Designing An E-Teacher Application As A Method Of Digitizing Learning In SMKN 1 Ampek Angkek

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A B S T R A C T

An electronic teacher is an alternative form that teachers and students can use to conduct online learning. The focus of this research is to build a valid, practical, and effective research product in the form of an e-teacher application that can be used to digitize learning in the midst of the COVID-19 pandemic in SMKN 1 Ampek Angkek. This research uses research and development (RnD) methods. System development in this research refers to the waterfall model with five stages: requirements definition, system and software design, implementation and unit testing, integration and system testing, operation and maintenance. Furthermore, the product is tested with three types of product testing: validity, practicability, and effectiveness. The research results from the design of an e-teacher application to assist teachers and students in the learning process in the form of a website where teachers can add learning materials, learning tools, and exam questions. Students can also use the internet to access learning materials and take tests. The results of the validity test on 5 experts were 0.79, which was declared valid; the practicality test on 4 practitioners was 93, which was declared very practical; and the effectiveness test on 8 students was 0.79, which was declared effective. Based on the product test results, it is possible to conclude that the product of this research is worth to use in the learning process by teachers and students.

1. Introduction

Teachers use various methods to teach students. In general, teachers use traditional methods to convey the learning process. The traditional method is a method of delivering learning through lectures that are supported by a blackboard as a tool for conveying the material. Whereas the traditional method still has flaws, such as students becoming bored during the learning process and students lacking independence during the learning process. Inappropriate methods of conveying material to students will cause problems for both students and teachers. Teachers will face issues such as being easily overwhelmed when delivering learning material, resulting in learning objectives not being met optimally. During the COVID-19 pandemic, teachers must be adaptable in order to adapt learning through the use of technology. Face-to-face learning, which is typically carried out in the same classroom between teachers and students, must be converted into a digital learning system. As a result, being able to use and utilize information and communication

technology for the benefit of learning is appropriate for a professional teacher. This situation necessitates teachers to sharpen their pedagogical skills [1].

Electronic Teacher (e-Guru) was developed to help teachers with their tasks and roles in the learning process. This is a virtual teacher who is not present in the room, but whose role and function is to complement the real teacher. Students do not need to meet the teacher in person, but they can still interact and learn with the teacher virtually. Electronic teachers (e-Guru) can also be defined as a set of automated processes, roles, and functions of teachers that run on a machine or digital device [2].

SMK N 1 Ampek Angkek is developing electronic learning (e-Learning). At the same time, the school will implement electronic learning called e-Guru (electronic teacher). An electronic teacher is an alternative form that teachers and students can use to conduct online learning. The rules of an electronic teacher (e-Guru) are similar to those of e-learning and other forms of electronic learning.

Furthermore, the researchers observed the learning process and methods used at SMK N 1 Ampek Angkek, as well as the effects of those methods, by meeting the teachers who were present at the school. The researcher inquired about the learning process at SMK Negeri 1 Ampek Angkek, including the fields of study BK and KKPI, so that researchers could conclude that the process of delivering material to students is still done in the traditional manner, in which the teacher has difficulty conveying material due to the large number of students. a lot of and excessive material. In addition, because the teacher had done less preparation for the learning process, what the teacher conveys was not in accordance with the learning material. Electronic devices such as computers were used in the Multimedia department to carry out learning in the form of practicum. However, they continue to use the traditional method of delivering the material, in which the teacher was more active and students only receive and carry out the teacher's instructions. As a result, students quickly forget what the teacher said.

The PHP programming language is used in this study to create an e-teacher application. PHP (Hypertext Preprocessor) is a working system program interpreter, not a compiler, with a programming language in the form of scripting. The difference between a compiler and an interpreter is that: Compailer language is a language that will convert several script programs into source code, then from source code form it will be converted into object code form. Meanwhile, the Interpreter language, the raw script does not have to be converted into source code form [3]. The website template used has a responsive design that can adjust to different screen resolutions, and the database management system is MySQL.

2. Method

2.1. Types Of Research

The research and development method, also known as R&D or Research and Development, was chosen for this research. R&D is the process of creating new products or improving existing ones. Products classified in this case include not only hardware, but also software [4]. The research step chosen is the ADDIE version (Analyze, Design, Development, Implementation, Evaluate) which is illustrated in Figure 1 below:
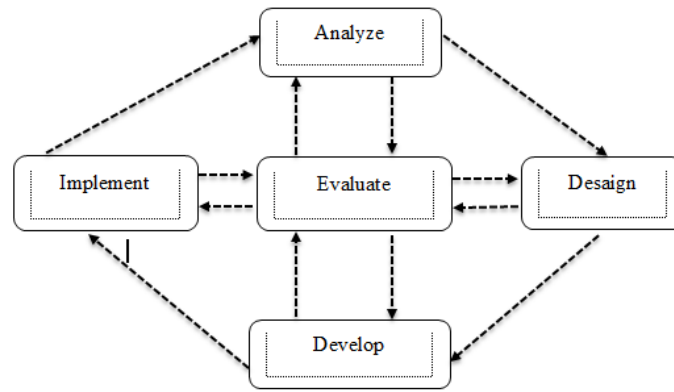
Figure 1. ADDIE Stages

Explanation of the figure above: (1) Analyze, Throughout this stage of analysis, the designer conducts a needs analysis, identifies a problem or need, and conducts a task analysis [5]. (2) Design, The design stage is carried out with a focus on four key elements in learning design: students, objectives, methods, and evaluation. (3) Develop, Develop is a physical activity that is carried out in accordance with established design specifications. A product prototype for system development is the end result of development activities [6]. (4) Implement, Implement is a real step toward incorporating the system that has been created into the ongoing learning process. And (5) evaluate, evaluate is the process of determining whether or not the system used in the learning process is successful in meeting the initial expectations. Evaluation is a process that is used to add value to a learning program [7].

