Development of Interactive Multimedia with Android-Based Gamification Concepts in Chemistry Class X SMA/MA Even Semester

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Abstract. The goal of this research is to develop interactive multimedia content with an Android-based gamification concept for X semester chemistry teaching materials suitable for use in chemistry learning. This research adopts the method (R&D) based on the development model of ADDIE, which includes phases of analysis, design, development, implementation, and evaluation. The methods of data analysis employed include quantitative description and qualitative description. Developed media products were validated by 2 material expert reviewers, 2 media expert reviewers, and 2 chemistry teachers. Android-based gamification concept developed according to material expert verifiers average media test result of 94%, 87% by 2 media expert verifiers, score by 2 chemistry teacher verifiers was 90%. This shows that the produced media is excellent for use in chemical learning.

Keywords: Interactive Multimedia, Gamification, Android, Chemistry.

1 Introduction

Technological advancements are having a rapid impact on the world of education. Over time, technology is needed in education so that teachers may use it as a tool while educating students [1]. In educational technology, information and communication technology (ICT) is used to move forward the quality of instructing and learning forms [2].

Technology advancements provide pupils the chance to learn continually and whenever they choose [3]. Technology may make learning possible anywhere, anytime, to anyone, about anything, in any way, and from anywhere according to conditions and needs [4]. Improving the quality of learning may be accomplished by incorporating technology into the learning process [5].

Learning media can be used to implement technology in the course of teaching and learning. The development of learning media can utilize technology as an effective and efficient tool [6]. Learning media can stimulate students' curiosity and interest [7]. One of the most crucial instruments for learning is learning media, and the choice of learning media may potentially determine the success or failure of a process of learning [8]. The use of educational media has a considerable influence on the success of the process of instructing and learning [9].

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The utilization of Android smartphones as learning devices is a case of a learning media that's mechanically related. The utilize of Android-based learning media has a noteworthy impact on understudy learning results [10]. Android-based learning media may be a learning media that's simple to apply and practice. The combination of images, text, color, and video as well as animation in learning material can make students interested in reading and learning it [11].

One branch of science is chemistry. The science of chemistry is critical in people's lives since we cannot be isolated from chemical components in our way of life [12]. One of the foundational fields of science, technology, and industry is chemistry. It enhances our existence, culture, and standard of living [13].

Until now, chemistry is still considered difficult because it consists of abstract concepts [14]. The concept of chemistry which is considered complex because it requires mastery of basic knowledge as well as application in everyday life becomes a problem when the learning process takes place [15].

Based on research results of teacher interviews with chemistry, the media used by the teacher was PowerPoint media. However, it had little effect on students' interest in learning. This decreases student participation in the learning process and affects understudy learning results. Low student learning outcomes are caused by a lack of student motivation in learning [16]. Students who are interested in learning will tend to be active and curious so they tend to think more creatively [17]. Rapid technological advances make teenage students have an interest in various media so that choosing media is adjusted to the media that students currently like [18].

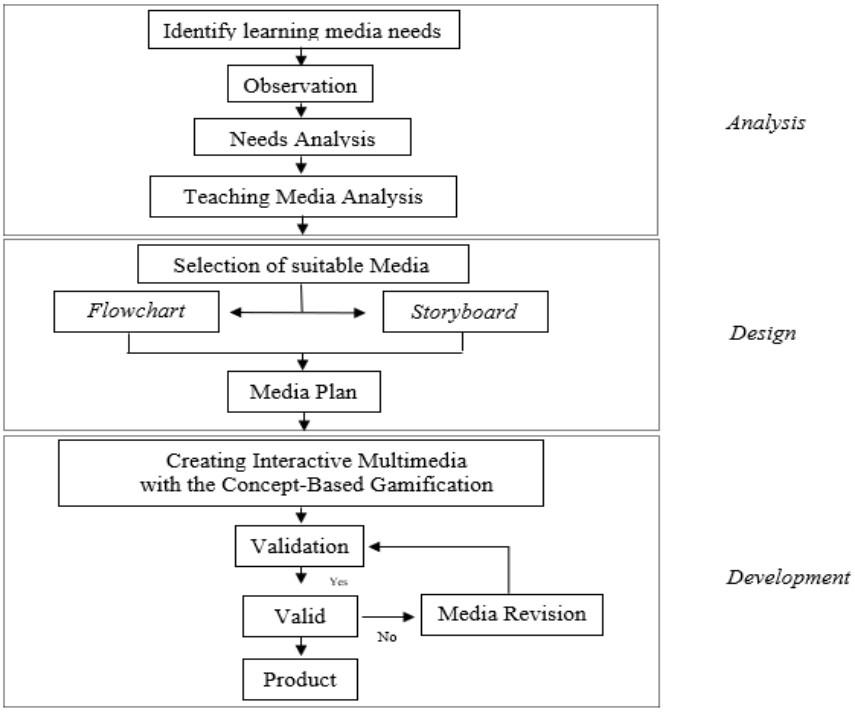
One of the instructional mediums that might help pupils solve problems in learning is learning media combined with the concept of gamification. Gamification is the use of games, approaches, and game elements in contexts different from games [19]. Gamification has the potential to encourage students and make students more actively involved with the subject matter [20].

