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Development of a CBT Application Using a Prototype Method for Major Determination Based on Talents and Interests

Pengembangan Aplikasi CBT Menggunakan Metode Prototipe untuk Penentuan Jurusan berdasarkan Bakat dan Minat

Musdalipa Mahyeandra [a,*], Ika Parma Dewi [a], Rizkayeni Marta [a], Lativa Mursyida [a], Hafizul Fahri Hanafi [b]

[a.] Department of Electronics Engineering, Universitas Negeri Padang, Indonesia
[b.] Department of Computer Science and Digital Technology, Universiti Pendidikan Sultan Idris, Malaysia

A B S T R A C T

Computer-Based Test (CBT) is a computer-based examination system used as a medium for administering tests. The presentation and selection of questions are computerized so that each participant receives a different set of questions. This system is developed to minimize cheating, question leaks, limited number of questions, and damage to questions, as well as to ensure more accurate exam results. The problem faced in this study is the inaccuracy in determining the majors for several new students at SMKN 1 Sitiung. This study aims to develop a CBT application that can help determine the majors of new students based on their talents and interests. The research method used is the prototype method, which includes three stages: Listening to the Customer, Building or Revising the Mock-up, and Testing. The results of the study show that the developed CBT application is able to help schools determine student majors more accurately, minimize errors in major placement, and ensure that students are placed according to their talents and interests.

Keyword: Computer-Based Test, Prototype Method, Application

A B S T R A K

Tes Berbasis Komputer (CBT) adalah sistem ujian berbasis komputer yang digunakan sebagai media pelaksanaan tes. Penyajian dan pemilihan soal dilakukan secara terkomputerisasi sehingga setiap peserta mendapatkan paket soal yang berbeda. Sistem ini dikembangkan untuk meminimalkan kecurangan, kebocoran soal, keterbatasan jumlah soal, dan kerusakan soal, serta untuk memastikan hasil ujian yang lebih akurat. Masalah yang dihadapi dalam penelitian ini adalah ketidakakuratan dalam menentukan jurusan bagi beberapa siswa baru di SMKN 1 Sitiung. Penelitian ini bertujuan untuk menghasilkan aplikasi CBT yang dapat membantu menentukan jurusan siswa baru berdasarkan bakat dan minat mereka. Metode penelitian yang digunakan adalah metode prototipe, yang meliputi tiga tahap: Mendengarkan Pelanggan, Membangun atau Merevisi Mock-up, dan Pengujian. Hasil penelitian menunjukkan bahwa aplikasi CBT yang dikembangkan mampu membantu sekolah menentukan jurusan siswa dengan lebih akurat, meminimalkan kesalahan dalam penempatan jurusan, dan memastikan siswa ditempatkan sesuai dengan bakat dan minat mereka.

Kata Kunci: Tes Berbasis Komputer, Metode Prototipe, Aplikasi

* Corresponding author:
Musdalipa Mahyeandra
Department of Electronics Engineering, Universitas Negeri Padang, Indonesia
E-mail addresses: dipa.mahyeandra@gmail.com
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1. INTRODUCTION

The foundation for developing competitive and high-quality human resources is education. Utilizing information and communication technology (ICT) in the classroom has become essential in this digital age. The use of computer-based tests (CBT) is one of the significant advancements in the field of learning evaluation [1]. With the development of technology today, the need for information is very important, so that information must be accessible anytime and anywhere. One of the media that has become increasingly familiar to the public today is websites. Because of its function, a website can provide complete information and does not cost too much. One of them is the creation of a web-based academic portal information system. This system will display information about things in accordance with what the creator of the system wants.

Computer-based tests (CBT) may be a test with an usage framework employing a computer as a medium to conduct the test [2]. The introduction and choice of computer CBT questions are carried out computerized so that each member who takes the test gets a distinctive address bundle. This framework was created to play down cheating or address spillage that regularly happens amid exams, prevent address impediments, and harm to questions, so that results do not come out after being inspected [3].