2.2. System Development Model

The system development model used is referring to the System Development Life Cycle with the waterfall model. The following is an Figure of the waterfall:
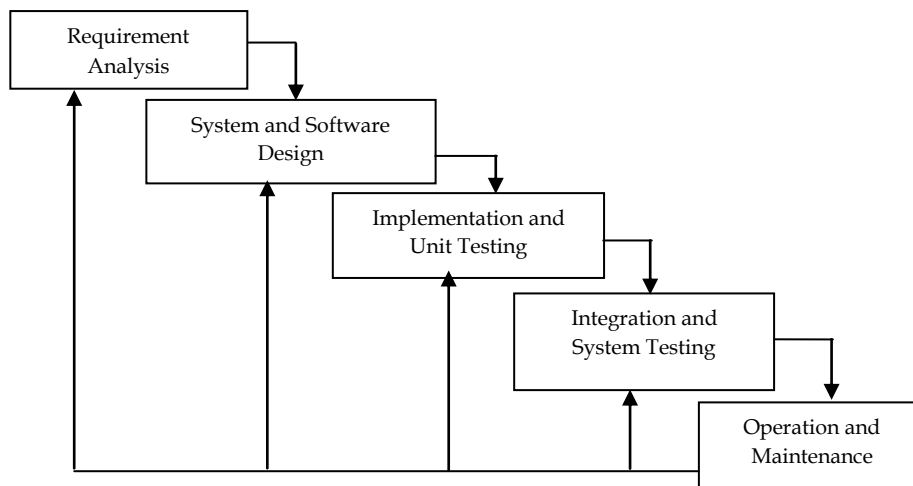

Figure 2. Waterfall Model System Development Life Cycle

Explanation of the Figure 2 above: (1) Requirement Analysis; The requirements definition procedure is carried out in consultation with the system user. Furthermore, the consultation is intended to discuss the determination of services, limits, and system objectives. These requirements are further defined in detail and serve as system specifications. (2) Sytems and Software Design; Determine the overall system architecture, system design, and dividing specifications in hardware or software systems are the steps taken. (3) Implementation and Unit Testing; The produced product is subsequently put into practice with the intention of turning the software into a functional program. (4) Integration and system testing; A unified system is

created by integrating the program parts, and the entire system is tested. Assuring that system requirements have been met is the goal of system testing. Black box testing method is the technique selected for system testing in this research. And (5) operation and maintenance; is the system life cycle's longest phase. Correctiosns and different errors that were missed in the earlier stages are included in maintenance [8].

2.3. Research Phase
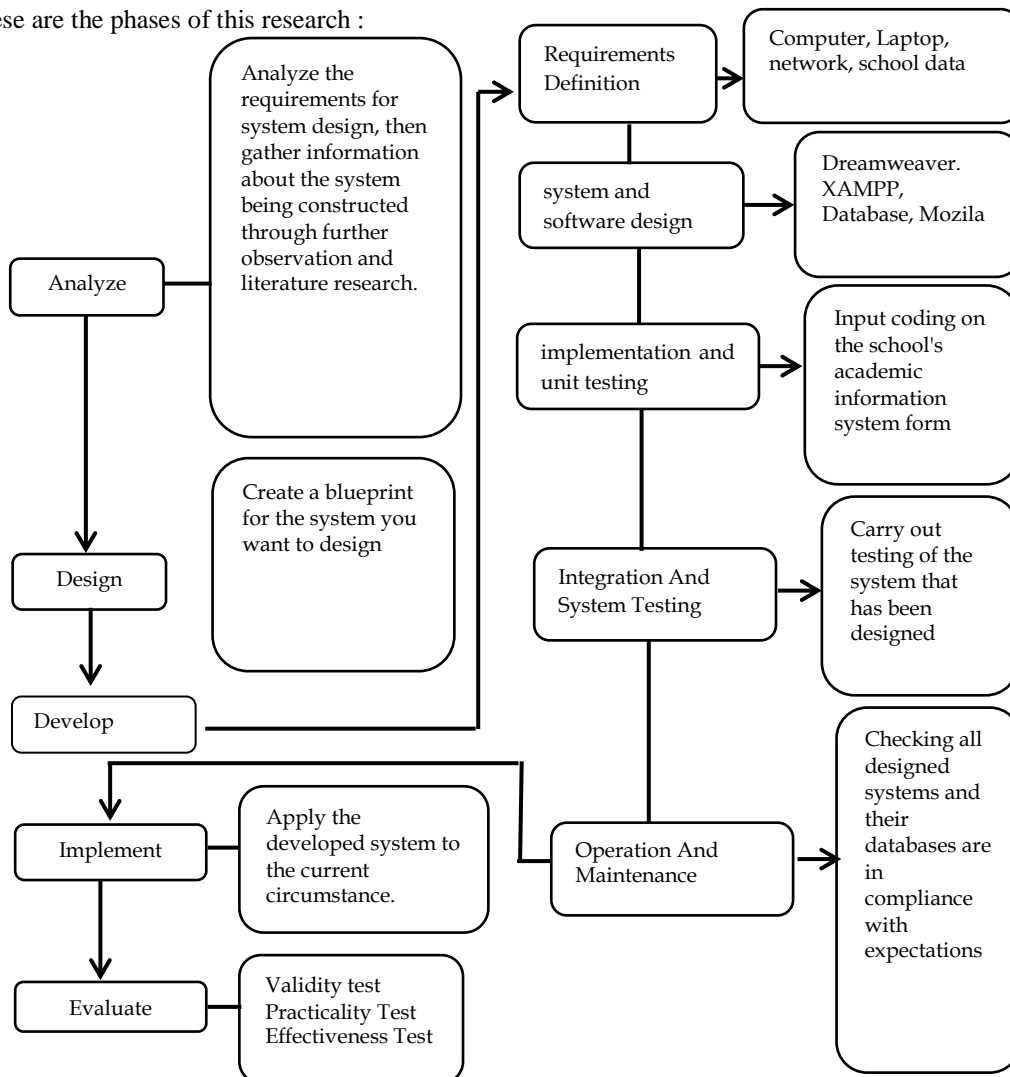
These are the phases of this research :

Figure 3. Research Phases Scheme

2.4. Product Test

Validity, usability, and effectiveness tests were performed on the products in this study. The validity, applicability, and efficacy of the test instrument are examined using a questionnaire sheet.

