Volume 11 (2) 2023, 048 – 061

Jurnal Pelita Pendidikan

Journal of Biology Education

https://jurnal.unimed.ac.id/2012/index.php/pelita/index

eISSN: 2502-3217 pISSN: 2338-3003

AUDIO VISUAL MEDIA DESIGN FOR PRACTICAL MICROBIOLOGY LEARNING

Aryeni[1*], Endang Sulistyarini Gultom[2], Qisthy Adha Fajriati[3], Nila Zusmita Wasni[4]

[1]*Biology Education Department, Science Faculty, Universitas Negerif Medan, Jl. Willem Iskandar Psr. V Medan Estate,Medan, Indonesia, 20221*

[2,3,4]*Biology Department, FMIPA, Medan State University, Jl. Willem Iskandar Psr. V Medan Estate,Medan, Indonesia, 20221*

*Corresponding Author: aryeni1968.unimed@gmail.com

ARTICLE INFO:

Article History:

Received April 17th, 2023
Revised June 26th, 2023
Accepted June 30th, 2023

Keywords:

audio visual media, microbiology learning, video for learning

ABSTRACT

This study aims to describe the process of making audio-visual media and to determine the feasibility of it based on the assessment of material experts, media experts and student responses. This research is a descriptive study that adopts the ADDIE development step which has five stages. However, this research is limited to only three stages, the analysis, design, and development stages. The population used in this study were all majoring students of Biology in the 2018 at Unimed and the sample of this study were 40 majoring students of Biology in the 2018 who had taken microbiology courses at Unimed. Theinstrument used in this study was a questionnaire using a Likert scale. The results showed that videos of sterilization and media making, videos of observing bacterial colonies and counting the number of bacteria using the pour plate dilution method, isolation videos of pure bacteria cultures, videos of bacterial staining, videos of bacterial biochemical activity, and video of testing of antibacterial activity on sponge symbionts against bacteria MDR (Multi Drug Resistance) is categorized as very feasible based on the assessment of material experts, media experts and student responses.

How to Cite:
Aryeni., Gultom, E.S., Fajriati, Q.A., & Wasni, N.Z. (2023). Audio Visual Media Design For Practical Microbiology Learning. *Jurnal Pelita Pendidikan,* 11(2), 048-061.

INTRODUCTION

Practical activities are activities that aim to enable students to be directly involved in gaining experience learning to improve skills as the application of previously learned knowledge (Lazarowitz and Tamir, 1994). One of the courses that carry out practical activities is microbiology. Microbiology is a branch of biology whose object of study is microscopic creatures in the form of single, multicellular, or acellular cells. The microbiology course is a compulsory subject for students of the Biology study program at the State University of Medan in semester V which weighs three credits (semester credit system) consisting of two credits (semester credit system) for theoretical lecture activities and one credit (semester credit system) for activities practice.

Semester Learning Plan (RPS) for Microbiology Course, Biology Department, State University of Medan, the learning achievement of this course is that students are able to master the concept of identifying microorganisms, analyzing microorganisms, inferring the interactions of microorganisms, observing and measuring the growth and reproduction of microorganisms, and the implications of applied microbiology in life. such as making tempeh, nata de coco, tofu, and bread. Referring to these achievements, students are required to have psychomotor abilities in addition to cognitive abilities.

Based on the results of an interview with one of the laboratory assistants for microbiology courses at the State University of Medan regarding the availability of audio-visual-based learning media, it was found that there was no learning media in the form of videos containing practical work procedures. The working procedure is demonstrated directly by the laboratory assistant to students who take part practical activities. This is in accordance with the results of the questionnaire analysis of student needs for learning media that audio-visual learning media are not yet available in microbiology courses, during practicum there are practicum activities that are not fully understood by students such as bacterial isolation, dilution with the petri dish method, bacterial biochemical activity, bacterial staining and antimicrobial activity test.

A good practicum guide must at least contain the elements that must be present in a practicum guide. According to Arifin (1995) the important elements that must be included in the practicum instructions are as follows: (1) The title of the practicum; (2) practicum objectives; (3) theoretical basis; (4) Tools and materials; (5) work procedures; (6) Evaluation. The practical guide for microbiology courses used at the State University of Medan has fulfilled all the elements that must be included in the practical instructions, it's just that the practical guide for microbiology courses is still in the form of a recipe model (cookbook) in printed form that is less attractive. Some practicum activities present pictures in black and white and some practicum activities are not accompanied by pictures.

Learning media that is expected to make it easier for students to understand microbiology practicum activities is learning media in the form of videos. Video learning media is one of the audio-visual learning media that has elements of sound and images that can be seen, such as video recordings, slides, sound, and so on (Wina Sanjaya, 2010). Furthermore, Vyraz and Tsitouridou (2005) state that audio-visual media plays an important role in the educational process. Audio-visual media provide students with a lot of stimulation because of its nature that displays sound and images. Based on this statement, it can be seen that audio-visual media is an effective medium to help the practicum learning process because students can see virtually every technique and stage of practicum activities and can be played back if students have difficulty remembering quickly and can reach a wide audience.

The results of research from Lisa et al. (2016) stated that there was an increase in the knowledge and skills of students who used video media compared to students who did not use video media. Furthermore, the results of research Suryandari et al. (2018) also stated that students' critical thinking skills in the psychomotor domain of the group of students who were assisted by audio-visual media were better than the group of students with printed worksheets as an experimental guide. Research results Effendi et al. (2017) also shows that there is an increase in students' biology learning outcomes using audio-visual media compared to students' biology learning outcomes using power point media.

Based on the description above, research on the production of audio-visual learning media in practical activities in microbiology courses needs to be carried out as a solution to optimize student understanding of microbiology practicum activities at Medan State University. The purpose of this study is to describe the process of making audio-visual media and determine the feasibility of audio-visual media based on the assessment of material experts, media experts and student responses.

