



Development Of Online Quizzes Using The Quizziz Application On Bacterial Material

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ABSTRACT

Education in the 5.0 era is related to the availability of digital infrastructure. Learning media that is in accordance with the 5.0 era uses multimedia technology such as video, audio, images, animation, and games. One of them uses Quizziz. The purpose of this study is to describe the feasibility of online quiz questions using the Quizziz application on bacterial material based on the validation results of assessment experts, material experts, and student responses. This research is development research using a 4D development model without disseminate. Data collection instruments in the form of validation sheets and response questionnaires. Data collection in the form of questionnaires, validation, and student responses. Eligibility is measured using validity tests by assessment expert validators and material expert validators. The results showed that the online quiz questions based on the assessment of expert assessment validators obtained a score of 78.57%. which means it is valid and the material expert validator obtained a value of 89.28% which means it is very valid. The results of student responses from this study showed that online quiz questions based on student response questionnaires obtained a score of 97.57%. which means it is very interesting.

Keywords: 4-D model, Online Quiz, Quizziz

INTRODUCTION

Education in the 5.0 era is closely related to the availability of digital infrastructure. In Khajjar's opinion (2023) that the education system must also adapt to the 5.0 era by implementing blended learning, which is a hybrid learning method that combines online and face-to-face learning. This opinion is supported by Rindawati et al. (2021) who stated that learning in the 5.0 era focuses on more than one source of learning media and receives information from various technology and information platforms such as the internet and social media, in line with blended learning, it is closely related to learning media in the 5.0 era incorporating advanced technology. This is in line with the opinion of Sururuddin et al., (2021) state that learning media in accordance with the 5.0 era are technology-based learning media and can facilitate active, creative, innovative, and critical thinking learning. As in learning media that use multimedia technology such as video, audio, images, animation, and games. One of them uses the Quizziz application.

Quizziz play an important role in the era of education 5.0. In line with this opinion, Saputri & Widiyatmoko (2023) explained that the application of Quizziz can improve students' critical thinking skills. Therefore, Quizziz can support the development of 21st-century competencies, such as higher-order thinking skills and technology skills, which are needed in the era of education 5.0 in a concise manner. Quizziz in the 5.0 era improves critical thinking skills that support the development of 21st-century competencies. This opinion is supported by Rahman et al (2020) explaining that the Quizziz application is a game-based educational application, which brings multiplayer activities to the classroom and makes them interactive and fun practice classes. Quizziz has game characteristics such as avatars, themes, and entertaining music in the learning process. In line with this opinion that applications require access via laptop / PC or smartphone, Quizziz is a fun learning medium.

Both of these opinions were reinforced by Khasanah et al. (2022) explaining that teachers use Quizziz media to help teachers reflect on students when the learning process is complete, without having to ask questions using oral or written paper. Students can use the Quizziz link to recall material that has been learned in class. In line with this opinion, the Quizziz application provides high learning motivation

to students, this can be seen when the quiz ends, and the grades immediately appear. One material that has an important role in biology is bacteria, by understanding bacterial material can help students to better understand other biological concepts, such as biotechnology, ecology, evolution, and genetics. This is in line with the opinion (Suryaningsih & Aripin, 2020) which states that biology is one of the basic science knowledge so that its science can be applied to various fields involving microorganisms such as bacteria.

An understanding of bacteria can be gained through studying bacterial material in schools. However, according to most learners, bacterial material has a difficult level of understanding. This is in line with the opinion of Agustina & Trimulyono (2020) which explained that students consider bacterial material difficult because they tend to memorize and remember difficult terms, therefore students are not able to analyze and evaluate the material. This opinion is supported by Apriyeni et al. (2021) stating that students' understanding of the concept of bacterial material as a whole tends to be lacking in bacterial material. Both opinions are reinforced by Rindiana & Rakhmawati (2022) who explained that the learning outcomes of students have low achievement in bacterial material.

