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The use of quizStar application for online examination in basic physics course

R Kustijono¹ and H Budiningarti¹

¹Department of Physics, Universitas Negeri Surabaya

E-mail: rudykustijono@unesa.ac.id

Abstract. The purpose of the study is to produce an online Basic Physics exam system using the QuizStar application. This is a research and development with ADDIE model. The steps are: 1) analysis; 2) design; 3) development; 4) implementation; 5) evaluation. System feasibility is reviewed for its validity, practicality, and effectiveness. The subjects of research are 60 Physics Department students of Universitas Negeri Surabaya. The data analysis used is a descriptive statistic. The validity, practicality, and effectiveness scores are measured using a Likert scale. Criteria feasible if the total score of all aspects obtained is $\geq 61\%$. The results obtained from the online test system by using QuizStar developed are 1) conceptually feasible to use; 2) the system can be implemented in the Basic Physics assessment process, and the existing constraints can be overcome; 3) student's response to system usage is in a good category. The results conclude that QuizStar application is eligible to be used for online Basic Physics exam system.

1. Introduction

The assessment of education is the process of collecting and processing information to determine the achievement of student understanding carried out based on applicable standards, namely standards related to mechanisms, procedures, and instruments of understanding of learners' understanding. Teachers must know the extent to which students have understood the material that has been taught or the extent to which the learning objectives have been achieved, then, the level of achievement of learning objectives that have been achieved is expressed by the score. Students not only learn from the teacher but also get other learning experiences from various learning sources, but the main thing in the assessment is how the material taught by the teacher can be understood by the students [1]. Assessment results are evidence of feedback from teachers, students, and other stakeholders who have access to the learning process [2]. Unfortunately, there are still many teachers who have not mastered the education assessment according to the applicable standards [3]. One of the assessments of learning in the classroom is the measurement through tests or examinations to the students used to measure the extent to which certain subject matter has been understood by the students. There are many types and ways of giving tests to students and currently, many tests are being developed using the computer and implemented online. One of the online exam applications is Quizstar which has several advantages over other applications. The objective of the study is to produce a Basic Physics exam system online using the QuizStar application

Basic Physics is the basic idea that arises from the application of the scientific method which examines the most fundamental ideas about the properties of Physics [4], which deals with the basic concepts and principles of Physics necessary to study further Physics or other sciences. Basic Physics



learning objective is to master basic knowledge of mechanics, heat, wave, sound, optics, static electricity, direct current circuit, magnet, electromagnetic induction, and alternating current. and can develop and apply them to study higher knowledge of physics. Physics is a science related to facts, processes, theories, concepts, and generalizations. Physics is not just a science of memorization, but a science that allows students to be able to link one concept with another concept to express the meaningful relationship. In learning meaningful new information is associated with information that already exists in the cognitive structure of students. Therefore, the study of physics must be able to present the phenomenon in everyday life that can encourage and train students to think analytically, critically and creatively. The best way to develop these skills is to give students the opportunity to investigate a Physical phenomenon in everyday life. One effective method that can be used in Physics learning is an inquiry-based learning. The current learning trend is to move away from teacher-centered teaching to a more student-centered approach. Science (including Physics) involves observation, identification, description, experimental investigation, and theoretical explanation of phenomena [5], thus requiring investigative activities. Learning-based learning is the process by which students engage in their learning, formulate questions, investigate extensively and then build new understandings, meanings, and knowledge. Inquiry-based learning can help students become more creative, more independent, and improve achievement [6]. Understanding science and student inquiry skills will increase with an investigative laboratory-based guide [7]. Inquiry-based learning provides us with the opportunity to help students learn concepts by allowing them to explore questions, develop and test hypotheses. Thus it can give students more opportunities to reflect on their own learning, gain a deeper understanding of concepts in an integrated way, and become better critical thinkers. The teaching of science has a specific characteristic, so science teachers avoid memorizing and only the small facts of science alone [8]. Science teachers develop teaching with scientific methods, critical thinking, scientific attitudes, problem-solving approaches, discovery methods, and methods of inquiry. When we start planning lessons, their level of experience will determine the number of structures and modeling that need to be developed [9]. Research on the assessment of the process of applying research-based tasks in science education shows that the most widely used method in science and technology is experimentation [10].