METHOD

This research was conducted from June to August 2020 at the Department of Biology, FMIPA,

Medan State University, Jl. Willem Iskandar Pasar V Medan Estate. The population in this study were all Biology students class 2018 and the sample of this study was Biology students class 2018 who had attended the microbiology course practicum as many as 40 peoples.

This type of research is a descriptive study adopting the steps of developing the ADDIE model from Dick & Carry (1996) which consists of five stages, but in this study it was carried out in three stages, namely the analysis stage (Analysis), the design stage (Design), and the development stage (Develop).).

At this stage consists of three analyzes, namely (1) problem analysis, aims to raise and determine the basic problems faced in learning so that a learning media is needed. This analysis will be obtained description of facts, hope of alternative problem solving or selection of learning media to be made; (2) Curriculum analysis, used as the basis for the author to compile the material on the learning media; and (3) needs analysis, which aims to find out what students need to support microbiology practicum activities. There is no learning media in the form of videos that contain practical work procedures. The working procedure is demonstrated directly by the laboratory assistant to students who take part practical activities.

The design phase consists of three steps, namely Step I: The selection of the content or the content of audio-visual media to be produced. The content contained in the video is in the form of sterilization processes and the manufacture of microorganism growth media, aseptic techniques, dilution techniques, isolation processes for pure bacterial cultures which include bacterial inoculation techniques, bacterial staining processes, bacterial biochemical activity test processes, pour cup dilution techniques and the antimicrobial activity test process. against other microbes. In this antimicrobial activity test, researchers used bacterial samples from bacteria associated with thesponge Haliclona sp.2(Gultom, et.al., 2017). Step II: Create audio-visual media scenarios based on pre-defined video titles or topics. The title or topic is formulated into a specific purpose. And the development stage is the stage where researchers produce media products that have been designed based on the previous stages.

The instrument in this study is a questionnaire validation sheet that uses a Likert scale to assess the feasibility of audio-visual learning media produced based on material experts, media experts and student responses.

The data that has been obtained from the questionnaire sheet of material experts, media experts and student responses were analyzed using qualitative analysis techniques and descriptive analysis. The descriptive analysis technique is a description of the data in the form of sentences, while the quantitative analysis technique is in the form of numerical data from the Likert scale score on the questionnaire sheet which is processed using the formula:

$$P = \frac{\sum}{N} X\ 100\%$$

P = Category percentage

∑= Total score of the selected category answers

N = Total ideal score

Table 1. Criteria for Answering Validation Instrument Items with Likert Scale

Definition of	Score
Very Good (SB)	4
Good (B)	3
Not Good (TB)	2
Very Not Good (STB)	1

RESULT AND DISCUSSION

The results of the analysis of the problem found that the practical guide for the microbiology course used at the State University of Medan has fulfilled the elements that must be in the practicum manual, namely the existence of a practicum title, practicum objectives, theoretical basis, tools and materials, work procedures and evaluation (Arifin , 1995). However, based on the results of the study of practicum guides and the results of interviews with biology students from the 2018 class, it was found that the practical guide for microbiology courses was still in the form of a recipe model (cookbook) in printed form that was less attractive. Some practicum activities present pictures in black and white and some practicum activities are not accompanied by pictures. The results of an interview with one of the laboratory assistants for microbiology courses at the State University of Medan regarding the availability of audio-visual-based learning media, it was found that there was no learning media in the form of videos containing practical work procedures. The working procedure is demonstrated directly by the laboratory assistant to students who follow it practical activities. Learning media that are often used are also still in the form of power points which are only used at certain times, such as during responses.

Based on the results of the questionnaire analysis of student needs for learning media that students need audio-visual learning media in the microbiology course practicum. At the time of the practicum there were practicum activities that

were not fully understood by students such as bacterial isolation, dilution using the pouring cup method, bacterial biochemical activity, bacterial staining and antimicrobial activity testing.

The curriculum used at Medan State University is a curriculum based on the Indonesian National Qualifications Framework (KKNI) by implementing six tasks, namely routine assignments,critical journal reviews, critical book reports, mini research, idea engineering, and project assignments that focus on aspects of knowledge, attitudes and skills. The skills referred to at the higher education level in Article 5 paragraph (1) of Permendikbud 3 of 2020 are general skills and special skills. Special abilities that must be possessed by biology students are listed in the learning outcomes contained in the RPS (semester learning plan). Microbiology learning outcomes have sub-course learning outcomes (sub-CPMK) in which there are several indicators. In making this video, researchers used indicators 2d, 3b, 4a, 4b, 5b, 9c, and 10a as follows: (1) Students are able to make microorganism growth media; (2) Students are able to isolate pure cultures from mixed cultures of microorganisms; (3) Students are able to identify the morphology of microorganisms; (4) Students are able to explain coloring techniques; (5) Students are able to explain about microorganism enzymes; (6) Students are able to count microorganisms; (7) Students are able to explain the metabolic processes of microorganisms.

Based on the explanation of the results of the analysis above, it is necessary to have a learning media as a solution to these problems. The learning media that is expected to optimize students' understanding of practicum activities and can help students achieve learning indicators for microbiology practicum courses that still cannot be achieved is audio-visual learning media. Audio visual learning media contains sound and color images with high resolution which can be easily repeated if students do not understand a practicum activity and can see practicum activities virtually. This is in accordance with Arsyad (2000) which states that one of the advantages of audio-visual media is that it can be viewed repeatedly and can reach a broad audience and can save time. Nurfathiyah, et al (2011) stated that video media has several functions including cognitive functions and compensatory functions. Cognitive function can accelerate the achievement of learning objectives to understand and remember messages or information contained in images or symbols. While the compensatory function is to provide context to the audience whose ability is weak in organizing and recalling the information that has been obtained.