The educational process at school is often found in the problem of students who feel that they are majoring in the wrong major and moving in the middle of education because the majors received by students are not in accordance with their interests and talents [4]. This problem occurs due to a lack of knowledge when choosing a major during school registration. Many students also feel that they have chosen the wrong major, but they choose to stay silent and continue until the end. This can affect the student's education process, such as making them lazy, having difficulty understanding learning, and decreasing student achievement.

This problem requires a solution in the form of a new student major determination system in the form of CBT-based exam questions to make it easier to determine new student majors at SMKN 1 Sitiung. The results of the exam will be used by the school to determine majors, whether the chosen major is in line with the results of the exam. Before this test was made, students' majors were only determined by the student's choice, without first knowing the student's talents.

Based on this description, SMKN 1 Sitiung also uses more modern technology in student admissions. Therefore, a system for determining student majors was designed with the title "Designing a New Student Major Test Based on Computer-Based Test (CBT) at SMKN 1 Sitiung." This system will help schools in determining the majors of new students accepted at SMKN 1 Sitiung.

2. METHODOLOGY

The prototype method is used when the project owner knows exactly what he wants, but does not know how to apply it [5]. The key lies in good communication between customers and developers. There are 3 stages in prototype development, namely Listen to customer, Design or make a prototype (Build / revise mock-up), Trial (Customer test drives mock-up) [6].

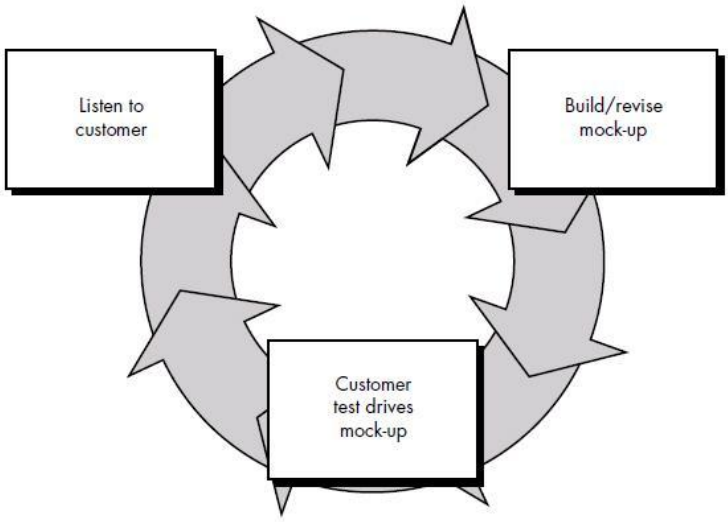

Figure 1. Stages of the Prototype Method

1. Listen to customer

Hearing customer complaints turns out to be one way to collect needs from the system, you know. Therefore, customers need to know whether the system is running well or if there are obstacles that finally find out the problem that occurred.

a. System Analysis

In the creation of a software project, it is necessary to analyze and design the system to be created [7]. This is so that the project to be made can be completed on time and in accordance with the original goal. Errors in the analysis can have an impact on the next stage of the project and will result in the project not being optimal or not in accordance with the goals that have been made.

This stage of analysis contains the identification and evaluation of existing problems and what needs are needed in this information system project. With the analysis and design, an overview of the needs in the information system to be built will be obtained.

b. Analysis of the proposed system

The proposed system analysis in this information system consists of user analysis, document analysis consisting of input documents and output documents, procedure analysis, then flowmap of the proposed system and analysis of requirements consisting of functional and non-functional requirements and analysis of the proposed system in this system.

User Analytics

The analysis of the actors in this system consists of what actors and activities are carried out on the running system. The following is a table of analysis of the perpetrators and the activities they carry out.