Learning outcomes can be grouped into three domains: the cognitive, the psychomotor, and the affective domains. Each subject always contains the three domains, but the emphasis can be different. Practical subjects focus more on the psychomotor domain, while the conceptual understanding subject emphasizes the cognitive domain, but both contain affective domains. The psychomotor aspect deals with manipulation skills involving muscle and physical activity, the cognitive domain is closely related to the ability to think (memorize, understand, apply, analyze, synthesize and evaluate), while the affective domain includes character and behavior (attitudes, interests, self-concept, values and morals). Assessment of learning outcomes in the classroom is actually aimed to improve the learning objectives [11]. The process of effective learning is goal-oriented, and its objectives are clearly understood. [12] Whatever the emphasis of the given realm, the judgment must be accountable[13]. The purpose of the cognitive aspect is oriented to the ability of thinking that includes simple intellectual ability (remembrance) to the problem-solving skills that require students to connect, incorporating some ideas, methods, and procedures to solve the problem. Thus the cognitive aspect is the sub-taxonomy that reveals the mental activity that often begins from the level of knowledge to the highest level of evaluation. Some aspects to be considered in making judgments are: valid, objective, fair, integrated, open, thorough, systematic, criteria, and accountable. Student assessment is based on data obtained through individual or group assignments, midterm exam, final exam, self-assessment, peer assessment, attitude assessment, and student performance observation through oral or written display. The assessment developed in this study is related to understanding the concept through online exams.

One of many online exam applications is QuizStar which can be used by accessing the site address: <http://quizstar.4teacher.org>. There are many advantages of using the QuizStar, among others, we can manage problems, classes, attach multimedia files to questions, create questions in various

languages, display questions at any given time, accessible from any computer connected to the internet, allow students to complete and review repeated quiz answers, and so forth. QuizStar application provides facilities for two users of User Instructor and User Student, both facilities have different functions. User Instructor is a user who has the right to administer and manage questions, classes, and reports. Manage the questions, give the score, set the timer or when the matter is displayed, determine the type and form of the question whether it is multiple choices, right-wrong, or essay. Managing the class is creating a class, determining which classes can access the tested questions and grouping students in specific classes. The report which is displaying the results obtained from each student for every conducted question, statistics, determining the number of access time for student user, evaluating the level of question difficulties, and so forth. User Student is a user who will access and work on the questions that have been given by User Instructor. In order to access these questions, students must first have an account as User Student. To register an account as User Student does not need an email address as well as on User Instructor registration. Simply enter your first name, last name, username, and password. User Student enrollment can be done by User Instructor or students themselves. The steps of using the QuizStar application are: a) User Instructor registration, b) Class Folder setup, c) User Student registration, d) problem preparation, answer options, and key and e) online exam management [14].

2. Research Methodology

This is a Research and development study with the ADDIE model which is an acronym for the stages of the model: Analysis, Design, Development, Implementation, and Evaluation [15, 16]. This research develops System of Basic Physics Exam online by using QuizStar with the following research procedure: 1) Analysis that is doing analysis include analysis of Basic Physics objectives, Basic Physics material content, Basic Physics problems that can be developed which refers to the rules of making the correct problem, and deepening QuizStar application characteristics; 2) Design is planning the system of Basic Physics Exams online by using QuizStar application based on the results obtained by the analysis phase, which refers to the study of Basic Physics materials, learning evaluation rules, and technical rules of the use of online examination system; 3) Development is developing the system of Basic Physics exam online by using QuizStar application include: a) User Instructor Registration, b) Class Folder Setup, c) User Student Enrollment, d) Preparation of questions, answer options, and key, e) Online exam management, subsequently validated by experts in their field, and revising according to the input of experts; 4) Implementation is to apply an online Basic Physics exam system using a QuizStar application that is valid in both categories on the Basic Physics exam in class; 5) Evaluation is to assess the practicality and effectiveness of QuizStar based on the application stage. Practicality is based on the implementation and constraints of learning evaluation, while the effectiveness is based on the mapping of basic physics understanding and positive responses from students.

