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Development of Science Comic Based on Auvidi Media on Global Warming Materials

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ABSTRACT

Science comic based on auvidi media are rarely applied in science learning. Based on the result of pre-research at SMP Al Hikam Kemayoran students consider that learning science is very difficult and boring due to the lack of use of learning media. The solution given is to develop science comics based on auvidi media on global warming materials. This development research aims to determine the feasibility, readability, and students responses to the media. This study uses the ADDIE development model. This research was conducted at SMP Al Hikam Kemayoran class VII with 34 students. The sampling method is a saturated sample technique for class VII students. Data collection techniques use interviews, quesrionnaires, and documentation. The results of the media feasibility validation obtained an average result of 0,98, while the material eligibility validation obtained an average of 0,83 as very valid. The readability percentage obtained an average score 83,50% and student respons obtained an average score of 88,88% in the very good category.

1. Introduction

Science education is a learning related to everyday life. Through learning science students can identify and solve problems ecountered (Setyawan et al., 2020). Interesting science learning will give students direct impressions and experiences, so that students knowledge is broader (Okra & Novera, 2019). However, in reality the science comic lessons currently being taught still tend to be teacher-centered and the learning media used are less varied (Wahyudin et al., 2020).

Based on the result of pre-research conducted at SMP Al Hikam Kemayoran, as many as 72,7% of students stated that science comic subjects were difficult subjects. In addition, science learning that has been carried out so far is still less varied. This is because learning only uses learning resources from textbooks, so student feel bored and less interested in learning activities. As many as 97% of students have never heard of science comics, because science comics have never been used as learning media. This research is in line with research conducted by Kade et al. (2021) which states that students are less

enthusiastic about participating in learning, due to the selection of learning media that is not adapted to student needs.

Based on the problems above, the solution given is to develop a learning media that suits the needs of students, one of which is comics. Subroto et al. (2020) explained that many school age children like comics, because students can identify the characters in comics and can recognize the problems that occur. Based on research conducted by Kasih et al. (2022) the use of comics in learning medium can be used in all subjects, one of which is science. Aulia et al. (2020) stated that science comic learning media is one of the teaching materials that can foster students interest in reading, because science comic display interesting and varied images, students will also be emotionally involved so students feel interest in reading. Science comics can be packaged in various form of media, one of which is through auvidi media.

According to Yusmawati et al. (2020) silent audio-visual media is a combination of 2 media elements, namely visual media elements and audio media. The use of auvidi media in learning activities can create student interest, because this media can help make it easier for students to understand subject matter (Prutanti et al., 2022). However, silent audio-visual media is still rarely used in learning, due to limited facilities and infrastructure to support the application of these learning media (Tanggur & Lawa, 2022).

The use of science comics based on auvidi media in this study uses global warming material. Global warming material was chosen because the issue of global warming is an important discussion for students to learn because it relates to environmental changes that are occurring (Mufida & Qosyim, 2020). Based on the background described above, it is necessary to conduct research to development of auvidi-based science comic on global warming materials as an effort to answer media needs in the learning process.

2. Methodology

The development of learning media in the form of science comic based on auvidi media on global warming material uses the ADDIE development model by Branch (2010). The ADDIE development model was chosen because this development model is a general learning model and is in accordance with development research (Rohaeni, 2020) The ADDIE stages include analyze, design, develop, implement, and evaluate.

In the analyze stages, an analysis of the needs of the development of a media in learning process is carried out. This research instruments in the analyze process are 4 stages, namely identification of problems in learning science, analysis of student characteristics, analysis of learning objectives, and analysis of the resources needed in development. The design stage is the stage used to answer the problems that exist in the analysis stage, as well as having ideas for product development.

Activities at this stage are making storyboards to facilitate the process of making media and selecting software used in media development. The develop stage is the stage of making a science comic based on auvidi media. After the auvidi media-based comic science media has been completed, a media feasibility test will then be carried out through the assessment process of the validation test of media experts, material experts and junior high school science teachers. The implement phase is the trial phase with 34 class VII students of SMP Al Hikam Kemayoran. The evaluate stage is the final stage of the ADDIE development model. The evaluation used in this development is a formative evaluation carried out at each stage. The instruments used in this study were media expert validation sheets, material experts, and science teachers, media readability questionnaires and student response questionnaires. Data collection techniques in this study used pre-research questionnaires, interviews, and documentation. Data analysis techniques in the form of validation data and questionnaires were made on a Likert scale with a score of 1-4. The validation results obtained are calculated using the following formula (Yolanda, 2020).

