The online assessment in education course

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Abstract. This research is a development research with the development method from Borg & Gall. This study aims to develop an online assessment program that can measure students' mastery of concepts in science education subject matter learning. The research was conducted at a university in Bogor, West Java, Indonesia. The purpose of this study was to determine the steps for developing an online assessment program in science education courses. This program testing analysis is only carried out until the program validity testing stage by experts and students as users. Data obtained through expert validation tests and questionnaires given to students as users. The results showed that the program developed had very good criteria so that it could be used as a tool for assessing science learning for students.

1. Introduction

Assessment is an important aspect of education. Students' concept mastery regarding the learning materials is arranged based on the final score of the assessment done. For an educator, a good assessment is an assessment that can measure the ability of students to answer the questions given. The assessment itself becomes a measure of success for a teacher in teaching a learning topic. Besides, the teacher will also be motivated in teaching if the learning outcomes provided by the assessment reaches maximum score, but to be able to measure the level of change in students' concept mastery based on the learning outcomes, the correct assessment must be used. Assessment is a learning tool used to determine whether students are progressing in achieving their learning goals or not [1]. Assessment is also referred to as the process done to obtain information that is used to make conclusions and decisions regarding students, curriculum achievement, implementation results of programs, and educational policies for any institution that organizes learning activities[2]. Assessment is an action taken by gathering various information about an individual or a group of individuals to understand them more thoroughly [3]. assessment is a part of learning that must be in learning activities, assessment shows the extent to which learning progress has been achieved by students from the learning process that they follow. Even so, several negative indications come from assessments for students, including that: tests make students anxious, tests separate and label students with different abilities, tests can undermine students' self-esteem, and tests make teachers have their assumptions about the ability of students, which often is true [4]. The best teacher is a teacher who uses various kinds of assessment strategies continuously to gather data of students' learning progression and also uses said data to provide feedback to students[5].

Teacher ability in assessment of educational is important thing in education [6]. The assessment itself has several types based on its function, namely formative assessment (assessment at the end of the learning program), summative assessment (assessment at the end of each unit of the learning program), diagnostic assessment (assessment to diagnose students' ability to determine the course of

improvement), selective assessment (assessment conducted for certain screening, for example, new admissions tests), among many others [7]. However, types of tests as assessment tools are divided into two types, which are test and non-test. The test itself includes oral test (individual & group), written test (essay & objective), performance test (individual & group). Whereas nontest include observation (direct & indirect), questionnaire, sociometry, case study, and checklist [8]. The assessment also has several principles, where the assessment must be well-planned, continuous, using appropriate assessment tools, and have follow-ups. An assessment in learning in higher education has the goal of providing a better change and can also be the best way to support student learning [9].

In this day and age, we enter the era of the industrial revolution where everyone wants to live with ease. Where everything is assisted with digital technology to speed up work and make the results obtained from said work to be more accurate. This also applies to the field of education, where the education system starting to apply the various digital system in the learning process. Technology provides many practical benefits for humans, such as increased efficiency regarding the design, implementation, and assessment of results of work conducted [10]. Current studies are continuing to discuss the educational needs expressed in various previous projects to develop assessment practices among teachers working with digital projects, utilizing practical review of digital project assessment for teachers that is started by improving the teachers' digital literacy, or in other words improving teacher knowledge about digital as the first step to digitizing education [11]. Curiosity is the basis of an assessment, where curiosity is one of the 21st-century skills that are very important in the digital age. However, assessment of students' work begins from the teacher's curiosity about the success of the learning process they lead, the curiosity in itself is very diverse and is expressed in a variety of ways, assessments to satisfy curiosity are often based on self-reports or subjective observations [12].

In learning integrated science, the learning materials are more focused on things related to phenomena around us, thus the material presented is considered a real material. One of the main objectives of science education is to prepare students to be able to understand said phenomena scientifically [13]. This certainly causes the assessment system to also be made as clear as possible. Science education should be conditioned to be able to accommodate all students' abilities from any background to learn optimally through inquiry and interaction with nature [14]. A broad approach to science education requires the identification of frameworks through assessments that can understand the complexity of learning [15]. Science education, lately, often no longer emphasizes rationality and idealism, but has shifted to the order of interests [16]. This is unfortunate since science education must always innovate and keep up with the times [17]. This makes science drifts off of its' origin as a nature study if the evaluation was not maintained thoroughly and continuously. Therefore it is very important to evaluate every science learning.

