Web-Based Animation for 8th Grade Science Student on Human Blood Circulation

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ABSTRACT
During the Covid 19 pandemic, education around the world has turned to online learning. It takes teacher creativity in delivering learning material to be attractive so that it motivates students to learn independently. With online learning, biology class 8 chapter, Human Blood Circulation put it on the media website. This media's benefits can be associated with attracting attention, and keeping students awake is paying attention. With the existence of learning media in the form of website-based interactive animation, it hoped that it could help teachers visualize material to students and help students achieve completeness in learning. After creating the website through the testing process, we got the website's success rate at 87.3% and in the top category, whereas in Nielsen Norman's rules, the success rate is up to 96%.

Keywords: *animation, web-based, online learning, covid, human blood*

1. INTRODUCTION

Education is one of the essential aspects of nation-building. In this covid-19 condition, the pattern of education in Indonesia has changed. Implemented by the government today is online-based education. This includes online learning for the scientific class, the implementation of the 2013 curriculum education. In applying these experimental methods, new tools and creativity of teachers need to deliver teaching materials. [1]. According to Permendikbud No. 65 of 2013 concerning Process Standards, a scientific approach carried out with the following steps: (1) observing, (2) asking, (3) trying, (4) associating, and (5) communicating and can be added (6) creating.

The initial stage in the scientific approach in science class is observing. Observing identifies essential things related to the real knowledge that must be studied, namely finding elements or aspects of that knowledge. This activity can be done by skimming chapters in student books. Not only books, but teachers can also provide other learning resources as objects of observation [2]. In online learning, inspections can't be done in a school laboratory. Additional tools are needed to make it easier for students to understand the material, such as blood circulation material in science lessons.

Making impressive teaching materials, to motivate students to learn independently is needed. Online content developed on a website connected to the internet, which the benefits of media can associated as attracting attention and keeping students paying attention. In material selection research, most students suggested using visual media to improve the effectiveness of science learning, especially biology. Biology contains many abstract concepts and phenomena that require observation, so students have to see what they are learning. [3]

In this case, the website interactive learning media about the human circulatory system, with visual animation to attract students' attention. This website is expected to help teachers in the process of visualizing online material to students. The interactive learning media can also be used as a supporting method in implementing learning through a scientific approach and can help students achieve learning completeness.

2. ANIMATION AS LEARNING MEDIA

The word of media comes from the Latin language, it is plural form of medium, which means intermediary. The National Education Association (NEA) defines media are forms of communication, both printed and

audiovisual, and their equipment. Media also can be managed, observed, listened to, state, or presented simultaneously by the tools applied in certain actions. Learning is a communication process between message recipients and the source of the message [4]. The selection of the wrong media can be problematic if it is not properly thought out. Media selection also needs to be reviewed from the comfort of the surrounding environment [5]. The animation is a series of images that form a movement. Animation can explain changes in state over time. Animation has three main features, namely: The figure, the animation is a depiction of something.The move, which is a movement animation. Simulation, which is the object drawn animation with other simulation methods [6].

The primary idea of applying animation-based media is that the theories or stuff in biology for human blood circulation are theoretical and abstract for students. Biology learning often involves figures to help scholars conceive micro-processes [7]. As in environment can be crammed, learned, and obtained by scholars thought, especially scholars that furthermore demand the guidance of existing instruments in life, obviously noticeable in learning the theories or material developed [8]. Animations may stimulate impassioned commitment. Sensations in biology classrooms are primary for scholars' improvement of attitudes towards studying biology [9]. Animations may be preferred to motionless visualizations in evolving scholars' scientific knowledge [10]

The common practical learning features of computer-assisted teaching is to create each animation rightly within the educative method and to control visual communications for discussion. Therefore, [11] declared that knowledge and implementing the interaction of gesture, tone or sound, period, and observed information within the animation in the learning process would provide the best outcomes for pedagogical study.