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

Information :

V = Expert validation

s = r - lo

r = The score of the validator's choice category

n = Number of validators

lo = The lowest validity rating score (lo=1)

c = The highest validity rating score (c = 5)

Based on these calculations, the validity criteria can be seen in Table 1.

Table 1. Criteria for Validity

Percentage	Criteria
$0,81 < V \leq 1,00$	Very valid
$0,61 < V \leq 0,80$	Valid
$0,41 < V \leq 0,60$	Less valid
$0 \leq V < 0,40$	No valid

Furthermore, the auvidi media based science comic readability questionnaire obtained can be analyzed using Formula (Cahyati et al., [2021](#)).

$$P = \frac{Xa}{Xm} \times 100\%$$

Information :

P = Total score of the assessment results

Xa = Total score of each item

Xm = Maximum total score

The readability percentage criteria can be seen in Table 2 (Sugianto et al., [2018](#)).

Tabel 2. Criteria for the Percentage of Media Readability

Percentage	Criteria
75% < R ≤ 100%	Very good
50% < R ≤ 75%	Good
25% < R ≤ 50%	Fairly good
0% ≤ R ≤ 25%	Not good

The response questionnaire that has been obtained is used to measure students' responses to auvidi media-based science comic media. Student response analysis is calculated using formula (Nazilah et al., [2018](#)). While the criteria for student response questionnaires can be seen in table 3.

$$\% \text{ Respons} = \frac{\text{jumlah skor yang diperoleh}}{\text{jumlah skor maksimal}} \times 100\%$$

The response questionnaire percentage criteria can be seen in Table 3.

Tabel 3. Criteria for the Percentage of Student Respons

Percentage	Criteria
75% < R ≤ 100%	Very good
50% < R ≤ 75%	Good
25% < R ≤ 50%	Fairly good
0% ≤ R ≤ 25%	Not good

3. Results and Discussion

The results of this development research are in the form of auvidi media-based science comic product development on global warming material that has been implemented at Al Hikam Kemayoran Middle School with a sample of class VII as many as 34 students. The place for implementing this development research is at Al Hikam Kemayoran Middle School which is located on Jl. Teuku Umar Gg IV/47 Kemayoran, Kec. Bangkalan, Kab.

Bangkalan. The results and analysis of science comic products based on auvidi media are as follows.

The analyze stage is carried out to find out the need for the development of science learning media and the needs needed in developing the media. The first stage of the analysis carried out was the identification of problems in learning science through interviews with science teachers. Based on the results of the interviews it is known that it is necessary to develop and use science learning media in schools. The development of this media is used to increase student interest in the teaching and learning process. Based on the results of the interviews that have been conducted, there is still no use of auvidi media-based science comics as science learning media, therefore auvidi media-based science comics can be creative and innovative learning media in schools.

The next stage of analysis is the analysis of student characteristics through a pre-research questionnaire by students. Based on the results of the analysis of student characteristics it is known that students still think that science lessons are difficult and boring. So that students are less interested in teaching and learning activities. Students prefer to read comics rather than textbooks, therefore students agree that science comics are used as learning media. The next stage of analysis is the analysis of learning objectives based on pre-research questionnaires.

The results obtained are that students still do not understand global warming material well. Therefore the development of this media uses global warming material that is adjusted to the basic competencies of global warming material. The fourth analysis is the analysis of the resources needed in development. The results obtained based on interviews with junior high school science teachers, namely that it is known that there are still limited facilities to support learning activities, such as only the availability of learning text books.

The second stage in the ADDIE development model is the design stage. In media design there are 2 stages. The first stage is designing a science comic. The steps taken in the first stage are by determining the characters and characters from the comic, compiling the storyline in the comic, the timeline, then associating the material used with the storyline. After associating the material with the storyline, the next step is to arrange dialogues between characters and design figures and storyboards on paper. The second stage is the selection of applications used to develop learning media.