The learning process is partly successful by using the concept of gamification because understudies are more fascinated by the learning process when it has gaming components. This shows the side of effectiveness in adding experience and student involvement [21]. Good learning outcomes must be supported by appropriate and quality learning media [22]. Therefore, based on these problems. Researchers will attempt to test the viability of newly designed learning material.

2 Methods

Research on learning media was conducted at MAS PAB 2 Helvetia. The R&D technique was employed in this study, along with the ADDIE development model, and included the stages of analysis, design, development, implementation, and evaluation. This research is only limited to the development stage. This study's subjects were chemistry lecturers and teachers.

The product to be developed is interactive multimedia with an Android-based gamification concept using the Smart Apps Creator 3.0 software. In this work, a more comprehensive technique is described in **Figure 1**.



Figures. 1 . Research Charts.

The data collecting tool utilized in this study was a validation questionnaire based on the modified National Education Standards Agency (BSNP) eligibility requirements. This questionnaire was distributed to material and media experts as well as chemistry teachers. A quantitative descriptive analysis approach and a qualitative descriptive analysis technique were employed to analyze the data. Data validation came about from material specialists, media specialists, and teachers calculated utilizing the Likert scale calculation percentage, which can be seen in **Table 1.**

Table 1. Likert Scale Criteria.

No	Score	Criteria
1	1	Not feasible
2	2	Not worth it
3	3	Pretty decent
4	4	Worthy
5	5	Very worth it

The table above explains that a minimum score of 1 for criteria is not feasible and a maximum score of 5 for criteria is very feasible. Acquisition of scores for the validation of material experts, media experts, and chemistry teachers will then be calculated using the following formula:

$$P\% = \frac{\sum data\ retrieval\ score}{max\ score} \text{ x } 100\ \% \ . \qquad (1)$$

The results obtained in the assessment of each aspect assessed were analyzed using score interpretation to determine the eligibility of learning media developed based on the eligibility criteria of learning media **Table 2.**

Table 2. Learning Media Eligibility Criteria.

No	Average	Variable Criteria
1	0% – 20%	Not feasible
2	21% – 40%	Not worth it
3	41% – 60%	Pretty decent
4	61% – 80%	Worthy
5	81% – 100%	Very worth it

Based on these criteria, interactive multimedia with an Android-based gamification concept is said to be feasible if the validator's assessment for each aspect gets a percentage of ≥61% [23].

3 Results and Discussion

The reason for this investigation is to set up the level of qualification of the produced interactive multimedia. The ADDIE model, which stands for Analyze, Design, and Development, is used in this development research process.

Analyst

This step attempts to gather the preliminary data required for interactive multimedia development materials. At this stage, an analysis of learning media and needs analysis is carried out through interviews and observations with the teacher concerned. The information obtained is that currently the teacher is still using the lecture, question-answer, and discussion method and using PowerPoint as a learning medium on oxidation-reduction material. However, it has less effect on students' interest in learning. Advances in technology also encourage students to face developments in an increasingly advanced world of education, One example is the usage of Android-based cellphones for learning media. The solution to this problem is the need for an android-based learning multimedia combined with a concept that is popular with teenagers, namely the game concept.