With the rapid progression of computing abilities and the advancement of visual design technologies, multimedia lore backgrounds have emerged from rising motionless subject and icon frames to improving complex visualizations. The usefulness of today's multimedia software has created vital fundamental diversity in the department of pedagogy. The delivery of a form, sound, and motion broadcasted to the viewer further efficiently [12]. The animation is used to build visual results in particular education substances implemented within each curriculum. Particular information is higher engaging while the tones, gestures, and texts applied in the education method imply displayed into a satisfying creation on the screen [13].

Variety of animation by merging distinctive animation varieties, including diversifying education methods. Scholastic animations present obscure information. The learners work by conversely view the animation with pleasure. Furthermore, while it completes, they understand that he /she has discovered something of that. Educative animations can be merged among other education techniques and implement comprehensive knowledge. We stand existing during the significant stage. It suggested that educators and other coaching professionals grasp the technology bearings and apply learning technologies in teaching efficiently, toward a model, into the unique teaching process and presenting lectures.

3. RESEARCH MODEL

3.1 Data Collecting

These data collected in this analysis begins with collecting information from grade 8 junior high school teachers at SMP Kemala Bhayangkari 7 Porong, regarding the process of teaching and learning activities in class. The method of gathering this information was carried out through an interview process with Ms. Mel as a biology teacher at SMP Kemala Bhayangkari 7 Porong. The results obtained in this interview describe the types of learning at SMP Kemala Bhayangkari 7 Porong. The learning method is carried out through scientific-based learning to support the 2013 curriculum. Through this scientific-based education, scholars ask to continue active toward teaching and learning activities. The material preparation stage is by sorting the information obtained at the literature from grade 8 science textbooks. The selected content is about the human circulatory system.

3.2 Website and Animation Development

After material validation, a sketch of the asset from the animation will display on the website. Assets are created manually by drawing. There are several assets, namely human assets, body organ assets, and assets, for the background on the website.

Figure 1 Human Blood Circulation Sketch

The next process after sketching is digitizing assets using Adobe Photoshop and Adobe Illustrator. With eight junior high schools as users (13-15 years), the creation of image styles, color palettes, typography adjusted to the user's taste. The results made are vector-based images.

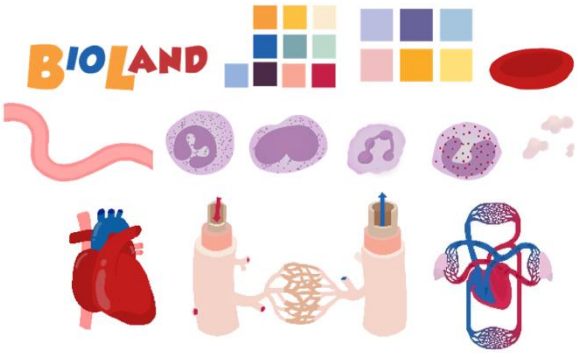

Figure 2 various kinds of vector assets made to animate according to the functions in the science material on the website using HTML 5 technology

3.3 Animated Process

The finished digital assets move through software. Assets are animated with the available tools, making it relatively easy to work on this project. And the results obtained from this animation are some in the GIF and animated raw vector format using HTML 5. There is a total of seven animations; blood flows, heartbeats, blood vessels, blood vessels large and small, people walking, and people with fever.

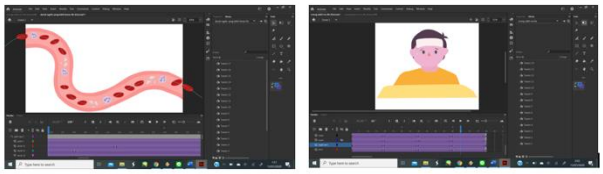

Figure 3 animated process on the software

3.4 Black Box Testing

Black Box Testing is an analysis to determine whether total software functions are running correctly according to their functional requirements. Black Box Testing can obtain software failures toward the following elective classes: Wrong or disappeared features, interface inaccuracies, failures during data arrangements or external database access, initialization and termination failures, functional validity, system sensitivity to specific input values, limitations of a data. Black box testing has several types, including Equivalence Class Testing, Sample Testing, Limit Testing, Robustness Testing, Response Testing, Qualification Testing [17].