Validation of Product Test, three qualified specialists in different domains evaluate the study product's validity. Utilize a questionnaire instrument to test the product's validity. The questionnaire should include questions about instructional design, display, programming, and content validity. Additionally, using a validation method based on the Aiken's V formula, results from the validated questionnaire are processed; the determination of the product category is declared valid if the value is between 0.60 and 1.00 and is declared invalid if the value is less than 0.60 [9]. A questionnaire instrument used in the product practicality test will also be validated by three other individuals. The practicality test will demonstrate whether the

developed system is workable and convenient for users. The formula Purwanto used is applied in practical analysis as follows:

$$Practical\ value = \frac{total\ score\ obtained}{highest\ total\ score} \times 100\%$$

.......(1)

The following Table 1 shows the criteria used to determine the product's practicability :

Table 1. Practical Reference

Criteria	Average Practical Value
Very Practical	86% – 100%
Practical	76% – 85%
Sufficiently practical	60% – 75%
Very Impractical	≤ 54%

Product Effectiveness Test, the effectiveness test will assess the compatibility of the product results with the objectives to be achieved. Product results that achieve all of the objectives set can be considered effective. This information system design produces the expected results operationally. The product effectiveness test was carried out using the Richard R. Hake Statistical Formula. With the following conditions: high effectiveness if the value is greater than 0.7, moderate effectiveness if the value is greater than 0.7 but less than 0.3, and low effectiveness if the value is less than 0.3 [10].

3. Results and Discussion

3.1. Analyze

To be able to design an application, the analysis phase should always be completed first. The analysis stage is carried out by investigating the issues encountered while designing the e-Guru application.

3.2. Design

Throughout this design phase, the author will design an application based on the needs of the school to assist teachers in carrying out the teaching and learning process effectively.

3.3. Development

3.3.1. Requirements analysis and definition

Following the completion of the design phase, the development stage is carried out by first conducting a needs analysis and defining it. The aim of this needs analysis is to determine what is required to solve these problems. Before designing a system, several analyses are performed, including problem analysis, needs analysis, and task analysis. The users in this analysis are administrators (TU), teachers and students.

3.3.2. System and software design

The following is the overall system design: Use case diagrams, such as e-Teacher application use case diagrams, describe an e-teacher system in general. Use cases are used to depict how all users interact with the system unit. The e-Guru application's use case diagram is shown below.
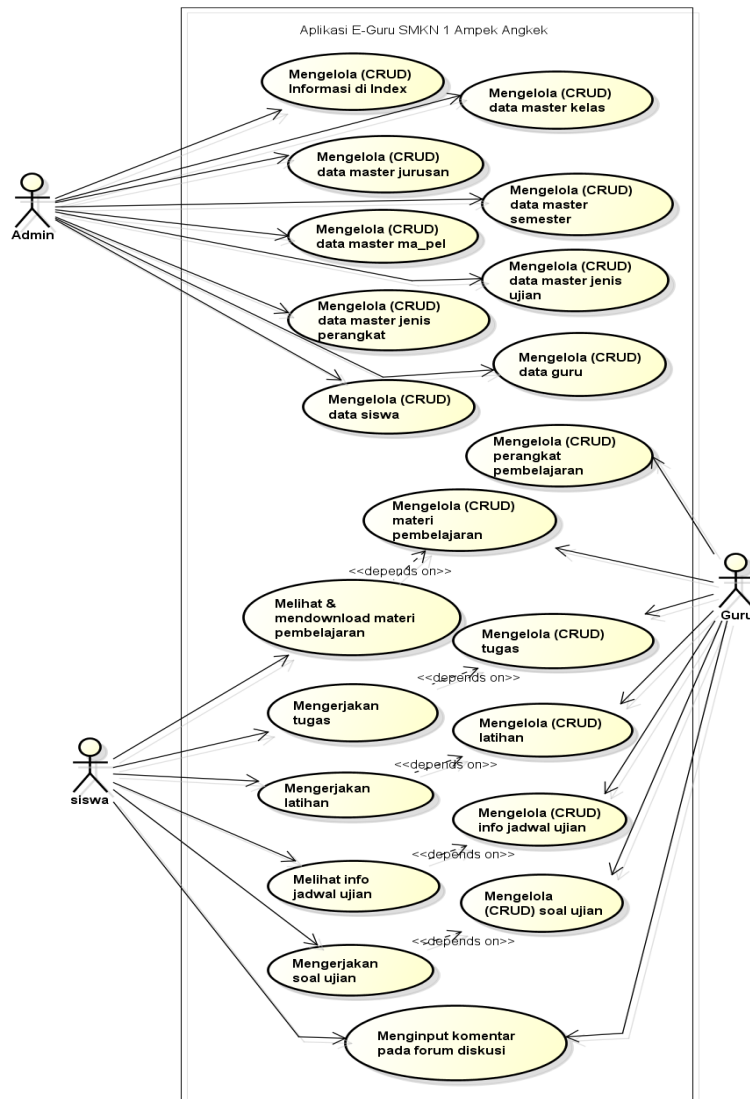
Figure 4. The e-Teacher Application's Use Case Diagram

According to Figure 4 of the use case diagram above, there are three actors, namely administrators, teachers, and students, and twenty-one actions, namely managing information in the index, managing master class data, managing department master data, managing semester master data, managing master data subject matter, managing test type master data, managing device type master data, managing teacher data, managing student data, managing learning devices, managing learning devices, and managing learning devices.