Design

At this stage, library sources are collected on chemical materials that will be included in the product being developed. Learning materials are made based on the chemistry subject syllabus in Class X SMA/MA in the even semester that has been determined. In addition, other materials such as images, animation, audio, and color compositions needed for product

development were also collected. Based on the components that have been collected, the researcher will create an interactive multimedia design that will be developed.

Development

At this development stage, product creation activities in the form of interactive multimedia with an Android-based gamification concept are carried done based on the analysis and design that has been made. The process of creating interactive multimedia will be developed using APK Smart Apps Creator. Applications are seen to be successful learning aids because they may expand and enhance the educational process while also creating an interactive, inclusive, and student-centered learning environment [24]. The media being developed is made as attractive as possible with the presence of music and games in the media. Interactive multimedia design with the concept of Android-based gamification can be seen in **Figure 2**.

Figures. 2. Interactive Multimedia Design with Draft Gamification Android-based.

Interactive multimedia with an android-based gamification concept that has passed the manufacturing stage and then standardized by an expert validator. Standardization by the validator is carried out using a validation questionnaire according to the modified BSNP standard. Material validation was carried out by 2 Chemistry Education lecturers using the feasibility instrument based on the modified BSNP, the following data were obtained:

Table 3. Materials Evaluation Results by Material Experts (Lecturers).

Aspect	Evaluation		Average Score	Percentage Score	Percentage of Average Score	Criteria Appropriateness
	V1	V2				
Learning	5	4,6	4,8	96 %	94 %	Very Worthy
Material	4,6	4,6	4,6	92 %		
Language	5	4,5	4,7	94 %		

In accordance with the table above, the evaluation was carried out by 2 chemistry education lecturers as material experts, the generated media is clearly in the extremely feasible category, with an average percentage of 94%. The next media assessment was carried out by 2 media experts on visual and audio-visual aspects as well as software engineering aspects. In this aspect, the following data is obtained:

Table 4. Media Evaluation Results by Media Experts (Lecturers).

Aspect	Evaluation		Average Score	Percentage Score	Percentage of Average Score	Criteria Appropriateness
	V1	V2				
Visuals and Audio Visuals	3,9	4,2	4	80%	87 %	Very Worthy
Software engineering	4,6	4,8	4,7	94 %		

In accordance with the table above, the evaluation carried out by media experts on visual and audiovisual aspects and software engineering aspects, with an average percentage of 87%, the chemistry learning media with the ensuing Android-based gamification idea falls into the extremely viable category. In addition, related aspects of the feasibility of the media were also assessed by 2 teachers, the following data was obtained:

Table 5. Materials Evaluation Results Chemistry Teachers.

Aspect	Evaluation		Average Score	Percentage Score	Percentage of Average Score	Criteria Appropriateness
	V1	V2				
Learning	4,8	5	4,9	98 %	90%	Very Worthy
Material	4,4	4,4	4,4	88 %		
Language	5	5	5	100 %		
Visuals and Audio Visuals	3,6	3,7	3,7	74 %		
Software engineering	4,6	4,6	4,6	92 %		

Based on the assessment carried out by 2 Chemistry Teachers, it can be observed that the media created falls into the category of extremely viable, with an average proportion of 90%. So that the overall results of the feasibility standardization test obtained a score of 94% from the material expert (lecturer), 87% from the media expert, and 90% from the teacher. The three experts' average percentage value was 90%, indicating that material experts, media experts, and instructors all agree that the learning media generated are extremely suited for use in learning activities.

4 Conclusion

Based on the data analysis and discussion, it is possible to conclude that the feasibility evaluation of interactive multimedia with the created Android-based gamification concept obtained a score of 94% from material experts (lecturers), 87% from media experts, and 90% from teachers. The three experts' average percentage value was 90%, indicating that material experts, media experts, and instructors all agree that the learning media generated are extremely suited for use in learning activities. This is done to establish the level of practicality of the interactive multimedia being built. This aims to determine the feasibility level of the interactive multimedia being developed.

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