The third stage of the ADDIE model is the develop stage. The first development stage is drawing comics using the CorelDraw x7 application. The next step is recording the voices of the characters, the voices that have been obtained are then edited using the Adobe Audition application to adjust the characters' voices, then combining images and audio using the CapCut application. When finished, the media that has been developed is uploaded to the YouTube platform for easy access. The develop stages are as follows.

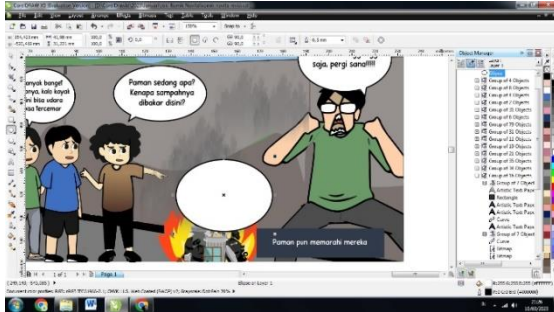


Figure 1. Draw the Science Comic

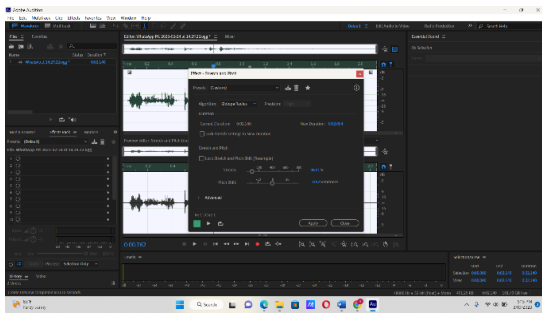


Figure 2. Edit Character Voice

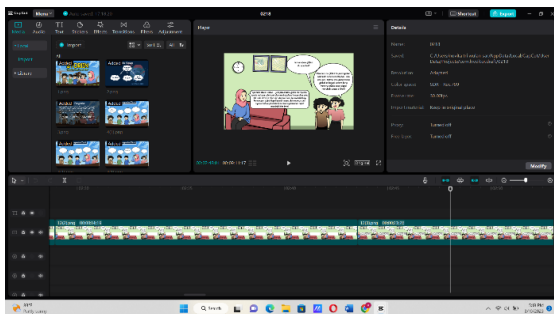


Figure 3. Combine Visual and Audio Element

After the media is developed, then it enters the validation stage. The validation stage consists of the validation of media experts and material experts. Validation by media experts and material experts as well as teachers of auvidi media-based science comics on global warming material produced was carried out before being tested at the implement stage.

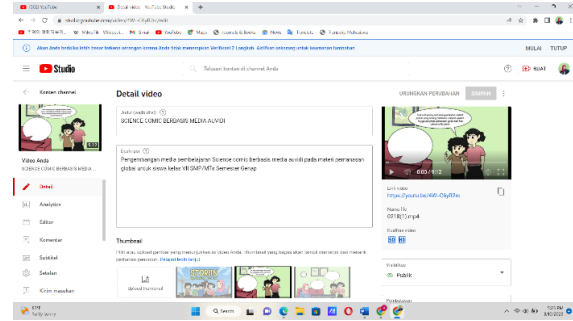


Figure 4. Upload Media

Validation aims to determine the quality and feasibility of science comics before being implemented on students. The results of the validation questionnaire analysis by media experts are presented in Table 4.

Table 4. Results of Media Expert Validation

Aspect	Expert media	Science teacher	Average aspect validity	Category
Feasibility of visual display	1	1	1	Very Valid
The characters in science comic	1	0,92	0,96	Very Valid
The storyline in science comic	1	1	1	Very Valid
The language in science comic	1	0,92	0,92	Very Valid
Compability with auvidi media	1	1	1	Very Valid
Average	1	0,92	0,98	Very Valid

The validity results obtained from media experts are equal to 0.98 with a very valid category. Based on the acquisition of these values, science comics based on auvidi media on global warming material are very suitable to be used as learning media. Science comics are declared appropriate and effective for use because the comic media produced is in accordance with the characteristics and needs of students (Febriyandani & Kowiyah, 2021). This is also supported by relevant research conducted by Khadar et al. (2022) that digital comic media is very feasible and can be used in science subjects. Science comics based on auvidi media also have attractive visuals so that readers who see them will not be bored. Besides that, based on

Ivan P. Pavlov's theory of behaviorism, when students are given a stimulus, there will be a response from students, learning media is used as a stimulus or stimulus (Laja & Simarmata, [2022](#)).