At the design stage, the creation of audio-visual learning media begins with determining the audio-visual media content that you want to produce. The audio-visual media content compiled is sourced from Capuccino and Sheman (2001), several journals and other relevant sources and adapted to the sub-CPMK (Course Learning Outcomes) in the RPS for the microbiology course. The content that has been created is then loaded into the audio-visual media scenario. Audio-visual media scenarios will be used as a guide or reference for the video capture process. The recorded video will be edited to produce the initial audio-visual media.

The following is the design design of the audio visual media:

1. Initial part: Video opening, rules for implementing microbiology practicum activities, practicum titles and indicators for practicum activities.
2. Contents section: Tools and materials used during practicum and practicum work procedures.
3. Closing: Displays the front image of the Unimed biology laboratory building.

The audio-visual learning media that has been produced are then validated by material experts and media experts. The validation of the material on this media was carried out by one lecturer in the microbiology course at the State University of Medan, namely Mr. Ahmad Shafwan S. Pulungan, S.Pd., M.Si. Material experts provide media assessments from material or content aspects, format aspects and linguistic aspects through an assessment sheet containing 13 statement items accompanied by suggestions as a basis for revision to improve audio-visual media. Meanwhile, media validation was carried out by one media lecturer at the State University of Medan, namely Mrs. Salwa Rezeqi, S.Pd., M.Pd. Media experts provide media assessments from aspects of benefits, content aspects, visual aspects of media, audio media aspects, typography aspects, linguistic aspects and programming aspects through an assessment sheet containing 17 statements accompanied by suggestions as a basis for revising the media so that audio-visual media are obtained that are worthy. The assessment criteria with four categories are very good, good, not good and very bad.

Based on the material expert's questionnaire, it can be seen that the audio-visual media created can be said to be "very feasible" after going through media revision activities. The result of the calculation of the questionnaire can be seen in Table 6.

Table 6. Validation Results Audio Visual Media Lab Microbiology By ExpertContent

Video	to-Aspect	Jlh Per nyataan	Total Score Rate		to-AverageRate		to-to-PercentageRate (%)		Category Rate To -	
			I	II	I	II	I	II	I	II
I	Material/Content	5	16	19	3.2	3.8	80	95	Very Eligible	Very Eligible
	Format	7	22	27	3.14	3.86	78.5	96.5	Eligible	Very Eligible
	Language	1	3	4	3	4	75	100	Eligible	Very Eligible
Total Rating		**13**	**41**	**50**	**3.15**	**3.85**	**78.85**	**96.15**	**Eligible**	**Very Eligible**
II	Material /Contents	5	19	19	3.8	3.8	95	95	Very Eligible	Very Eligible
	Format	7	22	27	3.14	3.86	78.57	96.43	Eligible	Very Eligible
	Language	1	3	4	3	4	75	100	Eligible	Very Eligible
Total Rating		**13**	**44**	**50**	**3.38**	**3.85**	**84.62**	**96.15**	**Very Eligible**	**Very Eligible**
III	Material /Contents	5	19	19	3.8	3.8	95	95	Very Eligible	Very Eligible
	Format	7	22	28	3.14	4	78.57	100	Eligible	Very Eligible
	Language	1	3	4	3	4	75	100	Eligible	Very Eligible
Total Rating		**13**	**44**	**51**	**3.38**	**3.92**	**84.62**	**98.08**	**Very Eligible**	**Very Eligible**
IV	Material /Contents	5	19	19	3.8	3.8	95	95	Very Eligible	Very Eligible
	Format	7	22	28	3.14	4	78.57	100	Eligible	Very Eligible
	Language	1	3	4	3	4	75	100	Eligible	Very Eligible
Total Rating		**13**	**44**	**51**	**3.38**	**3.92**	**84.62**	**98.08**	**Very Eligible**	**Very Eligible**
V	Material /Contents	5	19	19	3.8	3.8	95	95	Very Eligible	Very Eligible
	Format	7	22	28	3.14	4	78 .57	100	Eligible	Very Eligible
	Language	1	3	4	3	4	75	100	Eligible	Very Eligible
Total Rating		**13**	**44**	**51**	**3.38**	**3.92**	**84.62**	**98.08**	**Very Eligible**	**Very Eligible**
VI	Material/Content	5	19	19	3.8	3.8	95	95	Very Eligible	Very Eligible
	Format	7	22	28	3.14	4	78.57	100	Eligible	Very Eligible
	Language	1	3	4	3	4	75	100	Eligible	Very Eligible
Total Rating		**13**	**44**	**51**	**3.38**	**3.92**	**84.62**	**98.08**	**Very Eligible**	**Very Eligible**

In the first video entitled sterilization and media creation, it was found that in the aspects of material, format, and language there are improvement in assessment after revision. The total score from the material aspect for the assessment before the beginning gets an assessment of 16 and after the revision gets a total score of 19. The revision of the material aspect is done by adding some important information that appears in this video both in the form of narration and in the form of a text box. In the format aspect, the initial assessment of the media obtained an

assessment of 22, after the revision of the media the total score of the format aspect became 27. This happened because there was an improvement in the duration of the opening of the audio-visual media. The duration of the media opening before the revision was one minute, after the improvement the duration of the media opening was 41 seconds. The assessment of audio-visual media on the language aspect received a total initial assessment score of three, but after revisions were made in the form of adding text to strengthen the narrative the number of assessment scores increased to four.

In the second video with the title observation of bacterial colonies and counting the number of bacteria using the pour plate dilution method, there are differences in the number of scores. The initial assessment of the format aspect got a total score of 22. After the audio-visual media improvements were made, the total score of the assessment became 27. This was due to improvements in the form of cutting the duration of the media opening. The initial duration of the media opening was one minute to 41 seconds. The number of assessment scores from the language aspect also increased from three to four after revisions were made in the form of adding text to strengthen the narrative.

