Increasing Quality Test Ability of Vocational School Students of Agribusiness of Processing Agricultural Products through Virtual Laboratory Development as a Solution of Limitation the Facilities

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Abstract. One of the competencies that must be possessed by Vocational School students of Agribusiness of Processing Agricultural Products is having the ability to carry out quality tests. Quality testing cannot be separated from the competency of processing agricultural products because agricultural materials and agricultural-based products contain components of nutrients such as minerals, carbohydrates, fats, proteins, vitamins and other components. In addition, food and agricultural products may also contain dangerous components such as mercury. Quality testing has many important roles for the food industry. However, Vocational School of Agribusiness of Processing Agricultural Products is not equipped with facilities to conduct proper quality tests. Based on several studies that have been conducted, the virtual laboratory that was developed can provide an overview of quality test procedures that have not been able to be carried out in Vocational High School of Agribusiness of Processing Agricultural Products. Virtual laboratories design were developed by following the R & D method and validated by an expert in learning media based on ICT (Information Communications Technologies) and an expert content and language. The content and language validation is done by a teacher of Agribusiness of Processing Agricultural Products. Based on the results of validation and large-scale trials, it was found that the virtual laboratory developed was very feasible to be used in the learning process.

Key words: virtual laboratory, vocational, quality test, agribusiness

1. Introduction
Basic competencies in controlling the quality of agricultural products are one of the competencies that must be possessed by students and individuals engaged in the processing of agricultural products or food processing. Quality control has an important role in the food industry. A food processing industry on a small or large scale must be able to ensure that food products produced are safe and do not cause chemical, physical, and microbiological hazards to consumers. The formulation of Core Competencies and Basic Competencies of Agribusiness of Processing Agricultural Products Vocational School in 2017 stipulates that graduates of Agribusiness of Processing Agricultural Products Vocational High School must have deep knowledge competencies in:

- Identify basic quality laboratory equipment
- Analyze the need for quality laboratory equipment
- Apply SOP calibration equipment
- Apply aseptic work techniques
- Analyze the types of microbial culture media
• Understand the properties of chemicals
• Evaluate the basic testing of material quality

In addition, graduates of Agribusiness of Processing Agricultural Products Vocational High School must have psychomotor competency in:
• Detailing basic quality laboratory equipment
• Shows the need for quality laboratory equipment
• Calibrate equipment
• Carry out Aseptic work techniques
• Prepare the types of microbial culture media
• Describe the properties of chemicals
• Establish a basic test of material quality

Foodstuffs and agricultural products are generally natural chemicals that do not deviate from the chemical rules of other ingredients. However, food ingredients have special properties as a provider of nutrients such as carbohydrates, proteins, minerals, vitamins, and fats [1]. Chemical, physical and microbiological testing of food quality has a role to:
• Determine the type and number of components contained in a material so that the overall composition of the material can be arranged
• Determine the components of food ingredients and then determine how much they are so that the quality of the ingredients can be determined
• Determine the nutritional components in food ingredients to compile a daily menu or diet
• Determine the presence of associated materials or additives in food ingredients in the framework of formal regulations for the use of hazardous substances or protection of individuals who are sensitive to a substance
• Detect the presence of toxic substances or metabolites caused by chemicals or microorganisms such as mercury and E. coli
• Following changes both quantitative and qualitative material changes during the processing process for the purpose of process monitoring.

In general, Agribusiness of Processing Agricultural Products Vocational High School currently does not have adequate facilities to carry out quality testing practices. Based on the Directorate of Vocational High School Education in Indonesia, there are currently only 3 Agribusiness of Processing Agricultural Products Vocational High School that have Agricultural Product Quality Control Study Programs. The virtual laboratory is a virtual laboratory as an interactive environment for creating and conducting experiments or simulations [2]. Virtual laboratories are computer software designed so that someone can carry out experimental activities just as they do experiments in real laboratories. Virtual lab enables the learner to link between the theoretical aspect and the practical one, without papers and pens [3]. The disadvantage in using virtual laboratories is that there is a lack of experience in real laboratories so that there is confusion between students in assembling tools and operating them. However, the virtual laboratory can be a learning media that provides an initial description of work procedures of a type of testing, especially for schools that have limited facilities.