Activity diagrams illustrate the activities that take place in the system. Activity diagrams demonstrate the beginning and end of an activity, as well as any conditions or decisions that may occur in the system.
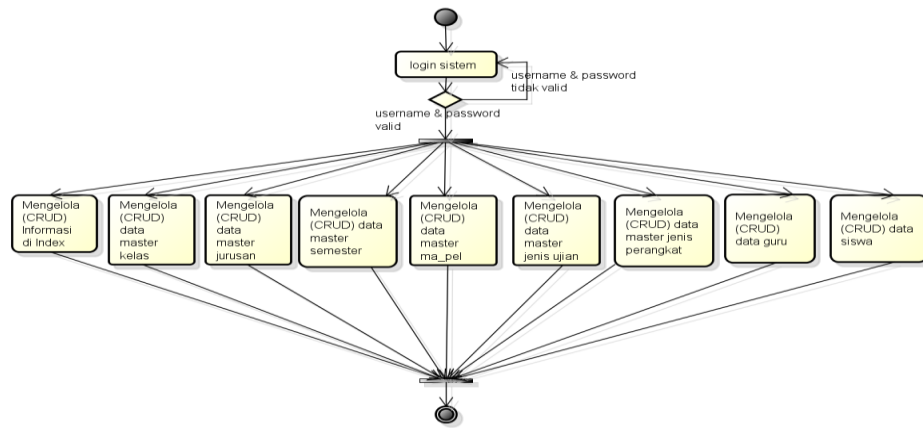
Figure 5. Activity Diagram Administrator

The administrator activity diagram in Figure 5 illustrates the admin's activities: the admin enters information in the index, master class data, department master data, semester master data, subject master data, exam type master data, device type master data, teacher data, and student data.
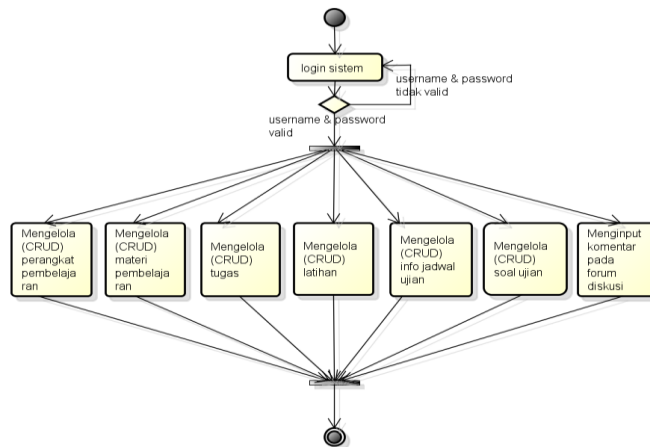

Figure 6. Activity Diagram Teacher

Figure 6 illustrates the teacher's Activity Diagram, which shows how teachers manage learning tools, learning materials, assignments, exercises, exam schedule information, exam questions, and input comments on discussion forums.
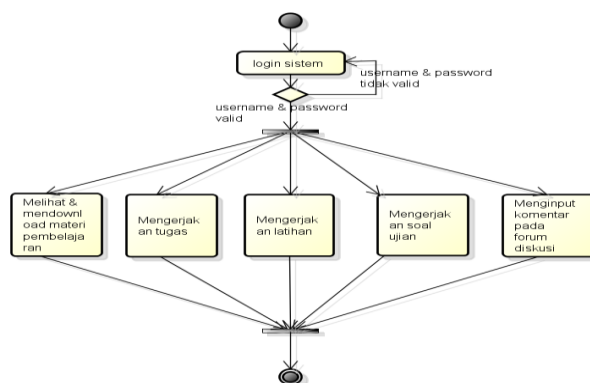

Figure 7. Activity Diagram Student

The activities carried out by students can be seen in the Student Activity Diagram showed in Figure 7 above. Students view and download learning materials, do assignments, exercises, exam questions, and post comments on discussion forums.

The interactions between objects in the system are illustrated using a sequence diagram. Sequence diagrams are used to depict the scenario of a series of steps performed in response to an event in order to produce a specific output. There are 17 sequence diagrams in this research that describe each object, actor, and lifeline vertical message as an arrow line from one object to another.

Class diagrams are commonly used in the modeling of object-oriented systems [11]. This diagram shows the relation of existing entities. Attributes such as key attributes and descriptive attributes exist for each entity. Class diagrams typically contain active classes, as shown in Figure 8 below [12].
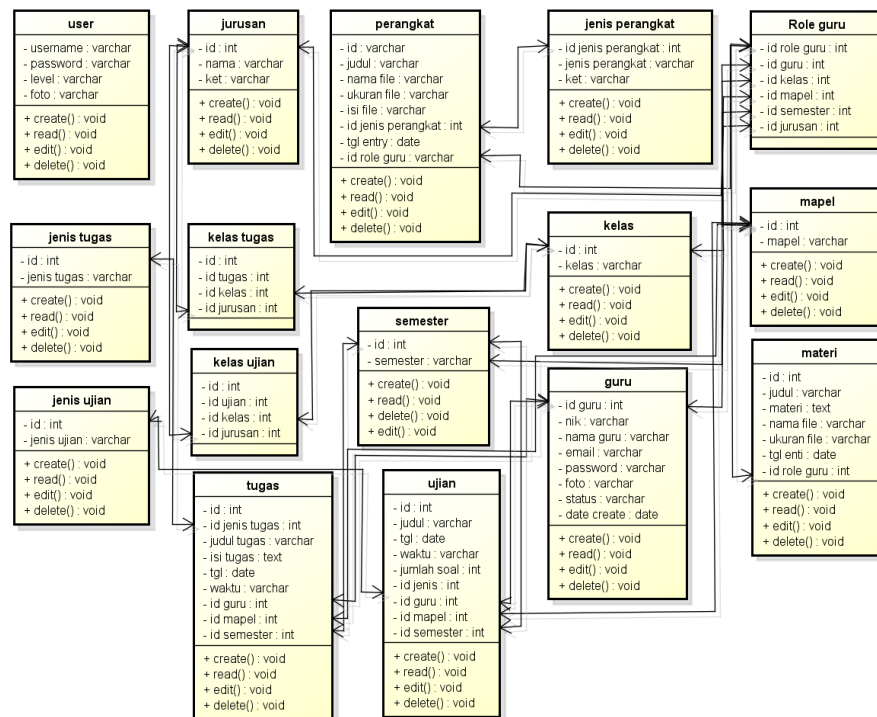

