Design Expert System to Identify Student Talent Based on Personality Type Using Certainty Factor Method in SMP Muhammadiyah Kandis Siak Riau Province

Febryanto[1,], Liza Efriyanti[2]*

[12]UIN Sjech M. Djamil Djambek Bukittinggi, Bukittinggi, Indonesia

Article Information

A B S T R A C T

The goal of this research is to create a system design that "can assist parents and teachers in recognizing the talents of their students" based on the child's personality, so that parents and teachers can provide "the right education and learning patterns for students". The author discovers that there is no expert system in SMP Muhammadiyah Kandis to identify children's talents based on personality type using certainty factor methods, and that at SMP Muhammadiyah Kandis, evaluations are still done manually and only to determine intelligence, not to determine student talent. The research method that the author uses is the Research and Development method, where the development method that the author uses is the Waterfall method according to Pressman, which the stages consist of Communication, Planning, Modeling, Construction, Development. Based on the findings of the authors' research, the authors were successful in creating this research product, with the functional suitability test results from two experts obtaining a feasibility value of 100%, which was declared Very Fair, and the compatibility test results obtaining a feasibility value of 100%, which was declared Very Eligible and the feasibility score for the usability test was 86.3%, which was declared Very Eligible, and the feasibility score for the material result test was 81%, which was declared Very Eligible, and the feasibility score for the Indonesian linguistic test was 87.5%, which was declared Very Eligible. The aim of this study is to develop a expert system to identify children's interests and talents that are validated and worthy of being operated.

1. Introduction

Children in the twenty-first century need to be prepared to live and develop in a globalized world. Children must understand their role in environmental protection as well as their obligation to participate in the community as citizens and even global citizens [1]. The rapid development of information technology, as well as its global spread, is a catalyst for further exploration of its potential [2]. Potential is a word that is familiar to everyone in our society, including ordinary people. People frequently use the term potential to see or determine things like intelligence (IQ), talent, achievement, and so on. For example, if there is a child with fluent and fluent verbal skills, the child will undoubtedly be described as a potential child; similarly, if there is a child who excels academically, the child will be described as a child with potential [3].

Children are born with different talents and personalities based on moral factors, namely psychological conditions in which the development of children's talents is dependent on the child's self and emotions. This will assist children in developing concepts and being optimistic and confident in developing their talents. Personality is a distinct and individual aspect of a person's behavior that can influence a person's ability to adapt to their surroundings [4].

Each child is born with unique talents and personalities based on personality factors, which is a psychological state in which the development of a child's potential is dependent on the child's own emotions and emotions. This will assist children in developing concepts as well as being optimistic and confident in their abilities. Personality is a distinct and individual aspect of a person's behavior that can influence the person's ability to adapt to their surroundings.

To accomplish this, we require a system that can assist parents in recognizing their children's talents as well as their children's behavior, allowing parents to direct the appropriate pattern of education and learning for their children. And children can maximize the potential of their talents and feel their childhood without any burden from their parents, because of mistakes in determining their child's education.

Based on this, parents, as the primary educators of their children, must support educational activities for their children, as stated in Article 6 of Law Number 2 of 1989, which states that every citizen has the right to the broadest possible opportunity to attend education in order to gain knowledge, skills, and abilities. and skills that are at least equivalent to basic education graduates' knowledge, abilities, and skills. A good education is not always the best education for a child. Because each child has unique abilities. Providing learning patterns that do not correspond to the child's personality. Errors in education or learning patterns that are not in line with the child's talents result in children being burdened with the education they are receiving.

Furthermore, the Certainty Factor method is used in this study to develop an expert system for diagnosing elephantiasis [5]. In addition, research on expert systems to determine talent has also been carried out using forward chaining, but does not obtain the appropriate accuracy of talent results [6]. The expert system determines the interests and talents of elementary school children; the study's findings indicate that the system can recommend talents and learning patterns. The findings of this study indicate that the system can identify recommended talents and learning patterns; in the research I conducted, I included recommendations to address information on the development of children's talents at SMP Muhammadiyah Kandis.