The RTD virtual Lab, and based on specific learning outcomes, teachers could assess significant improvement in students’ performance in the lab and also a more thorough discussion of the results in the reports. The survey results show that, in average, considering the two virtual labs and several classes, 93% of the students consider the virtual labs of great utility [4]. The visual laboratory and interactive features embedded have the potential to induce positive outcomes in mediating the students’ conceptualization of difficult theoretical notions [5]. The virtual laboratory was able to be effective as a tool for familiar rising students with the real laboratory [6]. The virtual laboratory (VL) leads to increased performance and higher level of learning. Students are satisfied by VL applications and think that they are attractive and enjoyable [7].
2. Methodology
The research method used in this study is Research and Development (R & D). In this case a virtual laboratory developed is qualitative testing of carbohydrates. The test consists of Molisch test, Benedict test, Barfoed test and Seliwanoff test. The stages of development are: (1) identification of potency and problems; (2) data collection; (3) product development; (4) design validation; (5) design revisions, (6) limited scale trials; (7) first product revision; (8) large-scale trials; (9) revision of the second product; and (10) end products production [8]. A limited scale trial was conducted to 4 respondents and large scale test was conducted to 17 respondents. Virtual laboratory media validation is carried out by an expert in learning media based on ICT (Information Communications Technologies) and an expert in Agribusiness of Processing Agricultural Products. The results of the validation by the expert are converted to determine the percentage of eligibility of the virtual laboratory using the equation as follows [9]:

\[
\text{Percentage of eligibility} = \frac{\text{Total score}}{\text{Maximum score}} \times 100\%
\]

The virtual laboratory eligibility category is then determined using the conversion table Table 1 [9].

| Score | Percentage         | Criteria   | Conversion         |
|-------|--------------------|------------|--------------------|
| 4     | 75% - 100%         | Very good  | Very eligible      |
| 3     | 50% - 74.99%       | Good       | Eligible           |
| 2     | 25% - 49.99%       | Bad        | Not eligible       |
| 1     | 0% - 24.99%        | Worst      | Very not eligible  |

The value of the student response questionnaire from small and large scale tests is done using the following equation:

\[
\text{Percentage (100%)} = \frac{\text{Total score}}{\text{Maximum score}} \times 100
\]

The percentage of the student response questionnaire from small and large scale tests are then determined using the conversion table in Table 2 [8].

| Score | Percentage         | Criteria   | Interpretation     |
|-------|--------------------|------------|--------------------|
| 4     | 81.25% \( < \text{x} \leq 100\% \) | Very agree | Very eligible      |
| 3     | 62.5\% \( < \text{x} \leq 81.25\% \) | Agree      | Eligible           |
| 2     | 43.75\% < \text{x} \leq 62.5\% | Disagree   | Not eligible       |
| 1     | 25\% < \text{x} \leq 43.75\% | Very disagree | Very not eligible |

3. Result and Discussion
The virtual laboratory development according to the R & D method is carried out through several stages, namely (1) identification of potency and problems; (2) data collection; (3) product development; (4) validation of virtual laboratory design; (5) revisions of the design, (6) limited scale trials; (7) first product revision; (8) large-scale trials; (9) revision of the second product; and (10) end products production [7].
3.1. Data Collection
The data collected consists of data that support the design of virtual laboratory, including 1) learning material that refers to the curriculum of 2013 on Basic Competencies of 3.11 (Evaluating the basic quality of food ingredients) and Basic Competency of 4.11 (Establishing the basic of material testing food in qualitative carbohydrate test which includes Molisch test, Benedict test, Barfoed test and Seliwanoff test, 2) practical instructions referring to the textbook of Basic Quality Test for Agricultural Product Quality from revised curriculum of 2013, and 3) Adobe Flash CS 6 software used to create simulation videos and Bandicam software and Windows Movie Maker to make a video tutorial.

3.2. Product Development
The design of the initial virtual laboratory qualitative carbohydrate test material was designed digitally interactively using Adobe Flash CS 6 software consisting of basic competencies explanations, Molisch test, Benedict test, Barfoed test and Seliwanoff test, and evaluation test. Each test menu includes a menu of learning materials, practicum modules, video tutorials, and practical simulations. The steps taken to complete the design of virtual laboratory products are: 1) Making material slides about qualitative carbohydrate testing; 2) Creating a carbohydrate test practice module that contains the test objectives, tools needed for testing, samples used for testing, procedures for making reagents and testing samples. The practicum module is displayed on the menu choices in each test. The third is making evaluation questions in the form of 20 multiple choice questions with 5 answer choices for students to practice related to the simulated material. The questions presented have been validated and revised. The question is made using Adobe flash CS 6 so that students know the answer that is chosen right or wrong and displays the value obtained after completing all the questions. Display of evaluations in virtual laboratories and final results of evaluation can be seen in Figure 1.

