for atomic structure and the periodic system of elements (Donasari and Silaban, 2021; Silaban et al, 2023b).

Table 1. Teacher responses on chemical bonding teaching media

No	Question	Answer
1	At this time what curriculum is implemented at SMAN 5?	The curriculum currently used at SMAN 5 is K13.
2	In the learning process, what learning media do you use?	The learning media that I use are textbooks.
3	Is the media effective enough in the learning process Ma'am?	In my opinion it is less effective, based on my observations there are still students who still do not understand the material that I convey
4	Did SMAN 5 already have Android application-based learning media on chemical bond material, Ma'am?	Not yet, so far the media used are only textbooks and internet from cellphones
5	Do you have an LKPD for learning chemical bonds?	Starting from the pandemic, I didn't use LKS (Student Worksheets) so for now I'm providing practice questions from the questions available in the textbook
6	What method do you use when learning chemical bonds?	For learning chemical bonds I use the lecture method, where I explain theory from the front and if there are students who don't understand the material after I explain, I can ask questions and also students are given assignments as exercises in class and at home.
7	How is the student's interest in participating in chemistry lessons, Miss?	Student interest in learning is still small because many students find it difficult to understand chemistry lessons so they tend to open their cellphones or chat with their friends rather than take part in learning.
8	What are the student learning outcomes in chemistry lessons, madam?	For learning outcomes there are still some students whose grades are incomplete or below the KKM.
9	Based on the information that you gave, I intend to develop learning media based on android applications on chemical bonding material. What do you think?	I think it's very good because so far there is no learning media based on android applications and later with this application it can make it easier for me in the learning process

Teachers' learning media are still traditional, making the learning process monotonous and boring for students. Furthermore, many students are already using smartphones for purposes unrelated to the learning process, such as social media (Facebook, Instagram, Line, and WA) and gaming (Lubis and Ikhsan, 2015). This will disrupt students' learning concentration and decrease their interest in viewing textbooks. Students will prefer to stare at their smartphone screens, causing them to focus more on their smartphones, leading to addiction. Alternative solutions to the following problems by developing learning media that are easy to use, informative, interactive, and interesting for students. Android-based applications are examples of learning media.

Table 2. Analysis of student interest on chemical bonding learning

I'm bored following chemistry lessons	Percentage
Strongly Agree	6,7
Agree	63.3
Disagree	20.0
Strongly Disagree	10.0
I have a hard time understanding chemistry problems	Percentage
Strongly Agree	10.1
Agree	70.0
Disagree	13.3
Strongly Disagree	6.6

The advantage use of Smart Apps Creator is simple to use and allows for the correction of mistakes in media preparation. Furthermore, the application can be used offline, so students do not require a data package

to use it. With the advancement of technology in Gen Z in modern times, this android application-based learning media is becoming more popular (Samodro, 2019).

To gauge students' interest, the questionnaire distributed consisted of 2 statements. The research instrument uses a Likert scale, namely by giving a score of 1 (strongly disagree), 2 (disagree), 3 (agree), and 4 (strongly agree). Table 2 shows the results of the questionnaire in terms of measuring student interest. The table obtains an overall percentage of 80.1% of students consider chemistry lessons difficult is due to abstract concepts, many calculations of chemical formulas that are difficult to understand and the learning media used by teachers is considered monotonous. This is the same as what was revealed by the teacher based on interviews that most students had difficulty understanding concepts and calculating chemical formulas, one of which was the subject matter of chemical bonds.

Based on the data in Table 1 and Table 2, the needs analysis can be seen that the low interest and learning outcomes in chemistry can be caused by chemistry learning in schools not using appropriate learning media. The same thing was also conveyed by previous researchers who have succeeded in developing interactive learning media to teach reaction rates for XI Class SMA student (Silaban et al., 2023a).

Design Stage to Preparing Chemical Bonding Android Base Teaching Media

At this stage the researcher designed the learning media based on android applications and hold discussions with supervisors, chemistry teachers at SMA Negeri 5 Medan. The results in this stage are storyboards. The resulting product is in the form of android application-based media. Furthermore, the results of the development of learning media products based on android applications chemical bond material were successfully developed with the help of smart apps creators as applications for making android applications. Users can access this media via share via whatsapp. Android-based chemical bond learning media is designed using the Smart Apps Creator program along with features that are in accordance with the description of the teaching material as follow in the Fig.-2.