3.5 Expert and User Review

After compiling the material, the material will validate by an expert in their field. The expert referred to here is Mrs. Mel as a science teacher for grade 8 at SMP Kemala Bhayangkari 7 Porong, who also teaches about the human blood circulation system to validate the website's material. The finished website tested on 8th-grade junior high school students at SMP Kemala Bhayangkari 7 Porong. This trial carried out using the Black Box method, namely testing to determine whether all software functions have been running correctly according to their functional requirements [18]. The website will be tested on the biology teacher as a guide and expert reviewers to see whether the site is proper and running well. After the test is complete, then it can be analyzed from the data results that have obtained. The website, design and animation results validate by illustrators, website experts, and animators.

4. RESULT AND DISCUSSIONS

The conclusion from this project is an interactive animated website that contains material about the human circulatory system. A total of five website pages consists of the landing page, material menu, and sub-menu for the content. Homepage display can be seen in the fig 4.

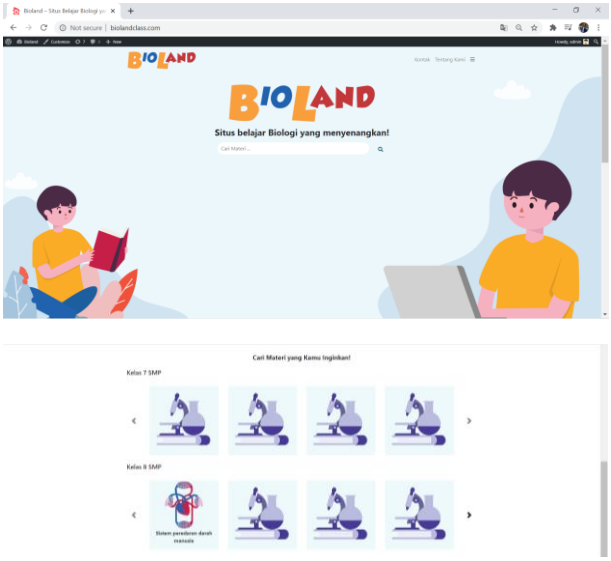

Figure 4 landing page on the website

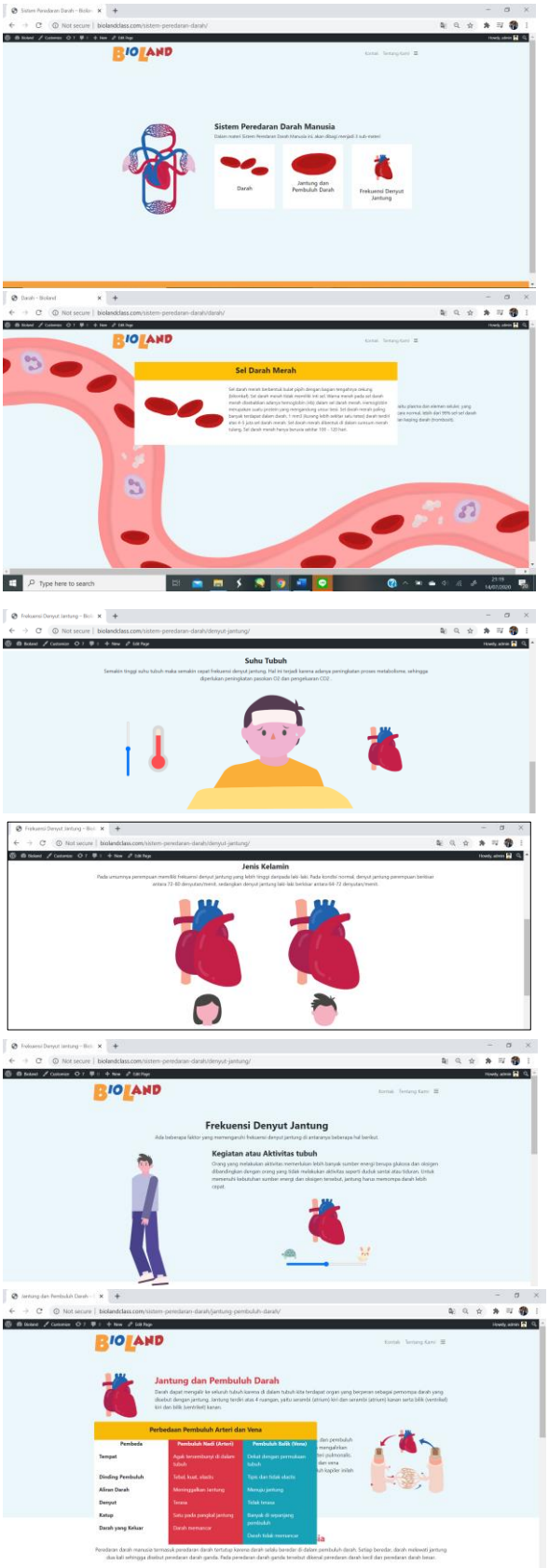

Figure 5 various screen capture on material menu, and sub-menu for material section

4.1 Result Analysis

This website trial conducts expert reviewers in three fields; teachers as material reviewers, illustrators as design reviewers, and people who are experts in the field of websites. Due to the current pandemic condition, testing is being carried out by asking questions through a questionnaire. User testing was carried out by grade 8 students at SMP Kemala Bhayangkari 7 Porong.

Table 1 Media Feasibility Criteria. Adapted: Firmantika and Mukminan 2014

Percentage Models Designation	Percentage Criteria Specification	Percentage Models Specification
76% - 100%	Valid	No Improvement
56% - 75%	Fairly Valid	Not Improved
40% - 55%	Less Valid	Partial Change
<40%	Invalid	Total Correction

This website tested on ten students. The students first tried the Bioland website and proved it by filling out a questionnaire to provide results. There are five answer options for each question; 1 (Very Poor), 2 (Poor), 3 (Fair), 4 (Good), and 5 (Very Good). The following are questions asked of respondents and their results.