![Display of evaluations of (a) Evaluation questions and (b) Final results of evaluation](image)

Figure 1. Display of evaluations of (a) Evaluation questions and (b) Final results of evaluation

The fourth stage is making video tutorials in the form of animation as an illustration of the work steps of Molisch test, Benedict test, Barfoed test and Seliwanoff test using bandam software and windows video maker software. The video tutorial display is presented in Figure 2.
The fifth stage, which is making simulations using Adobe flash CS 6. The simulation allows users to carry out their own testing stages starting with making preparations before testing (such as the use of lab clothes), selecting tools, materials, and samples. The initial simulation display of virtual laboratory products is shown in Figure 3.

3.3 Validation of virtual laboratory design

3.3.1 Media Validation

Validation of virtual laboratory design is done to find out expert opinions and measure the eligibility of virtual laboratories from several aspects, namely software, text, visual, audio, video, and animation quality. The results of validation of the virtual laboratory by an expert in learning media can be seen in Table 3. From Table 3, it can be seen that each aspect is “Very eligible” to be used as learning media.

| No | Aspect | Indicators | Score | Category |
|----|--------|------------|-------|----------|
| 1  | Software | The effectiveness of virtual laboratories as learning media | 4 | 100 | Very eligible |
| 2  | Consistency of virtual laboratories when used | 4 | 100 | Very eligible |
| 3  | The accuracy of the software for designing a virtual laboratories | 4 | 100 | Very eligible |
| 4  | Virtual laboratories can describe the actual conditions | 3 | 75 | Very eligible |
| 5  | Easy to operate | 4 | 100 | Very eligible |
| 6  | The consistency of the virtual laboratory display provides | 4 | 100 | Very eligible |
### 3.3.2 Content and Language Validation

The appraisal of material feasibility refers to the Ministry of National Education (2006) combined with an assessment of the eligibility of the material content based on Sungkono and Widarwati [10]. The aspects assessed included material content relevance, adequacy of benefits, and quality of language. The results of validation of the virtual laboratory by an expert of Agribusiness of Processing Agricultural Products can be seen in Table 4. From Table 4, it can be seen that each aspect of material content is "Very eligible" to be used as learning media.

|   | Evaluation                                                                 | Score | 100%       | Result          |
|---|---------------------------------------------------------------------------|-------|------------|-----------------|
| 7 | The icons easy to operate                                                 | 3     | 75         | Very eligible   |
|   | Average score                                                             | 3.71  | 92.86      | Very eligible   |
| 8 | The font size easy to read                                                | 3     | 75         | Very eligible   |
| 9 | The colour of text is easy to read                                       | 4     | 100        | Very eligible   |
| 10| The font type is easy to read                                             | 4     | 100        | Very eligible   |
|   | Average score                                                             | 3.5   | 87.5       | Very eligible   |
| 12| The navigation can help the user                                          | 4     | 100        | Very eligible   |
| 13| The navigation key functions according to the label                       | 3     | 75         | Very eligible   |
| 14| Consistency of the buttons according to their functions                   | 4     | 100        | Very eligible   |
|   | Average score                                                             | 3.67  | 91.67      | Very eligible   |
| 15| The suitability of the font colour with the background                    | 4     | 100        | Very eligible   |
| 16| The appearance of virtual laboratory attracts the user’s attention        | 4     | 100        | Very eligible   |
| 17| The colour composition in each part of the virtual laboratory is correct  | 4     | 100        | Very eligible   |
| 18| The placement of the content is in place                                  | 4     | 100        | Very eligible   |
| 19| The quality of the animation is good                                      | 4     | 100        | Very eligible   |
|   | Average score                                                             | 4     | 100        | Very eligible   |
| 20| Audio compositions are appropriate                                        | 4     | 100        | Very eligible   |
| 21| The audio does not disturb the user                                       | 3     | 75         | Very eligible   |
|   | Average score                                                             | 3.5   | 87.5       | Very eligible   |
| 22| The video is easy to understand                                           | 4     | 100        | Very eligible   |
| 23| The duration of video is appropriate                                      | 4     | 100        | Very eligible   |
| 24| The tutorial video is appropriate                                         | 4     | 100        | Very eligible   |
|   | Average score                                                             | 4     | 100        | Very eligible   |
| 25| The animation resembles the original image                                 | 4     | 100        | Very eligible   |
| 26| The animation has appropriate function                                    | 4     | 100        | Very eligible   |
| 27| The animation runs well                                                   | 4     | 100        | Very eligible   |
|   | Average score                                                             | 4     | 100        | Very eligible   |
Table 4. Validation result of the material content of virtual laboratory