The results of the needs analysis in the form of questionnaires to 34 students of grade XI MIPA 1 explained that the percentage of 56%, of students stated that bacterial material was difficult to understand, complicated, and difficult to memorize. This is supported by the learning outcomes of students still below KKM, which is 78. In addition, the learning methods used in the classroom still use conventional learning methods so that students are not interested in bacterial material. 34 students said they had never done an online biology quiz using the Quizziz app. Interactive quizzes are expected to affect the level of interest of students in learning, especially in bacterial material. Understanding the concept of biology in bacterial material needs to be realized so that an interactive online quiz is needed, this is because previous quizzes using oral quizzes were carried out with a sampling method by showing enthusiastic fingers of students who were less responsive and dexterous.

In line with this opinion, it can be seen that students are less enthusiastic about bacterial material, teachers need to provide interactive learning media and evaluation quizzes. In the attractive quiz, the form of questions or questions has been made in such a way as to be effective, efficient, and able to train the abilities of students (Virgiawan & Marlini, 2018). Based on the background above, the researchers conducted a study entitled "Development of Online Quizzes Using the Quizziz Application on Bacterial Material"

METHOD

This research is a type of development research with a 4-D model. Researchers use the 4-D development model because it has structured and clear stages in its implementation, making it easier for researchers to develop learning products such as interactive quizzes using the Quizziz application. This development model has 4 stages Define, Design, Develop, and Disseminate (Sukorini & Purnomo, 2019). Researchers conducted research and development of online quiz questions using the Quizziz application with bacterial material.

Procedure The development of the online quiz developed is in the form of an interactive quiz Quizziz about bacterial material. This research is a research design for the development of 4-D models according to Thiagarajani (in Taufik et al., 2021). This development model includes 4 stages, namely the stages of defining (define), design (design), development (develop), and dissemination (disseminate) which can be explained as follows:

The type of data used is quantitative and qualitative data. Quantitative data is obtained from the validation results of assessment experts, material experts, and students. Qualitative data is obtained from criticisms, suggestions, and inputs put forward by validators. The data collection instrument consists of an assessment expert validation sheet, a material expert validation sheet, and a questionnaire of students' responses about the attractiveness of Quizziz online quiz questions. The instrument used to assess the attractiveness of Quizziz online quiz questions developed based on the Likert scale.