Video three with the title of pure bacterial culture isolation got an initial score of 22 from the format aspect and increased to 28 after the video was improved by cutting the opening part of the video from one minute to 41 seconds. In the aspect of video language, the total score increased from three to four after revisions were made in the form of adding text to strengthen the video narration. According to Hartono (2013) students have diverse learning styles, there are students who easily accept a lesson by hearing (auditory), there are students who easily understand and accept a lesson by seeing (visual) and there are students who are easier to understand. or receive a lesson by practicing directly what is seen or heard (kinesthetic). The addition of text is used in addition to strengthening the narrative, it can also be used to help students who have a visual learning style where students can more easily understand a subject matter by looking.

In the fourth video, namely the bacterial staining video, it got a score of 22 for the initial assessment and 28 for the final assessment of the format aspect. The increase occurred after revisions were made to the opening part of the one minute video to 41 seconds. In the initial assessment of the video from the language aspect, it got a score of three. However, after revisions were made by adding text to strengthen the narration in the video, the total score was four.

Video five with the title of bacterial biochemical activity there is an increase in the video assessment score from the format aspect, getting an initial assessment with a score of 22 and in the final assessment after video revision, namely by shortening the opening duration of the video, it gets a score of 28. In the language aspect, the video of bacterial biochemical activity gets a score of 28. the initial assessment score was three, but after adding text to the video to strengthen the video narration, the score became four.

Video six, which is a video of the antibacterial activity test on sponge symbiont bacteria against MDR (bacteria,Multi Drug Resistance)got a change in the assessment score after being revised. The total initial score from the format aspect is 22. After a revision by shortening the opening duration of the video, the assessment score changes to 28. In the initial assessment of the antibacterial activity test video on sponge symbiont bacteria against MDR (bacteriaMulti Drug Resistance)from the language aspect, they get an assessment score of three, but after revisions were made in the form of adding text to strengthen the narrative on the video, the total score changed to four.

The calculation results from the questionnaire assessment sheet by media experts can be concluded that the audio-visual media is categorized as "very feasible". The results of the questionnaire calculations presented in Table 7.

Table 7. Results of Audio-Visual Media Lab Validation Microbiology By Expert Media

Video	to-Aspect	Jlh Per nyat aan	Total Score Rate		to-AverageRate		to-to-PercentageRate (%)		Category Rate to-	
			I	II	I	II	I	II	I	II
I	Benefits	2	8	8	4	4	100	100	Very Eligible	Very Eligible
	Contents	3	12	12	4	4	100	100	Very Eligible	Very Eligible

Video	to-Aspect	Jlh Pernyataan	Total Score Rate		to-AverageRate		to-to-PercentageRate (%)		Category Rate to-	
			I	II	I	II	I	II	I	II
	Visual Media	5	20	20	4	4	100	100	Very Eligible	Very Eligible
	Audio Media	3	12	12	4	4	100	100	Very Eligible	Very Eligible
	Typography	2	7	8	3.5	4	87.5	100	Very Eligible	Very Eligible
	Language	1	4	4	4	4	100	100	Very Eligible	Very Decent
	Programming	1	2	3	2	3	50	75	Less	Eligible
Total Rating		**17**	**67**	**68**	**3.94**	**4**	**98.53**	**100**	**Very Eligible**	**Very Eligible**
II	Benefit	2	8	8	4	4	100	100	Very Eligible	Very Eligible
	Contents	3	12	12	4	4	100	100	Very Eligible	Very Eligible
	Visual Media	5	19	19	3.8	3.8	95	95	Very Eligible	Very Eligible
	Audio Media	3	12	12	4	4	100	100	Very Eligible	Very Eligible
	Typography	2	8	8	4	4	100	100	Very Eligible	Very Eligible
	Language	1	4	4	4	4	100	100	Very Eligible	Very Decent
	Programming	1	2	3	2	3	50	75	Less	Eligible
Total Rating		**17**	**65**	**66**	**3.82**	**3.88**	**95.59**	**97.06**	**Very Eligible**	**Very Eligible**
III	Benefits	2	8	8	4	4	100	100	Very Eligible	Very Eligible
	Contents	3	12	12	4	4	100	100	Very Eligible	Very Eligible
	Visual Media	5	20	20	4	4	100	100	Very Eligible	Very Decent
	Audio Media	3	12	12	4	4	100	100	Very Eligible	Very Decent
	Typography	2	7	8	3.5	4	87.5	100	Very Decent	Very Decent
	Language	1	4	4	4	4	100	100	Very Eligible	Very Decent
	Programming	1	4	4	4	4	100	100	Very Eligible	Very Eligible
Total Rating		**17**	**67**	**68**	**3.94**	**4**	**98.53**	**100**	**Very Eligible**	**Very Eligible**
IV	Benefits	2	8	8	4	4	100	100	Very Eligible	Very Eligible
	Contents	3	12	12	4	4	100	100	Very Eligible	Very Eligible
	Visual Media	5	20	20	4	4	100	100	Very Eligible	Very Decent
	Audio Media	3	12	12	4	4	100	100	Very Eligible	Very Decent

Video	to-Aspect	Jlh Pernyataan	Total Score Rate		to-AverageRate		to-to-PercentageRate (%)		Category Rate to-	
			I	II	I	II	I	II	I	II
	Typography	2	8	8	4	4	100	100	Very Eligible	Very Decent
	Language	1	4	4	4	4	100	100	Very Eligible	Very Decent
	Programming	1	2	3	2	3	50	75	Less	Eligible
Total Rating		**17**	**66**	**67**	**3.88**	**3.94**	**97.06**	**98.53**	**Very Eligible**	**Very Eligible**
V	Benefits	2	8	8	4	4	100	100	Very Eligible	Very Eligible
	Contents	3	12	12	4	4	100	100	Very Eligible	Very Decent
	Visual Media	5	20	20	4	4	100	100	Very Eligible	Very Eligible
	Audio Media	3	11	12	3.67	4	91.67	100	Very Eligible	Very Eligible
	Typography	2	7	8	3.5	4	100	100	Very Eligible	Very Decent
	Language	1	4	4	4	4	100	100	Very Eligible	Very Decent
	Programming	1	2	3	2	3	75	75	Eligible	Eligible
Total Rating		**17**	**64**	**67**	**3.76**	**3.94**	**94.12**	**98.53**	**Very Eligible**	**Very Eligible**
VI	Benefit	2	8	8	4	4	100	100	Very Eligible	Very Eligible
	Contents	3	12	12	4	4	100	100	Very Eligible	Very Eligible
	Visual Media	5	20	20	4	4	100	100	Very Eligible	Very Eligible
	Audio Media	3	11	12	3.67	4	91.67	100	Very Eligible	Very Eligible
	Typography	2	8	8	4	4	100	100	Very Eligible	Very Eligible
	Language	1	4	4	4	4	100	100	Very Eligible	Very Decent
	Programming	1	3	3	3	3	75	75	Eligible	Eligible
Total Rating		**17**	**66**	**67**	**3.88**	**3.94**	**97.06**	**98.53**	**Very Eligible**	**Very Eligible**