2. Methods

This study uses a Development research design. There are 6 steps in the research development method, which are (1) Defining the problem; (2) Mapping the problem; (3) Creating a research framework; (4) Determining problem limitation; (5) Literature review, and (6) Research procedures. Preliminary research phase, gathering information in the form of literature review, classroom observations, and identification of problems [18]. An overview of the research methods can be seen in Figure 1.

Figure 1. Borg & Gall Model Development Design.

The following are the research phases carried out in this study, which are based on the Borg & Gall model [19] Which are:

1. Preliminary research phase: At this phase, preliminary studies, observations, interviews, and literature studies are carried out to analyze the problem.
2. Planning phase: Activities carried out in this phase are identifying and defining skills, development objectives, and conducting preliminary tests as an analysis of the main problems.
3. Prototype design and development phase: preparing product prototypes and developing the said product.
4. Expert validation phase: The initial product is assessed, criticized, and given feedback by experts.
5. Revision phase 1: revision is done based on the feedback, suggestions, and criticism from the experts
6. Limited trial phase: The product was tested on 10 students at a state university in Bandung, West Java, Indonesia.
7. Revision phase 2: the second revision is done based on the results of a questionnaire and interviews with users on a small scale group
8. However, the dissemination and implementation stages were not carried out in this study.

This study was only done up until the product revisions after a limited trial. Meanwhile, to find out the level functionality and readability of the program, a system usability scale (SUS) is used to find out whether the online science assessment program is valid and can be used for its intended purpose.

The test is carried out in four phases, where the first test is unit testing, then integration testing, system testing, and acceptance testing.

1. Unit Testing. This test is carried out by the program developer at the time of making and designing the program. The developer uses a trial and error method to ensure the program works properly in accordance with the storyboard or prototype that was designed.
2. Integration Testing. Integration testing is done through a black box testing mechanism using functionality as a test subject. In this test, the smooth usage flow of this program becomes an absolute and main thing to be tested, which is whether the program functions properly in line with planning expectations or not. Following are the results of the black box testing that can be seen in Table 1.

Table 1. BlackBox Testing

Testing	Menu Testing Criteria	Testing Result
Opening the program	The menu can be opened easily	Passed
Opening the evaluation menu	The menu can be opened easily	Passed
Sign-up admin (Teacher)	The menu can be opened easily	Passed
Login : Students, Admin	The menu can be opened easily	Passed
Log out	The menu can be opened easily	Passed
Opening user's identity	The menu can be opened easily	Passed
Editing user's profile	The menu can be opened easily	Passed
Changing password	The menu can be opened easily	Passed
Using dashboard	The menu can be opened easily	Passed
Showing the multiple-choice	The menu can be opened easily	Passed
Showing the essay questions	The menu can be opened easily	Passed
Answering the test questions	The menu can be opened easily	Passed
Displaying the score recapitulation of the answers	The menu can be opened easily	Passed
Downloading the results data	The menu can be opened easily	Passed

3. Results and Discussion

3.1. Acceptance Testing (Validity Testing by Experts)

Expert test or expert validation: The initial product is assessed and criticized, also given suggestions for improvements by two experts in the field of technology and the field of assessment. Validity is the degree to which a measure appears to be related to a particular construct, in the judgment of both the expert and the test subject [20]. The technology experts provide input regarding the assessment program developed. Revisions are done based on the input, suggestions, and criticism from the experts.

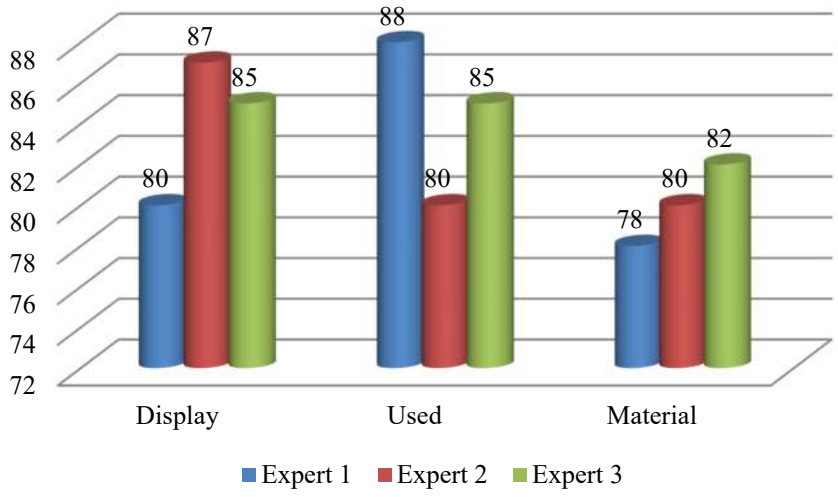

Figure 2. Experts' Validation

In Figure 2, we can see that the validation according to the experts is very good. On average, all scores meet the high scoring criteria. To determine the validity criteria of the scores obtained based on expert judgment, it can be seen in Table 2 [21].