Table 1. System Actor Analysis

It	Perp	Activities
1	Admin	Manage the entire system
2	Operator	Manage student data, exam test data
3	Principal	Approve the results of the test to determine the student's major
4	Waka Curriculum	Knowing the results of determining the student's major
5	Student	Doing exam questions

Document Analysis

Analysis of related documents is the analysis of various documents that are needed, used and made in all activities and business processes. For more details can be seen in the following table:

1) Input Documents

Analysis of input documents is related to the data entered by the user into the system. This document will later be processed in the system to become information needed by other users. The following are the input documents that are entered into the system, namely:

Table 2. Input Document Analysis

It	Related Documents	Related Users	Information
1	Student data	Operator	Data on students who took the test

2) Document Output

Output documents are documents generated by the system after carrying out the process. For more details, it will be discussed in the following table:

Table 3 Output Document Analysis

It	Document	Related Users	Information
1	Value da	Admin	The value data will be printed by the admin

3) Proposed flowmap

Flowmap are charts that have a current that illustrates the steps to solve a problem [8]. Based on the description flowmap There are actors including Admins, operators, curriculum waka, students and school principals. Each user has their own tasks and limitations of their activities. For more details, you can see the following picture.

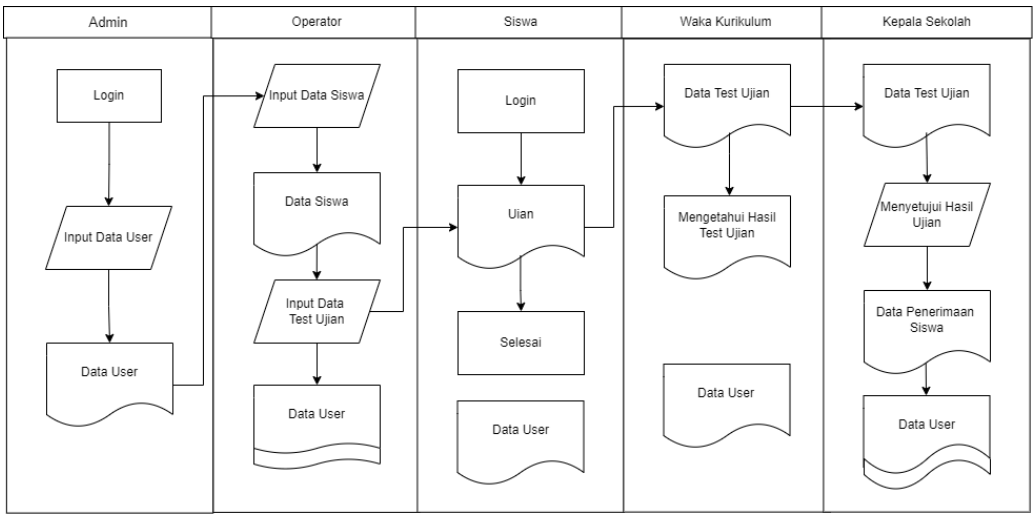

Figure 2. Proposed flowmap

c. Build or Revise Mock-up

System Planning

The next stage is to design the system, which is to model the application or system so that it can overcome the problems that exist in the current running system. The design of this system uses diagrams Unified Modelling Language (UML) [9].

1) Use Case Diagram

Use case Diagrams are around the exercises and intuitive that happen between on-screen characters and the framework to be built. By using use case We can see how the rights of each actor, what are the actors who are given and get from the system that will be built [10]. Design use case The system diagram being designed is as shown in the following figure.

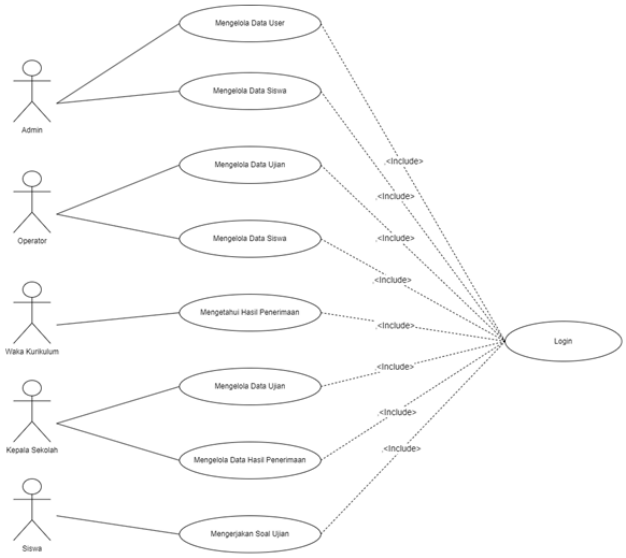

Figure 3. Use Case Diagram

2) Database Design

A database can also be interpreted as a storage medium. However, differences in storage media can give rise to other differences regarding the number and type of methods that can be used in storage efforts [11].