2. Method

The author's research method is the R&D method, which is a research model used to create specific products and test their effectiveness. R&D is a research method used to create products and test their effectiveness [7]. Research and Development (R&D) is a process aimed at developing new technology or improving existing ones in order to gain a competitive advantage at the industry, business, or national levels [8]. Type of R&D research is defined as a systematic step taken to discover, formulate, improve, develop, produce, test validity, effectiveness, and practicability [9].

2.1. System Development Mode

The author employs a development model, specifically the waterfall model, which is one of the SDLC (Software Development Life Cycle) models, also known as the System Development Life Cycle. This waterfall model is divided into five stages: communication, planning, modeling, construction, and deployment. Figure 1 is the waterfall model's process. The steps taken in "the Waterfall Model according to Pressman" are explained below:
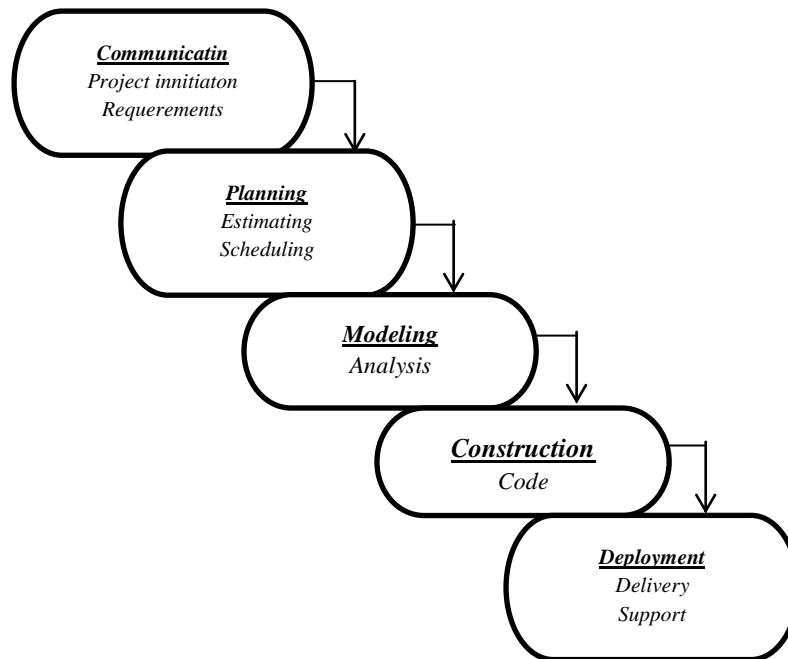
Figure 1. Waterfall Development

2.2. Research Stage

2.2.1. Communication

The first step is important because it entails gathering data and information about the needs of consumers and users. This step begins with communication from consumers or users to the responsible party in order to obtain more accurate information tailored to the needs of application users. At this point, data is collected through interviews.

2.2.2. Planning

The planning stage is a step in determining a plan that explains the estimation of technical tasks that will be performed, as well as the risks that may occur, the resources required to build the system, the work products that will be produced, and the scheduling that will be performed. And keeping track of the system's development process (work following the path or stages).

2.2.3. Modeling

This is the system architecture design and modeling stage, which focuses on the design of data structures, interface display software architecture, and program algorithms. The goal is to gain a better understanding of what will be done in the long run.

2.2.4. Construction

This stage is the process of converting the design form into a code or language form that a computer/machine can recognize. After the coding is completed, the system and the code that was created are tested. The goal is to locate the error and correct it.

2.2.5. Deployment

This stage involves delivering software to customers, as well as "software repair, software evaluation, and software development" based on feedback, so that the system can continue to run "and develop in accordance with its function."

2.3. Product Test

Testing is the functional compatibility of system aspects performed by someone who writes an expert computer program. This is accomplished through the completion of a questionnaire.