Table 2. Score Level Criteria

Score	Validity
85,01 – 100	Very Valid
70,01 – 85	Valid
50,01 – 70	Enough
01,00 - 50	Less
< 50	Invalid

3.2. User Trial

The program went through a limited trial with 30 science education major students as the participants at a university in Bogor, West Java, Indonesia. The trial was analyzed using a questionnaire based on the computer usability satisfaction test indicators, consisting of System Usefulness (ease of use, efficiency, effectiveness, securing necessities, work system, usage procedure, and productivity), Information Quality (Usage, error information, clarity of information, and layout of information), Interface quality (display quality, visual quality, language quality, user comfort, and functions availability) [22]. Before and after students learn the material given by the teacher, pre-test and post-test questions are given accordingly through this assessment program. Afterwards, the use of this assessment program is evaluated using a questionnaire of satisfaction. The results of the trial of the science learning assessment program can be seen in Figure 3.

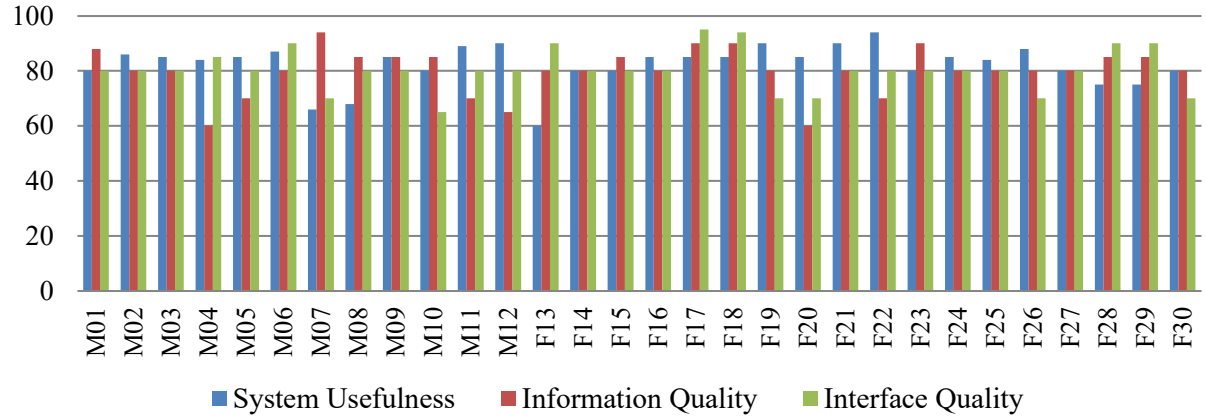

Figure 3. The Programs' Readability Level

Figure 3 shows that the average user gave a positive response to the assessment program. The average score obtained is 82.23% for System Usefulness, 80.1% for Information Quality, and 80.16% for Interface Quality. These scores show that this program is suitable for evaluating the learning process in the science education course. Based on the questionnaire data given to the students, System Usefulness falls into the "Very Good" criteria, Information Quality falls into the "Very Good" criteria, and similarly, the Interface Quality also falls into the "Very Good" criteria. The Criteria can be seen in Table 3 [23]. Readability has been widely used in various contexts: educational themes, in newspapers, publications, military procedures, documents on state administration, advertisements and academic journals, to ensure and improve readers' understanding) [24]. Empirical investigation into the advantages of a product is

how individual responses to the shape of a product have traditionally been carried out by consumers in research conducted [25].

Tabel 3. Product Score Criteria

Score	Criteria
80,01 – 100	Very Good
70,01 – 80	Good
50,01 – 70	Enough
< 50	Less

Although this assessment program is specifically designed for a science education course, in its application, this program can also be used for other courses and can also be used by teachers at elementary to high school levels, because its very easy and simple use that can be adjusted according to the practical needs of teachers to analyze the success of their learning process quickly.

4. Conclusion

The results of experts' validation also indicate that this program is considered valid and tested, and can be used as an online assessment tool in science education learning courses. Data analysis of the program used in this study was only done up to the physical testing phase of the program, and not on testing the program with specific science questions. But from the results of testing the program to 30 students/users, it can be concluded that this program can be used based on the score of the computer usability satisfaction test. According to this research, usability of products or apps tends to be overlooked for the sake of performance measures, but often these metrics measure the aspects of the user experience that are most closely related to the quality of a product [26]. The testing results of this assessment program showed a high score and falls into the "Very Good" criteria.

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