sterilization and media creation there is a change in the number of category scores from the typographic aspect in the initial assessment of seven and the final assessment after the video was revised by eight. Revisions made by researchers related to typographical aspects, namely improving the size of the letters on indicators of practicum activities changed from five to six and the duration of the appearance of dry sterilization and wet sterilization text boxes from four seconds was extended to six seconds. This is in accordance with one of the technical provisions of the video according to Riyana (2007), namely if the text is animated, set it so that the animation of the text is at the right speed and is not too repetitive. If the appearance of the text on the video disappears too quickly, then the readability of the text will decrease. Assessment of the programming aspect gets an initial score of two. After making revisions by shortening the duration of the opening of the

video, there was a change in the number of scores to three.

In the video of observing bacterial colonies and counting the number of bacteria using the pour-cup dilution method, there is a difference in the initial assessment score with the final assessment score on the programming aspect, from two to three. Changes in the assessment occurred after a revision was made in the form of cutting the duration of the opening on the video. According to Riyana (2007) the duration of a good video media is around 20-40 minutes considering the limited human memory and concentration ability between 15-20 minutes. The total score for the video assessment of pure bacterial culture isolation based on the typographic aspect, there was a change in the score from the initial score of seven to eight. This happened after the video was revised, namely by changing the font size on the practicum activity indicators from five to six. In video four with the title of bacterial staining, there is an increase in the number of assessment scores from two to three in the programming aspect after the revision, namely by shortening the duration of the opening of the video.

Video five with the title of bacterial biochemical activity changes in the number of initial assessment scores and the total number of final assessment scores on the audio media, typography and programming aspects. In the audio media aspect, the initial score was 11. However, after making improvements to the audio media in the triple sugar iron agar and gelatin media pouring activities, the total score of the assessment changed to 12. Improvements were made because the volume of thebacksongfrom the video was greater than that of the video. narrator's voice. According to Riyana (2007), one of the provisions for the use of music and sound effects is music for sound accompaniment, preferably with a weak volume intensity (soft) so that it does not interfere with the visual presentation and the narrator. The number of initial scores on the typographical aspect of seven changed to eight after the video was revised by changing the font size of the indicators for practicum activities, media incubation, and the text of the catalase test work procedure. This is done so that the text can be read and understood by the reader in accordance with the typographic principles of Rustan (2008) which states that the quality of the letters must belegibility, the relationship between the letters used must be easy to read (to read.readability), and the abilitya letter, word, and sentence in a work can be read within a certain distance (visibility) and the ability of the letters can be read and understood by the reader (clarity). The programming aspect gets an initial assessment score of two and a final assessment score after the video is revised by shortening the opening duration of the video to three.

After the audio-visual media is declared valid by media experts and material experts, then the media will be distributed to students to get student responses to audio-visual learning media.

Table 8. Results of Student Responses to Audio Visual Media of Microbiology Practicum

Video	Aspect	Number of Statements	Number of Assessment Scores	Average Rating	Percentage of Assessment (%)	Assessment Category
I	Media	7	1029	3.68	91.88	Very Eligible
	Language	1	150	4	93.75	Very Eligible
	Benefit	1	154	3.85	96.25	Very Eligible
Total Rating		**9**	**1333**	**4**	**92.57**	**Very Eligible**
II	Media	7	1022	3.65	91.25	Very Eligible
	Language	1	147	3.68	91.88	Very Eligible
	Benefit	1	150	3.75	93.75	Very Eligible
Total Rating		**9**	**1319**	**3.66**	**91.60**	**Very Eligible**
III	Media	7	1051	3.75	93.84	Very Eligible
	Language	1	151	3.78	94.38	Very Eligible
	Benefit	1	148	3.7	92.5	Very Eligible
Total Rating		**9**	**1350**	**3.75**	**93.75**	**Very Eligible**
IV	Media	7	1040	3.71	92.86	Very Eligible

Video	Aspect	Number of Statements	Number of Assessment Scores	Average Rating	Percentage of Assessment (%)	Assessment Category
	Language	1	146	3.65	91.25	Very Worthy
	Benefits		1143	3:58	89.38	Very Decent
Total Rating		**9**	**1329**	**3.69**	**92.29**	**Very Decent**
	Media	7	1040	3.71	92.86	Very Decent
V	Language		1146	3.65	91.25	Very Worthy
	Benefits		1145	3625	90.63	Very Decent
Total Rating		**9**	**1331**	**3.70**	**92.43**	**Very Decent**
	Media	7	1035	3.70	92.41	Very Eligible
VI	Language	1	147	3.68	91.88	Very Eligible
	Benefits	1	144	3.6	90	Very Eligible
Total Assessment		**9**	**1326**	**3.68**	**92.08**	**Very Eligible**

Based on the results of student response data From table 8 it can be concluded that the audio-visual media produced are in thecategory "very feasible". Media assessment of student responses is assessed from three aspects, namely media aspects, language aspects and format aspects. In the media aspect with seven statement items, namely: The

1. image is clear (focus, stable, not blurry)

In this statement, 30 students chose a score of four with a very decent assessment category and as many as 10 students chose a score of three with a proper assessment category for video sterilization and manufacture media. In the video of observing bacterial colonies and counting the number of bacterial colonies using the pour-cup dilution method, 32 students chose a score of four, seven students chose a score of three and one student chose a score of two. The isolation video for pure bacterial cultures on this statement item was 35 students chose a score of four and five students chose a score of three. The bacteria staining video received an assessment score of four out of 33 students and three out of seven students for this statement item. The video of the biochemical activity of bacteria got a score of four out of 32 students and a score of three out of eight students and the video of the antibacterial activity test on sponge symbiont bacteria against MDR bacteria got a score of four out of 34 students and a score of 3 out of six students.