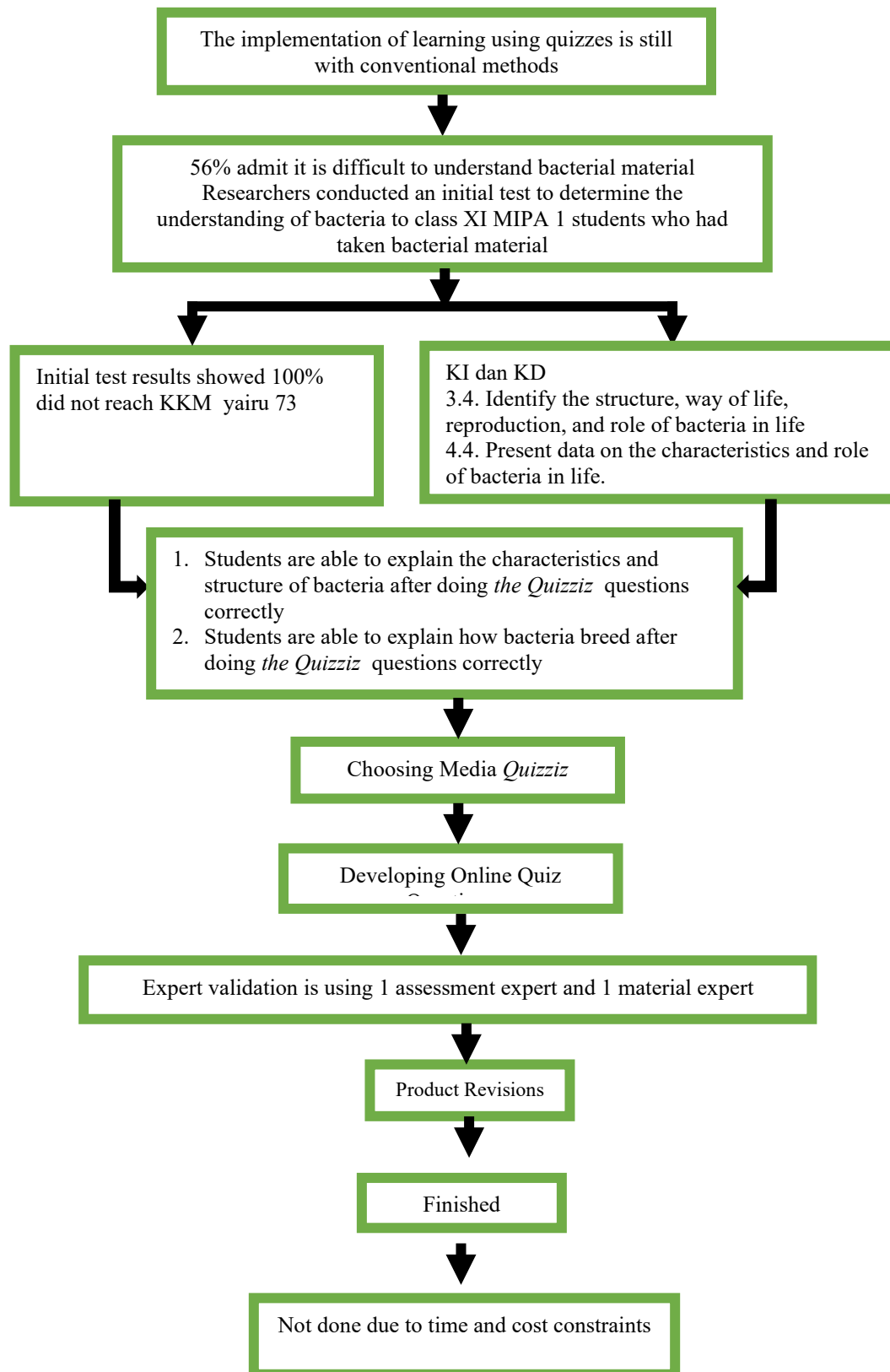


Figure 1. Stages of 4-D development

Modification of the stages of development of learning tools Sutarti & Irawan (2017)

- Data Analysis Techniques

Feasibility is known through the results of the analysis of expert responses, in this way it is expected to facilitate and understand the data for the next process. The results of data analysis are used as a basis for revising the developed product. Data on opinions or responses to products collected through questionnaires are analyzed with descriptive statistics. Quantitative data obtained from the validation of material experts and media experts, product development, and product trial results are further interpreted,

and then explained qualitatively.

Material expert validation sheet and assessment expert validation in the form of questions with answers to each instrument in the form of four scores corresponding to the Likert scale (Table 1)

Table 1. Poll Statement Score Conversion

Statement	Score
Excellent	4
Good	3
Less	2
Very Lacking	1

(Source: Adapting from Sabana, 2015)

The percentage formula used in the assessment of development products (Arikunto, 2013) is as follows:

$$P = \frac{\sum x}{\sum xi} \times 100\%$$

Information

P : Percentage of validity level or assessment score

$\sum x$: Number of validator answers

$\sum xi$: Maximum number of answers

Presentation of data in percentage form after the validation stage is carried out. Based on the percentage of validation scores, the media eligibility criteria to be developed are in accordance with the scale of media eligibility criteria as shown in Table 2. as follows:

Table 2. Eligibility Level Qualifications by Percentage

Presented	Qualification
81 – 100%	Sangat Valid
61 – 80%	Valid
41 – 60%	Quite Valid
21 – 40%	Kurang Valid
<21%	Highly Invalid

Modification of (Suharismi & Arikunto, 2013)

The answer to each instrument in the student response questionnaire uses a Likert scale, then the formula used for processing student response data is: Questionnaires containing several statements that must be filled in by students can be accessed through Google form. In this study, researchers made 10 statements on a questionnaire on a scale of 1-4 as answer choices. All statements in the questionnaire are positive statements.