| No | Aspect                        | Indicators                                                                 | Score | (%) | Category            |
|----|-------------------------------|---------------------------------------------------------------------------|-------|-----|---------------------|
| 1  | Content relevance             | The material presented is in accordance with the competencies needed       | 3     | 75  | Very eligible       |
| 2  |                               | Material is presented systematically                                       | 3     | 75  | Very eligible       |
| 3  |                               | Coverage of material presented                                              | 3     | 75  | Very eligible       |
| 4  |                               | The depth of material presented                                             | 3     | 75  | Very eligible       |
| 5  |                               | Material presentation is easy to understand                                  | 3     | 75  | Very eligible       |
| 6  |                               | The images in accordance with the material                                  | 3     | 75  | Very eligible       |
| 7  |                               | The image helps students to understand the material                          | 3     | 75  | Very eligible       |
| 8  |                               | Simulations in accordance with the material                                 | 4     | 100 | Very eligible       |
| 9  |                               | Simulation helps students to understand the material                         | 3     | 75  | Very eligible       |
|    | **Average score**             |                                                                           | **3.22** | **80.56** | Very eligible       |
| 10 | The adequacy of benefits      | The material helps the teacher in learning process                          | 3     | 75  | Very eligible       |
| 11 |                               | Material presentation helps students to understand the subject              | 3     | 75  | Very eligible       |
| 12 |                               | Material presentation attracts students' attention                          | 4     | 100 | Very eligible       |
|    | **Average score**             |                                                                           | **3.33** | **83.33** | Very eligible       |
| 13 | Language quality              | The language is in accordance with the rules of Indonesian right            | 3     | 75  | Very eligible       |
| 14 |                               | The term is in accordance with qualitative carbohydrate testing            | 3     | 75  | Very eligible       |
| 15 |                               | The language in accordance with the user's target                           | 3     | 75  | Very eligible       |
|    | **Average score**             |                                                                           | **3.33** | **83.33** | Very eligible       |

3.3.3 Revisions of the design
The revisions of the design based on input and results of media evaluations by media experts and material experts.

3.3.4 Limited scale trials
Small-scale product testing is carried out after the virtual laboratory has been revised by considering the advice of media experts and material experts. The testing was conducted to determine the responses of respondents to the virtual laboratory that was designed. Small-scale trials were conducted on 4 students who had studied about qualitative carbohydrate tests. There are some aspects that are asked in this questionnaire, namely software, navigation, text, visual, audio, video, animation quality, and effect of virtual laboratory to the learning process. The results of limited scale trials of the virtual laboratory can be seen in Table 5. From Table 5, it can be seen that each aspect is "Very eligible” to be used as learning media.
Table 5. The results of limited scale trials of virtual laboratory

