

## E-Coli Bacterial Pollution Test Results in Mineral Water As a Learning Media for Electronic Practicum Instructions

**Habibatur Rohmah<sup>1</sup>, Ospa Pea Yuanita Meishanti<sup>2\*</sup>**

<sup>1,2</sup>Biology Education, Universitas KH. A. Wahab Hasbullah

\*Email: [ospapea@unwaha.ac.id](mailto:ospapea@unwaha.ac.id)

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### ABSTRACT

*The contamination test determines the microbiological contamination contained, does not exceed the limit of provisions to be able to determine the quality and safety of raw materials, because high microbiological contamination can endanger health. An example of microbiology is the bacterium Escherichia coli. E-coli is usually found in the feces of living things carried by the flow of water sources until it is absorbed by the soil. If the water source is used as drinking water by the community without going through a processing process and still contains e-coli bacteria. In this modern era, information is easily obtained through online and in the learning process. Learning will be more interesting if the learning media presented are varied. The following research is a development research that aims to determine the feasibility of electronic practicum instruction media. Media development uses a 4D model, with quantitative research data types obtained from scores and qualitative data obtained from suggestions. The results obtained from media experts are 84% Very Worthy, while material experts are 75% with proper criteria. The results obtained indicate that the media is feasible to be developed.*

**Keywords:** E-Coli; Learning Media; Electronic Practicum Instructions.

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### INTRODUCTION

The essential substance in life is water, to meet very basic needs, one of which is drinking water. All functions of the human body depend on water (Hilmarni et al., 2018). The developing technology brings progress in the field of life, drinking water is packaged into bottled drinking water (AMDK). Bottled drinking water (AMDK) is raw water that has gone through a sterilization process, is packaged and is safe for consumption, including mineral water (Vita Meylani, 2019). Drinking water that is safe for consumption must meet the requirements of being free of microbes and other harmful substances (Hilmarni et al., 2018). In accordance with the Minister of Health No. 492/MENKES/Per/IV/2010, the determination of drinking water quality was not found to contain Coliform and Escherichia coli contamination in 100 ml of water (Fajri, 2016). The cause of polluted water is due to the entry of substances, energy or other components into the water due to human activities so that the water quality decreases to a certain level which is dangerous so that the water does not function as needed (Mukono, 2011).

The community does not understand this because of the lack of information obtained, both in the activities carried out by the community and in the educational learning process. But in this modern era, learning is mostly done online without face to face, so teachers must be more creative in presenting teaching materials. One of them is by compiling learning media for bacterial practicum instructions with files, so that they are easy to disseminate to students for learning. Learning media can be interpreted as something that can be used by communicators to channel messages (learning materials), so that they can stimulate the attention, interests, thoughts, and feelings of the communicant in learning activities to achieve learning goals (Minah, 2018). Learning media is an intermediary tool between educators and students in learning that is able to connect, provide information and distribute messages so as to create an effective and efficient learning process (Meishanti, 2021). (Irawati, 2020) Practical activities in the microbiology course are one way to improve students' critical thinking skills. Electronic practicum

instructions are a list of practical work steps that are made electronically that can be accessed online based on the internet so that they can expand the information network (Linda, 2016).

The benefits of this research are to add insight for researchers, add information for readers, as a contribution of information for educators in the context of deepening practicum steps in the laboratory, for students, it can be used as an alternative in studying E.coli bacteria practicum. The purpose of this research is to determine the content of E.coli bacteria in mineral water, to determine the quality of air minerals, to determine the development of electronic practicum instruction media as a learning medium for bacterial practicum.

## METHOD

This type of research procedure for developing a modified 4-D Thiagarajan learning device (Kurniawan et al., 2017) has 4 stages, namely define, design, develop, and disseminate. Define (defining) this stage aims to analyze the requirements of product development according to the user, there are 2 first stages of material analysis where this media is obtained from the results of bacterial trials at BBPPTP (Balai Besar Gerbend and Plant Protection), which is in accordance with KD 3.5 Identify the structure, way of life, reproduction and the role of bacteria in life and KD 4.5 Presenting data on the characteristics and roles of bacteria in life. And the second with the analysis phase of students to adjust the learning process to the characteristics of students. Design (planning) the purpose of this stage is to get the design of learning tools, in this stage the first is to prepare a draft of the media that will be developed for consultation. The second is the collection of materials according to the concepts compiled in the draft and the third is the preparation of the e-practice guide media as the media to be developed. Develop (development) at this stage to determine the quality of the learning media developed. The quality of the media is obtained from the validation results of material experts and media experts so that deficiencies or errors in the media are known to be corrected. Researchers will know the media to be developed is said to be feasible or not by looking at the validation results. The fourth 4D stage is dissemination, but researchers limit it to the develop stage only.

The subjects of this study were students of class X SMA who had received the Bacteria material. By using instruments in the form of validation sheets of material experts and media experts. The data analysis technique was obtained from qualitative and quantitative data as a reference for the feasibility of the product to be developed. Using 4 alternative answers as described in table 1.

**Table 1.** Assessment Guidelines

Material and Media Validation Assessment	Score
Very Worthy	4
Worthy	3
Decent enough	2
Less worthy	1

Source: (Widoyoko, 2012)

The results of the validation of material experts and media experts are compared with the maximum value or amount expected to obtain a percentage (Riduwan, 2013). With the formula:

$$V = \frac{F}{N} \times 100\%$$

V = Percentage of gain

F = Result obtained

N = Maximum value (expected amount)

The data from the percentage gain is then described to draw conclusions using table 2.

