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# User interface design of a *sengkedan* concept-based digital test

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**ABSTRACT**

This study's purpose was to demonstrate the design of a digital test for the "educational evaluation" course based on the *sengkedan* (swales) concept that has good quality. This research approach was a development that used the Borg and Gall model with more focus on the design development stage, initial design trials, and revisions. Subjects involved in the initial testing of the digital test user interface design were 42 respondents. The tool used to conduct initial testing of the digital test user interface design is a questionnaire. The data analysis technique used in this research was descriptive quantitative. The results showed user interface design of a *sengkedan* concept-based digital test for the "educational evaluation" course was quite good. The impact of this research on evaluators in the education field was a positive thing that added to their insights in developing a digital test. The evaluators will finally understand the importance of designing the user interface before finalizing the physical application to minimize errors.



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## 1. INTRODUCTION

A test is a measurement tool. Lecturers use it to measure students' cognitive abilities. Then the lecturer knows how far they can understand the material from the lecturer [1], [2]. Advances in information technology help make it easier for lecturers to prepare tests in digital form. So the measurement of students' cognitive results is faster whenever and wherever they are working on the test [3], [4]. A digital test is a measurement procedure that is systematically designed and digital in format to measure attributes [5]. A digital test is a measuring tool in a digital format. People use it to assess or evaluate whether the learning process reaches its goals [6].

However, problems in the field occur if the execution of digital tests without direct supervision from the lecturer. Besides that, if the execution of the test is without direct control from the lecturer, there is a tendency to cheat and exchange answers between students. It will be difficult for lecturers to know the ability of each student. It is according to the actual situation. Therefore it is necessary to prepare for breakthroughs to overcome these conditions. One suitable breakthrough is providing a digital test that is nicely packaged with a tiered arrangement of questions like a *sengkedan* (swales) concept starting from the lowest or easiest to the highest or hardest level. This breakthrough is specifically called a digital test based on the *sengkedan* concept. *Sengkedan* is an inclined plane concept with flat surfaces resembling steps for land effectiveness [7].

*Sengkedan* is also a conservation method by creating terraces to reduce the length of the slopes, restrain or minimize surface runoff so that water can seep into the ground, and increase the opportunities for water absorption by the soil [8]. The concept of the *sengkedan* in making tests in this study is to arrange questions with tiered levels from easy to increasingly difficult.

The next problem is that not all lecturers are good at preparing or making digital tests based on the *sengkedan* concept. Therefore the research question was "How is the user interface design of the digital test based on the *sengkedan* concept?" The specific objective of this study was to demonstrate the design of a digital test user interface based on the *sengkedan* concept that has good quality so that it can accurately measure students' cognitive abilities. The urgency of this research was to obtain a user interface design from a digital test based on the *sengkedan* concept that was effectively used to assess students' cognitive abilities, especially those taking the education evaluation course.

Several previous studies underlie this research, including Rerung and Hartono's research [9] pointed to a digital test for language testing for English foreign language (EFL) learners. The limitation of Rerung and Hartono's study [9] was that it did not show the availability of multilevel test items from low to high difficulty levels. Research by Nurwahidah *et al*. [10] demonstrated the development of a test to test students' higher-order thinking skills (HOTS) and digital literacy. Limitations of research Nurwahidah *et al.* did not show the test difficulty level from the lowest to the highest. Saputra and Ihsan's study [11] showed the development of a digital test to measure students' sit-up abilities. The limitation of Saputra and Ihsan's research [11] was that it did not clearly show the form of the digital test. A study by Afrianto *et al*. [12] pointed to a test of user acceptance of digital signature applications. The limitation of this research was that it did not indicate the user interface design of the instrument used in the test. Perdana *et al*. research [13] showed the stages of developing an open test to measure students' skills regarding digital literacy. It also demonstrated the validity and reliability of the open test. Research limitations Perdana *et al*. [13] did not show the user interface design of the open test.

