Development of Online Examination Application in Junior High Schools of Surakarta City

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ABSTRACT

The rapid development of technology and the demands of the digital revolution 4 require all educational institutions to adjust as soon as possible. Currently, electronic learning is the first demand in all educational institutions. Not only in the scope of the University, even in the scope of high schools and junior high schools are required to apply this technology. Electronic learning or so-called E-Learning provides alternatives and new perspectives in today's learning. An online exam model that can be integrated into institutional information systems. The online exam model is expected to be applied in the junior high school environment in addition to adjusting to the times, as well as a media to familiarize students with electronic-based exams. Thus, when they enter higher education or even into the world of work, students are no longer surprised. Broadly speaking, the stages follow the modified development flow of Borg and Gall. With this method, an online exam tool is produced which is integrated into the information system. The purpose of this study is as an alternative online exam that can be used as a solution in a pandemic that is currently hitting the world.

Keywords: CAT, E-Learning, Online exam, Information system.

1. INTRODUCTION

In fulfilling the demands of the 4th digital revolution launched by the government, all institutions, especially educational institutions, are encouraged to implement electronic learning in teaching and learning activities. Electronic learning or so-called E-Learning is a concept or education system that uses and utilizes information technology in the teaching and learning process. Several sources translate the meaning of E-Learning as follows; (a) The learning system is used as a means for the teaching and learning process which is carried out without having to meet face to face directly between teachers and students [1] (b) The distance learning process combines the principles of the learning process with technology [2]; (c) Learning is structured to use an electronic or computer system so that it can support the learning process [3].

E-Learning has the following characteristics according; the characteristics of E-learning are networked, which makes it able to quickly repair, store or retrieve, distribute, and share learning and information [3].

The benefits of E-learning are (1) Flexible. E-learning provides flexibility in choosing the time and place to access trips. (2) Learning independently. E-learning provides opportunities for learners to independently take control of learning success. (3) Efficiency in cost. According to Sujana [5], the advantages of implementing E-learning are that it provides flexibility, interactivity, speed, visualization through various advantages of each media. Meanwhile, the drawback of E-learning according is that learning with the E-learning model requires more additional equipment (such as computers, monitors, keyboards) [6].

An online exam is an exam method using internet access. Online is where students and students do not need to use stationery equipment (stationery) but only use electronic equipment such as laptops, computers, or other devices such as mobile phones based on smart-phones provided that their electronic equipment is connected to a network or connected to the internet.

School education institutions such as Junior High Schools have only implemented E-Learning for the

Teaching and Learning Activities process with standard features of the Learning Management System for example, giving assignments, materials, quizzes, forums, and assessments. No application of exams exists in the E-Learning system, both for E-Learning devices at the junior high school level and at the high school level. With this design, it is hoped that in the future junior high school students will become accustomed to the application of information technology so that they can quickly adapt to higher education levels in high schools and universities

1.1. Literature Review

This study uses several libraries including Dr. Winarno, S.Si., M.Pd. with the title "Testing Results Computerized Adaptive Testing (CAT) Software Islamic Religion Education Subject in Making Rekam Medik Pembelajaran (RMP) diagnose student's ability at School". This study aims to (1) produce Computerized Adaptive Testing (CAT) software for Islamic religious education subjects for seventh-grade students of state/Islamic junior high schools; and (2) to see the results of CAT software testing from Islamic religious education with the subject in making learning medical records (RMP) to diagnose students' abilities. [7]

This research uses a research and development (R&D) approach and consists of two parts: (1) CAT PAI software development for junior high school public grade 7 students; and (2) conducting tests on 20 students of grade 7 SMP N 1 Salatiga city as a sample, data were collected by conducting observations, documentation, and questions, quantitative data collected from the evaluation results of experts, individuals, small groups, and large groups in activities. The test was analysed using the concept of reliability among class students/respondents, namely the generalization coefficient using Genova.

The results of the learning medical record (RMP) data for Islamic education were analysed using quantitative descriptive techniques. The research findings show that: (1) CAT can be developed based on user needs which is web-based, user-friendly, interactive, highly secure, and easy to access; (2) CAT can recognize three different users: school administrators, teachers, and students; (3) Quantitative data collected from experts. Evaluation results, individuals, small groups, and large groups have a high enough consistency (4) CAT can accurately and accurately estimate the ability of students to see the learning medical record (RMP).