No	Feature/ Story Board	Information
1	Main View 	Main view is the initial appearance of mobile learning media. The front cover consists of the title of the material, the learning base used, pictures related to chemistry
2	Main Menu 	Main menu is a display that contains several main menus for practice questions, essays and summaries.
3	Learning material 	Learning materials consist of learning objectives, explanations of the formation of covalent, ionic and metal bonds along with examples of questions on each topic. In each material there are learning videos and sample questions to broaden students' insights in understanding the material. The addition of pictures, moving animations, videos, and so on aims to enable students to be more interactive and not feel bored with the features available.
4		Practice contains 10 multiple choice type questions with a discussion after students answer all the questions.
5	Evaluation	The evaluation contains 10 questions that aim

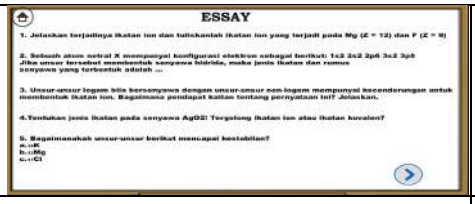
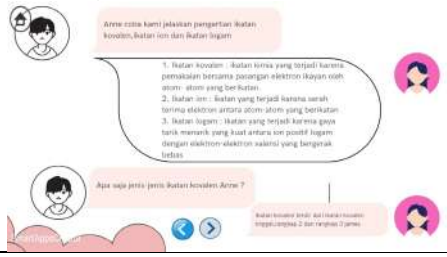
		to strengthen students' understanding of the learning material.
6	Summary 	The summary menu contains conclusions about all the learning materials contained in the application.
7	References 	The references contains references to the source of subject matter contained in mobile learning media)

Fig.-2. Characteristics and features of the resulting Android-based chemical bond learning media using Smart apps Creator program

Chemical bond learning media using a smart apps creator program that has been obtained have 7 charakteristis and specification features those are main view, main menu, learning material, exercises, evaluation, summary and references. The advantage of this feature is that the time duration is not limited and can be opened not always in sequence. Similar results have also been reported in previous studies. The unlimited ability for students to open features will have a positive impact on increasing their interest in learning (Lubis and Ikhsan, 2015; Silaban et al., 2023a).

Development Stage to know Feasibility of Chemical Bond Android Base Teaching Media

The develop stage aims to produce mobile learning media products that have a valid or good feasibility level. The results of this stage are intended as input for the creation of feasibility of learning media based android application (Table 3). This stage also to validate or provide an assessment of the feasibility level of learning media products by experts both in terms of chemistry and learning media. Media products that have been validated and given suggestions for improvement will be revised again until the media product can be declared feasible and of good quality for use in limited development trials for students.

Table 3. The results of the feasibility of chemical bonding android base learning media by expert validator

Nu	Validator	Average Score Validator	Percentage
1	Validator I	3.40	85%
2	Validator II	3.43	85%
3	Validator III	3.43	88%
4	Validator IV	3.40	85%
Average		3.41	85.6%
It means		Suitable to use	

There are 4 person expert validators consisting of 3 lecturers and one chemistry teacher. The three lecturers come from the Chemistry Department of Unimed were adjusted according to their expertise, namely chemistry material experts, computer program-based learning media experts and language experts. Meanwhile, the chemistry teacher expert validator is a chemistry teacher who has at least than 10 years of experience from SMA Negeri 5 Medan.

The provision of a feasibility assessment of learning media products by experts is guided by expert validation instruments that have been made by researchers consisting of assessment component indicators.

The instrument has been given input and approved by the supervisor to be given to the expert validator. At this stage the expert validator also provides suggestions for improvement beforehand to be revised by the researcher, after the revision is carried out in accordance with the suggestions for improvement then the expert validator provides an assessment of the feasibility of the media product. The percentage of the assessment results of the validation of media experts and material experts using the Likert scale is found in the classification "suitable to use" according to the table of validity based on established criteria (Silaban et al., 2022; Asmi et al., 2023; Fitri et al., 2023).

Disseminate Stage to Determine Students' Responses to the Produced Learning Media

Android-based chemical bond learning media using the smart apps creator program that has been obtained has been disseminated to students through providing personal assessment response questionnaires. Student responses were divided into 6 categories, namely response for chemical bonding material, response to media interesting, appearance, language, software and efficiency of teaching media produced. Each category is outlined in the student response assessment instrument using a Likert scale. Following are the results of the student response questionnaire on the feasibility of learning media products based on Android applications shown in Fig.-3.