Figure 8. Class Diagram

The following is the system design in detail. The input design consists of a login form, a form for adding users (teachers and students), a form for adding subjects, a form for adding classes, a form for adding majors, a form for adding semesters, a form for adding learning tools, and a form for adding exam types. The first input design is the login form design, which serves as the application's gateway. The login form is assigned a user level, allowing all system users to access the application via this form. The login form design shown in Figure 9 below :
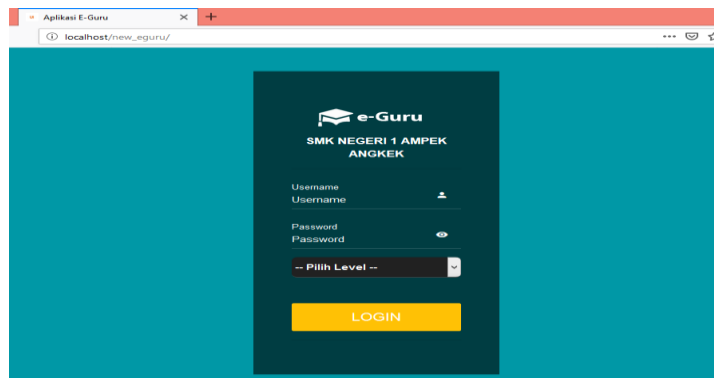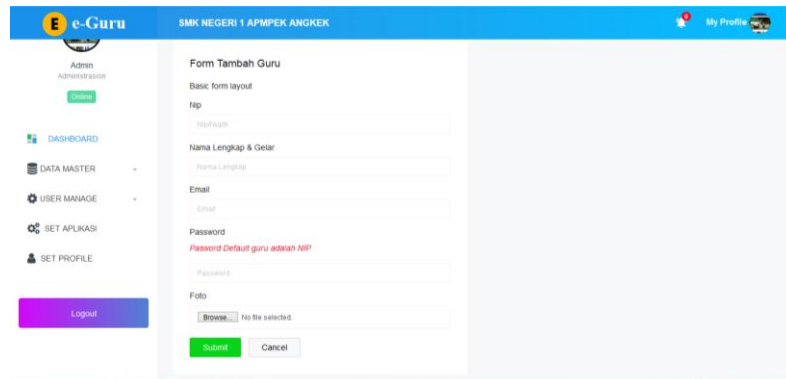
Figure 9. Login Form Design

Figure 10. Form Design Add Teacher Data

The next input design is the form to add teacher data. This form serves to manage teacher data, such as adding, editing and deleting teacher data. The form design adds teacher data as shown in Figure 10.
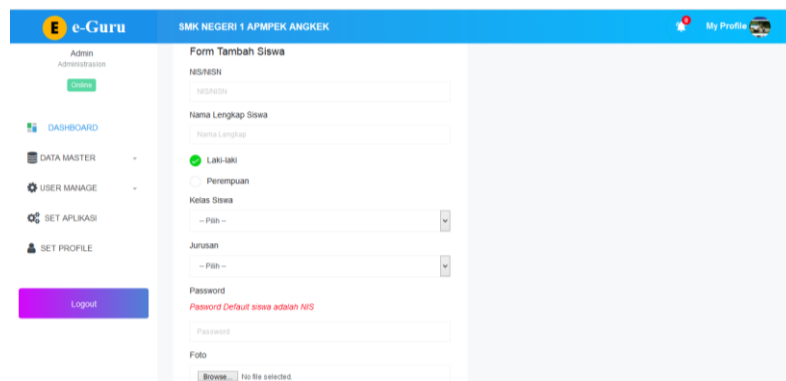

Figure 11. Form Design Add Student Data

The next input design is the form to add student data. This form serves to manage student data, such as adding, editing and deleting student data. The form design adds student data as shown in Figure 11.
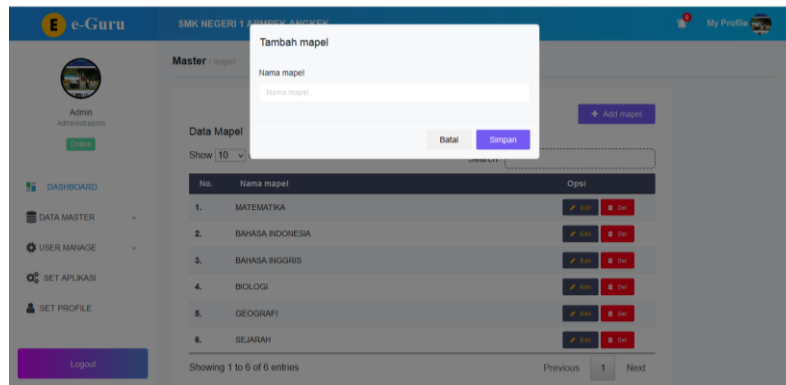
Figure 12. Form Design Adds Subjects

The following feature is subject data management. This form is useful for managing subject data, such as adding, editing, and deleting subjects. Figure 12 depicts the form design for adding subject data.
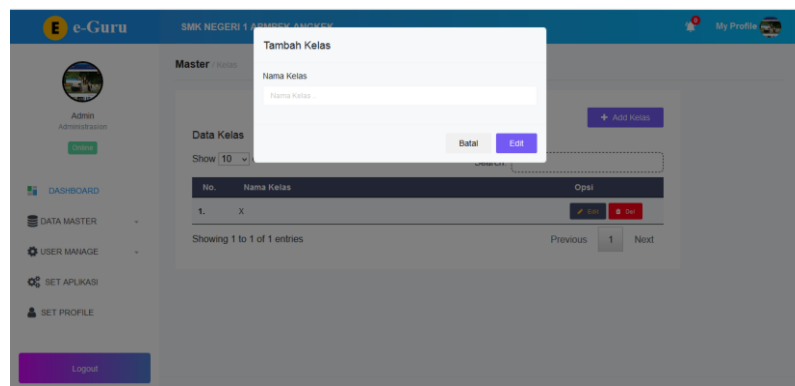

