

Development of Bacterial Leaflets as a Means of Educating High School Students Class X SMA PGRI 1 Ploso

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ABSTRACT

The river is a gathering place for water, water quality is greatly influenced by human activities. One of the causes of river water pollution is the presence of domestic waste. This can lead to pollution of water due to microorganisms, one of them are bacteria Coliform. Coliform bacteria are microorganisms that are usually used as indicators in determining whether a water source is contaminated by pathogens or not. Konto River is a river in East Java originating from the mountains of Argowayang-Anjasmoro Malang. Media is part which can't be separated from the learning process. In the 2013 curriculum, bacteria material is listed in Basic Competencies (KD) 3.5 and 4.5. Leaflet media for river water quality test that will be developed in this research.

Keywords: Leaflet; Pengembangan Media; Learning Media; 4D; River Water Quality Test.

INTRODUCTION

River is one of the places gathering water from a region that has a stream open the drain (lotic) from a place that is higher toward a place that is low, the quality of water of the river is affected by the activities of the community that there is around river (Yogafanny, 2015). Water is one of the important elements in supporting life activities for the survival of humans and other living things, so safe water, both in quality and quantity, is needed in maintaining the sustainability of water use, especially river water (Rustiasih et al., 2018).

Rivers are a source of fresh water with the greatest potential (Adrianto, 2018). River is a stream of water fresh water that flows from the source of the eyes water toward and comes down on the lake, sea or river that is large (Pangestu, Hendar; Haki, 2013). The river is divided into three zones upstream which is the end with the source of the eyes water, the zone downstream of which is located at the end of the other of the zones upstream, and the zone of the center which is located between the zone upstream zone and downstream (Genisa & Auliandari, 2018); (Wulandari & Wardani, 2019).

Rivers are widely used by humans as a dumping ground for garbage and sewage. In addition to the handling of waste domestic that is not managed by properly so that the channel exile often flowed into the river without a manageable first advance (Fajrina et al., 2013). One of the causes of pollution of the water of the river is the waste of domestic which is derived from the waste bins kitchen, room shower, laundry, waste industrial house stairway and dirt humans (Puspitasari et al, 2017). It's can lead to pollution of water due to microorganisms pathogens that contained in feces can transmit various diseases when entered into the body of man (Adrianto, 2018). One of the most common microorganisms found in polluted water bodies is Coliform bacteria (Safitri et al., 2018).

Bacteria Coliform is a microorganism which is normally used as an indicator in determining a source of water contaminated by pathogenic or not, the bacteria is produce substances etionin that can cause cancer (Sutiknowati, 2018). If in a water many contain bacteria coliform then the water that has been contaminated (Yaqin & Sholihah, 2021). The bacteria is able to detect pathogens in water, for example, viruses, protozoa, and parasites (Adrianto, 2018). Bacteria *Coliform* has the power hold much higher than bacterial pathogens other. The characteristics of the bacteria *Coliform* among others can ferment lactose to produce acid and gas at a temperature of 35°C - 37°C. Examples of the bacteria

Coliform is *Escherichia coli*, *Salmonella sp.*, *Citrobacter sp.*, *Enterobacter sp.*, *Klensiella sp.* (Sutiknowati, 2018). Examination of water in microbiology is very important, either in qualitative or quantitative. To test water quality, it can be done using the *Most Probable Number* (MPN) method (Sunarti et al., 2016). MPN is a method for detecting and counting the number of bacteria *Coliform* and *Colifekal* to have two stages, namely stages of preliminary or referred to *Persumtive Test* and stage of the assertion or referred to *Confirmatif Test* (Dewi & Gusnita, 2019).

In this study, the researchers took a sample of the water quality test in the Konto River. Konto River is a river in East Java originating from the mountains Argowayang - Anjasmoro Malang. River Konto flowing to the West Sea crossing the district of Kediri and empties into the River Brantas in the District Bandar Kedungmulyo Regency Jombang. The results of the water quality test are then used as material for developing learning media.

Said media originating Latin language is *medius* that it literally means the middle, intermediary, or introduction (Arsyad, 2014). Media learning are all things that can be used to distribute a message, stimulate the mind, feelings, attract attention and willingness of participants learners in activities of learning that can motivate the participant students in activities to learn (Asyhari & Silvia, 2016). Media Learning is a device support which is very important to use in activities to learn the teaching that would facilitate teachers to understand the concept of the participant students and also make it easier for the participant students in understanding the concept of matter (Ramadhan, 2021).

One of the medium used is a media-based mold. Media-based mold of the most common is the book text, journals, magazines, and a sheet of paper. In a media-based mold there are six things that must be considered when designing, among other consistent, format, power pull, the size of the letters, and use of space is empty (Arsyad, 2014). Leaflets are one of one of the media-based printing that can be harnessed into a medium of learning (Abdia et al., 2020). Leaflets very practical, valid and effective as leaflets are media print written in the form of a sheet that is folded. Leaflets effective to convey the message that is short and dense. This media is also easy to carry (Roskaputri, 2018).