| No | Aspect                          | Indicators                                                                 | Score | (%)  | Category       |
|----|--------------------------------|-----------------------------------------------------------------------------|-------|------|----------------|
| 1  | Software                       | The effectiveness of virtual laboratories as learning media                   | 4     | 100  | Very eligible  |
| 2  |                                | Consistency of virtual laboratories when used                                | 3.75  | 93.75| Very eligible  |
| 3  |                                | The accuracy of the software for designing a virtual laboratories            | 3.75  | 93.75| Very eligible  |
| 4  |                                | Virtual laboratories can describe the actual conditions                       | 3.5   | 87.5 | Very eligible  |
| 5  |                                | Easy to operate                                                             | 3.5   | 87.5 | Very eligible  |
| 6  |                                | The consistency of the virtual laboratory display provides convenience for users | 3.5   | 87.5 | Very eligible  |
| 7  |                                | The icons easy to operate                                                   | 3.75  | 93.75| Very eligible  |
|    | Average score                  |                                                                             | 3.68  | 91.96| Very eligible  |
| 8  | Text                           | Text clear to read                                                          | 3.5   | 87.5 | Very eligible  |
| 9  |                                | The font size easy to read                                                  | 3.5   | 87.5 | Very eligible  |
| 10 |                                | The colour of text is easy to read                                          | 3.25  | 81.25| Very eligible  |
| 11 |                                | The font type is easy to read                                               | 3.5   | 87.5 | Very eligible  |
|    | Average score                  |                                                                             | 3.44  | 85.94| Very eligible  |
| 12 | Navigation                     | The navigation can help the user                                            | 3.25  | 81.25| Very eligible  |
| 13 |                                | The navigation key functions according to the label                         | 3     | 75   | Very eligible  |
| 14 |                                | Consistency of the buttons according to their functions                     | 3.25  | 81.25| Very eligible  |
|    | Average score                  |                                                                             | 3.17  | 79.17| Very eligible  |
| 15 | Visual                         | The suitability of the font colour with the background                      | 3.25  | 81.25| Very eligible  |
| 16 |                                | The appearance of virtual laboratory attracts the user's attention          | 3.5   | 87.5 | Very eligible  |
| 17 |                                | The colour composition in each part of the virtual laboratory is correct     | 3.25  | 81.25| Very eligible  |
| 18 |                                | The placement of the content is in place                                    | 3     | 75   | Very eligible  |
| 19 |                                | The quality of the animation is good                                        | 3     | 75   | Very eligible  |
|    | Average score                  |                                                                             | 3.2   | 80   | Very eligible  |
| 20 | Audio                          | Audio compositions are appropriate                                          | 3.25  | 81.25| Very eligible  |
| 21 |                                | The audio does not disturb the user                                         | 3.25  | 81.25| Very eligible  |
|    | Average score                  |                                                                             | 3.25  | 81.25| Very eligible  |
| 22 | Video                          | The video is easy to understand                                             | 3.5   | 87.5 | Very eligible  |
| 23 |                                | the duration of video is appropriate                                       | 3     | 75   | Very eligible  |
| 24 |                                | The tutorial video is appropriate                                           | 3.5   | 87.5 | Very eligible  |
|    | Average score                  |                                                                             | 3.33  | 83.33| Very eligible  |
| 25 | Animation                      | The animation resembles the original image                                  | 3.5   | 87.5 | Very eligible  |
| 26 |                                | The animation has appropriate function                                      | 3.5   | 87.5 | Very eligible  |
| 27 |                                | The animation runs well                                                     | 3.25  | 81.25| Very eligible  |
|    | Average score                  |                                                                             | 3.42  | 85.42| Very eligible  |
| 28 | Learning Process               | The virtual laboratory can increase the motivation to learn                  | 3.75  | 93.75| Very eligible  |
Virtual laboratories increase the desire to learn qualitative carbohydrate testing

The virtual laboratory helps to understand the material of qualitative carbohydrate test

The virtual laboratory helps to understand the procedure of qualitative carbohydrate test

The procedure for qualitative carbohydrate testing in a virtual laboratory is clear and easy to understand

Qualitative carbohydrate testing procedures are presented systematically

| Average score          | 3.5  | 87.5 | Very eligible |

3.3.5 First product revision
At this stage product repairs are carried out from the results of small-scale trials with suggestions given by respondents to the results of small-scale trials.

3.3.6 Large-scale trials
Large-scale product testing was carried out to determine the feasibility level of the virtual laboratory based on the responses from the larger respondent than respondent in small-scale trials. The assessment of the virtual laboratory aspects at this stage is the same as the aspects assessed in the small scale trials, namely software aspect, navigation, text, visual, audio, video, animation quality, and effect of virtual laboratory to the learning process. The results of large – scale trials of the virtual laboratory can be seen in Table 6. From Table 6, it can be seen that each aspect is "Very eligible" to be used as learning media.