Further validation is carried out by a team of material experts. The results of the material expert validation questionnaire analysis are presented in Table 5.

Tabel 5. The Result of the Material Expert Validation

Aspect	Expert material	Science teacher	Average aspect validity	Category
Content eligibility	0,83	0,83	0,83	Very valid
Feasibility of presentation	1	1	1	Very valid
Language	0,67	0,67	0,67	Valid
Average	0,83	0,83	0,83	Very valid

Based on the table, it can be seen that the validity of the material expert obtains an average result of 0.83 which is categorized as very valid. This shows that the material presented in science comics based on auvidi media has complete material related to Basic Competence. Global warming material presented in the media contains the understanding of global warming, the greenhouse effect, the causes of global warming, the effects of global warming, and efforts to tackle global warming.

Astuti et al. ([2021](#)) explains that the completeness and breadth of the material taught in learning is something important. This is because the level of students' cognitive development is influenced by the level of students' ability to understand the material well. Based on Jean Piaget's learning theory of cognitivism, the higher a person's understanding, the more organized and abstract his way of thinking will be.

After the science comic is declared very valid by media experts and material experts, then the media will be tried out to the implementation stage. Science comics were implemented to 34 students of class VII SMP Al Hikam Kemayoran. The trial was carried out by distributing readability questionnaires and student response questionnaires as research subjects. The trial phase is used to determine students' responses to the auvidi media-based science comics that have been developed. The results of the analysis of the assessment of the average score of each aspect based on the readability of the media are presented in Table 6.

Tabel 6. The Result of the Product Trial Readability Questionnaire

Aspect	Average score (%)	Category
Media display	82,43	Very Good
Concept accuracy	84,74	Very Good
Language	86,40	Very Good
Average	83,50	Very Good

The readability of science comics based on auvidi media aims to determine students' readability of the media that has been developed. The results obtained from the product trial, namely 83.50%, obtained a very good category. This shows that students are very interested in science comics based on auvidi media because the images displayed are clear, the designs are attractive, the colors are attractive, and the material is easy to understand (Solehah, et al., [2022](#)). In addition, the material presented in the media is explained in a clear and easy-to-understand language.

After students fill out the readability questionnaire, then students are given a student response questionnaire. The results of the student response questionnaire are presented in Table 7.

Tabel 7. Results of the Student Response Questionnaire

Aspect	Average score (%)	Category
Material	92,28	Very Good
Usefulness	87,75	Very Good
Average	88,88	Very Good

The student response questionnaire aims to determine student responses to the use of auvidi media-based science comics on global warming material. Student response questionnaires obtained an average result of 88.88% in the very good category. Based on this, the developed media has been able to explain the subject matter well and can be accepted by students, so that students can easily understand the content of global warming material. Material in learning media is a very important element. Material in comic science can be used as a support for learning science material. This statement is also in line with the position of the media based on David Ausubel's meaningful learning theory, namely the media functions as a link between students' newly acquired knowledge and previously received knowledge, so that students will better understand and remember the content of the material (Muamanah & Suyadi, [2020](#)). In line with the results of research conducted by Efendi et al. ([2021](#)) which states that the use of science comic media in the learning process can

make learning activities effective and increase students' interest in reading.

4. Conclusion

Based on the results described above, it can be concluded that the results of science comics based on auvidi media on global warming material are appropriate and can answer the research problem formulation. This can be seen in the validation results obtained from the expert team which are categorized

as very valid, so that the media that has been developed is feasible to be implemented to students. Science comics based on auvidi media on global warming material that has been declared feasible by a team of experts will be implemented on students. The results of student implementation were obtained based on readability questionnaires and student response questionnaires. Based on this, science comics based on auvidi media are effectively used in learning activities and get good responses from students.

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