Eligibility Presentation (%)= (Score obtained)/(Maximum score)×100% ....(1)

The researcher used the success-fail option. The successful choice is worth 1 and the unsuccessful answer is 0. The following formula is used to calculate the test to be performed:

Eligibility Presentation (%)= (Score result)/(Maximum score)×100% ....(2)

Here's how to calculate usability test scores:

Total Score = (Jss X 5) + (Js X 4) + (Jn X 3) + (Jts X 2) + (Jsts X 1) ....(3)

Description :

Jss = amount of respondents answered Strongly Agree

Js = amount of respondents answered Agree

Jn = amount of respondents answered Neutral

Jts = amount of respondents answered Disagree

Jsts = the number of respondents answered strongly Disagree

Search the percentage of scores to find the criteria for interpreting usability test results:

Pscore = Total Score x 100 ....(4)
i x r x 5

Description :

Total score = total score of respondents' answers

i = amount of question

r = amount of responden

3. Results and Discussion

3.1. Communication

This stage of communication must understand what is required to solve problems when designing an expert system using the Certainty Factor method.

3.2. Planning

A method for locating a plan that describes the estimated tasks that the technician will perform, the responsibilities that may arise, the resources required to create the system, the work products to be produced, the work to be performed scheduling, and tracking of the system's work processes.

3.3. Modeling

3.3.1. Use case diagram

Figure 2 is a use case diagram of this research:
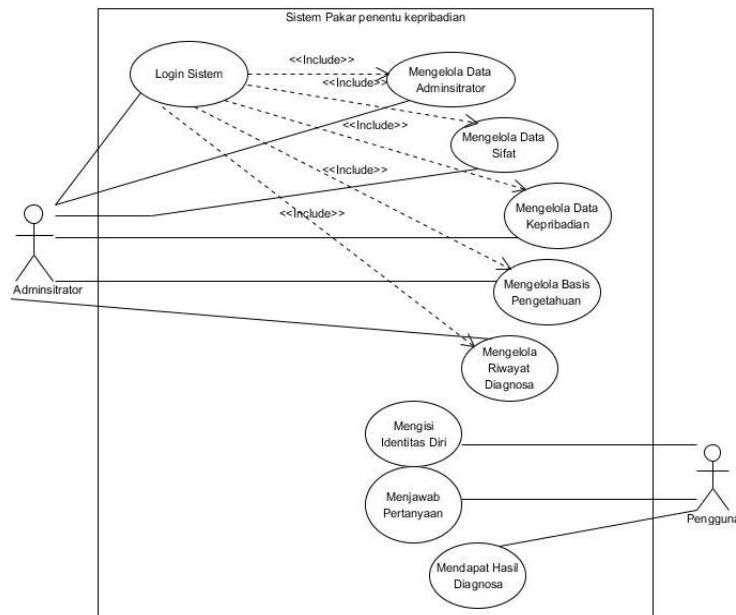
Figure 2. Use Case Diagram of Expert System Design

According to the use case diagram above, the two actors are administrator and user, and there are nine use cases, namely the login system, managing administrator data, managing trait data, processing personality data, managing knowledge base, managing diagnostic history data, filling in self-identity, answering questions, and getting a diagnosis.

Table 1 below is an explanation of the actors involved in the system:

Table 1. Actor

No.	Actor	Description
1.	Administrator	The administrator is in charge and has access to the expert system to perform operations for identifying children's interests and talents.
2.	Student	The student is in charge of completing the data by following the steps determined by using an expert system system with the certainty factor method.

Table 2 below is an explanation of the use cases in the system:

Table 2. Use Case

No.	Use Case	Description
1.	Login system	Admin manages user data or administrator, lecturer, and student data.
2.	Manage administrator data	Admin can change, add and delete lecturer data if there is something that is not in accordance with the provisions of the application.
3.	Managing trait data	Admin can change, add and delete student data if there is something that is not in accordance with the provisions of the application.
4.	Manage personality data	Admin can move questionnaire data from one user to another.
5.	Manag knowledge base	Lecturers can update, delete, change their data in this application.
6.	Manage diagnostic history	Lecturers must complete personal data before entering the application.