Table 6. The results of large – scale trials of virtual laboratory

| No | Aspect                          | Indicators                                                                 | Score | (%)    | Category         |
|----|--------------------------------|----------------------------------------------------------------------------|-------|--------|------------------|
| 1  | Software                        | The effectiveness of virtual laboratories as learning media                 | 3.53  | 88.24  | Very eligible    |
| 2  |                                | Consistency of virtual laboratories when used                              | 3.47  | 86.76  | Very eligible    |
| 3  |                                | The accuracy of the software for designing a virtual laboratories          | 3.35  | 83.82  | Very eligible    |
| 4  |                                | Virtual laboratories can describe the actual conditions                   | 3.41  | 85.29  | Very eligible    |
| 5  |                                | Easy to operate                                                           | 3.53  | 88.24  | Very eligible    |
| 6  |                                | The consistency of the virtual laboratory display provides convenience for users | 3.47  | 86.76  | Very eligible    |
| 7  |                                | The icons easy to operate                                                 | 3.47  | 86.76  | Very eligible    |
|    | Average score                   |                                                                            | 3.46  | 86.55  | Very eligible    |
| 8  | Text                            | Text clear to read                                                        | 3.29  | 82.35  | Very eligible    |
| 9  |                                | The font size easy to read                                                | 3.35  | 83.82  | Very eligible    |
| 10 |                                | The colour of text is easy to read                                        | 3.35  | 83.82  | Very eligible    |
| 11 |                                | The font type is easy to read                                             | 3.41  | 85.29  | Very eligible    |
|    | Average score                   |                                                                            | 3.35  | 83.82  | Very eligible    |
|   | Category       | Description                                                                 | Score | Eligibility       |
|---|----------------|-----------------------------------------------------------------------------|-------|-------------------|
| 12 | Navigation     | The navigation can help the user                                            | 3.41  | 85.29 Very eligible |
| 13 |               | The navigation key functions according to the label                           | 3.53  | 88.24 Very eligible |
| 14 |               | Consistency of the buttons according to their functions                      | 3.59  | 89.71 Very eligible |
|    | **Average score** |                                                                             | **3.51** | **87.75** Very eligible |
| 15 | Visual         | The suitability of the font colour with the background                        | 3.41  | 85.29 Very eligible |
| 16 |               | The appearance of virtual laboratory attracts the user's attention           | 3.35  | 83.82 Very eligible |
| 17 |               | The colour composition in each part of the virtual laboratory is correct     | 3.24  | 80.88 Very eligible |
| 18 |               | The placement of the content is in place                                     | 3.41  | 85.29 Very eligible |
| 19 |               | The quality of the animation is excellent                                    | 3.35  | 83.82 Very eligible |
|    | **Average score** |                                                                             | **3.35** | **83.82** Very eligible |
| 20 | Audio          | Audio compositions are appropriate                                           | 3.35  | 83.82 Very eligible |
| 21 |               | The audio does not disturb the user                                         | 3.47  | 86.76 Very eligible |
|    | **Average score** |                                                                             | **3.41** | **85.29** Very eligible |
| 22 | Video          | The video is easy to understand                                              | 3.41  | 85.29 Very eligible |
| 23 |               | The duration of video is appropriate                                         | 3.24  | 80.88 Very eligible |
| 24 |               | The tutorial video is appropriate                                            | 3.59  | 89.71 Very eligible |
|    | **Average score** |                                                                             | **3.41** | **85.29** Very eligible |
| 25 | Animation      | The animation resembles the original image                                   | 3.59  | 89.71 Very eligible |
| 26 |               | The animation has appropriate function                                       | 3.59  | 89.71 Very eligible |
| 27 |               | The animation runs well                                                      | 3.59  | 89.71 Very eligible |
|    | **Average score** |                                                                             | **3.59** | **89.71** Very eligible |
| 28 | Learning Process | The virtual laboratory can increase the motivation to learn                  | 3.53  | 88.24 Very eligible |
| 29 |               | Virtual laboratories increase the desire to learn qualitative carbohydrate testing | 3.24  | 80.88 Very eligible |
| 30 |               | The virtual laboratory helps to understand the material of qualitative carbohydrate test | 3.47  | 86.76 Very eligible |
| 31 |               | The virtual laboratory helps to understand the procedure of qualitative carbohydrate test | 3.29  | 82.35 Very eligible |
| 32 |               | The procedure for qualitative carbohydrate testing in a virtual laboratory is clear and easy to understand | 3.47  | 86.76 Very eligible |
| 33 |               | Qualitative carbohydrate testing procedures are presented systematically      | 3.47  | 86.76 Very eligible |
|    | **Average score** |                                                                             | **3.41** | **85.29** Very eligible |
3.3.7 Revision of the second product
This stage is done if there is input or suggestion to make improvements to the virtual laboratory by respondents from large-scale trials.

4. Conclusions
Virtual laboratory on qualitative carbohydrate test material according to media experts, material and language experts, respondent tests on limited scale and large scale are very feasible to be used as learning media.

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