Development of Animation Video Learning Media to Improve Class XI Science Students' Understanding

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Abstract: *This research and development (R&D) aim to produce valid, practical and effective animated video learning media. The research subjects are divided into two parts, namely the first part of the product design validation subject or expert test conducted by 2 material experts and 1 media expert and the second part of the product trial subject conducted by testing the learning media in class XI IPA 3 and 2 class XI teachers of SMA Negeri 1 Gowa as observers. This learning media has been validated, has been tested limitedly and revised. The results of this study are: (1) validation by media experts of 3.4 with very valid criteria and (2) validation by material experts of 3.79 with very valid criteria. Animated video media based on the implementation test, teacher and student responses with an average percentage score of 88%, 86.11% and 86% respectively. For animated video media, the effectiveness criteria are in the very high category, with student learning outcomes meeting the effective criteria ($\geq$80%), where the class completion percentage is 88.8%. Animated video learning media developed using the ADDIE model is suitable (valid, practical and effective) for use in learning.*

Keywords: *ADDIE development model; chemical equilibrium; discovery learning*

INTRODUCTION

The goal of education is to cultivate and enhance human potential and personality in its entirety. Curriculum and education are closely intertwined (Aryuni et al., 2024). The National Education System Law No. 20 of 2003, states that education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and skills needed by themselves and society (Neolaka & Neolaka, 2017)

Currently, technology is the main role for society with the aim of building the nation. In line with the rapid development of science and technology, learning resources in the learning process are not only in the form of printed materials such as textbooks, but can utilise other learning resources such as: smartphones, tablet televisions, computers, e-mail, interactive videos, and multimedia computer technology. Many science subjects require learning media, one of the subjects that requires the most media in learning is chemistry. One of the most crucial components of teaching and learning activities, or of the process by which teachers

convey information to pupils, is learning media. Therefore, the selection of learning materials that are carefully crafted to meet the needs of the students can aid in the process of making learning both effective and efficient as well as engaging (Irham et al., 2024).

Based on the results of preliminary observations and interviews with teachers and students of SMA Negeri 1 Gowa who stated that the lack of understanding of chemical equilibrium material, especially difficulties in understanding the concept of dynamic equilibrium (Basyiroh et al., 2022).The lack of understanding of students' chemical equilibrium material is marked by learning outcomes that have not been maximized or KKM has not been achieved properly, students also lack participation in the learning process and also students are used to learning depending on the material delivered by the teacher (teacher centre). Teachers teach using the Discovery Learning model, this model has not been effectively used by teachers in the learning process. In addition, the problem found at school is that the use of learning media such as videos in the learning process is still rarely used, due to media limitations so that teachers find it difficult to convey abstract material. Teachers still more often use the lecture method and use textbooks that contain simple text and pictures. Teachers rarely use animated videos so that they make students less interested and tend to get bored (Arief et al., 2021)

Learning is more meaningful if the media used contains animated videos that will make students more interested. Media functions as a message delivery tool from the sender of the message to the recipient of the message which aims to facilitate the teacher in the learning process which makes students not bored with the learning that is being carried out (Andiyani et al., 2019). Employing educational media can enhance the clarity with which educators communicate concepts to their students. Conversely, students may readily absorb information conveyed through the media utilized by educators (Agustina et al., 2023).

To activate students in the learning process, it is necessary to have an interesting learning model and media so that students can be active during the learning process. One of the models used in this development research is the Discovery Learning Model. Finding The learning model places a strong emphasis on students' conceptual comprehension, and learning will have greater value if students actively participate in the process of learning the material. In order for students to use all of their skills to solve difficulties and discover an idea or principle that they were previously unaware of, the instructor must thus create a dilemma that inspires students to make discoveries (Yunsyahana et al., 2022).

In order to establish facts and theoretical knowledge about matter whose veracity could be explained using mathematical logic, chemists sought to understand what and why the qualities of materials exist in nature. This ambition gave rise to chemistry. While some components of chemistry are simply abstract (invisible), meaning they cannot be demonstrated by mathematical reasoning so that rationality can be developed, other aspects of chemistry are visible, allowing for the creation of tangible facts (Saragih & Sugiharti, 2024). Animated videos in the Discovery Learning Model are used in the stimulus and data collection syntax, emphasizing the ability of learners to actively engage in gathering knowledge, conducting research, and expressing their own opinions about a given problem. Often in the learning process, learners have difficulty connecting the subject matter in everyday life, to overcome this, maximizing the use of learning media is one alternative in solving the problem (Dagmar & Mariono, 2018)

The above problems require efforts to help students to actively participate in the learning process to improve students' understanding. One of the efforts that can be made is to use learning media. The need to develop learning media with the ADDIE development model has a close relationship with improving students' understanding through a systematic and structured approach

in designing and developing learning materials, namely helping to ensure that investments in making animated video media are effective and in accordance with predetermined learning objectives and helping to create a better learning experience for students in the hope of improving understanding of the concept of dynamic equilibrium for students in a more interesting way.