Figure 13. Form Design Add Class

Another feature is class data management. This form is intended for adding, editing, and deleting class data. Figure 13 illustrates the form design for adding class data.
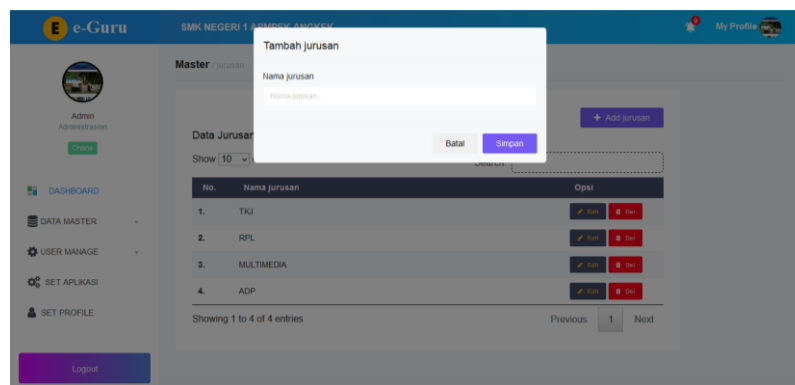

Figure 14. Add Majors Form Design

The next design is the departmental data management form design. This form can be used to manage majors data such as adding, editing, and deleting departmental data. Figure 14 shows the design of the added majors form.
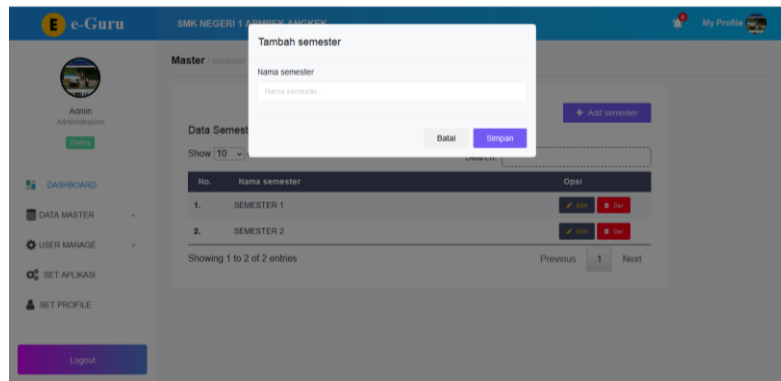
Figure 15. Add Semester Form Design

Figure 15 depicts the added semester form's design. This form is used for semester data management, such as adding, editing, and deleting semester data.
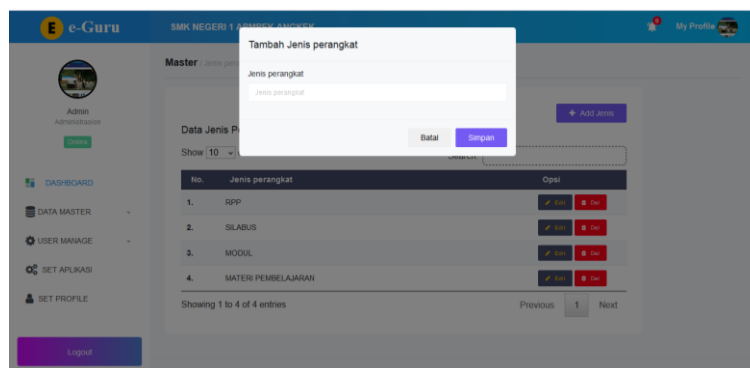

Figure 16. Add Device Form Design

The features designed in this application also accommodate the teacher's wishes when uploading learning tools. This feature appears on the main menu of the teacher account. Figure 16 shows the process of uploading learning tools carried out by the teacher.

Figure 17. Form Design Add Test Type
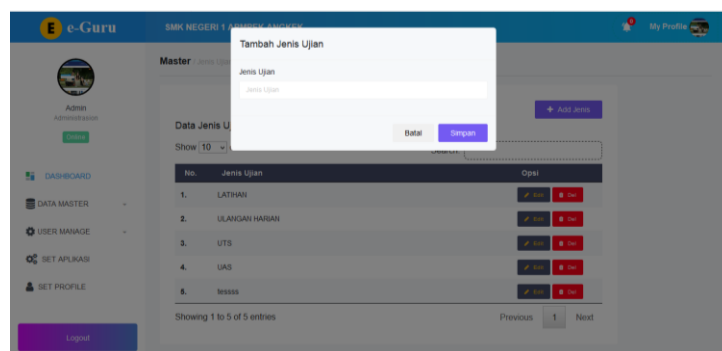
The e-Guru is also equipped with an exam feature. Before starting the online exam process, the teacher must plan the type of exam, title, exam questions, and other details. Figure 17 depicts the teacher's process of determining the type of exam.

The output design is the report's form design. The teacher data report is the application's first report or output. As shown in Figure 18.
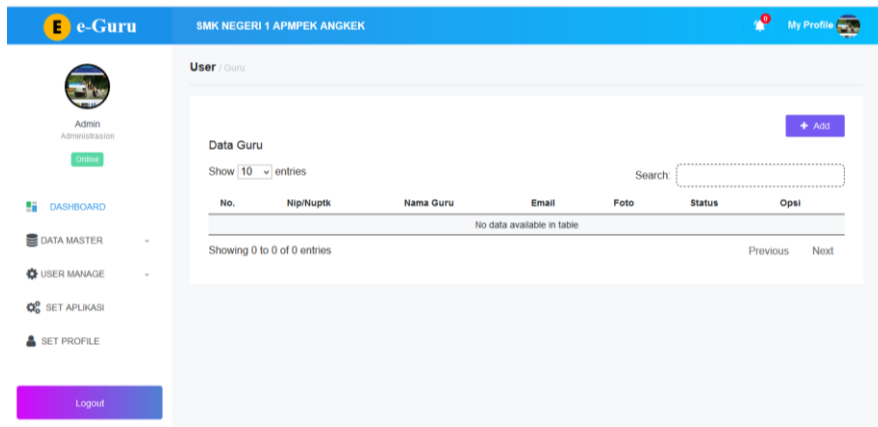
Figure 18. Teacher Data Report Design
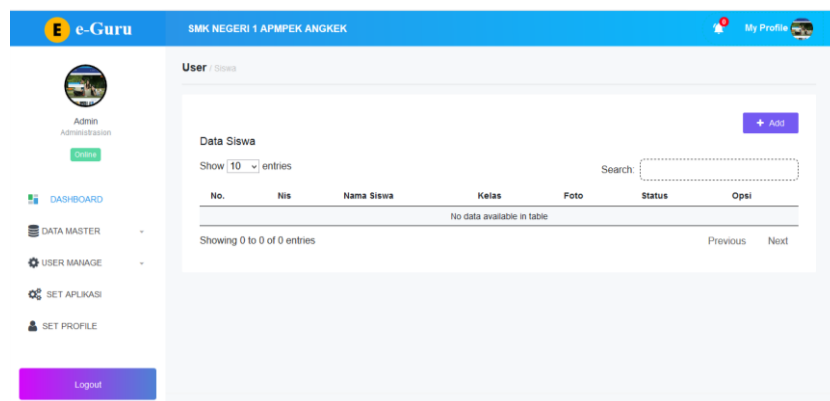
Figure 19. Student Data Report Design