Table 3. Poll Statement Score Conversion

Statement	Score
Totally Agree	4
Agree	3
Disagree	2
Strongly Disagree	1

Adapted from (Widiyoko, 2015)

In the existing research questionnaire, there are 10 statements with the highest score of 4 and the lowest score of 1. From the available information, it is known that the highest score is 40 (4×10) and the lowest number of scores is 10 (1×10). The percentage of student responses is calculated by the following formula:

$$\text{Response Percentage} = \frac{\text{Jumlah Skor}}{\text{Jumlah Skor Maksimal}} \times 100\%$$

Data on the presentation of student response questionnaire results in the form of percentages. Based on the percentage of the score, the criteria for media attractiveness are determined based on the criteria scale in **Table 4.**

Table 3. The scale of Media Attractiveness Criteria

Percentage of achievement	Category
81 - 100%	Very interesting
61 - 80%	Pull
41 - 60%	Quite Interesting
21 - 40%	Less Attractive
0 - 20%	Very Less Attractive

(Source: adapted from arikunto, 2010)

RESULT AND DISCUSSION

- Result
- Product Trial Results

Product trials presented in online quiz research using the Quizziz application on bacterial material validation of lecturers as assessment experts, data from the validation of one biology teacher as a material expert, and data on the results of student responses to the media. The validation activity was carried out by one lecturer at the Faculty of Education, Universitas KH. A. Wahab Hasbullah Tambakberas Jombang, and one biology teacher of Plandaan State High School Meanwhile, the response data was carried out by 34 students of class XI MIPA SMA Negeri Plandaan Jombang who had taken bacterial subjects.

- Expert Validation Result Data Assessment

The online quiz development validation questionnaire using the Quizziz application on bacterial material contains 7 indicator items including a suggestion and input sheet. The suggestions and input provided by the assessment expert are used as consideration for improving the online quiz questions. Data from expert assessment validation results are shown in Table 5.

Table 5. Assessment Expert Validation Results Data

No.	Assessment Indicators	Result			
		x	Have	Presented	Criterion
1	Conformity of question items with competency standards and basic competencies, indicators, and learning objectives	3	4	75%	Valid
2	Compatibility of question items with material	3	4	75%	Valid
3	The pictures presented in the question items are in accordance with the material	3	4	75%	Valid
4	The style of language used in the question items is clear	3	4	75%	Valid
5	Compatibility of question items with answer options	3	4	75%	Valid
6	Suitability of question items with the ability of students at high school level grade x	4	4	100%	Very Valid
7	The use of stimulus in the question items and the deceptive conformity in the answer options with the question items	3	4	75%	Valid
Sum		22	28		
Rata-rata		3,14		78,57%	Valid

Information:

x = score from validator

xi = max score

The average score of the assessment expert was 3.14 or 78.57% with good criteria. A total of 1 aspect got a score of 4 and 6 aspects got a score of 3 from the assessment expert. One aspect that scored 4 was: the suitability of the question items with the abilities of high school grade X students. The six aspects that scored 3 include the suitability of the question items with competency standards and basic competencies, indicators, and learning objectives; conformity of question items to the material; The picture presented in the question item is in accordance with the material; The style of language used in the question items is clear; conformity of question items with answer options; the use of stimulus in the question item; and deceptive conformity on answer options with question items. As for suggestions and input from assessment experts on online quiz questions using the Quizziz application on bacterial material, namely in making questions, questions should be given with little narration in the opening of the questions, too many narratives make the questions less meaningful because they have the same characteristics. Directly enter the core of the problem without needing to mention who and where. This is found in questions 5, 6, 7, and 8. Having the same characteristics, if you want to train C4 cognitive, it is better to use pictures and question descriptions, or just question descriptions without pictures. Pay attention to the percentage component of easy, medium, and difficult questions. Pay attention to the

accuracy of writing words on each question. In questions number 2 and 18, the suitability of the questions and answers is not right, paying attention to writing answer choices. If 1 answer key consists of 3 words, then the other answers are adjusted to 3 or 4 words, the unequal answer choices can be seen from question number 4.

- **Material Expert Validation Results Data**

The validation questionnaire for online quiz development using the Quizziz application on bacterial material contains 7 indicators by including a suggestion and input sheet as for the suggestions and inputs provided by assessment experts Used as a consideration to improve online quiz questions. The data from the validation results of material experts are shown in Table 6.