This learning video media contains explanations of material in everyday life, with a more attractive design. By providing interesting learning, such as animated video learning media, students will be more interested. Animated video media can be made from several applications on smartphones, such as plotagon, PowToon, Canva, capcut and others (Ispratiwi & Mellisa, 2023). In this research, the applications used are cap cut and Canva because they are easy to make and simple

The cap cut application is an editing application that has many interesting features to support the creation of animated videos. The Canva application is an online design programmed that is present in the busy world of technology, which provides a variety of equipment needs, such as presentation slides, resumes, bookmarks, newsletters, and so on (Junaedi, 2021). Using this application is also simple so that everyone, especially teachers, can easily create learning videos in the form of animations. The implication is that the learning process is more interesting and creative.

Several studies on the use of animated videos as media, including reporting that the development of animated video media based on plotagon, Canva and cap cut can improve student learning outcomes (Suryaman & Suryanti Y, 2022). Based on the background described above, researchers are interested in conducting a study entitled 'Development of Animated Video Learning Media to Improve the Understanding of Students of Class XI IPA SMA Negeri 1 Gowa on the Subject Matter of Chemical Equilibrium'.

LITERATURE REVIEW

1. Research and Development

Development research is a simplification of the term research and development (R & D). Development research is a basic research activity to obtain information on user needs, then continued with development activities to produce products and assess the effectiveness of these products. Research and development is a process or steps to develop a new product or improve existing products that can be accounted for. The purpose of research and development is effective products for use in schools (Emzir, 2018). The research and development method is a research method used to produce certain products and test the effectiveness of these products (Sugiyono, 2016)

2. Learning Media

The word media comes from Latin and is the plural of medium which literally means intermediary or introducer. Media is an intermediary or messenger from the sender to the receiver (Sadiman, 2014). More specifically, in the teaching and learning process, it tends to be interpreted as graphic, photographic, or electronic tools to capture, process, and reconstruct visual or verbal information (Sugiyono, 2016). Learning media is often referred to as educational media. Educational media is a set of tools or complements used by teachers or educators in order to communicate with students (Danim, 2018). Learning media as an intermediary used to convey the content of learning materials.

3. Video Animation

Animation is media, animation is audio-visual media in the form of a series of non-living images that are sequenced on frames and projected mechanically electronically so that they appear alive on the screen. Animation video is a tool to help the learning process in the form of images that move like life (Agustien et al., 2018). Animation can give objects the ability to move and can change shape, size and colour. The

advantages of animated video media are a combination of elements such as audio, text, images, and sound combined into one so that it becomes an attractive media for students (Maulida, 2019). Animated videos can also be used as entertainment, guides, inspirations, and messengers (Putri, 2016). The use of animation as a video can describe objects that cannot be seen by the eye or complex events and need detailed explanations that can be conveyed clearly and easily understood.

4. Animation Video as Learning Media

This animation video is appropriate to be used as learning media because it displays interesting elements of text, images, sound so that it can attract the attention of students and help provide understanding of material that is abstract and that occurred in the past. Animation has advantages that can help in shaping learners' understanding of abstract concepts (Harrison & Hummell, 2010)

5. Discovery Learning Model

Discovery learning model is one of the recommended models in the 2013 curriculum. The Discovery Learning model is a learning model that links problems that occur in the real world. The problem is used as a concept for students to produce critical thinking and skilled in problem solving, as well as to gain knowledge (Hosnan, 2014). Discovery Learning is a mental process where learners are able to assimilate a concept or principle. The mental processes referred to include: observing, digesting, understanding, classifying, making conjectures, explaining, measuring, making conclusions and so on. Learners are left to discover for themselves or experience the mental process themselves, in order to only guide and provide instructions (Shobirin, 2016).

METHOD

This type of research is development research (Research and Development) or commonly referred to as R & D. The development model used in this research is the ADDIE model which consists of stages, namely: analysis, design, development, implementation and evaluation.

This research was conducted in the odd semester of the 2023/2024 academic year and adjusted the chemistry subject hours. This research was conducted at SMA Negeri 1 Gowa class XI IPA which is located at Jl. Andi Mallombasang No. 1A, Pandang, Somba Opu District, Gowa Regency, South Sulawesi 92111.