The subjects are 60 students of Physics Department, State University of Surabaya consisting of classes A, B, C, and D. Each class consist of 15 students. This research was conducted at Computer Service Unit of Faculty of Mathematics and Natural Sciences of Universitas Negeri Surabaya in the even semester of academic year 2016/2017 and the odd semester of academic year 2017/2018.

The research variables defined and the operational definitions used in this study are: 1) The validity is the level of suitability of the design with the latest study [17]. The study referred to in this study is the study of learning aspects (material and evaluation) and technical aspects. The validity is defined as the suitability of the online Basic Physics exam system by using QuizStar with material review and Basic Physics learning evaluation as well as technical studies. The validity is measured by using a validation sheet instrument assessed by experts; 2) Practicality is the degree to which other users can use it in learning conditions [17]. Practicality is defined as the success of other users using the online Basic Physics exam system by using QuizStar in learning evaluations. Practicality is measured by the instrument of observation sheet of the implementation of the evaluation evaluated by the observer; 3) Effectiveness is the level of conformity of results with the desired goal [17]. Effectiveness is defined as the success of the Basic Physics exam system online by using QuizStar in

mapping out basic Physics understanding and positive responses from students. The effectiveness is based on the results of the test of the use of the system in the online Basic Physics exam from the students and the response was obtained from the student response questionnaire instrument.

The instruments used in this study include the validation sheet, the observation sheet for the implementation of the online Basic Physics exam system by using QuizStar, and the student response sheet on the use of the online exam system. The instrument used briefly can be explained as follows: 1) The validation sheet is the instrument used to assess the validity of the online Physics Baseline test system by using QuizStar. The aspects assessed on the validation sheet refer to the Basic Physics material, meet the rules of making the right questions, and the technical suitability; 2) The instrument of practicality is the observation sheet of the implementation and learning constraints. Aspects assessed on the observation sheet of learning constraints and constraints refer to the fulfillment of the principles of evaluation of learning; 3) Student response questionnaire is the instrument used to assess the response of students in the implementation of the Basic Physics exam online. Aspects assessed on this questionnaire refer to the response to the evaluation of Basic Physics and Systems operating techniques. Assessment of validity, practicability, and effectiveness using Likert scale scores (1 = very less, 2 = less, 3 = good, and 4 = very good [18]).

Data collection techniques used in this study are questionnaires, observations, and tests. The brief description is as follows: 1) Questionnaires are used to assess the validity of the online Basic Physics exam system using the QuizStar application in terms of their conformity with the Basic Physics aspects, the appropriate rules, and the technical aspects. Questionnaires are also used to assess the effectiveness of the system based on student responses; 2) Observations are used to assess the practicality of an online Basic Physics exam system by using the QuizStar application in terms of the implementation and constraints of learning evaluation. To assess the practicality, observers are given subjectivity observation sheets and learning obstacles that refer to the appropriateness of the exam on the principles of learning and their appropriateness with the technical aspects. 3) The test is used to assess the effectiveness of the online Basic Physics exam system by using the QuizStar application in terms of the system's ability to map the basic physics understanding of the students.

Data analysis techniques used in this study is descriptive statistics to determine the validity, practicality, and effectiveness of the online Basic Physics exam system using the developed QuizStar application. The percentage of validity, practicality, and effectiveness is calculated by summing the average validators/observers score on every aspect of good and very good categories, then divided by maximum scores, then multiplied by 100%. Validity, practicality, and effectiveness are categorized good if the percentage is in the range of 61% - 80% and very good if the percentage is in the range of 81% - 100%. The Basic Physics Examination system online is eligible if the percentage of each validity, validity, and effectiveness is $\geq 61\%$.

3. Research Results

3.1. *The validity of Online Physics Exam System by Using QuizStar*

The validity of online physics exam system by using the QuizStar application is assessed from learning and technical aspects. Aspects of learning include Basic Physics content and constructions of making a good understanding of the problem. Technical aspects include ease of operation, ease of access, and affordable. The validity was assessed by three experts in the Basic Physics course who understood how to make the matter according to the rules. The results of the validity are shown in Table 1, as follows:

Table 1. The validity of Online Physics Exam System By using QuizStar.