Databases are considered a key concept in system development. The database design carried out to build this website is by using the MySQL Database Management System. The database design is carried out so that there's no information excess or duplication of information so that the framework built produces valuable information. In arrange to attain this objective, a normalization handle and connections between tables (Entity Relationship Diagram) are needed [12]. The process is as follows:

Table Structure
The tables that will be built in this system database are as follows:

a) Headmaster's Table

Table 4. Principal

Attributes	Type/data	Size	Information
Nip	Integer	20	Primary Key
Name	Varchar	25	
Password	Varchar	10	

b) Operator Table

Table 5. Operator

Attributes	Type/data	Size	Information
Username	Varchar	20	Primary Key
Name	Varchar	25	
Password	Varchar	10	

c) Exam Table

Table 6. Test

Attributes	Type/data	Size	Information
Kd_Ujian	Varchar	20	Primary Key
Exam Number	Varchar	25	
Name	Varchar	25	
Kd_siswa	Varchar	25	Foreign Key

d) Student Table

Table 7. Student

Attributes	Type/data	Size	Information
Kd_siswa	Varchar	20	Primary Key
Name	Varchar	25	
TTL	Date		
School Origin	Varchar	50	
Address	Varchar	50	

3) ERD (Entity Relationship Diagram)
Entity-Relationship Diagram (ERD could be a shape of graph that employments connections and substance data [13]. Entity relationship diagrams built utilizing recognitions that comprise of a set of objects that exist, exist, and are diverse from other objects [14]. The ERD of this system is shown by the following figure:

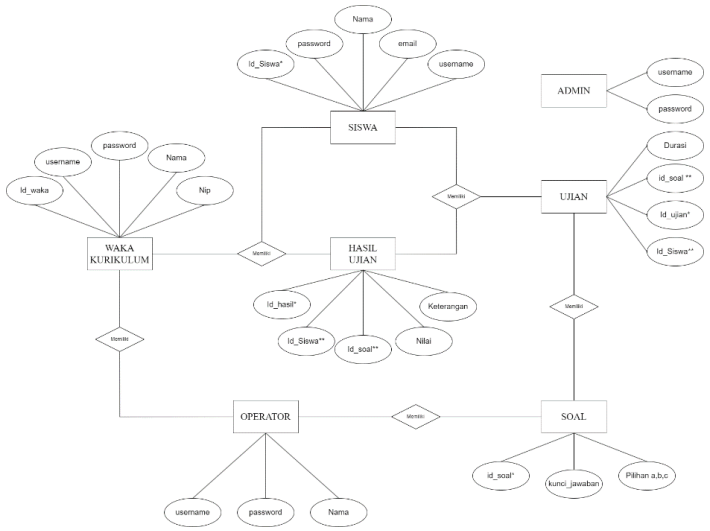

Figure 4. ERD CBT SMKN 1 Sitiung

3. RESULTS AND DISCUSSION

1. Listen to customer

Listening to customer complaints turns out to be one way to collect needs from the system, customers need to know if the system is running well or if there are obstacles that finally find out the problem that occurs [15].