2. The movement of the image in each frame flows smoothly, according to the narrative so that it is easy to see and understand.

In this statement, 33 students chose a score of four with a very decent category and seven other students chose a score of three with a proper assessment category for video sterilization and media creation. In the video of observing bacterial colonies and counting the number of bacterial colonies with the pour-cup dilution method, students chose a score of four, 33 students and seven other students chose a score of three. The pure bacterial culture isolation video and the bacterial staining video got an assessment score of four out of 32 students and a score of three out of eight students. In the video of the biochemical activity of bacteria, 31 students chose a score of four and nine other students chose a score of three for this video. In the video of the antibacterial activity test on sponge symbiont bacteria against MDR bacteria, four out of 32 students got an assessment score of four out of 32 students and an assessment score of three out of eight students.

3. The content on the audio-visual media that is displayed is in accordance with the practicum activities for sterilization of tools and the manufacture of microorganism growth media.

In the video of sterilization and media creation, 30 students chose a four assessment score in the very appropriate category and 10 students chose a three assessment score for this statement item. Video observation of bacterial colonies and counting the number of bacterial colonies using the pour-cup dilution method on this statement item as many as 28 students chose a score of four and 12 other students chose a score of three. In the isolation video for pure bacterial cultures, 32 students chose a score of four and eight

other students chose a score of three. The bacteria staining video got a score of four out of 29 students and a score of three out of 11 students for this statement item. In the video of the biochemical activity of bacteria, 31 students chose a score of four and 9 students chose a score of three for this statement item. In the video of the antibacterial activity test on sponge symbionts against MDR bacteria, 29 students chose a score of four and 11 students chose a score of three.

4. The voice of the narrator in the audio-visual media is clearly audible.

In this statement, for the sterilization video, four out of 32 students received a very decent assessment category and as many as eight students chose a three assessment score with a decent category. Video observation of bacterial colonies and counting the number of bacterial colonies with the pour-cup dilution method on this statement item, 23 students chose a four assessment score and 17 students chose a three assessment score. The isolation video for pure bacterial cultures received an assessment score of four out of 26 students and an assessment score of three out of 14 students. In the bacterial staining video, as many as 25 students chose an assessment score of four and 15 students chose an assessment score of three. The video of the biochemical activity of bacteria received an assessment score of four out of 21 students and an assessment score of three out of 19 students. The video of the antibacterial activity test on sponge symbiont bacteria against MDR bacteria got an assessment score of four out of 25 students and an assessment score of three out of 15 students.

5. Types and sizes of letters in proportional audio-visual media

In the sterilization and media creation video for this statement item, it gets a score of four with a very decent rating category from 26 students and a score of three with a proper assessment category from 14 students. The video of observing bacterial colonies got an assessment score of four out of 29 students, an assessment score of three out of 21 students. In the isolation video for pure bacterial cultures, 25 students chose a score of four and 15 other students chose a score of three. The bacteria staining video got a score of four out of 29 students and a score of three out of 11 students for this statement item. In the video of the biochemical activity of bacteria, 27 students chose a score of four and 13 students chose a score of three for this statement item. In the video of the antibacterial activity test on sponge symbionts against MDR bacteria, 23 students chose a score of four and 17 students chose a score of three.

6. Colors in audio-visual media are contrasting or easy to distinguish between background, writing, images and text.

In this statement, 24 students chose a score of four with a very decent assessment category and as many as 16 students chose a score of three with a proper assessment category for video sterilization and media creation. In the video of observing bacterial colonies and counting the number of bacterial colonies using the pour-cup dilution method, 26 students chose a score of four, 14 students chose a score of three. The isolation video for pure bacterial cultures on this statement item as many as 29 students chose a score of four and 11 students chose a score of three. The bacterial staining video received an assessment score of four out of 29 students and three out of 11 students for this statement item. The video of the biochemical activity of bacteria got a score of four out of 22 students and a score of three out of 18 students and the video on the antibacterial activity test on sponge symbiont bacteria against MDR bacteria got a score of four out of 26 students and a score of 14 out of six students.

7. The explanation of the material by the narrator in audio-visual media is easy to understand.

In this statement, 26 students chose a score of four in the very appropriate category and 14 other students chose a score of three with a proper assessment category for video sterilization and media creation. In the video of observing bacterial colonies and counting the number of bacterial colonies using the pour-cup dilution method, students chose a score of four, 25 students and 15 other students chose a score of three. The isolation video for pure bacterial cultures received an assessment score of four out of 27 students and a score of three out of 13 students. The bacterial staining video got a score of 4 out of 20 students while the other 20 got a score of three. In the video of the biochemical activity of bacteria, 25 students chose a score of four and 15 other students chose a score of three for this video. In the video of the antibacterial activity test on sponge symbiont bacteria against MDR bacteria, four out of 26 students scored and three out of 14 students scored.