Table 2 User Testing on Bioland website results

Grading Assessment	∑ score	∑ max score	**Information**
Material display clearly	4.5	5	Valid
Colors in media learning remain convenient to view	4.8	5	Valid
illustration in media learning remain convenient to view	3.8	5	Valid
Animation are displayed clearly	4.4	5	Valid
illustration in media learning details	4.6	5	Valid
Colour in typography are convenient to view	4.6	5	Valid

Grading Assessment	∑ score	∑ max score	**Information**
The figure cleared and understandable	4.5	5	Valid
Website features run fine	4.7	5	Valid
Website as learning support	4.8	5	Valid
Website usability	4.6	5	Valid

According to Nielsen Norman's rules [19,20], If each user can complete assignments primarily defined stock, this implies completion and is identified by S and given 1 point. If any user makes non-complete tasks, this is perceived as any failure and marked with F and 0 points. If each user can somewhat accomplish assignments, next, it is recognized partly successful furthermore labeled with P and given 0.5. In this study, scores below four will be marked as a partial success, and below three will be given a value of 0 following Nielsen Norman's rules. The score will count by formula (1), and the final project could be scored successfully if the final score is higher than 90% [21].

$$\text{Success rate} = \frac{\sum s + 0.5 x \sum p}{\sum \text{user} \times \sum \text{task}} \times 100\% \quad (1)$$

$$\text{Success rate} = \frac{96 + 0.5 \times 4}{10 \times 10} \times 100\% = 96{,}02\%$$

42 Media and Topic Validation

Website trials conduct on science teachers at SMP Kemala Bhayangkari 7 Porong, illustration experts, and web experts. This test aims to validate the material, illustrations, user interface, and test the website's suitability as an online learning medium. This test conduct using a questionnaire method due to the current pandemic conditions. There are five aspects tested, namely material elements, illustrations, animation, typography, and website. There are also five answer options for each component of the question; 1 (Very Poor), 2 (Poor), 3 (Fair), 4 (Good), and 5 (Very Good). Queries and results can be seen in the following table.