**Table 2.** Percentage Scale Criteria

Achievement Percentage (100%)	Criteria for Assessment of Material Experts and Media Experts
81 – 100	Very Worthy
61 – 80	Worthy
41 – 60	Decent enough

Achievement Percentage (100%)	Criteria for Assessment of Material Experts and Media Experts
21 – 40	Less worthy
0 – 20	Very Less Worthy

Source: (Ain, 2013)

## RESULT AND DISCUSSION

### Result

The results of the development of electronic practicum media, after becoming a media, media experts and bacteria material experts were validated, so that the results from material experts in table 3 and media experts in table 4 were as follows:

**Table 3.** Material Expert Validation Results

Number	Rated aspect	Score		Percentage	Criteria
		Total score	Maximum Score		
1	Content Aspect				
	a. The suitability of the material regarding bacteria in the e-Practicum Instructions is in accordance with the competence of KD 3.5 Identifying the structure, way of life, reproduction and the role of bacteria in life. KD 4.5 Presenting data about the characteristics and roles of bacteria in life	2	4	50	Decent enough
	b. Material depth	3	4	75	Worthy
	c. Material update	3	4	75	Worthy
	d. Concept accuracy/misconception	3	4	75	Worthy
2	Language Aspect				
	a. Sentences in the material description of Bacteria Practicum Instructions are easy to understand	3	4	75	Worthy
	b. The terms used in the material description of the Bacteria Practicum Instructions are correct	3	4	75	Worthy
	c. The writing of punctuation in the e-practice instructions is correct	2	4	50	Decent enough
	d. There are no ambiguous sentences	3	4	75	Worthy
3	Image Aspect				
	a. The image on the material does not cause misconceptions	4	4	100	Very Worthy
	b. Image on readable material	4	4	100	Very Worthy
	Score total	30	40	75	Worthy

The following are the results of the validation of learning media experts regarding electronic practicum instructions, table 4 below:

**Table 4.** Media Expert Validation Results

Number	Rated aspect	Score		Percentage	Criteria
		Total score	Maximum Score		
<b>Media Engineering Aspect</b>					
1	The effectiveness of the media to repeat the subject matter	3	4	75	Worthy
2	Media efficiency to take advantage of the allocation of learning time	3	4	75	Worthy
3	Can be used repeatedly	3	4	75	Worthy
4	Easy to maintain	3	4	75	Worthy
5	Mudah digunakan	3	4	75	Worthy
6	Easy to share	4	4	100	Very Worthy
7	Bacterial media and material compatibility	3	4	75	Worthy
<b>Visual Communicative Aspect</b>					
8	Communicative	3	4	75	Worthy
9	Creative and innovative	3	4	75	Worthy
10	Sederhana	4	4	100	Very Worthy
11	Typography (letter arrangement)	3	4	75	Worthy
12	Media equipment	3	4	75	Worthy
13	Picture	4	4	100	Very Worthy
14	Layout	4	4	100	Very Worthy
15	Color	4	4	100	Very Worthy
16	Design	4	4	100	Very Worthy
Score total		54	64	84	Very Worthy

## Discussion

Discussion of Material Expert Validation Results, the validation of material experts get suggestions for e-practice instructional media that will be developed, preferably equipped with a sequence number of work steps to make the sequence easier to understand. In accordance with the function of learning media according to (Sapriyah, 2019), namely learning media help attract and direct students' attention to concentrate more on the media content presented. In order for the learning media to achieve a good function, the learning media must be systematic so that it is easy to learn.

Based on table 3, the results of material expert validation obtained a score of 4 for aspects of the assessment of points 3 (3a and 3b) with very good criteria. Score 3 for aspects of assessment points 1 (1b, 1c, and 1d), 2 (2a, 2b and 2d) with good criteria. And a score of 2 for aspects of the assessment of points 1 (1a) and points 2 (2c) with sufficient criteria. It can be concluded from the results of material expert validation, that the e-practice instructional instructional media is feasible to be developed with revisions, because it has not been equipped with a serial number in its working steps. Suggestions from the validator stated that the e-practical instruction learning media should be added to the description of the shape of bacteria on the theoretical basis, but in making this learning media, the researchers limited the contamination test only to the stage to determine the presence or absence of bacteria contained in the sample water, not to the stage to determine the shape of the bacteria.

Discussion of Media Expert Validation Results Suggestions from media expert validators regarding the development of practicum e-guidance media are that the fonts should be equated to make it look neater. As mentioned by (Rayandra, 2012) the criteria that are considered in the selection of learning media, one of which is clear and neat. In order to achieve the criteria of a good learning media, the learning media should be neatly and clearly arranged.

Based on table 4, the results of the media expert's validation obtained a score of 4 for aspects of the assessment points 6, 10, 13, 14, 15, and 16 with very good criteria. Score 3 for aspects of assessment points 1, 2, 3, 4, 5, 7, 8, 9, 11, and 12 with good criteria. It can be concluded that the e-practice manual learning media can be developed but with revisions because the fonts are not the same so that it looks less neat.

## CONCLUSION

From the data above, it can be concluded that the e-practice guide media is feasible to be developed through the revision stage to correct the shortcomings obtained from the suggestions of material experts and media experts validators. Because seen from the validation data of material and media experts, it shows the results of the feasibility of the media that will be developed by researchers.

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