Another literature used by researchers is research by Evi Murniati with the title "Computer-Based Test (CBT) As an Alternative Learning Evaluation Instrument". This study aims to determine the feasibility of the Computer-Based Test (CBT) learning evaluation instrument and to test the effectiveness of the instrument to improve learning in vocational schools in Karanganyar Regency. This study used the modified Borg and Bile. Data analysis was used for the development of descriptive analysis, the feasibility of the analysis instrument based on the CBT evaluation score criteria, and the analysis of student learning outcomes using the t-test [8].

The results of this study based on the results of the descriptive analysis concluded that the evaluation of the validation of media experts was obtained by a percentage of 87.18 with very good criteria, subject matter experts with a percentage of 90.48 with very good evaluation criteria, expert evaluation obtained a percentage of 75.00 with good criteria and by practicing experts 87.50 percentage evaluation criteria were obtained very well.

Based on the analysis of the effectiveness test t = 5,631 > table = 2,000, with a significant value of 0,000, which means the increase in the value of learning outcomes in the archive experiment class is better than the value of the control class, 11.53 points. This shows that the evaluation of learning archival instruments using Computer-Based Tests (CBT) is effective in improving student learning outcomes by comparing archives without using the Computer-Based Test (CBT) instrumental evaluation.

This research concludes that the learning evaluation instrument uses a Computer-Based Test (CBT) which is suitable and effective for improving student learning outcomes.

Other research conducted by Ir. Ahmad Ridoh, Arnita, M.T, and Gufron, S.T, M.T with the title "Designing a Web-Based Online Exam System Using PHP MySQL for Vocational School Students". School exams are activities carried out by schools to measure the achievement of competent students as recognition of study achievement or school completion. Exams using information and communication technology have transformed the manual test system into an online exam. The case study in the research is the examination at SMK Muhammadiyah 1 Padang which still uses manual tests which in terms of the protected teacher presentation only type the questions on the question paper and distribute one by one to students as well as manual audit assessments which are usually carried out by the teacher. As a result, the deployment test process can take a long time. By designing a Web-based online using PHP and MySQL, it is hoped that it will be truly effective in testing the level of   intelligence of students. [9]

This application includes effectiveness and efficiency in the creation and presentation of problems, minimizing the level of compilation errors and correcting the results of answering questions, as well as minimizing the level of student cheating in exam questions based on the skill level of each student. The system analysis method used is the PIECES framework method (Performance, Information, Economy, Control, Efficiency, and Service).

The design of the online exam system is carried out using PHP and the MySQL programming language as a database and the JQuery function as a tool for manipulating components in HTML documents, handling events, animation, effects, and processing Ajax. In providing security data and information, user names and passwords are used for each user. As for the final result of designing this system is to produce a Web-based Online Exam.

2. METHOD

2.1. Research Approach

The process of designing the design of this online exam kit consists of several stages. Broadly speaking, the stages follow the modified development flow of Borg and Gall [10] which is as follows:
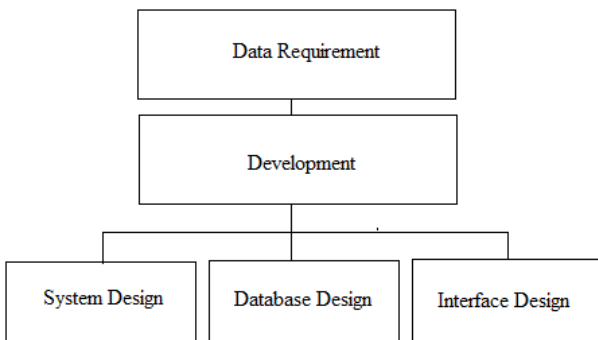

Figure 1. Research approach

This research stage begins with the data requirements stage which includes the steps to collect what is needed in system development. Next is the design development stage, in this stage, it consists of the system design stage which is built using a structured approach method, namely the Data Flow Diagram (DFD).[11] The second design is a design for database needs which is built using a structured approach, namely Entity Relationship Diagram (ERD). [12]The third design is a design to create an interface or interface. The interface design is built using the Pencils application and Adobe Photoshop. [13].

The system development method uses the Prototype Method. The Prototype method itself is an evolution in the world of software development. [14] This method is a development or revolution of the Waterfall method which is often used in software development. In the

Prototype method or development with prototyping, the software that will be produced will be tested on a limited basis to clients or users so that they are allowed to provide input and criticism so that the software produced is following the needs and wants of the customer. Software changes can be made several times until finally an agreement is reached on the definite form of the software being developed [15]