## 2. METHOD

This study used a development approach. The development model used was Borg and Gall [14]–[23]. It focused on the stages of design development, initial testing, and revision of initial trial results. Its focus was based on this research purpose which is to create a high-quality *sengkedan* concept-based digital test user interface design. The subjects involved in the initial trial phase of the *sengkedan* concept-based digital test user interface design was an expert in electrical engineering education and an expert in the educational evaluation field, 40 students of the Department of Electrical Engineering Education at Universitas Pendidikan Ganesha. The research team revised the digital test user interface design based on the *sengkedan* concept.

The data collection tool was a questionnaire. The test location for the design of the user interface test in digital format for the "educational evaluation" course by adopting the *sengkedan* concept was in the Department of Electrical Engineering Education at Universitas Pendidikan Ganesha. The analysis technique in this research was descriptive quantitative. This technique compared the percentage level of user interface design quality for a digital test based on the *sengkedan* concept. The quality standard of it referred to as a five scale. To determine the percentage level of user interface design quality, a digital test based on the *sengkedan* concept uses (1) [24], [25]. The quality standard refers to the eleven scales in Table 1 [26]–[28].

$$P = \frac{f}{N} \times 100\% \quad (1)$$

Where P is a percentage of digital test user interface design quality level, f is the total acquisition value, and N is the total maximum value.

Table 1. Quality standards based on Eleven's scale

| Classification of quality | Range of quality percentage (%) | Follow-up |
|---|---|---|
| Excellent | 95 to 100 | No revisions |
| Very good | 85 to 94 | No revisions |
| Good | 75 to 84 | No revisions |
| More than enough | 65 to 74 | No revisions |
| Enough | 55 to 64 | Needs revision |
| Almost enough | 45 to 54 | Needs revision |
| Minus | 35 to 44 | Needs revision |
| Very minus | 25 to 34 | Needs revision |
| Poor | 15 to 24 | Needs revision |
| Very poor | 5 to 14 | Needs revision |
| Highly poor | 0 to 4 | Needs revision |

## 3. RESULTS AND DISCUSSION

### 3.1. Results

#### 3.1.1. Design of the *sengkedan* concept-based digital test user interface

At the design development stage, the shape of the digital test user interface design for the *sengkedan* concept-based "educational evaluation" course was obtained using the Balsamiq Wireframes mockups application. The display of the digital test user interface design for the "educational evaluation" course referred to can be seen in Figures 1-4. Figure 1 focuses on showing the user interface design for inputting question data used in the digital test. Figure 2 focuses on showing the user interface design for setting questions used in the digital test based on the *sengkedan* concept. Figure 3 focuses on showing the user interface design facility to make it easier for users to input answers to the questions available in the digital test. Figure 4 focuses on showing the user interface design of the facility for viewing the final score.

Figure 1 shows the user interface design for inputting question data. This design consists of several text boxes for inputting question data. There are several option buttons for answer choices. Several load images buttons for uploading questions in the form of images. Several combo boxes to select the difficulty level of questions. Figure 2 shows the user interface design for setting questions based on the *sengkedan* concept. This design consists of a text area that functions to display a list of questions. There is a combo box that functions to adjust the difficulty level of questions. There is a process button to process the ordering of questions. There is a save button to save the results of sorting questions. Figure 3 shows the user interface design of the facility for answering questions. This design consists of two text boxes for inputting student names and study program data. Several text areas to display question data. Several option buttons to display answer choices. Figure 4 shows the user interface design for facilities for viewing the final score. This design consists of one final text box to show the last question from several previously answered questions. Several option buttons to display answer choices for the last question. There is a finish button to end the activity of answering questions. There is a score button to process the final score calculation. There is one green text box to show the final score.