7.	Fill in identity data	Lecturers are able to process questionnaires that will be filled out by students.
8.	Answer the question	After the students complete the questionnaire, the next task for the lecturer is to confirm the questionnaire that has been filled out by the student.
9.	Get a diagnosis	Students can update, delete, change their data in the application.

3.3.2. *Activity diagram*

Figure 3 below is an activity diagram:
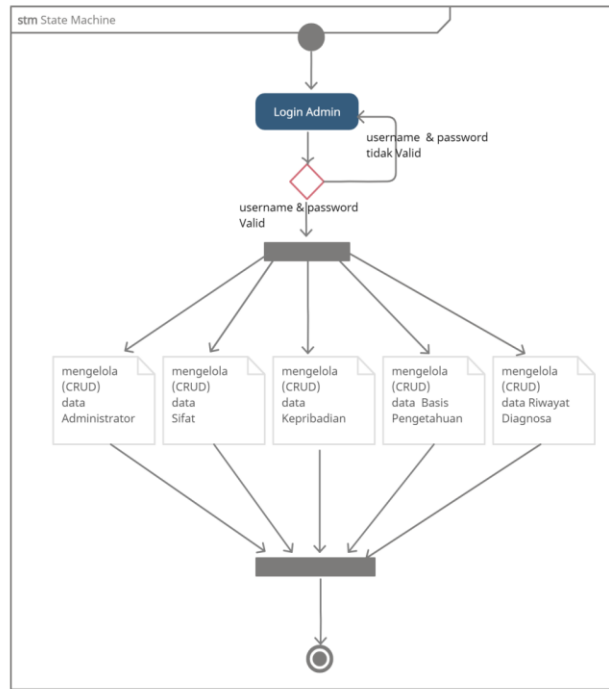
Figure 3. Administrator Activity Diagram

According to the diagram above, the admin's activities include managing (CRUD) administrator or user data, managing (CRUD) trait data, managing (CRUD) personality data, managing (CRUD) knowledge base data, and managing (CRUD) diagnostic historical data.