Table 6. Material Expert Validation Results Data

No.	Assessment Indicators	Result			
		x	Have	Presented	Criterion
1	The material presented is complete in accordance with TP	4	4	100%	Highly Valid
2	The breadth of the question material in accordance with the Learning Objectives	3	4	75%	Valid
3	The depth of material presented in the <i>Quizziz questions</i> is complete and in accordance with the Learning Objectives	4	4	100%	Highly Valid
4	The style of language used in the question items is clear	4	4	100%	Highly Valid
5	The compatibility of the picture with the question material	4	4	100%	Highly Valid
6	Language accuracy	3	4	75%	Valid
7	Consistency of use of terms	3	4	75%	Valid
Sum		25	28		Highly Valid
Rata-rata		3,57		89,28%	Highly Valid

Information:

x = score from validator

x_i = max score

The average score of material experts is 3.57 or 89.28% with excellent criteria. A total of 4 aspects got a score of 4 and 3 aspects got a score of 3 from material experts. The four aspects that get a score of 4 are: the material presented is complete in accordance with tp; the depth of material presented in the Quizziz questions is complete and in accordance with the learning objectives; the style of language used in the question items is clear; and the compatibility of the image with the question material. The three aspects that get a score of 3 are the breadth of the question material in accordance with the learning objectives; language accuracy; and consistency of use of terms. As for material expert suggestions and input on online quiz questions using the Quizziz application on bacterial material, namely question number 5, multiple choice should be more specific, not just focused on the genus, that all the others are good.

- **Student Response Data**

Filling out this questionnaire aims to find out whether or not online quiz questions use the Quizziz application on bacterial material based on student responses. The questionnaire response to the development of online quiz questions using the Quizziz application on bacterial material contains 10 criteria. Data on learners' responses to online quiz questions are shown in Table 7.

Table 7. Student Response Data

No	Statement	Result				
		$\sum x$	X	Have	Presented	Criterion
1	I followed well while taking quizzes through <i>Quizziz</i>	132	3,88	4	97,05%	Very interesting
2	I am more enthusiastic about taking the bacteria material quiz if I use <i>Quizziz</i>	131	3,85	4	96,32%	Very interesting
3	I like it if the bacteria material quiz is using <i>Quizziz</i>	134	3,94	4	98,52%	Very interesting
4	I focus on taking the bacteria quiz if I use <i>Quizziz</i>	134	3,94	4	98,52%	Very interesting

5	Quizzes using <i>Quizziz</i> helped my understanding of bacterial material	135	3,97	4	99,26%	Very interesting
6	The display of quiz media in <i>Quizziz</i> makes it easier for me to understand bacterial material	133	3,91	4	97,79%	Very interesting
7	I did the quizzes on the <i>Quizziz</i> app really	128	3,76	4	94,11%	Very interesting
8	The implementation of quizzes using <i>Quizziz</i> has an attractive appearance and is easy to use	132	3,88	4	97,05%	Very interesting
9	The implementation of quizzes using <i>Quizziz</i> increased my enthusiasm to compete with friends in answering questions correctly and quickly	132	3,88	4	97,05%	Very interesting
10	The implementation of quizzes using <i>Quizziz</i> increased my interest in learning bacterial material	136	4	4	100%	Very interesting
	Sum		39,02	40	97,57%	Very interesting

$\sum x$ = Total score obtained

\bar{X} = Average score

X_i = Max score

The percentage obtained from student responses was 97.57% with very interesting criteria. The following is the average score obtained for each aspect in the student response questionnaire: the aspect I followed well when taking the quiz via Quizziz got an average score of 3.88, I was more enthusiastic about taking the quiz on bacteria if I used Quizziz got an average score of 3, 85, I am happy if the quiz on bacteria material using Quizziz gets an average score of 3.94, I focus on taking the quiz on bacteria material if using Quizziz gets an average score of 3.94, the quiz using Quizziz helps my understanding of bacterial material gets an average score – average 3.97, Quizziz made it easier for me to understand bacteria material 3.91, I took the quiz on the Quizziz application seriously, got an average score of 3.76, taking the quiz using Quizziz has an attractive appearance and is easy to use, got an average score – average 3.88, Quizziz increased my enthusiasm to compete with friends in answering questions correctly and quickly, got an average score of 97.05%, and taking quizzes using Quizziz increased my interest in learning about bacteria, got an average score of 100% which is the highest average score obtained.