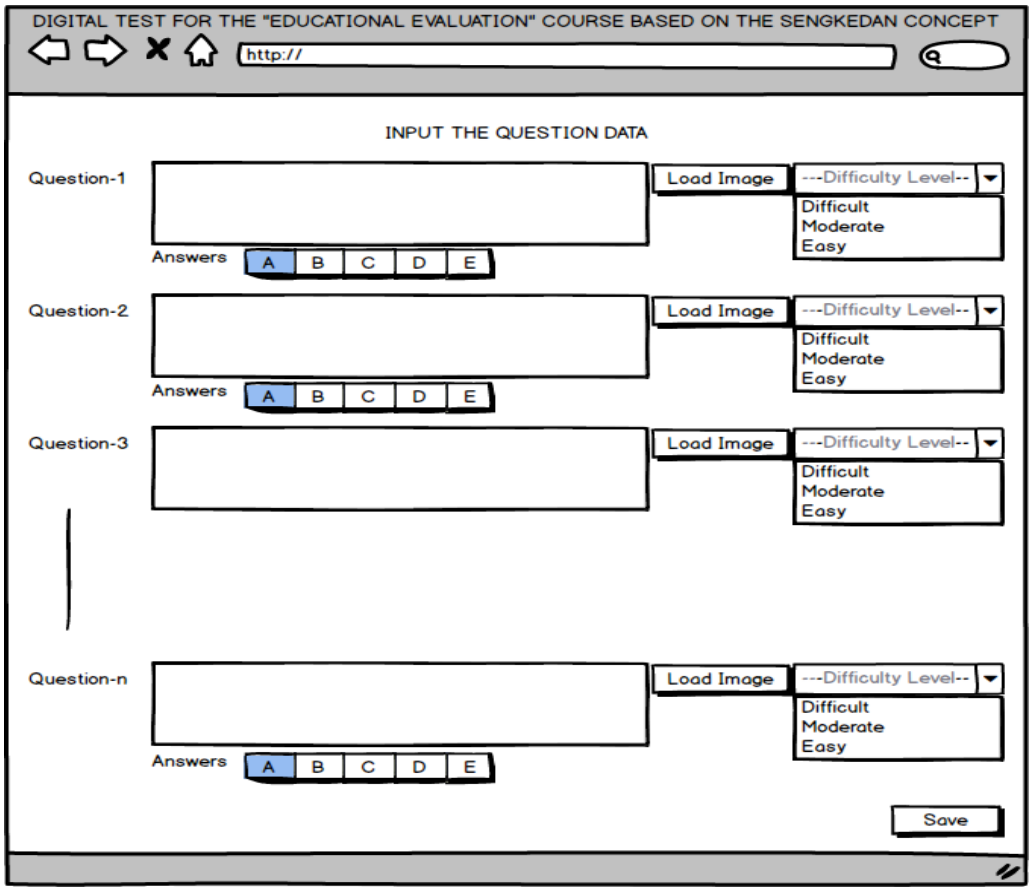


Figure 1. User interface design for question data input

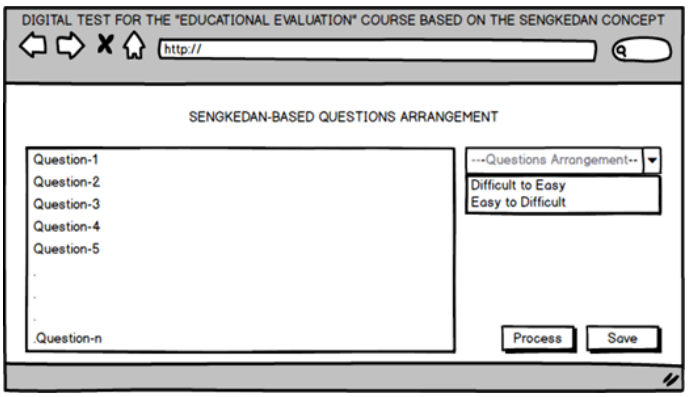


Figure 2. User interface design for setting questions based on the *sengkedan* concept