The system development method with the prototype method can be seen as in Figure 2 above. The development method with the prototype generally consists of: Software developers and users work together in defining what software is needed. Then determine the requirements of the system to be made. Build software prototypes by temporarily designing software that focuses on serving customers for example, designing input and output formats. At this stage, the customer participates in the evaluation process whether it is following the customer's wants and needs or not. If there is a customer discrepancy or dissatisfaction, the prototype will be revised according to input. But if appropriate, it will proceed to the next stage. The software in design form will be translated by programming language into ready-to-use software. After the software is ready for use, it is tested first by the developer using the Black Box and White Box methods. This is done to analyse if there is a software error. Customers evaluate the system that can be used and can be analysed whether it suits their needs or not. Software has been tested on a limited basis by customers and can be used if there are no more revisions. The location of this research was conducted in junior high school in the city of Surakarta

The data collection technique used was a document study. Document study is a method of collecting data that is not aimed directly at the research subject. Document study is a type of data collection that examines various kinds of documents that are useful for material analysis. Two documents can be used in the collection of research data, namely: Primary documents are documents written by people who have experienced an event directly. In this case, the researcher uses previous studies with the theme of electronic education that has been carried out. [16] Secondary documents are documents written based on other people's reports/stories, for example in this study the authors took from books and other similar studies. The data analysis method used is descriptive qualitative data analysis method. Qualitative descriptive data analysis methods in qualitative research are useful for developing theories that have been built from data that has been obtained in the field. Qualitative research methods at the initial stage the researchers conducted an exploration, then carried out in-depth data collection, starting from observation to compiling reports in the

form of online exam device design designs for electronic learning [17]

3. RESULT AND DISCUSSION

User requirements are defined into 3 designs, namely system design, database design and interface design. Context diagram is a diagram that part of the DFD (Data Flow Diagram) created to define the system design requirements. It shows how the system and subjects outside the system are related to each other. The usual context diagram is also called with DFD Level 0. Figure 2 below is the result of the context diagram design or DFD Level 0;

Figure 2. Context diagram for system

Figure 2 shows how the relationship between the internal system and subjects outside the system. There is one (1) system, namely the online exam and two (2) subjects outside the system, namely Admin / teacher and Students.

Development of the next Context Diagram is DFD Level 1. Figure 3 below shows DFD Level 1 where there are 4 processes; (1) The login form is a form that shows the user authorization process into the system. There are 2 accounts for this authorization process,

namely admin / teacher and student accounts. (2) Exam is the process of students working on exam questions provided by the admin / teacher with Database Question connected, (3) Score is the process between the student finishes the exam questions until the system display the results of the exam. Students will immediately be able to see their test results while the admin or teacher can see and can also change, repeat or even delete their scores. (5) Management is a process that only the admin/teacher can do. This process is related to admin/teacher activities in adding, changing or deleting student data and selection data, namely data on the relationship between students and exam questions

3.1. Database Design

The database design is based on the data requirements in the online exam program. The database design was made using the ERD (Entity Relationship Diagram) design. Figure 5 below is an ERD design;

The interface design is made based on the consideration of system design, database design and also adjusts the age / status of the user who is the target for this program. Figure 3 below is one page as an example of an interface design for this program.