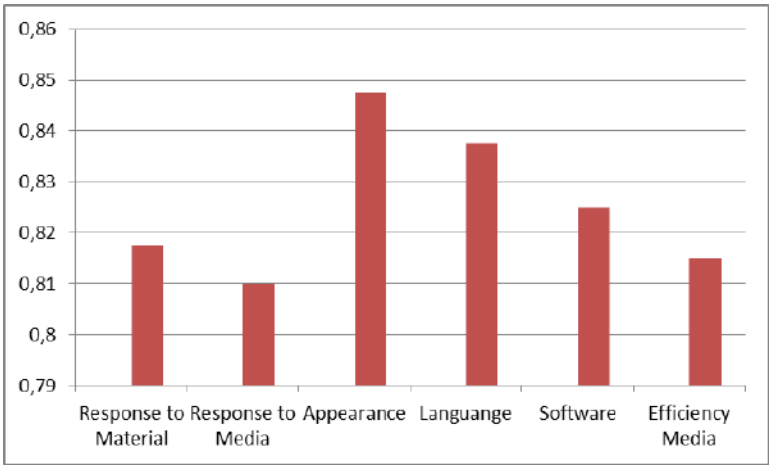


Fig.-3. Student response for chemical bonding android base learning media

Based on Fig.-3 above, it can be concluded that the total value of the overall average score of student responses is 82.6% in the range of good eligibility categories. The results of research regarding student responses to Android-based chemical bond learning media using the Smart Apps Creator program obtained are relevant to the results of previous research that Android-based chemistry learning media are very popular with students (Lubis and Ikhsan, 2015; Donasari and Silaban, 2021; Silaban et al., 2023b).

Conclusion

Based on the description above, the following conclusions can be drawn: An Android-based chemical bond learning media has been obtained using a smart apps creator program with specification features main view, main menu, learning material, evaluation, summary and references. The Android-based chemical bond learning media obtained was deemed suitable for use in learning with a feasibility level of 85.60% with very worthy category; The students give good eligibility responded (82.6%) for the Android-based chemical bond learning media obtained with meets the requirements for use as learning media categpry.

Conflict of Interests

The author (s) declares that there is no conflict of interest in this research and manuscript.

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References

Asmi, A., Silaban, R., & Silaban, S. (2023). Problem based learning (PBL) chemistry E-module development for class X high school students. *Proceedings of the AISTEEL 2023*, September 19, Medan, Indonesia. http://dx.doi.org/10.4108/eai.19-9-2023.2340436

Donasari, A., & Silaban, R. (2021). Pengembangan media pembelajaran kimia berbasis android pada materi termokimia kelas XI SMA. *Jurnal Inovasi Pembelajaran Kimia*, 3(1), 86. https://doi.org/10.24114/jipk.v3i1.23056

Fitri, D., Silaban, S., & Darmana, A. (2023). Implementation of interactive electronic books based on project based learning for class XI high school even semester on student motivation and learning outcomes. *Proceedings of the AISTEEL 2023*, September 19, Medan, Indonesia. http://dx.doi.org/10.4108/eai.19-9-2023.2340419

Lubis, I. R., & Ikhsan, J. (2015). Pengembangan media pembelajaran kimia berbasis android untuk meningkatkan motivasi belajar dan prestasi kognitif peserta didik SMA. *Jurnal Inovasi Pendidikan IPA*, 1(2), 191. https://doi.org/10.21831/jipi.v1i2.7504

Murtihapsari, M., Patandean, S. N., Surbakti, P. S., Larasati, C. N., & Toding, M. T. (2021). Efektivitas penerapan model pembelajaran kooperatif tipe stad (student team achievment divison) terhadap hasil belajar kognitif peserta didik secara daring. *Quantum: Jurnal Inovasi Pendidikan Sains*, 12(2), 185. https://doi.org/10.20527/quantum.v12i2.11109

Silaban, R., & Sianturi, P. A. (2021). Pengembangan media pembelajaran berbasis android pada materi laju reaksi. *Jurnal Inovasi Pembelajaran Kimia*, 3(2), 191. https://doi.org/10.24114/jipk.v3i2.22814

Silaban, R., Sitorus, M., Musa Panggabean, F. T., & Manullang, E. (2022). The development of electronic module based on scientific literacy on colloidal topic. *International Journal of Computer Applications Technology and Research*, 11(06), 223–230. https://doi.org/10.7753/ijcatr1106.1007

Silaban, R., Alexander, I. J., Panggabean, F. T. M., Simanjuntak, H., Nababan, J. L., & Sitorus, M. (2023a). Development of android-based learning as interactive learning media in reaction rate material on XI class SMA Student. *International Journal of Computer Applications Technology and Research*, 22–31. https://doi.org/10.7753/ijcatr1202.1004

Silaban, R., & Manalu, R.T., Girsang, OA, Sitorus, M., Tarigan, S., Alexander, I.J. (2023b). Preparing atomic structure and periodical system android based-teaching media using funchem smart apps creator program. *International Journal of Computer Applications Technology and Research*, 1–7. https://doi.org/10.7753/ijcatr1206.1001

Samodro, N. U. (2019). Pengembangan media pembelajaran berbasis tablet android pada pelajaran bahasa Inggris di SMK harmoni Batam. e-Repository Dosen Universitas Gajayana Malang.