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DESIGN AND DEVELOPMENT OF 2D ANIMATION VIDEO AS A GENETIC MATERIAL BIOLOGY LEARNING MEDIA USING ADDIE METHOD

Deli, Widya Risma Ilahi

Faculty of System Information, University International Batam

{ deli@uib.ac.id 1831042.widya@uib.edu }

ABSTRACT

Genetic material is one of the lessons that is abstract, so that abstract material becomes easier to understand, a learning media that applies animation is needed. The use of animation in the design of this video makes the media more creative to attract students' attention, the use of animation media can also generate interest and increase student learning motivation. In addition, animated videos can also specifically explain abstract material to help students understand biology, especially genetic material. This study uses the ADDIE method which has five stages, namely Analysis, Design, Development, Implementation, Evaluation, and is designed using Adobe After Effects software. The results of the design and development of animated videos that have been carried out by the author will be implemented on youtube. Thus, the use of animated media is easy to find and can help students in studying the biology of genetic material.

Keywords: Animation, Biology, After Effect

INTRODUCTION

The presence of information technology plays an important role in aspects of life, along with the changes and developments that are happening at this time where there are very rapid changes in various fields, including in the field of information and technology, this field has a very large influence on education. This influence can be seen from the application of technology in learning. These technological advances allow teachers to provide and utilize technology in the form of multimedia as material to facilitate and motivate students in learning (Marhani, Aunurrahman, and Umar

2019). Education in Indonesia is more often known as the conventional system, where teachers will provide more learning materials using books. So that there are challenges for teachers in conveying material to their students, so that they don't look boring in learning activities. No wonder many teachers are getting left behind in getting information compared to their students (Rengkuan 2020). This is because the faster and easier information can be obtained by students without having to wait for learning materials at school. The use of learning media during teaching is one source that can be used as a message distributor, thus

helping teachers in conveying some material that is difficult to describe. It is also more interesting and effective to use as a carrier of information from teachers to students. This video media packaging is combined with animation. Animation is the activity of moving and moving stationary objects. Therefore, animation is a static object that is projected into a moving image that looks alive (Zakirman and Hidayati 2017). Animation is known as a frame, which means a series of images arranged sequentially, in one frame usually consisting of one image, if the arrangement of images is displayed alternately with a certain time will produce an image that looks moving. This study uses the ADDIE method which provides opportunities for continuous evaluation and improvement at every stage that is passed, so that the final product becomes an effective product. This method consists of 5 stages, namely *Analysis, Design, Development, Implementation, Evaluation* (Budiarta 2017). Therefore, the author wants to make a study entitled "Design and Development of 2D Animation Videos as Learning Media for Biology of Genetic Material Using the ADDIE Method". This research is also supported by several literature reviews as the basis for the research which is explained as follows:

In research conducted by Hera, (2017) is a non-applied research that analyzes case studies in the process of learning genetic concepts. This study aims to determine the problems in the process of learning the concept of genetics at SMA Negeri 2 Seulimun, Aceh Besar District. The research method used is descriptive exploration method by distributing

questionnaires, conducting interviews and observations. Data analysis was carried out qualitatively and presented in a descriptive form. And the results of this study turned out to be several factors related to genetic learning problems related to the models and facilities used, such as learning media and the use of science laboratories. Other research was also carried out by (Anwar, Schadaw, and Althafani 2018) is an applied research that designs interactive animation about Sundanese language. This study aims to determine students' understanding of the development of interactive animation applications for learning Sundanese. This study uses several software including Adobe Animate, Adobe Photoshop CS, Adobe Illustrator CS, and Adobe After Effects CS 3. In this research the method used is R&D (Research and Development) with the ADDIE model. The result of this design is an interactive animation application that can provide convenience in learning the Sundanese language among elementary school students.

Furthermore, in other supporting research conducted by Agustien & Umamah, (2018) is an applied research that develops historical learning media in the form of 2D animated videos in Bondowoso. The purpose of this research is to produce 2D animation video learning media products. The method used in this research is the ADDIE development method. The results of this study indicate that this 2d animation learning media product is validated and is in an interesting category.

In research conducted by (Febriyanto, Hidayat, and Saputra 2018) is an applied research that creates a 3D animated bumper

video for the Almado Buana Utama logo with After Effects. Aims to attract people to become animators even if it's just to make light animations. Because wages are quite low in Indonesia, making young people less interested in becoming an animator, this author makes an animated 3D logo bumper video using Adobe After Effects software, the research method used is observation and literature review. The result of this research is an animated video that will be implemented through social media such as youtube. The latest supporting research conducted by (Saadah 2018) is an applied research research that develops mathematics learning media based on animated videos and aims to find out how the process of developing, valid, practical and effective mathematics learning media based on animated videos is for students of SMP Negeri 1 Selorejo Blitar. In this study the author uses the Research and Development method or commonly abbreviated as R&D, the design of this animated video uses Adobe After Effects software and produces an animated video as a medium for learning mathematics which is implemented for SMP Negeri 1 Selorejo Blitar.