The process of making a prototype is the process of combining system design, database design and interface design into one integrated display called a prototype. The functions that can be executed in this prototype are minimal functions because in the prototype it only focuses on the core of the presentation to the user. Suppose displaying the name input button to the top corner of the page in the program and so.
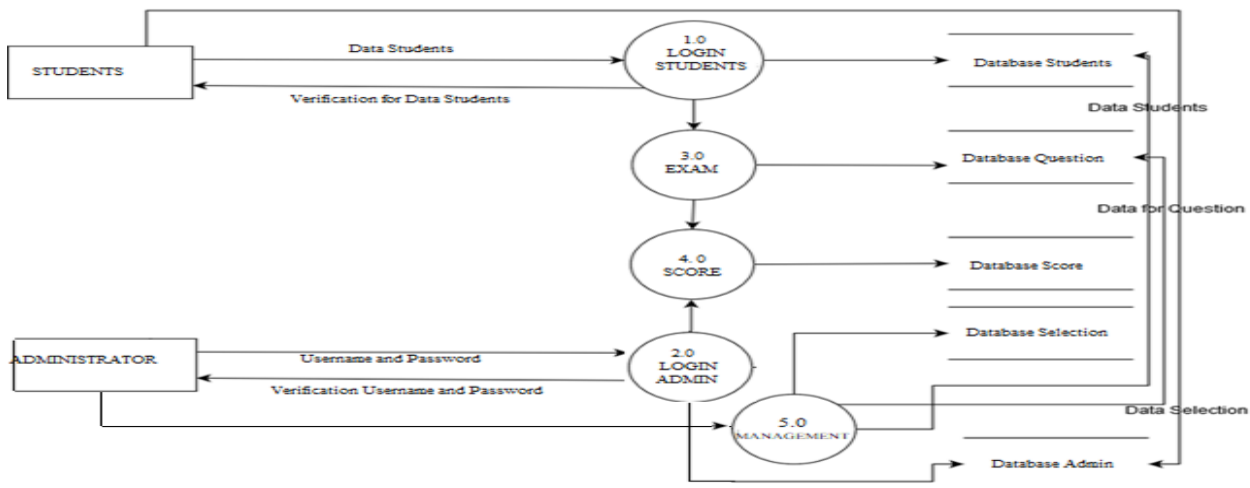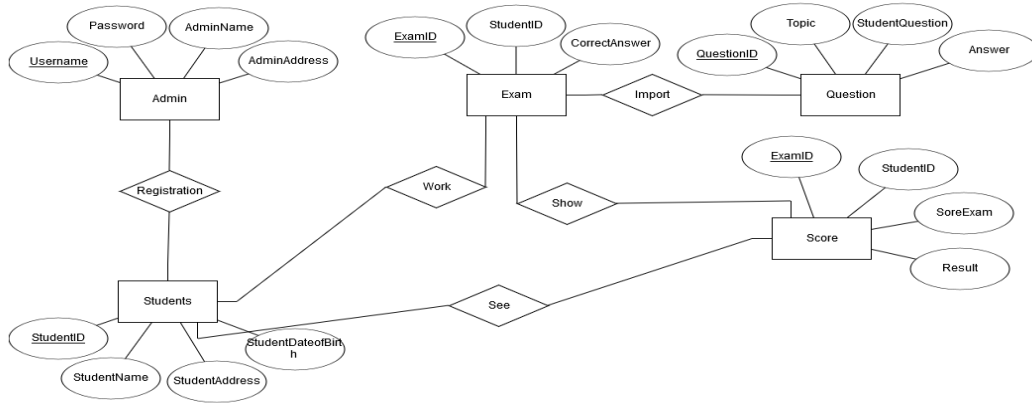

Figure 3. DFD level 1
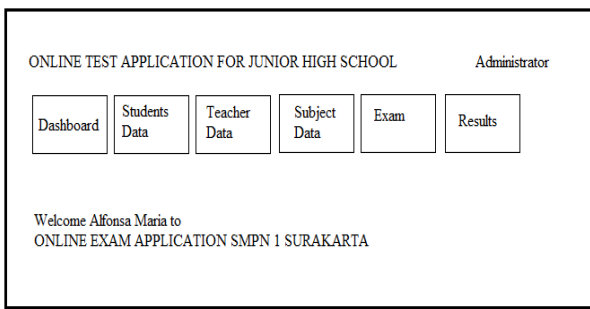
Figure 4. Database design with ERD

Figure 5 . One page example of interface design

The prototype of the design results to the user, in this case, the teacher and student. Then the results of this activity are in the form of evaluations from these users. In this article, there is an evaluation in the form of input from one (1) teacher and one (1) student as a limited sample, that they want the program display to be simple and easy to use and less desirable if there are many menus that are not important

System coding is an implementation activity for programming, namely the process of translating the system design, database design and interface design into an executable program. This program is created using the PHP programming language with MySqL database and Code Editor Notepad ++. This stage produces a program in the form of a prototype or also known as beta. Here's an example of how the program looks, in Figure 6 until Figure 13.
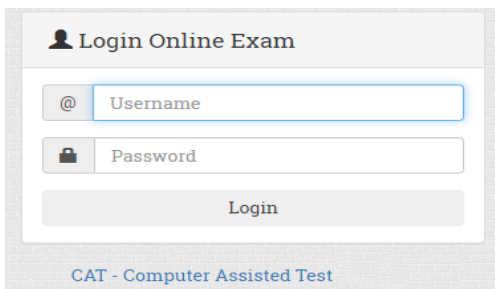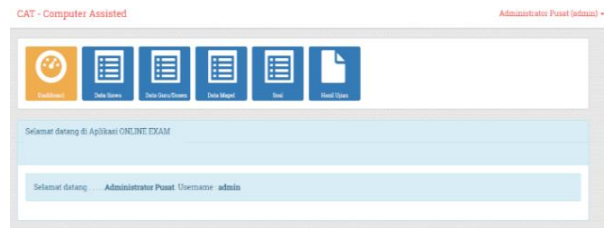