The next output design is the student data report design. This application includes a student data printing feature, making it easier to print student data both privately and per class. Figure 19 depicts the layout of student data reports.

Figure 20. Subject Data Report Design

Figure 20 illustrates the design of the subject data report. Afterward, subject data can be selected and printed based on the needs of the user. Furthermore, class data can be printed using the class data report feature, as shown in Figure 21 below.
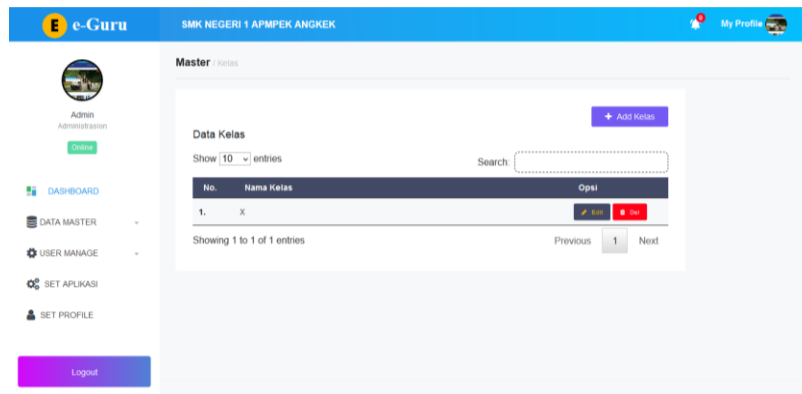
Figure 21. Class Data Report Design

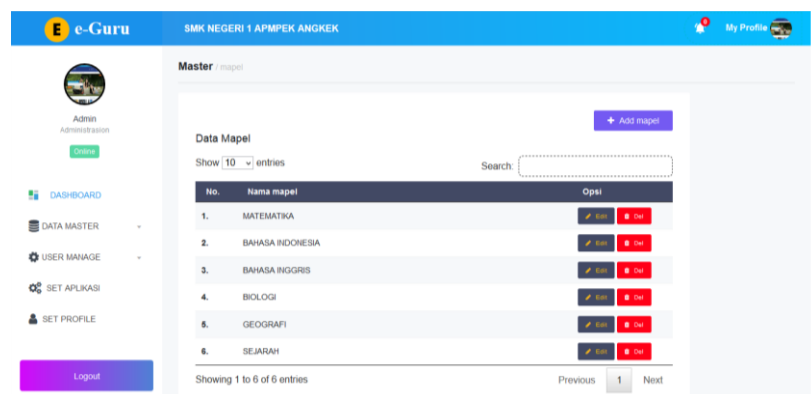The major data report design is the next report design or application output. The main data print feature is shown in Figure 22 below.
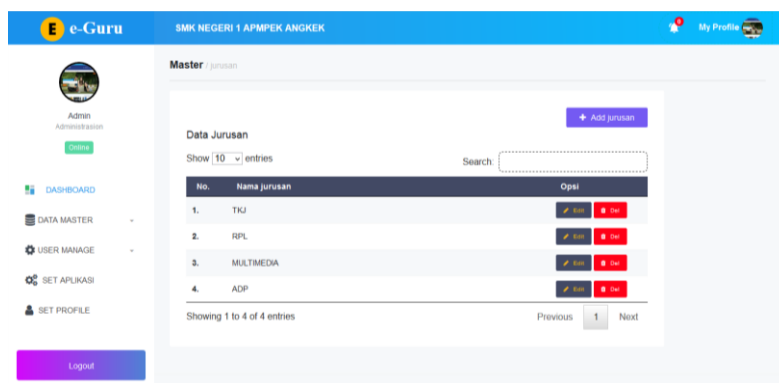
Figure 22. Major Data Report Design

The next output feature is the ability to print a test type data report. This feature is used to print test type data that has been previously organized by the teacher.
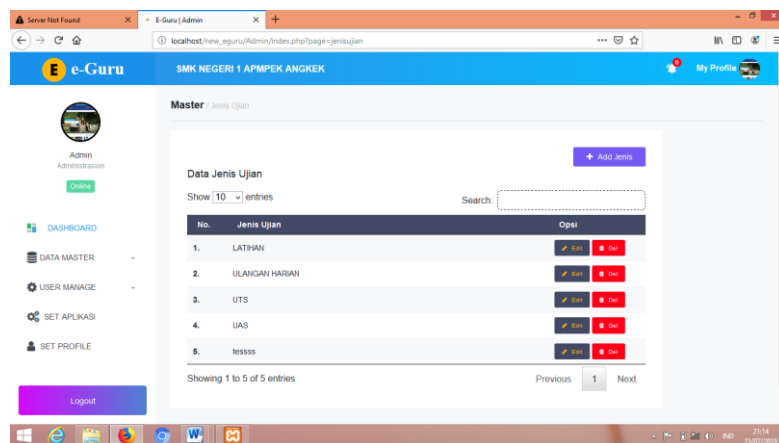
Fiture 23. Exam Type Data Report Design

A class diagram was used to describe the database design of the e-Guru application. The e-guru application's database table contains 16 tables, including the user table, department, device, type of device, teacher role, teacher, subject, class, material, semester, assignment, exam, class assignment, type of assignment, class exam, and duty.