PROPOSED INNOVATION

Animation is a display that combines various kinds of media such as graphic media, text and sound in an activity. animation displays or visualizes various images that are arranged sequentially in such a way that makes the audience feel the real picture that is displayed sequentially. This animated video is designed in such a way that it can display text, color images, audio and animation in a single

unit, so that it can attract students to be able to learn through the animated video material that has been presented. In the development stage of this animated video, it will follow five stages of ADDIE which starts with analyzing the needs and problems that are happening, then the author will collect the materials needed in the design stage, and the author will carry out the editing stage using Adobe After Effects software and will be implemented. to the author's youtube account, and can be accessed in general by viewers. And this animated video can later be used as a biology learning media material that can be accessed by students or teachers and can be used as a medium of information about genetic material.

METHODS

The research entitled "Design and Development of 2D Animation Videos as Learning Media for Biology Genetic Material Using the ADDIE Method", the design method used by the author is the ADDIE (Analysis, Design, Development, Implementation, Evaluation) method. The display of the stages of designing a 2D animation video using the ADDIE research method consists of five stages, namely analysis, design, development, implementation, evaluation. As in **Figure 1** *ADDIE (Analysis, Design, Development,*

Implementation, Evaluation) as follows:

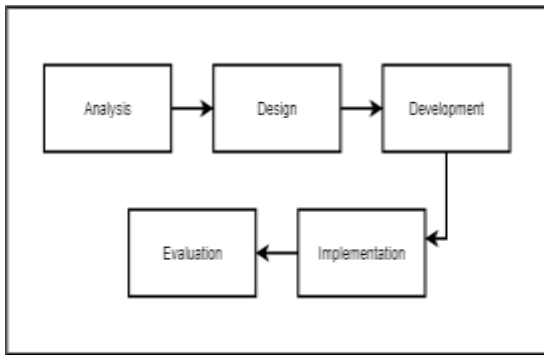


Figure 1. ADDIE (Analysis, Design, Development, Implementation, Evaluation)

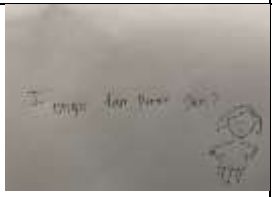

The following is an explanation of the five stages of the ADDIE method (Analysis, Design, Development, Implementation, Evaluation) in designing 2D animation videos, namely:


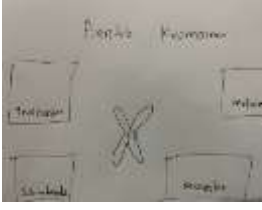

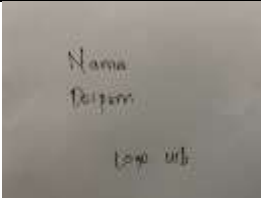
A. Analysis

This biology learning media is intended for 12th grade high school students. Based on the observations made, it was found a needs analysis for animation learning media users, students who study genetic material need a media that can help them in receiving lessons, one of which is animation, in media design. This learning also requires a series of equipment to assist and support the smooth process of making animated learning media. In designing this 2D animation video, several design stages are carried out, namely the first stage is carried out first by determining what ideas or concepts will be made in the 2D animation video genetic material, then looking for materials that will be used in designing 2D animation videos, after collecting the materials. -Process materials will proceed to the creation of 2D animated videos using Adobe After Effects CC 2017 Software.

B. Design

At this stage, a plot of the development of an animated video will be made in the form of a sketch, which is an idea board or also known as a storyboard. The storyboard contains attributes in the form of visual images, sounds, duration, and descriptions for each scene in the video that will be designed. **Table 1.** Storyboard

No	scene sketch	Duration	Description
1.		0:00:54	The first display as an opening will display an explanation of the gene and the function of the gene.
2.		0:01:28	This scene will show an example of a genetic code command.

3.		0:03:00	This scene displays the location of the gene at the locus.
4.		0:05:18	The next scene will state about chromosomes and the forms of chromosomes.
5.		0:06:05	Display as a closing thank you.
6.		0:06:16	This final scene will display the author's name, supervisor and the logo of Batam International University.

C. Development

This animated video design will be developed according to the arrangement of the design on the storyboard that has been made. The concept of this video is to explain what genes, DNA, and chromosomes mean and examples in everyday life, which of course will be explained briefly in the video. Making this animated video will be assembled using Adobe After Effects software. Every editing in Adobe After Effects will follow the flow of the storyboard sketch that has been made. below is an example of the display editing done by the author using Adobe After Effects software.

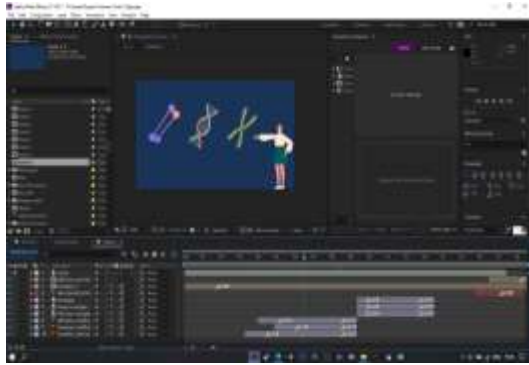


Figure 2. *Editing process*

D. Implementation

The final video will be rendered via Adobe After Effects. This animated video can be used in teaching and learning activities and can help students learn biology lessons, especially genetic material. The total duration of the video is 6 minutes 23 seconds including opening to closing. Here are some explanations of the appearance of the animated video designed using Adobe After Effects Software:

The initial display of this video is the title of the animation entitled "GENETIC MATERIALS" with Montserrat font size 90, color 1A3459 with a 2 second transition in.