Based on the language aspect which consists of one statement item, namely audio-visual media using easy-to-understand language, it was found that in the video sterilization and media creation, four out of 29 students were categorized as very

feasible and three out of 11 students were eligible for this statement item. . In the video of observing bacterial colonies and counting the number of bacterial colonies using the pour-cup dilution method, you get an assessment score of four out of 28 students and an assessment score of three out of 12 students. For pure bacterial culture isolation videos and bacterial staining videos, four out of 30 students scored and three out of 10 students scored. The bacteria staining video got a score of 25 students and got a score of three out of 15 students. In the video of the biochemical activity of bacteria, the video received a score of four out of 26 students and a score of three out of 14 students. The video of the antibacterial activity test on sponge symbiont bacteria against MDR bacteria got an assessment score of four out of 27 students and an assessment score of three out of 13 students.

Student responses to audio-visual media from the aspect of format with one statement, namely audio-visual media helps students to understand the process of sterilization and media making in video one gets an assessment with a score of four out of 33 students who are categorized as very feasible and a score of three out of seven students who are categorized as eligible. . For the statement item in video two, audio-visual media helps students to understand the technique of taking bacteria from sponges, aseptic techniques, and dilution techniques and can help students to identify bacterial morphology, getting a score of four out of 31 students with a very decent category and an assessment score of three. of nine students with eligible categories. The statement item in video three, namely audio-visual media helps students to understand the process of isolation of pure bacterial cultures which includes bacterial inoculation techniques, getting a score of four out of 29 students in the very feasible category and three out of 11 students in the proper category. In the fourth video statement item, namely audio-visual media helping students to understand bacterial staining techniques, four out of 22 students scored in the very feasible category and three out of 18 students scored in the appropriate category.

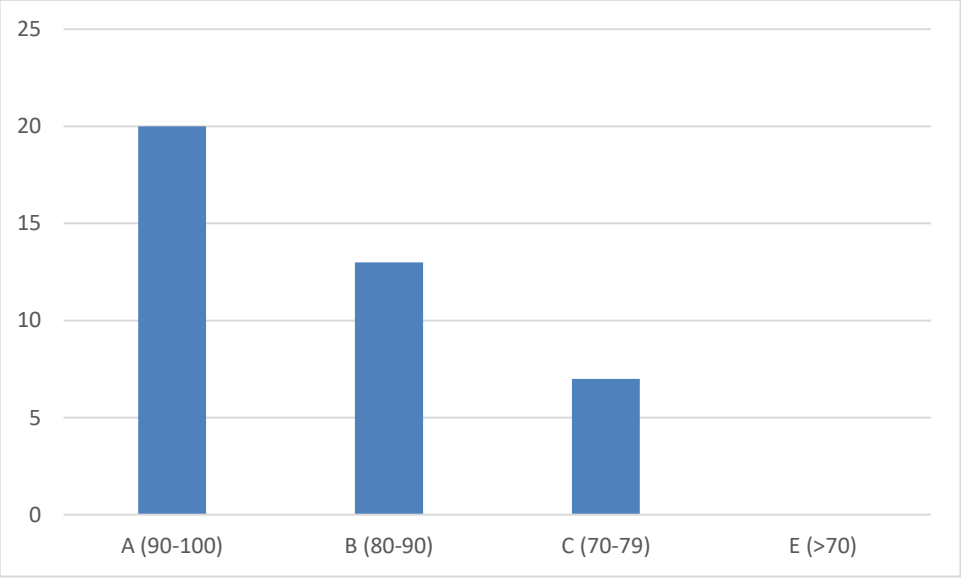

Figure 1. Study result of cognitive student

Students' cognitive learning outcomes are also in a good category during learning. There is no student who has a score below 70. The average student has a very high score. This shows that this learning media is successfully used in learning. The high cognitive learning outcomes indicate that students master various abilities developed during the learning process using media (Talakua & Elly, 2020). Good grades result from good learning as well. this can happen because the media has been developed using various long and quality stages and is specially designed in this course (Rezeqi, Brata, Handayani, & Gani, 2020). The media was developed based on the validator's suggestions and previous student responses. Media continues to be developed to be even better and in accordance with the times. Media will also be developed to become a source of information that can improve students' information literacy and skills (Gani & Arwita, 2020).

Learning using this media provides direct experience for students. Students can experience practical work through videos which provide a

separate learning experience. Watching videos can teach students various skills, one of which is thinking skills and science process skills (Silitonga, Gani, & Silitonga, 2021). Students can think procedurally, because the video presents the material in stages. Students will understand the sequence of practicum and analyze to conclude in learning. This learning can increase students' knowledge because students will feel like doing direct practicum. For this reason, this media can be a reference in microbiology learning and can continue to be developed to be even better (Chen, 2020).

The high value of validation, student responses, and student cognitive values after doing this learning shows that the media is very suitable to be used to improve student abilities (Giri & Paily, 2020). This learning media can help lecturers as teaching materials in microbiology learning. Media and teaching materials are very important for learning. Learning media can be used to improve learning outcomes and student motivation during online learning due to the effects of the COVID-19 pandemic (Patricia Aguilera-Hermida, 2020). Appropriate media will be able to be applied to broader microbiology learning. Of course, further research is needed to examine it (Susanti, Fitriani, & Sari, 2020).

CONCLUSION

Based on the results of the research that has been done, it can be concluded that the audio-visual learning media produced can be categorized as very feasible based on a feasibility assessment by material experts and media experts as well as student responses. The results of the validation of audio-visual media for microbiology practicum courses at the State University of Medan from material experts were categorized as very feasible with the percentage of assessment for video sterilization and media making of 96.15%; video of observing bacterial colonies and counting the number of bacteria using the pour dish dilution method of 96.15%; video isolation of pure bacterial culture of 98.08%; bacteria staining video 98.08%; videos of bacterial biochemical activity of 98.08% and videos of antibacterial activity tests on sponge symbiont bacteria against MDR (Multi Drug Resistance) bacteria of 98.08%.