- Discussion
- Analysis of Assessment Validation Results

Based on the results of the assessment conducted by the assessment expert in Table 5, a percentage value of 78.57% was obtained. According to Suharismi & Arikunto (2013), this value shows that online quiz questions using the Quizziz application on bacterial material, meet the validity criteria ($\geq 61\%$) included in the valid criteria. According to the overall comment by the assessment validation regarding the development of questions using the Quizziz application on this bacterial material, some improvements are needed, namely in making questions, it should be given questions with little narration in the opening of the questions, too many narratives make the questions less meaningful because they have the same characteristics, directly into the core of the question without the need to mention who and where. for example, in questions 5, 6, 7, and 8, have the same characteristics, if you want to practice cognitive C4, it is better to use pictures and question descriptions, or just question descriptions without pictures, pay attention to the percentage components of easy, medium and difficult questions. Pay attention to the accuracy of writing words on each question. In questions number 2 and 18, the suitability of the questions and answers is not quite right. Pay attention to writing answer choices, if 1 answer key consists of 3 words, then other answers are adjusted to 3 or 4 words, the unequal answer choices can be seen from question number 4. This is in line with the opinion (Suhady et al., 2020) which states that each question item focuses on three characteristics, namely content, construct, and language.

In Table 5 there are six aspects that get a score of 3 from the assessment validator. First, the aspect of conformity of question items with competency standards and basic competencies, indicators, and

learning objectives gets a score of 3. This shows that the suitability of the question items is still relatively good. The assessment validator assesses that there are conceptual errors in the problem, both in the material and the way it is presented. This is in line with the opinion of Salsabila & Maya (2021) which states that mistakes that often occur in students are that students do not understand the basic concepts, so students experience mistakes when answering questions.

Second, the aspect of the suitability of the question items with the material also received a score of 3 from the assessment expert which shows that the suitability of the question items with the material is classified as good. This happens because the problem covers only a few aspects of the bacterial material. This is in line with the opinion of Rahmawati et al., (2021) which states that in producing quality questions, it is necessary to pay attention to one of them that is in accordance with the rules for preparing questions, both in the aspects of material, construction, and question language. The three pictures presented in the question items are in accordance with the material also get a score of 3 from the assessment expert which shows that the images presented in the question items are classified as good. This is because there are images that are in accordance with the material in general, but not specifically related to the question asked. Students make many mistakes in answering questions because there are pictures that misconceptions with the questions (Mauliandri & Kartini, 2020). The four language styles used in the question items clearly also get a score of 3 from the assessment expert which shows that the language style used in the question items is classified as good. This is in line with the opinion of Fitriah et al. (2021) who explained that the ineffectiveness of sentences that cause ambiguity or double meaning such as adding inappropriate words to the question and placing words that are not right needs to be eliminated. Fifth, the compatibility of question items with answer options also received a score of 3 from the assessment expert, which shows that the compatibility of question items with answer options is classified as good. This is because there are questions that vary in difficulty, so that test takers can choose the most appropriate answer. This is in line with Fitriani's opinion (2021) which states that in order for the test to measure learning outcomes appropriately, the test must be developed correctly with pay attention to the question items. The last one gets point 3, namely in the aspect of using stimulus in the question item and the deceptive suitability in the answer option with the question item also gets a score of 3 from the assessment expert which shows that the use of stimulus in the question item and the deceptive fitness in the answer option are in the good category. This happens because there is a confusing stimulus that makes it difficult for students to understand the question and choose the right answer. This is in line with the opinion of Rini & Budijastuti (2021) which states that the stimulus used must function, which is directly tied to the question so that students cannot answer the question without any stimulus given. One aspect that gets a score of 4 is in the aspect of the suitability of the question items with the abilities of students at the high school level grade x from the assessment expert which shows that the suitability of the question items with the abilities of students in the category is very good. This happens because the difficulty level of the questions is in accordance with the abilities of class x students, the questions are not too difficult and not too easy. This opinion is supported by Setiyoningtyas & Kasmui (2020) which states that a good question is one that is not too easy or not too difficult.