In the process of developing animated video learning media, researchers use the ADDIE development model which has several steps, namely: Analysis, Design, Development, Implementation, and Evaluation. The research steps used by researchers are as follows:

1. Analysis Stage

   a. Problem analysis
   b. Analysis of learning materials
   c. Curriculum analysis
   d. Analyze learner characteristics

2. Design Stage

   a. Designing research instruments
   b. Designing learning tools
   c. Determining Competency Standards (SK), Basic Competencies (KD) and Indicators
   d. Designing the framework of animated video learning media

3. Development Stage

   This stage, the development of animated video learning media is carried out in accordance with the design, which begins with designing the cover and background of the animated video using Canva software, for the material and layout of the animated video is designed using Microsoft Word, then continues the animation video design process using cap cut to make the video look more attractive by including other components in the video such as sound, music, links to exercise questions and links to evaluation questions that are integrated into the animated video.

4. Implementation Stage

   At this stage, the animated video learning media was implemented in the

learning process in class XI IPA SMA Negeri 1 Gowa to determine the practicality and effectiveness of the animated video produced. The practicality aspect is measured using the media implementation observation sheet in the learning process as well as the teacher and student response questionnaire to find out their response to the resulting product. Meanwhile, the effectiveness aspect is measured using a student learning outcome test after using the animated video that has been developed in the learning process.

5. Evaluation Stage

This stage is carried out by revising the shortcomings that are still found in the animated video learning media developed (Widyoko, 2016)

The research instruments used in this study include:

1. Validation Sheet, determining the validity of a product is based on validity data determined by the respondent. This validation sheet contains a validation grid of learning evaluation tools that will be assessed by the validator by giving a check mark on the answer choices that are considered appropriate or appropriate.

2. Questionnaire Sheet, data related to students' responses to the practicality of the animated video developed can be obtained from a questionnaire that has been filled in by students. The data collection techniques used in this study are interviews and observations conducted at the analysis stage. Then the data collection technique in the form of a questionnaire is carried out on the product that has been developed.

3. Learning Outcome Tests, tests in this study aim to determine the effectiveness of learning evaluation tools. The instrument used is a question in the form of multiple choice.

Data analysis techniques used by researchers to process this research data include:

1. Data Analysis of Learning Media Validity. This technique is a way of analyzing quantitative data obtained from validity test questionnaires by media and material experts. Quantitative data in the form of numbers from assessments or measurements can be processed by summing, then comparing with the expected number, the average assessment value is obtained (Arikunto, 2021). Then if this method is described in the formula, it can be written as follows:

Average assessment = total score of assessment results: number of assessors

Table 1. Media validity criteria

Average Value	Validity Criteria
$X > 3.20$	Very Valid
$2.40 < X \leq 3.20$	Valid
$2.40 < X \leq 3.20$	Less Valid (revised)
$0.80 < X \leq 1.60$	Not Valid (total revision)

2. Data Analysis of Practicality of Learning Media

Practicality of animated video learning media by processing and analyzing EHEGRTARdata from observation sheets of device implementation, student and teacher response questionnaires. So that the data analysis for the three components.

a. Data Analysis of Device Implementation Observation

Tabulation of data scores from learning observations by giving a score of 1 for 'yes' and 0 for 'no'.

b. Analysis of Teacher and Learner Response Questionnaires

3. Data Analysis of Learning Media Effectiveness

The effectiveness of animated video learning media is measured by processing and analyzing data from student learning outcomes tests. Learner learning outcomes test data were analyzed quantitatively using descriptive analysis and describing the characteristics of the research subjects in the form of the highest score, lowest score, average score obtained by students. The descriptive statistics were calculated manually. While the effectiveness analysis is reported in the form of individual

completeness scores and class completeness percentages.

RESULTS AND DISCUSSION

This research and development aim to produce animated video learning media on quality chemical equilibrium material. The quality of this animated video learning media is based on its validity, practicality, and effectiveness. This development research refers to the development of the ADDIE model.

In this study, researchers developed animated video learning media on chemical equilibrium material. The development was used to determine the quality of the animated video developed. The criteria that must be met to be said to be of quality include the validity, practicality, and effectiveness of the animated video. The quality criteria are seen from the animated video instrument and animated video media. The test instrument refers to the items of chemical equilibrium material. Then the animated media in the form of animated videos as learning media.