2. Build or Revise Mock-up

a. System Interface

Login Page

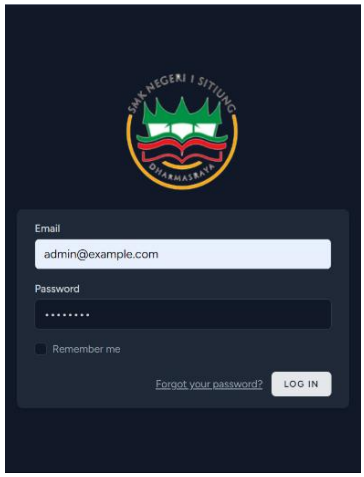

Figure 5. Login Page

The page in figure 5 is a page that functions to log in to the system by using e-mail as a registered username and password, an account is created by the application admin. On this page, there is also a menu to change the password if the students forget the password.

Forgot Password Page

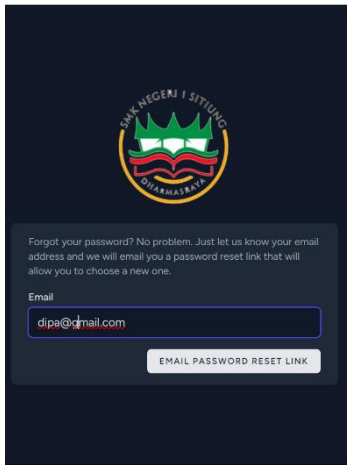

Figure 6. Forgot Password Page

The page in figure 6 is a page that functions to change the password if the user forgets the password, to change the password, a link will be sent to the email that has been registered.

b. Discussion

Home Page for Admins

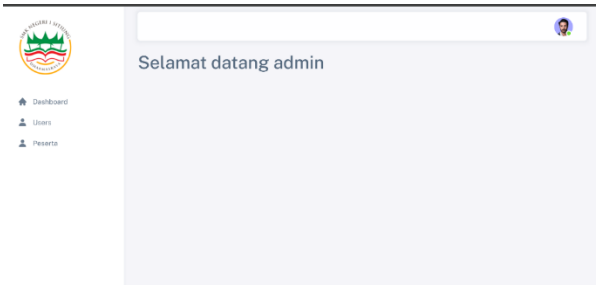

Figure 7. Admin Home Page

Page on Figure 7 is the initial page when the admin logs in, on that page there is an interface that is in accordance with the admin function.

User Interface Page

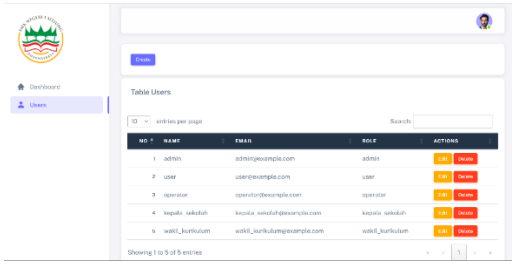

Figure 8. User Interface Page

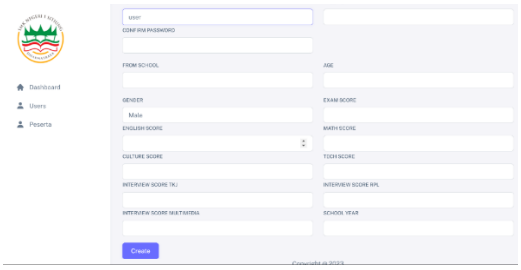

Figure 9. Example of Account Creation

The page in Figure 8 is where the accounts are available to access the CBT application according to their respective roles. In Figure 9 is an example when the admin will create an account to be able to access the application according to their respective roles.

Operator Home Page

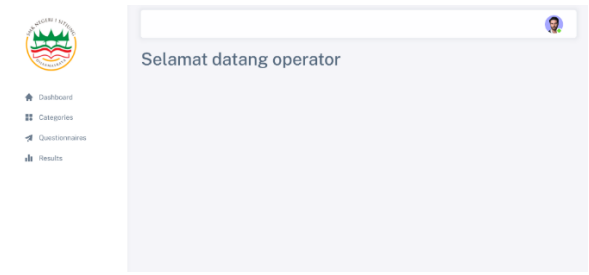

Figure 10. Operator Home Page

Page on image. 10 is the first page when the operator logs in, on that page there is an interface that corresponds to the operator's function.