- **Analysis of Material Expert Validation Results**

Based on the results of the assessment conducted by material experts in Table 6, a percentage value of 89.28% was obtained, the value shows that online quiz questions using the Quizziz application on bacterial material are included in the very valid criteria. According to the overall comment by the validation of the material regarding the development of questions using the Quizziz application on this bacterial material, it needs improvement on question number 5, it should be multiple choice more specific, that's all the others are good. In Table 6, there are four aspects that get a score of 4 from material validators. First, the aspect of the material presented is complete in accordance with TP, namely the Learning Objectives, getting a score of 4 from material experts, which shows that the material presented is classified as very good. This is because the material presented has covered all the important points in TP. This opinion is supported by Muhammad et al., (2022) who stated that material aspects related to the suitability of the material and the validity of the material concept are closely related to the main reference in learning. Both aspects of the depth of the material presented in the Quizziz questions are complete and in accordance with the learning objectives get a score of 4 from material experts which shows that the depth of the material presented in the Quizziz questions is classified as very good. This is because the questions already have complete material depth and are in accordance with TP so as to encourage students to understand the concept more deeply. This opinion is supported by Muthmainnah et al., (2023) who state the depth of knowledge has a significant positive impact on learners' learning achievement. The

three aspects of language style used in the question item clearly also get a score of 4 from the material expert which shows that the language style used in the question item is classified as very good. This is because the style of language used varies and uses the right vocabulary. This can make the questions more interesting and avoid boredom for students. This opinion is supported by Geovana & Akbar (2023) which states that a clear and easy-to-understand language style can improve students' ability to understand problems. The four aspects of image compatibility with the question material also received a score of 4 from material experts which shows that the compatibility of the image with the question material is classified as very good. This is because images that are relevant to the question material show the ease of students understanding the questions listed. This is in line with the opinion of Nisa et al., (2020) which states that images can help students to improve understanding, information retention, and critical thinking. In Table 4.2, there are three aspects that get a score of 3 from material validators. The first aspect of the breadth of the question material in accordance with the learning objectives gets a score of 3 from the material expert which shows that the breadth of the question material is in the good category. This is because the questions do not cover all the material learned in the learning objectives.

This is in line with the opinion of Pido et al., (2022) which states that alignment is important to ensure that learners learn what is expected of them and can demonstrate their understanding in a valid and reliable way. The second aspect of language accuracy also gets a score of 3 from material experts which shows that language accuracy is in the good category. This is because there are incomplete sentences. This is in line with the opinion of Kusuma et al., (2023) which states that appropriate and clear language is important to help learners understand problems and find solutions. The last aspect that gets a score of 3 is consistency in the use of terms getting the score of 3 from material experts which shows that consistency in the use of terms in the category is good. This is because there are some terms that are used incorrectly in the text. This is in line with the opinion of Andhani et al., (2021) who stated that consistency is important to ensure that all learners interpret questions in the same way.

- **Analysis of Student Response Results**

Based on Table 7, the results of the attractiveness assessment by students of grade XI MIPA 1 SMA Negeri Plandaan showed a percentage of 97.57%. Based on these results, the online quiz questions using Quizziz on bacterial material are included in the category of very interesting so that they are suitable for use as independent study material by students. In the aspect of conducting quizzes using Quizziz increased my interest in learning bacterial material, I got the highest average score from students, which was 4. This shows that the implementation of quizzes using Quizziz increases interest in learning bacterial material is already very interesting. This is because Quizziz uses attractive visualizations and gamification elements such as images, animations, and points. This is in line with the opinion of awalia et al., (2021) which states that Quizziz can increase student engagement in science learning and help them achieve better learning outcomes.

While in the aspect I did the quiz in the Quizziz application really got the lowest average score (3.76) with a very interesting category. This is because students have high motivation and enthusiasm for learning when using game media. This is in line with the opinion of Ismara et al., (2021) which states that students who take the Quizziz quiz seriously are more motivated to learn and more active in class.

CONCLUSIONS

Research on the development of online quizzes using the Quizziz application on this bacterial material uses a 4-D model, namely define, design, develop, and disseminate. Online quizzes are validated by assessment experts and material experts and student response questionnaires are to find out the attractiveness of the media. The validation results conducted by assessment experts showed "feasible" criteria with a percentage of 78.57% and material experts showed "very feasible" criteria with a percentage of 89.28%, the results of responses by 34 students to the media obtained a percentage of 97.57% with "very interesting" criteria. This shows that the development of online quizzes using the Quizziz application on bacterial material is very feasible to be used as a learning medium for bacterial material biology subjects in class x and is good for students.

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