Table 3 Material Aspect Validation

Grading Assessment	∑ score	**Information**
Depth of material	5	Valid
Material display clearly	5	Valid
Enough material display	4	Valin

Table 4 Illuatration Aspect Validation

Grading Assessment	∑ score	**Information**
Images are displayed clearly	5	Valid
Depth of material	4.5	Valid
illustration in media learning details	4	Valid
Colors in media learning are remain convenient to see	5	Valid
Sizing in media learning are remain convenient to see	5	Valid
The ilustration is clear and understandable	4.5	Valid

Table 5 Animation Aspect Validation

Grading Assessment	∑ score	**Information**
Animation are displayed clearly	4.5	Valid
Suitable with material	4	Valid
Animation movement in media learning details	3.5	Enough Valid
Colors in media learning are remain convenient to see	5	Valid
Sizing in media learning are remain convenient to see	5	Valid
The animation is clear and understandable	4.5	Valid

Table 6 Typography Aspect Validation

Grading Assessment	∑ score	**Information**
Tipography are displayed clearly	5	Valid
Suitable tipography	5	Valid
Typography sizing	5	Valid

Table 6 Website Aspect Validation

Grading Assessment	∑ score	**Information**
Landing page are displayed clearly	5	Valid
website features run fine	5	Valid
Website as learning support	4.5	Valid
Website usability	5	Valid
Whole website is clear and understandable	5	Valid

From the ratings given by reviewers and users, it can conclude that the success rate is in the outstanding category on this website and its features.

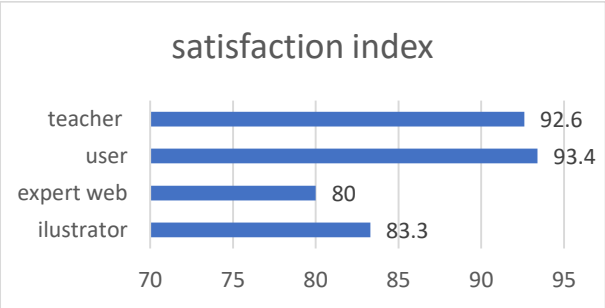

Figure 6 The satisfaction index of all examiners has been processed in the form of a percentage of success. The figure that appears in the figure is already in the form of a percent.

The formula, according to a Likert scale (2), is used to calculate the percentage of success.

$$\text{average} = \frac{amount}{gamut} \qquad (2)$$

$$\text{average} = \frac{349{,}3}{4} \text{ x } 100\% = 87,\ 3\ \%$$

These results can be drawn that this website's average success value is 87.3% and in the outstanding category and valid for use with no revision.

5. CONCLUSIONS

In the Covid pandemic, the animation is the answer to illustrating abstract concepts in lessons, especially lessons related to microcells that cannot be seen without tools. Animation makes abstract things into real things that students can imagine with the help of visual media that moved according to their original circumstances. In several previous studies, it concluded that students could grasp abstract concepts more easily with the help of animated visuals than hearing the teacher's explanation alone.

Interactive Web-Based Animation for Class 8 Science Learning This human circulatory system material can be a learning support medium for grade 8 students. Calculations that have been created after testing, this website's success rate is 87.3% and in the outstanding category. Whereas in Nielsen Norman's rules, the success rate is up to 96% from a minimum of 90% for success rate. The material on this website is appropriate and still based on the 8th-grade science textbook, which guides students and teachers in learning. The illustrations and animations are excellent and exciting, and the website and its features are running well.

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