Number.	Aspects	Average score	Explanation
<i>Compatibility with Basic Physics content</i>			
1	Basic Physics Material	4.0	Very good
2	Concept Accuracy	3.7	Very good
<i>Conformity with the rules of making the questions</i>			
1	In accordance with the purpose	4.0	Very good
2	The decking works well	3.7	Very good
3	The questions have only one correct answer	4.0	Very good
4	The subject matter is formulated clearly and firmly	4.0	Very good
5	The questions do not give directions to the right answer.	3.7	Very good
6	The questions do not contain double negative statements.	4.0	Very good
7	Choice of answers are homogeneous and logical	3.3	Good
8	The length of the choice formula is relatively the same	3.3	Good
9	The questions do not contain the statement "All are wrong/correct"	4.0	Very good
10	The questions are sorted based on the value of numbers	3.0	Good
11	The images, graphs, tables, diagrams, are clear and functional.	4.0	Very good
12	The questions do not use meaningless words	4.0	Very good
13	The questions do not depend on the answer to the previous question	4.0	Very good
14	The questions use formal language	3.7	Very good
15	The questions do not repeat words that are not part of the understanding.	3.7	Very good
<i>Technical Conformity</i>			
1	The ease of operation	3.3	Good
2	The ease of access	3.3	Good
3	Affordable	3.7	Very good
Total average score		62.7	
Maximum score		80	

From Table 1, the validity level of the online Basic Physics test system by using QuizStar is 78%. Based on these results can be stated that conceptually the system of Basic Physics exam online is feasible to use. Nevertheless, these results still need to be implemented further to prove its practicality and effectiveness.

3.2. Practicality of Online Physics Exam System By using QuizStar

The level of practicality of the online exam system can be known from the implementation and constraints faced during implementation. The data needed to know the level of practicality of the online Basic Physics exam system by using the QuizStar application is reviewed from the aspect of its ability to meet the rules of good comprehension exam implementation and meet the technical aspects. Practicality is obtained based on the observation of 3 peers who use the online exam system. The result of practicality is shown in Table 2 as follows:

Table 2. Practicality of Online Physics Exam System by Using QuizStar.

Number.	Aspects	Average score	Explanation
<i>Compliance with test execution rules</i>			
1	The exam reflects the ability to measure	4.0	Very good
2	Clarity of procedures and assessment criteria	4.0	Very good
3	The exam is not affected by the condition of the learners	3.7	Very good
4	Alignment with the learning process	3.3	Good
5	The exam scores are easily accessible to learners	4.0	Very good
6	Continuity of use of the test system	4.0	Very good
7	Planning and systematic exams	3.7	Very good
8	Test results can be used for capability mapping	4.0	Very good
9	Test results can be justified	3.7	Very good
<i>Technical Conformity</i>			
1	The ease of operation	3.0	Good
2	The ease of access	3.0	Good
3	Affordable	3.7	Very good
Total average score		44.1	
Maximum score		48	

From Table 2, the level of practicality of the online Basic Physics test system by using QuizStar is 92%. Based on these results can be stated that the online exam system can be used in Basic Physics learning. Nevertheless, these results still need to be strengthened by testing their effectiveness by looking at how far the system can map students' basic physics understanding and student responses to the use of the online exam system.

3.3. The effectiveness of the Online Basics Physics System By using QuizStar

The ability of online examination system in mapping the students' basic physics understanding is seen from the report features of the online exam system. The assessment was obtained based on the observation of 3 colleagues who used the online examination system. The results obtained are shown in Table 3 as follows:

Table 3. Online Test System Ability in Reporting Test Results.

Number.	Test results Reporting Feature	Average Score	Explanation
<i>Individual report</i>			
1	The identity of the participants	4.0	Very good
2	Date	4.0	Very good
3	The time for the test to begin	4.0	Very good
4	The time for the test to end	4.0	Very good
5	Scores obtained by participants	4.0	Very good
<i>Class report</i>			
1	Scores per examinee	4.0	Very good
2	Average Score	3.3	Good
3	Maximum Score	3.3	Good
4	Minimum Score	3.3	Good
5	Student score chart	3.7	Very good
Total average score		37.6	
Maximum score		40	

From Table 3 can be obtained the calculation of the level of ability of the online exam system in mapping the understanding of Basic Physics students is 94%. Student responses are obtained from a questionnaire given to students by using the QuizStar application. The results obtained are shown in Table 4 as follows:

Table 4. Student Response To the Use of Online Exam System.