Page Interface Categories

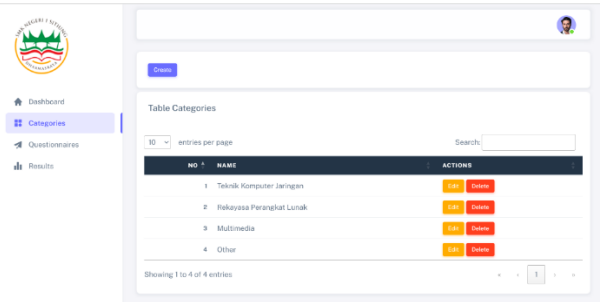

Figure 11. Page Interface Categories

The page in Figure 11 is a page to add option categories to questions that are in accordance with the major at school.

Interface Questionnaires Page

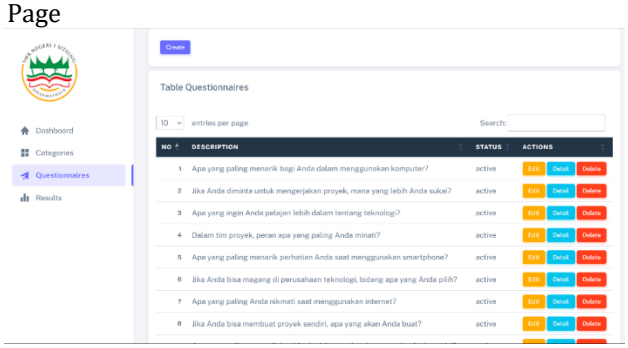

Figure 12. Interface Questionnaires Page

The page in Figure 12 is the page where the operator adds the questions that will be done by the students.

Interface Result Page

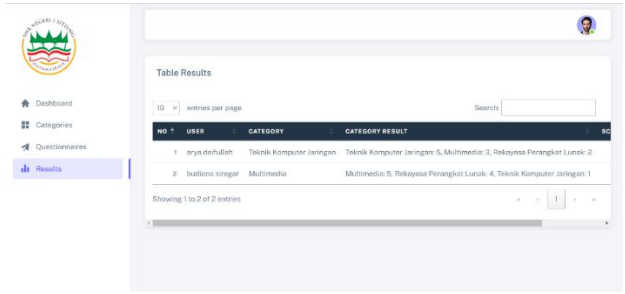

Figure 13. Interface Result Page

The page in picture 13 is a page to display the exam results of the students, on this page the students' scores will be displayed in detail with the category of questions answered.

Home for Students

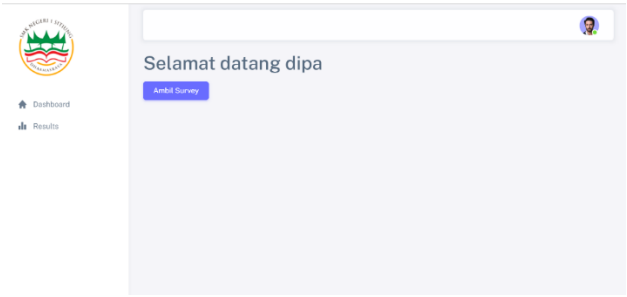

Figure 14. Student Home

The page in Figure 14 is the main page if you log in with the user/student role, there is a take survey menu to enter the test.

Test Page

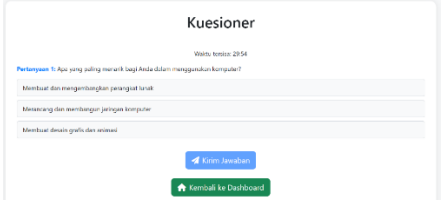

Figure 15. Test Page

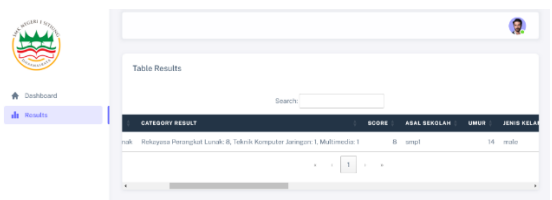

Figure 16. Student Test Results Page

The page in Figure 15 is the test page that will be done by new students, there are questions and answer options to be selected, there is also a button to send the test results if you have filled in all the questions. The page in Figure 16 is the result of the student test along with the grades needed in the major.