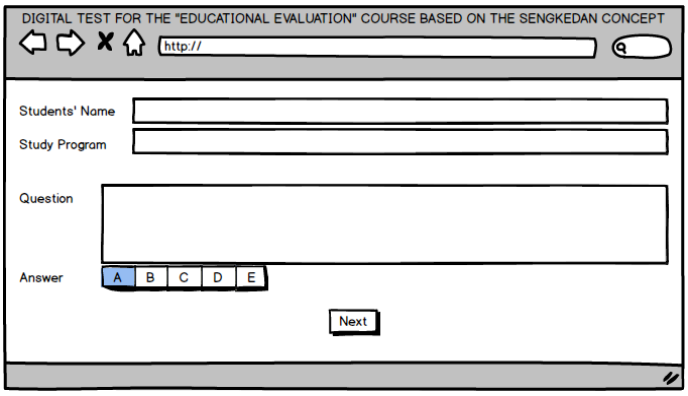


Figure 3. Facility user interface design for answering questions

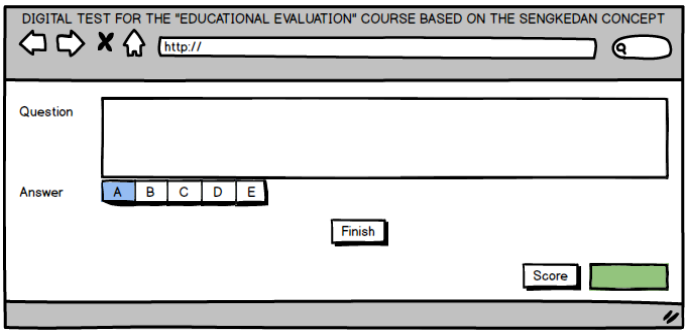


Figure 4. Facility user interface design for viewing the final score

### 3.1.2. Initial trial of user interface design

Initial trials of the design of the digital test user interface for the "educational evaluation" course based on the *sengkedan* concept were carried out by several experts. Two experts, such: an expert in electrical engineering education, and an expert in the field of educational evaluation) and 40 students in the Department of Electronics Engineering Education at Universitas Pendidikan Ganesha. The results of the initial trial can be seen in Table 2.

There were several suggestions given by respondents when conducting initial trials on the digital test user interface design for the "educational evaluation" course based on the *sengkedan* concept. The aim of providing suggestions from several respondents is so that the design will be more perfect. The suggestions can be seen in Table 3.

Table 2. Results of preliminary trials on user interface design digital tests for "educational evaluation" course based on the *sengkedan* concept

| No | Respondents | Items- | | | | | | | | | | Σ | percentage of quality (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | I1 | I2 | I3 | I4 | I5 | I6 | I7 | I8 | I9 | I10 | | |
| 1 | Expert-01 | 4 | 4 | 4 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 42 | 84.00 |
| 2 | Expert-02 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 5 | 5 | 3 | 40 | 80.00 |
| 3 | Student-01 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 40 | 80.00 |
| 4 | Student-02 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 40 | 80.00 |
| 5 | Student-03 | 4 | 4 | 3 | 4 | 3 | 4 | 4 | 4 | 3 | 4 | 37 | 74.00 |
| 6 | Student-04 | 4 | 4 | 4 | 4 | 3 | 3 | 4 | 4 | 5 | 5 | 40 | 80.00 |
| 7 | Student-05 | 4 | 5 | 5 | 4 | 4 | 4 | 5 | 5 | 5 | 4 | 45 | 90.00 |
| 8 | Student-06 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 40 | 80.00 |
| 9 | Student-07 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 42 | 84.00 |
| 10 | Student-08 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 39 | 78.00 |
| 11 | Student-09 | 4 | 4 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 5 | 43 | 86.00 |
| 12 | Student-10 | 4 | 4 | 4 | 4 | 3 | 4 | 5 | 5 | 4 | 4 | 41 | 82.00 |
| 13 | Student-11 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 40 | 80.00 |
| 14 | Student-12 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 40 | 80.00 |
| 15 | Student-13 | 4 | 4 | 4 | 5 | 5 | 3 | 5 | 4 | 4 | 4 | 42 | 84.00 |
| 16 | Student-14 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 42 | 84.00 |
| 17 | Student-15 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 40 | 80.00 |
| 18 | Student-16 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 39 | 78.00 |
| 19 | Student-17 | 4 | 3 | 4 | 4 | 5 | 5 | 4 | 4 | 4 | 3 | 40 | 80.00 |
| 20 | Student-18 | 4 | 4 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 43 | 86.00 |
| 21 | Student-19 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 5 | 5 | 41 | 82.00 |
| 22 | Student-20 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 40 | 80.00 |
| 23 | Student-21 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 3 | 38 | 76.00 |
| 24 | Student-22 | 4 | 4 | 4 | 4 | 4 | 5 | 3 | 5 | 5 | 4 | 42 | 84.00 |
| 25 | Student-23 | 4 | 4 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 42 | 84.00 |
| 26 | Student-24 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 40 | 80.00 |
| 27 | Student-25 | 4 | 4 | 5 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 40 | 80.00 |
| 28 | Student-26 | 4 | 4 | 4 | 3 | 4 | 5 | 5 | 3 | 5 | 5 | 42 | 84.00 |
| 29 | Student-27 | 4 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 42 | 84.00 |
| 30 | Student-28 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 40 | 80.00 |
| 31 | Student-29 | 5 | 5 | 3 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 40 | 80.00 |
| 32 | Student-30 | 5 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 4 | 4 | 43 | 86.00 |
| 33 | Student-31 | 4 | 3 | 4 | 5 | 5 | 3 | 5 | 4 | 4 | 4 | 41 | 82.00 |
| 34 | Student-32 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 39 | 78.00 |
| 35 | Student-33 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 42 | 84.00 |
| 36 | Student-34 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 5 | 4 | 40 | 80.00 |
| 37 | Student-35 | 4 | 3 | 4 | 4 | 5 | 5 | 4 | 5 | 4 | 4 | 42 | 84.00 |
| 38 | Student-36 | 4 | 4 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 43 | 86.00 |
| 39 | Student-37 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 40 | 80.00 |
| 40 | Student-38 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 41 | 82.00 |
| 41 | Student-39 | 4 | 4 | 4 | 3 | 4 | 4 | 5 | 5 | 4 | 4 | 41 | 82.00 |
| 42 | Student-40 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 4 | 4 | 4 | 41 | 82.00 |
| | | Average | | | | | | | | | | | 81.63 |