Figure 6. Login page

Figure 7. Dashboard for admin

Figure 8. Dashboard for students
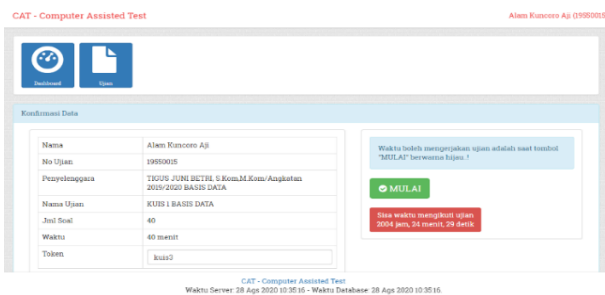

Figure 9. List of exam

Figure 10. Exam confirmation page
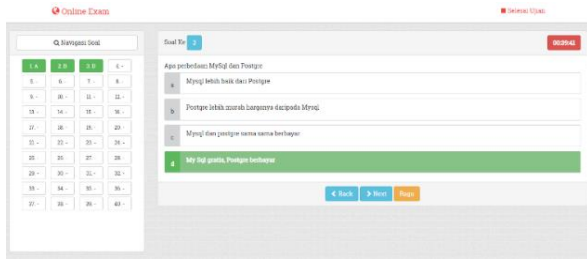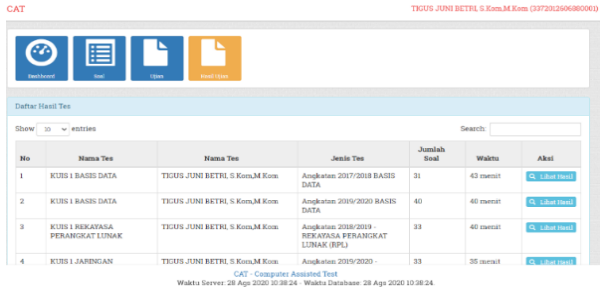
Figure 11. Exam page
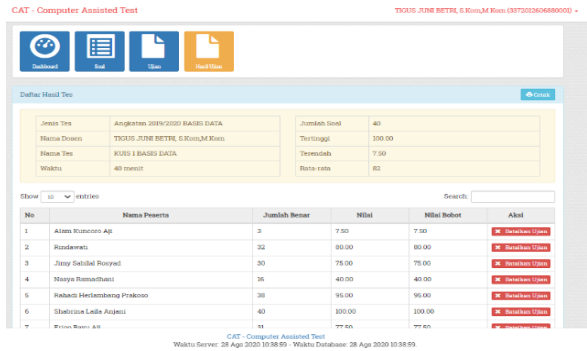

Figure 12. Results list

Figure 13. Results detail

3.2. System Testing

System testing is the activity of testing software functionality in two (2) steps, namely White Box testing and Black Box testing. White Box Testing is a testing in the form of assistance on matters relating to security and program performance and is carried out in stages along with the stages of program development from the start. This test is "found and fix" so that if the floating stage is found from the beginning, an error is immediately corrected at that time. In this program, White Box Testing has been carried out in stages from the initial design to the implementation stage.

3.1.1. Black Box Testing

Black Box testing is what is seen and focuses on functionality. This part tests the functions that run in a program whether they can run in accordance with the design document. The results of this stage are as follows;

Table 1. Black box testing result

No	Activity	Expected Realiza-tion	Results	Conclu-sion
1	Login Menu	The username and password login form appears	match	Accep-ted
2	User name-Password	Go directly to the teacher / student dashboard page	match	Accep-ted
3	Exam Menu	Go to the available test options page	match	Accep-ted
4	Choose Exam	Enter according to the desired choice of exam	match	Accep-ted
5	Enter Code Exam	Enter the exam question confirmation page	match	Accep-ted
6	Enter the exam	Go to the exam question execution page	match	Accep-ted
7	Next and previous button	Continue to the next question for the next button. Continue to the previous question for the previous button	match	accepted
8	Exam navigation	Enter the desired question number	match	accepted

No	Activity	Expected Realiza-tion	Results	Conclu-sion
		according to the selected navigation		
9	Finish Exam	Enter the page that the exam has finished and cannot return to the previous page	match	accepted
10	Request the exam result	Enter the page of the exam results that have been done	match	accepted

System evaluation is carried out by the user as a limited test that is carried out on one (1) teacher and one (1) student. Limited test results show that both in terms of appearance and functionality, the program is in accordance with user requests. If this program is to be continued to a more advanced stage, then program testing with a larger sample test is required.

5. CONCLUSIONS

Software development of online exam application by prototyping method can be done in several stages including gathering needs for user requirement, making prototypes, evaluating prototypes, coding the system, testing the system and evaluating the system. From the results of these stages it can be concluded that software development can be implemented properly provided that both prototype testing and system testing are carried out on limited sample tests. The sampling decision was based on the closest users, namely teachers and students

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