The results of the validation of audio-visual media for practicum microbiology courses at the State University of Medan from media experts were categorized as very feasible with the percentage of assessment for video sterilization and media making of 98.53%; video of observing bacterial colonies and counting the number of bacteria using the pour dish dilution method of 97.06%; 100% pure bacterial culture isolation video; bacterial staining video by 98.53%; video of bacterial biochemical activity of 98.53% and video of antibacterial activity test on sponge symbiont bacteria against MDR (Multi Drug Resistance) bacteria of 98.53%.

The results of student responses to audio-visual media for microbiology practicum courses at the State University of Medan are categorized as very feasible with the percentage of assessment for video sterilization and media making of 92.57%; video of observing bacterial colonies and counting the number of bacteria using the pour dish dilution method of 91.60%; video isolation of pure bacterial culture by 93.75%; bacterial staining video by 92.29%; video of bacterial biochemical activity of 92.43% and video of antibacterial activity of sponge symbiont bacteria against MDR (bacteriaMulti Drug Resistance)of 92.08%.

REFERENCES

Arifin, M. (1995). Pengembangan Program Pengajaran Bidang Studi Kimia. Surabaya: Airlangga University Press.

Arsyad, A. (2000). Media Pengajaran. Jakarta: PT. Raja Grafindo Persada.

Chen, C. H. (2020). Impacts of augmented reality and a digital game on students' science learning with reflection prompts in multimedia learning. Educational Technology Research and Development, 1–20. https://doi.org/10.1007/s11423-020-09834-w

Dick & Carry. (1996). The Systematic Dessign of Instruction. New York: Harper Collins Publishers.

Effendi, A., Hasanah, U., & Sefrida, M. (2017). Perbedaan Hasil Belajar Siswa Menggunakan Media Audio-Visual Dan Media Powerpoint Pada Materi Pokok Sistem Reproduksi Manusia Di Kelas XI IPA SMA Negeri 1 Kisaran. Jurnal Pelita Pendidikan, 5(1): 118-124.

Gani, A. R. F., & Arwita, W. (2020). Kecenderungan Literasi Informasi Mahasiswa Baru Pada Mata Kuliah Morfologi Tumbuhan. Jurnal Pelita Pendidikan, 8(2), 145–150. Retrieved from https://jurnal.unimed.ac.id/2012/index.php/pelita/index

Giri, V., & Paily, M. U. (2020). Effect of Scientific Argumentation on the Development of Critical Thinking. Science and Education, 29(3), 673–690.

https://doi.org/10.1007/s11191-020-00120-y

Gultom, E, S., Suryanto, D., Munir, E., & Diningrat, DS (2017). Bacteria Extract Activity Associated With Sponges Haliclona sp.2 and Axinellid sp. as Antibacterial. International Journal of Advanced Research (IJAR). 5(1): 751-759.

Hartono, R. (2013). Ragam Model Mengajar yang Mudah Diterima Murid. Yogyakarta: Diva Press.

Lazarowitz, R & P. Tamir. (1994). Research on Using Laboratory Instruction in Science. Handbook of Research on Science Teaching and Learning. Edited By: D. L, Babel. New York: Macmillan Publishing Company.

Lisa, U, L., Hernowo BS, & Anwar, R. (2016). Pengaruh Penggunaan Media Video pada Pembelajaran Praktikum terhadap Pengetahuan dan Keterampilan Mahasiswa dalam Penanganan Distosia Bahu di Universitas Ubudiyah Indonesia. Journal of Healthcare Technology and Medicine, 2(1): 46-58.

Nurfathiyah, P., Mara, A., Siata, R., Farida, A., & Aprollita. (2011). Pemanfaatan Video Sebagai Media Penyebaran Inovasi Pertanian. Jurnal Pengabdian pada Masyarakat, (52): 30-36.

Patricia Aguilera-Hermida, A. (2020). College students' use and acceptance of emergency online learning due to COVID-19. International Journal of Educational Research Open, 1(July), 100011. https://doi.org/10.1016/j.ijedro.2020.100011

Rezeqi, S., Brata, W. W. W., Handayani, D., & Gani, A. R. F. (2020). Analisis Kebutuhan Bahan Ajar Taksonomi Organisme Tingkat Rendah Terhadap Capaian Pembelajaran Berbasis KKNI. Jurnal Pelita Pendidikan, 7(2), 080–086.

Riyana, C. (2007). Pedoman Pengembangan Media Video. Jakarta: P3AI UPL.

Rustan, S. (2008). Layout Dasar dan Penerapannya. Jakarta: Gramedia.

Sanjaya, W. (2010). Strategi Pembelajaran Berorientasi Standar Proses Pendidikan. Jakarta: Kencana.

Silitonga, B. I. A., Gani, A. R. F., & Silitonga, M. (2021). Analysis of Students Science Process Skills on Digestive System Learning Using The 7E Learning Cycle Model. Jurnal Pelita Pendidikan, 9(2), 50–56.

Sudjana, N. (2009). Penilaian Hasil Proses Belajar Mengajar. Bandung: PT. Rosdakarya Youth.

Sugiyono. (2018). Metode Penelitian Kuantitatif, Kualitatif, dan R&D. Bandung: Alfabeta.

Susanti, D., Fitriani, V., & Sari, L. Y. (2020). Validity of module based on project based learning in media biology subject. Journal of Physics: Conference Series, 1521(4). https://doi.org/10.1088/1742-6596/1521/4/042012

Talakua, C., & Elly, S. S. (2020). Pengaruh Penggunaan Media Pembelajaran Biologi Berbasis Mobile Learning terhadap Minat dan Kemampuan Berpikir Kreatif Siswa SMA Kota Masohi. Biodik: Jurnal Ilmiah Pendidikan Biologi, 6(1), 46–57. https://doi.org/10.22437/bio.v6i1.8061

Vryzas, K., & Tsitouridou, M., (2005), "Communication Technologies in Preschool Education: The Educator's Role", pp. 430-440. In: The Interdisciplinary Approach to Teaching and Learning in Preschool and Primary School. Athens: Ellinika Grammata. [Text in Greek].