Table 3. Respondent's suggestions for improving the design of the digital test user interface for educational evaluation courses based on the *sengkedan* concept

| Respondent | Suggestions |
|---|---|
| Expert-02 | Please add facilities to edit the difficulty level. |
| Student-02 | Please add facilities to view the score recapitulation of each question item. |
| Student-15 | Please add facilities to edit the difficulty level. |
| Student-20 | Please add facilities to find out the score of each question item. |
| Student-31 | Please add facilities to be made to find out the score obtained on each question item. |

### 3.1.3. Revision of initial trial results

Based on these suggestions, the research team made several improvements to improve the design of the digital test user interface for the "educational evaluation" course based on the *sengkedan* concept. The results of these improvements can be seen in Figures 5 and 6. Figure 5 focuses on showing the form of the user interface design facility for editing difficulty levels. Figure 6 focuses on showing the design user interface of scores recapitulation for each question item.

Figure 5 shows the user interface design for facilities for editing difficulty levels. This design consists of one text box to display the difficulty level status. One combo box is used to select the difficulty level. Edit button to carry out the data manipulation process. Save button to save the editing data. Figure 6 shows the user interface design of scores recapitulation for each question item. This design consists of

several white text boxes to display the recapitulation score and one green text box to display the total score. Besides that, there is a save button to save the recapitulation score data and total score.