Number.	Aspects	Average score	Explanation
1	The test Confidentiality	3.0	Good
2	Reduce the cheating in exams	2.9	Good
3	After completion of the exam, the score is immediately shown	3.5	Very good
4	The correct answer key is shown	3.2	Good
5	Build an exam atmosphere that is not stressful	2.9	Good
6	The ease to operate	3.2	Good
7	The ease of access	3.2	Good
8	Affordability of application operating costs	3.3	Very good
9	Empower smartphone in learning	3.4	Very good
10	Student support for online examination system	3.3	Very good
Total average score		31.9	
Maximum score		40	

Table 4 shows that the effectiveness of the system based on students' response to the online Basic Physics test system by using QuizStar is 79.8%. Based on these results it can be stated that students support the use of the Basic Physics exam system online using the QuizStar application. Since the online examination system has the ability to map the students' basic physics understanding and get students' responses with the effectiveness level of $\geq 61\%$, then the online Basic Physics exam system using the QuizStar application can be declared effective. Therefore, the online exam system has validity, practicality, and effectiveness in both categories. Based on these results it can be concluded that the online Basic Physics exam system by using QuizStar application is worth using.

4. Discussion

Assessment of student learning outcomes is to test whether the material listed in the learning objectives has been studied and impact students' retention [19]. Of the multiple choice of exam types, multiple choice is the most selected teachers. Multiple-choice exams are used by teachers for the following reasons: 1) fast, easy and economical to achieve goals; 2) can be objectively assessed and thereby provide a fairer and more reliable test view than the description test; 3) score obtained easily converted; 4) reduces the likelihood of students guessing answers compared to true-false issues [20]. Although multiple-choice exams have advantages over other types, it is necessary to take into account the factors that influence the assessment in general. There are several important factors that influence the student's assessment: structure, self-regulation cognition, autonomy, and writing skills of activities and assessment as a process [21]. In making multiple choice questions, in addition to emphasizing the content of Basic Physics, must also meet the criteria of making the multiple choice questions.

Currently, distance learning is beginning to be widely implemented and taking into account the characteristics of distance learning, online assessment becomes a favorable alternative assessment [22]. Alternative assessment is particularly useful for students who are involved in distance learning, as self-assessments can be obtained, and can eliminate time pressures, but are unlikely to be implemented over time [23]. This research develops an online Basic Physics exam system using the QuizStar application and tests its feasibility including validity, practicality, and effectiveness. The instructional aspects (Basic physics matter and criteria of problem-making) are met with a good

category, which means the developed online test system has been conceptually feasible. Good execution rules and technical aspects are also met with a good category of online exams using the QuizStar application without any significant constraints. Although there are some students who still feel anxious about the online exam, but with the training of the students before the online exam is done related to the technical operation, and make them not feel depressed, will be able to establish good cooperation between students and instructors, so that the constraints there is resolved [24]. These results indicate that a practical online exam system can be used in the Basic Physics online exam. The developed online exam system can also map exam results and get student responses in either category, which means the developed online test system is effective. Based on the results of the study, the online Basic Physics exam system by using QuizStar is worthy of use in the Basic Physics exam because it has met the aspects of validity, practicality, and effectiveness in both categories.

5. Conclusions

The results obtained are: 1) online test system by using QuizStar is conceptually feasible to use in Physics Elementary examination in terms of learning and technical aspects; 2) the system can be implemented in the Basic Physics assessment process, and the existing constraints can be overcome; 3) students' responses to the use of systems is in good category. This research can conclude that the QuizStar application is worthy of being used for the online Basic Physics exam system.

Suggestions that can be proposed for future researchers are developing the online exam by exploring more multimedia such as video and voice usage which are not yet applied in this research. This is to get the impression that the exam can be fun for the students and not something that is worrying or scary.

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