Figure 3. *Display of genetic material*

The next display will explain the gene with the font size 156 Montserrat color 1A3459, for the explanation of this gene

will take a duration of 22 seconds.

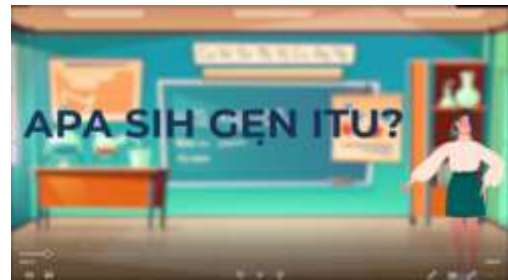


Figure 4. *Initial view of genes*

The next scene will show DNA and RNA which briefly explains the genes that combine to form chromosomes, the font used is Montserrat size 55, color 1A3459.

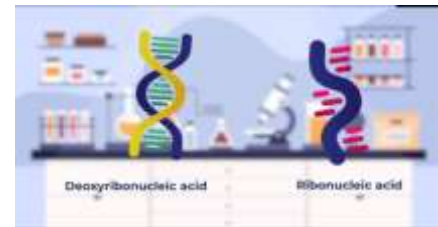


Figure 5. *DnA & RnA*

In this scene, we will display child vectors as examples of genetic code commands, the font used in this scene is Montserrat with size 127 and color E0867B, and the background used in this scene is a laboratory.



Figure 6. *Command of the genetic code*

This scene describes the function of genes which carry genetic information and regulate metabolism in living things. In this scene, we use the Montserrat font with color 0D1418, the size for "GEN

FUNCTION" is 127 while "BRINGING GENETIC INFORMATION" uses size 54, the duration used in this scene is 31 seconds.



Figure 7. *Gene function*

The next scene will show examples of nitrogen bases that last 12 seconds, with the font Montserrat size 162 and the color EBEBEB.



Figure 8. *Nitrogen*

This scene will explain where the gene is located, and will show an overview of the loci and display a table of the differences between DNA and RNA. The size used for "LOKUS" is 109, while for "GEN POSITION" it is 156. The font used is Montserrat. The duration used in this scene is 44 seconds.



Figure 9. *Gen position*

The next scene will explain about chromosomes, starting from the understanding of chromosomes, types of chromosomes such as autosomes and gonosomes, and in this scene will briefly show parts of chromosomes and will also show an overview of chromosome parts. With a duration of 1.25 seconds.



Figure 10. *Chromosomes*

In this chromosome scene, 4 shapes of chromosomes will be displayed, each shape will be explained per scene with the font Montserrat size 90 and the color E9EBED. The duration used to explain the shape of the chromosome is 40 seconds.



Figure 11. *Chromosomal shape*

The closing section ends with a thank you and will display a slide of the author's name and the lecturer who guides the author in completing the final project. With font Montserrat size 93 and color

1A3459.



Figure 12. *Closing*

After the editing process is complete, the author will render in Adobe After Effects software, the rendering process begins with an estimate of approximately 20 minutes, and the specifications of the laptop used for rendering also affect the speed, the greater the processor speed, the faster the rendering process is carried out.

E. Evaluation

The results of this animated video will be tested to assess whether the video has shortcomings such as lag, video quality, audio, and will be tested whether the designed video is in accordance with the previous storyboard.

Table 2. *Test result*

No	Tests carried out	Test result
1	Video fluency test on run	Pass
2	Testing video rendering quality	Pass
3	Audio video test	Pass
4	Testing the image according to the storyboard	Pass

The results of this 6 minute 23 second video will be uploaded and distributed to the "Wdya Rsma" Youtube platform. Viewers only need to search for the video on Youtube via the title "2D Animation Video as Learning Media for Biology of Genetic Material" or just search the Youtube channel "Wdya Rsma". The following is the implementation of the author.



Figure 13. *Youtube implementation*

LIMITATIONS

1. In collecting materials, it is difficult to find some vectors about genes, DNA, and chromosomes, so the author takes time in collecting materials
2. When the editing stage is complete, the author has difficulty rendering because the laptop used at the editing stage is not supportive.

FUTURE WORK

The design and development of this 2D animated video is a learning medium about genetic material that may have advantages and disadvantages. Some of the propositions are as follows:

1. This research is a must in future schemes to find a better design for the next learning media.
2. The editing process can be added using some software to design animations.
3. The design and development of 2D animated videos in the future can be implemented through various social media to make it easier to find widely and can be enjoyed by many.

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