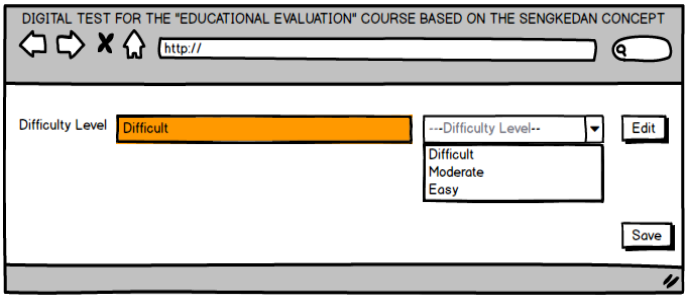


Figure 5. Facility user interface design for editing difficulty level

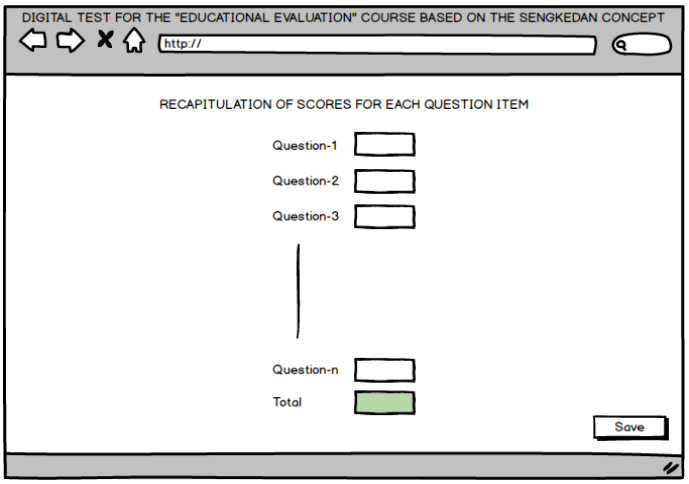


Figure 6. Design a user interface of scores recapitulation for each question item

### 3.2. Discussion

Figure 1 shows the appearance of the user interface design for inputting question data. This design consists of a text box to enter a question, a combo box to select a difficulty level, an answers button to choose an answer key, a load image button to upload questions containing pictures, and a save button that functions to store question data. Figure 2 shows the appearance of the user interface design for managing questions based on the *sengkedan* concept. This design consists of a text area to display all lists of questions, a combo box to select the question setting category, a process button to execute the settings, and a save button that functions to store the data resulting from the question settings. Figure 3 shows the appearance of the user interface design for answering questions. This design consists of a text box to enter the student's name and study program, a text area to display questions, an answer button to select the correct answer for the question provided, and a next button to proceed to the next question. Figure 4 shows the display of the user interface design to see the final score. This design consists of a text area that displays the question, an answer button to choose the right for the question provided, a finish button to stop answering questions, a score button to process the final score calculation, and a green text box to display the final score. The test results in Table 2 show that the quality percentage average of the digital test user interface design for the "educational evaluation" course based on the *sengkedan* concept was 81.63%. It means that the digital test user interface design belongs to the good when referring to quality standards based on a scale of eleven.

Figure 5 is the user interface design display to follow up on the suggestions given by expert-02 and student-15. Figure 5 consists of an orange text box that displays the previous difficulty level data, a combo box that functions to select the difficulty level to be updated, an "edit" button to execute the editing process, and a "save" button to save the edited data. Figure 6 is the user interface design display to follow up on suggestions given by student-02, student-20, and student-31. Figure 6 consists of several text boxes to display the score for each question and the total score. Besides that, there is a "save" button to save score data.

This research succeeded in answering the constraints of Rerung and Hartono's study [9], Nurwahidah *et al*.'s research [10], the research by Saputra and Ihsan [11], the research by Afrianto *et al*. [12], and the study by Perdana *et al*. [13], by demonstrating the existence of a user interface design from a digital test that adopts the concept of *sengkedan* in compiling levels of question difficulty in stages starting from the lowest level of difficulty to the highest. This study had principal similarities with the research of Buschek *et al*. [29], the research by Botello *et al*. [30], the research by Cochran and Rayo [31], the study by D'Souza *et al*. [32], then the study by Rivero *et al*. [33]. It related to the user interface design creation for a digital application using the Balsamiq Wireframes mockups application facility. The difference lies in the research focus. This research focuses more on the *sengkedan* concept to create a digital test with a tiered arrangement of questions ranging from low to high levels.

The novelty of this study is the demonstration of a user interface design to make it easier for educational evaluators to understand the facilities available in a digital test. The advantage for evaluators with the presence of this novelty is that it makes it easier for them to understand digital test facilities from an early. It is before deciding to make the final application of a digital test whose quality is uncertain. Although this research had advantages, there were also disadvantages found in this study. It was that there were no valid and no reliable question items used in the digital test for the *sengkedan* concept-based "educational evaluation" course.

## 4. CONCLUSION

The research answers the research questions well by demonstrating the user interface design form of a digital test based on the *sengkedan* concept. It was to support the "educational evaluation" course in the Department of Electrical Engineering Education at Universitas Pendidikan Ganesha. The digital test user interface design formed through this research was of good quality. As indicated by the average percentage quality was 81.63%. Future work that needs to overcome the shortcomings of this research is to test the validity and reliability of each question item used in the digital test in the "educational evaluation" course based on this *sengkedan* concept. The impact arising from the presence of the results of this study is positive as new knowledge for evaluators in the field of education in developing a quality digital test.

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