The final product of this development is in the form of 20 evaluation questions on chemical equilibrium material. To be able to access the animated video, users can access via smartphone or laptop. The animated video is designed in such a way as to meet the needs of teachers in carrying out assessments both online and offline in today's world of education.

The quality of animated video learning media instruments in terms of validity includes the validity of test instruments according to material experts, validity based on the validity test of test items, the level of difficulty of test questions, and the differentiating power of test questions. While the quality of animated video learning media is reviewed from its validity based on validation by media experts.

Material validation was carried out by means of a validator assessing a test grid instrument containing test items and discussion of answers to material validators. Validators assessed 9 items that had been designed. The results of validation by the material are shown in Table 2. as follows:

Table 2. Data from material expert assessment results

Assessment Aspects	V1	V2	Average Score	Category
Contents	3.75	3.5	3.625	Very Valid
Presentation	4	4	4	Very Valid
Language Eligibility	4	3.5	3.75	Very Valid

The average value of each assessment from the material validator is 3.79, which means it is categorized as very valid so that the animated video learning in terms of material is very valid. Comments and suggestions from the validator were used as material for revising the animated video media questions before the initial field trial. The validity of the test instrument at the validation stage by the material obtained an RTV value of 3.79 which means the test instrument is very valid. Then some comments and suggestions for improving the test instrument which were then corrected by the researcher before the initial field trial was carried out.

The quality of animated video learning media can be seen from the results of validation by media experts. In the validation by media experts there are three aspects of assessment to assess how valid the animated video media developed. In the overall programming aspect, the validator's assessment obtained 3.5, which means that in terms of presentation it is categorized as very valid based on validity indicators. In the aspect of the overall appearance of the validator's assessment, 3.36 was obtained, which means that it is categorized as very valid in terms of appearance. And in the aspect of content accuracy which means in terms of content accuracy is categorized as very valid. The average validity of the media is 3.42.

Media expert validation is a validation of the animation video. Data on the results of validation by media experts can be seen in table 3.

Table 3. Media expert assessment results data

Assessment Aspects	V1	Average Score	Category
Programming	3.5	3.5	Very Valid
Appearance	3.36	3.36	Very Valid
Accuracy of content	3.4	3.4	Very Valid

Then the animated video media used in the evaluation of chemical equilibrium material can be categorized as valid based on the validity analysis in terms of test instruments and in terms of animated video media. This is based on the data generated in the main field trial, both of which show the results of the instruments used are valid based on the test of item validity, reliability, difficulty level and distinguishing power. Then the animated video media used as learning media is valid based on the results of media expert validation. So that the implementation of evaluation using animated video media on chemical equilibrium material is said to be valid.

The quality of video animation in terms of practicality means referring to the practicality of video animation media. The practicality of a media can be known based on the results of a questionnaire of students' responses to the use of animated video media in the implementation of evaluations on chemical equilibrium materials. The questionnaire contains aspects of media navigation/operation, display, and media benefits. In the initial field trial involving 9 students, the response was obtained in the form of:

Table 4. Recapitulation of learners' response to animated video per aspect (small group trial)

No	Assessment Aspects	Percentage	Category
1	Navigation / Media Operation	82%	Very high
2	Views	85%	Very high
3	Benefits of media	84%	Very high
	Average	83%	Very high

The percentage of all aspects is 83%, so the animation video is categorized as very practical in the initial field trial.

Table 5. Recapitulation of learners' response to animated video per aspect (large group trial)

No	Assessment Aspects	Percentage	Category
1	Navigation/ Media Operation	88%	Very high
2	Views	85%	Very high
3	Benefits of media	84%	Very high
	Average	86%	Very high

While in the main field trial involving 36 students, the percentage of responses to the main field trial from all aspects was 86%. From all aspects is 86%, so the animated video is categorized as practical.

Based on the review of the quality of the animated video, there are several questions that must be revised and replaced because they have a low level of validity and poor discriminatory power, so that the main field trial produced data that showed that the animated video developed was effective, but several questions still had to be revised again.

CONCLUSION

The conclusion based on the results of the research and discussion that have been described previously is that the animated video learning media that has been developed is said to be of quality. With the quality criteria in the form of: (1) The animated video learning media is said to be very valid by material experts at 3.79 and by media experts at 3.4; (2) The animated video learning media on the chemical equilibrium material is categorized as practical based on the implementation test, teacher and student responses with an average percentage of values of 88%, 86.11% and 86% respectively; (3) The animated video learning media has a very high category of effectiveness criteria, with student learning outcomes meeting the effective criteria

(≥80%) where the class completion percentage is 88.8%.

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