The combination of text and images in a leaflet which is packed in such a form can add power pull, and can facilitate the understanding of the information that is presented (Arsyad, 2014). Leaflet Media has a value of practical because of the information that is presented only in outline large so Constructing the reader understand the points of the message that was delivered. But media leaflet using letters too small and the material that is conveyed not be too much (Luthfiyah, Nisrina; Telisa, 2019). In the 2013 curriculum, bacteria material is listed in Basic Competencies (KD) 3.5 and 4.5. The KD 3.4 formulation is “analyzing the structure, way of life, reproduction and the role of bacteria in life” while the KD 4.5 formulation is “presenting data on the characteristics and roles of bacteria in life” (Peraturan Menteri, 2018). Leaflet media which will be developed in the study is expected to be the solution of the problems mentioned. So with this the researchers took the title “Test of Water Quality of the Konto Tembelang River in Jombang as Material for Leaflet Media Development”.

METHOD

The first stage is the define stage. Stage is aimed to analyze the terms of the development of products that correspond with the needs of the user. Stage is divided into two, namely the analysis of the material and the analysis of the character of the participant students. Analysis of the material is done by way of identifying the material, collecting and selecting materials that conform with KD 3.5 and 4.5. Analysis of the character of students is an important thing to do because all learning processes must be adapted to the characteristics of students. The things that are considered to determine the characteristics of students are cognitive and psychomotor development.

The second stage is design. At stage the researchers make the product early or design a product that will be developed which consists of three stage, namely the drafting of leaflets, collecting materials, and preparation of the leaflet. Making the leaflets started from planning (*drafting*), then proceed with the collection of material, with me doing the collection of materials that conform with the concept that has been made in the draft, among others conduct research test the quality of water of the river that carried out in the Laboratory of Big Hall Protection and Seed Crop Plantation (BBPPTP) Surabaya which then documentation of lab test the quality of water of the river used as an ingredient material on media leaflet test the quality of water, drawing illustrations as support, background material, as well as material that is in accordance with KD 3.5 and 4.5. Material collected from various sources among other documentation of personal, articles journals, books reference. Then proceed to the drafting stage of leaflets are on stage is carried out preparation of leaflets in accordance with the draft which has been in consultation with

faculty mentors. Components of the contents of the leaflets using language that is appropriate to the EYD. Leaflets are designed by using an application-based computer that is *CoreIDRAW X7*.

The third stage is development. At this stage to determine the quality of learning media. Quality media can be known by way of validating the product to the expert material and expert media. Phase validation experts carried out with the purpose to know the errors and shortcomings in the media so it can be improved with more good. Researchers will know the medium of learning that developed feasible or whether by way see ratings and suggestions and inputs were given by experts (validator). The fourth stage is the dissemination stage. On stage it spreader extents limited to that done on one school alone.

To produce a quality product is required instruments able to explore the data needed for the development of media leaflet test water quality. The instruments used to collect data in this study were in the form of validation sheets. The results of the analysis were obtained from the data of quantitative and qualitative used as a reference in determining the feasibility of the product results development. Questionnaires were used in the analysis of the data of quantitative is using scale Likert. The guidelines for assessing the Likert scale category described by (Riduwan, 2013) can be seen in table 1.

Table 1. Guidelines for Rating Categories Likert Scale

Media and Material Validation Assessment	Score
Very Worthy	5
Worthy	4
Decent Enough	3
Less Worthy	2
Very Less Worthy	1

(Source: Riduwan, 2013)

Data assessment validation of expert media were collected were analyzed by means sum, compared with the amount that is expected to be obtained percentage (Riduwan, 2013), or may be written with the formula as follows

$$\text{Eligibility Percentage (\%)} = \frac{\text{score obtained}}{\text{max score}} \times 100\%$$

The data collected was analyzed by the technique of analysis of quantitative and qualitative are disclosed in the distribution of scores and percentage on a scale of assessment that has been determined. After the presentation in the form of percentage, here in after descriptive and take conclusions about each indicator. The suitability of aspects in the development of water quality test leaflets can use table 2.

Table 2. Percentage Scale Criteria

Percentage of Achievement (100%)	Media and Material Validation Assessment Criteria
81 – 100	Very Worthy
61 – 80	Worthy
41 – 60	Decent Enough
21 – 40	Less Worthy
0 – 20	Very Less Worthy

(Source: Riduwan, 2013)

RESULT AND DISCUSSION

Result

The validation data by media experts was obtained from the results of filling out the media expert validation questionnaire. The data from the media validation results can be seen as follows

Table 3. Media Expert Validation Results

No	Questin Items	Score			Information
		X	Xi	%	
1.	Compatibility of size with the contents of the leaflet	5	5	100%	Very Worthy
2.	Appearance elements of governance lies in the section advance	5	5	100%	Very Worthy
3.	Color elements of governance lies the harmony has rhythm and unity are consistent	5	5	100%	Very Worthy