3.3.3. Implementation and unit testing

The steps taken include translating the design, which has been designed in the form of a system description ranging from use case diagrams to class diagrams, into a predetermined programming language. The programming language used is a web-based programming language, namely the PHP programming language. While the Database Management System uses MySQL.

3.3.4. Integration and system testing

System testing is the phase of testing that is performed on the system in an integrated and overall manner after all system units have been merged. If an error occurs in the system, it will be repaired, and if the program is operational, it will be deployed to the field (distribution).

Testing with the Blackbox method is a test performed on the software interface to ensure that all functions work as expected. The test table below was created using the Blackbox testing method.

Table 2. Table of Test Results with Blackbox Testing

No	Design And Process	Expected	Desc
1	Navigate to the login page	Show login page	Succeed
2	Login as admin	Show admin menu page	Succeed
3	Click master data	Show master data	Succeed
4	Click master class data	Show master class data page	Succeed
5	Click on the major master data	Show the major master data page	Succeed
6	Click on semester master data	Show semester master data page	Succeed
7	Click on the subject master data	Show subject master data page	Succeed
8	Click on the exam type master data	Show the exam type master data page	Succeed
9	Click device type master data	The device type master data page appears	Succeed
10	Click on user management	Show user management data	Succeed
11	Login as teacher	Show teacher menu page	Succeed
12	Login as student	Show student menu page	Succeed
13	Click the subject menu	Show subject page	Succeed
14	Click the add subject menu	Show subject data that has been added	Succeed
15	Click device menu	Show device page	Succeed
16	Click the add device menu	Show device data that has been added	Succeed
17	Click the material menu	Show material page	Succeed
18	Click the material input form	Show material data that has been added	Succeed
19	Click the set task menu	Show task set page	Succeed
20	Click the add task menu	Show task data that has been added	Succeed
21	Click the exam menu	Show exam page	Succeed
22	Click the add test menu	Show data add test	Succeed
23	Click the material menu	Show material page	Succeed
24	Click the task menu	Show task list page	Succeed

3.3.5. Operation and maintenance

The researcher has updated the system and corrected various deficiencies that have gone through the testing and system testing phase, used and controlled anti-virus on a regular basis, and performed database backups and data file backups on a regular basis.

3.4. Implementation

After the system has been successfully tested, the following steps are taken: Validity test, Validity test using a questionnaire instrument consisting of four aspects, namely Programming Concept Aspects, Program Content Validity Aspects, Instructional Design Aspects, and Display. The validity test

questionnaire was completed by 5 experts who were chosen for their expertise in programming. Practicality Test using a questionnaire instrument consisting of 5 aspects, namely the program has an attractive appearance, the composition of the writing and colors used in the program is appropriate and can be read, the use of the program is simple, the presentation of the contents in the program is more practical and can be used repeatedly, and the program can be used independently or without the guidance of others. Practicality test questionnaires were completed by practitioners in the field, in this case four teachers in the field of study under consideration. Effectiveness Test employs a questionnaire instrument that assesses five factors: ease of use, clarity of instructions for use, easy access to the program, program's ability to be used repeatedly, and clarity of instructions in using the program. Eight students completed the effectiveness test questionnaire.

The product test results which include Validity test, Practicality test, and Effectiveness test obtain the results which are described as follows :

3.4.1. *Validity test*

The validity testing phase was carried out by distributing questionnaires to five expert validators. The e-Teacher application is declared valid after calculating the validity test results using Aiken's V statistical formula.

3.4.2. *Practicality test*

This phase of practicality testing was carried out by distributing questionnaires to four examiners at the research site. The e-Teacher application receives a value of 93 after calculating the practicality test results using the practicality formula, indicating that it is very practical.

3.4.3. *Effectiveness test*

The effectiveness testing phase was completed by distributing questionnaires to eight students. The e-Guru application receives a value of 0.79 after calculating the effectiveness test results using the kappa moment formula, indicating high effectiveness.

3.5. **Evaluation**

Following the system's testing, which includes the Validity, Practicality, and Effectiveness tests, there are several suggestions and inputs from experts (validators), practitioners, and students. The researcher has summarized the following suggestions and input for the improvement of this application design:

3.5.1. *Program expert (validator) suggest*

Instead of deleting the registration form, user data is all teacher and student data entered by the admin, then on the account of each user who updates the profile. It is also recommended to include user photo uploads. The application should then be loaded in the form of an Android Package Kit (APK) that can be accessed by mobile whenever and wherever.

3.5.2. *Suggestion from teacher*

This product is very good at assisting and making it easier for teachers and students, but it must be reviewed and evaluated on a regular basis to ensure that it is still in accordance with the conditions of the pandemic and after the pandemic has ended.

3.5.3. *Suggestion from student*

This application is good and has an appealing appearance, but it is necessary to include how to use or application instructions because there are several menus in the application that are still difficult for students to use.

4. Conclusion

This research resulted in a product, namely an e-teacher application as a means of digitizing learning at SMKN 1 Ampek Angkek in the midst of the covid 19 pandemic. This e-Teacher application was tested on experts, teachers, and students, with the results indicating that it is valid (based on the Aiken's formula), very practical (93), and effective (79). Based on the results of the research product tests that have been carried out and described, it is possible to conclude that the e-teacher application that is the product of this research is suitable for use at SMKN 1 Ampek Angkek. This application can assist teachers in carrying out the digital learning process by providing learning materials, practice questions, and exams. It can also be used by students in carrying out digital learning by downloading learning materials and questions given by the teacher. Furthermore, teachers can use this application to digitally store important documents such as learning tools.

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