Principal's Home Page

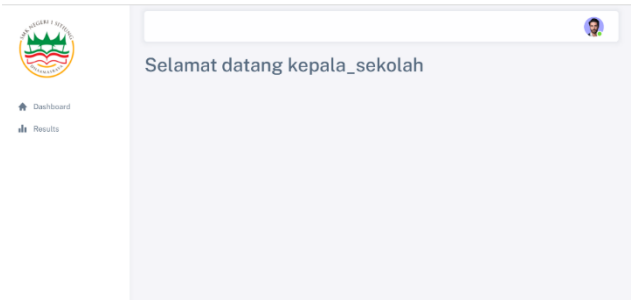

Figure 17. Principal Home

The page in Figure 17 is the initial page when the principal logs in, on the page there is a result interface so that the principal knows the test results and later approves the test.

Main Page of Deputy Kurikilum

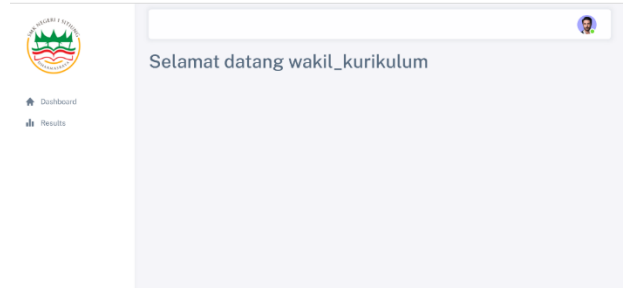

Figure 18. Curriculum Representative Home

The page in figure 18 is the initial page when the curriculum representative logs in, on that page there is an interface for the curriculum representative to know the test results.

3. Testing

The testing that's done is by conducting Blackbox testing. The testing that's done alludes to exercises to ensure that the program unit meets desires expressed within the detail .

Table 8. Blackbox testing table

No	Feature Tested	Test Description	Input	Expected Result	Result (Pass/Fail)
1	Login Page	Ensure users can log in to the application	Valid username and password	User successfully navigates to the dashboard	Pass
		Ensure login fails with incorrect username/password	Invalid username/password	Error message "Invalid username or password"	Pass
2	Student Account Registration	Ensure new students can register an account	Complete and valid registration data	Account successfully created and confirmation message appears	Pass
		Validate incomplete or empty registration input	Incomplete input	Error message "Please complete all required fields"	Pass
3	CBT Question Submission	Ensure students can access and answer questions	Answer choices	Answers are saved to the system	Pass
4	CBT Time Limit	Ensure the exam ends when the time limit is reached	Time exceeds the limit	System automatically submits answers and exits	Pass
5	Automatic Scoring	Ensure the system calculates scores automatically based on student answers	Student answers	Score is displayed according to student performance	Pass

6	Student Stream Recommendation	Ensure the system displays stream placement results based on scores	Student scores	Stream placement results displayed as per rules	Pass
7	Export Placement Results	Ensure placement results can be downloaded in a specific format	Export request	Placement results file downloaded (PDF/Excel)	Pass
8	Password Reset	Ensure the password reset feature works	Valid email	Password reset link sent to the email	Pass

4. CONCLUSION

After planning and developing the Unused Understudy Major Test application with a Web-based Computer Based Test (CBT) for SMKN 1 Sitiung, it can be concluded that the application successfully simplifies the process of determining majors for new students, based on their choices and the results of the tests conducted. Additionally, the CBT-based exam application proves to be versatile, as it is not only applicable for major selection tests but can also be used for mid-term, final exams, and even mock exams. Looking ahead, it is hoped that this application will be implemented in schools to support the process of determining the majors of new students. Furthermore, there are plans for its development into an Android-based application, which would expand its accessibility and usability, making it even more beneficial for a wider range of academic purposes.

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