No	Questin Items	Score			Information
		X	Xi	%	
4.	The color of the layout elements defines the content	5	5	100%	Very Worthy
5.	The letters were used interesting and easy to read				
	a. The size of the leaflet title is more dominant and proportional than the size of the leaflet and the author's name	3	5	60%	Decent Enough
	b. Color title leaflet contrast with the background behind	4	5	80%	Worthy
6.	Don't use too many letter combinations	5	5	100%	Very Worthy
7.	Illustration cover of leaflets				
	a. Describing the content / teaching materials	5	5	100%	Very Worthy
	b. Shape, color, size, proportion of objects according to reality	5	5	100%	Very Worthy
8.	Consistency layouts				
	a. Placement element layout layout consistent based pattern	5	5	100%	Very Worthy
	b. The separator between paragraphs is clear	4	5	80%	Worthy
9.	Suitability elements of layouts				
	a. Printable area and proportional margin	5	5	80%	Worthy
	b. Spacing between text and illustrations is appropriate	4	5	80%	Worthy
10.	Completeness element layout				
	a. Title activities, sub- titles, and the activities are carried out	5	5	100%	Very Worthy
	b. Illustrations and picture captions	5	5	100%	Very Worthy
11.	Placement decoration / illustration as a background behind not interfere with titles and text	5	5	100%	Very Worthy
12.	Placement title, sub the title, illustration and description of the picture does not interfere with understanding	5	5	100%	Very Worthy
13.	Simple module content typography				
	a. Do not use too many types of letter	5	5	100%	Very Worthy
	b. The use of letter variations (<i>bold, italic, all capital, small capital</i>) is not excessive	5	5	100%	Very Worthy
	c. Normal text array width	3	5	60%	Decent Enough
	d. Spacing between lines of normal text arrangement	4	5	80%	Worthy
	e. Spacing between letters normal	4	5	80%	Worth
14.	The topography of the leaflet content makes it easier to understand	5	5	60%	Decent Enough
Amount		116	125		
Average					92,8%

Discussion

Based on the assessment of the media expert validator the percentage score on each question item is not the same, namely 12 questions at numbers 2, 3, 6, 7a, 7b, 8a, 10a, 10b, 11, 12, 13a, 13b got a 100% percentage score with very good criteria. worthy, 9 other questions on number 1, 4, 5a, 5b, 8b, 9a, 9b, 13d, 3e got a percentage score of 80% with eligible criteria, 2 other questions on number 5a and 13c got a percentage score of 60% with fairly decent criteria.

Total scores were obtained from expert media amounted to 116. Score a maximum of the overall answer is 125. Scores percentage of the results of validation of expert media overall reached 92.8 % with criteria very decent. The media expert validator gave criticism and suggestions for the water quality test leaflet, among others: (1) the author's name is included under the leaflet title, (2) the image should be enlarged so that it is clearly visible, (3) the size of the writing on the media is enlarged to make it visible.

Data were obtained from the validation expert media is the data that is taken by way of filling the questionnaire for expert media. The media expert validation questionnaire consists of 23 questions by including a critique and suggestion column. Scores were obtained from the validator media treated with the formula amount score that is obtained from the expert media (X) divided by the number of score maximum ratings (Xi) is multiplied by the percentage of the maximum (100%). So, there is the final

result of the assessment with an average percentage of 84% with the very feasible criteria. Seeing the results of the assessment above, it can be concluded that the media is very feasible to use in learning activities. This is in accordance with the results of (Meliyanti, 2015) research which states that leaflet media is effective in increasing knowledge.

Results less than the maximum in the grain question number 5a (size letter headline leaflet is more dominant and disproportionate compared to the size of leaflets and name of the author) case is caused due to not write the name of the author of the leaflet. According validator expert media write down the name of the author of the leaflet media that has been made to avoid the occurrence of plagiarism. It is relevant to the research that is carried out by Wibowo (2012) that plagiarism occurs when after reading the works of authors other and feel that writing it is not a work of science that considers not need to write the author or authors and sources of information are cited. Results less than the maximum also at number 13c (wide arrangement of text normal) caused due to the size of the letters on the contents of the leaflet is too small. It is relevant to the research that is carried out by Cahdriyana & Richardo (2016) that the media instructional design visuals have reached either for election types and sizes of letters are right, setting the distance that right.

CONCLUSION

Based on the analysis of the data that has been done, it can be concluded that: (1) research test the quality of water of the river Konto Tembelang Jombang were conducted at the Laboratory of big hall Protection and Seed Crop Plantation by using the method of MPN with through phase estimation and confirmation drawn the conclusion that the positive containing bacteria *Coliform*, (2) quality of media leaflet in terms of aspects of the media that the media leaflets test the quality of water worthy developed. It is evidenced by the poll ratings expert media got a score percentage of 92,8% with the criteria of very worthy.

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