3.3.3. *Sequence diagram*

Figures 4 until 9 below are the sequence diagrams contained in the system:
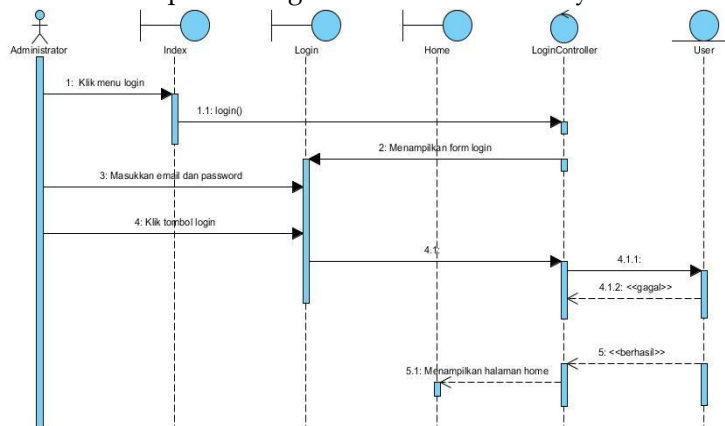
Figure 4. Sequence Diagram Login
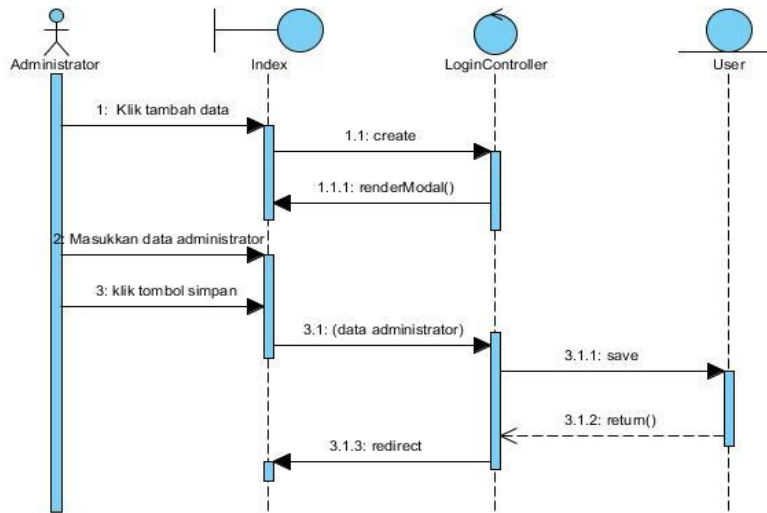
Figure 5. Sequence Diagram of Managing Administrator Data
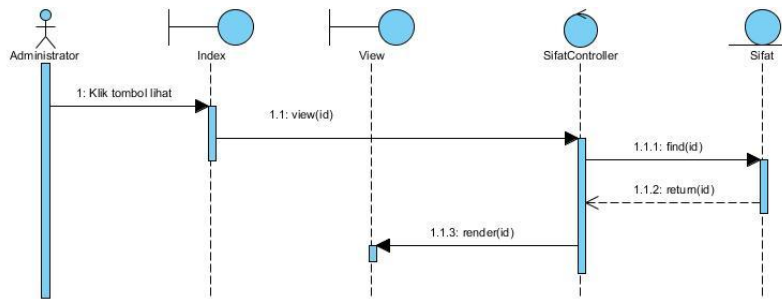
Figure 6. Sequence Diagram Managing Trait Data
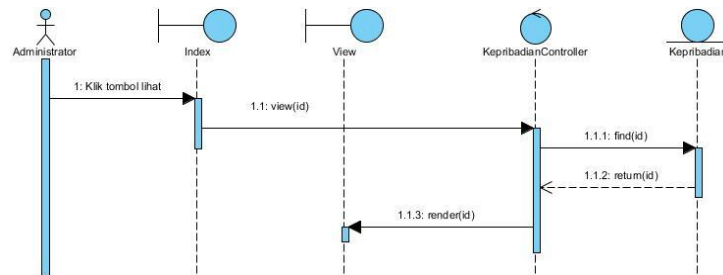
Figure 7. Sequence Diagram to See Personality Data
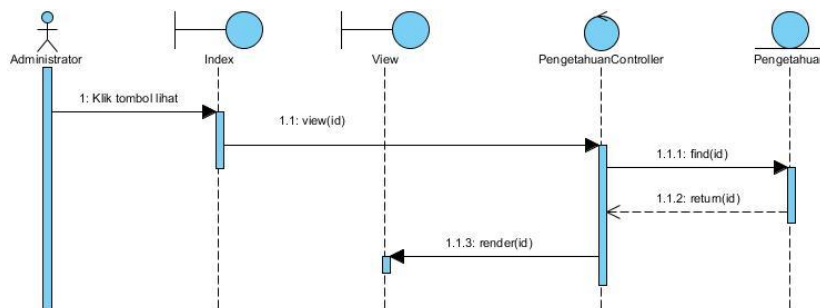
Figure 8. Sequence Diagram to See Knowledge Base Data
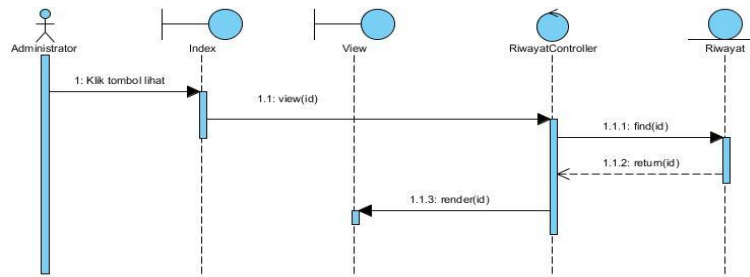
Figure 9. Sequence Diagram to See The History Of Diagnosis

3.3.4. Class diagaram

Figure 10 below is a class diagram of the system:
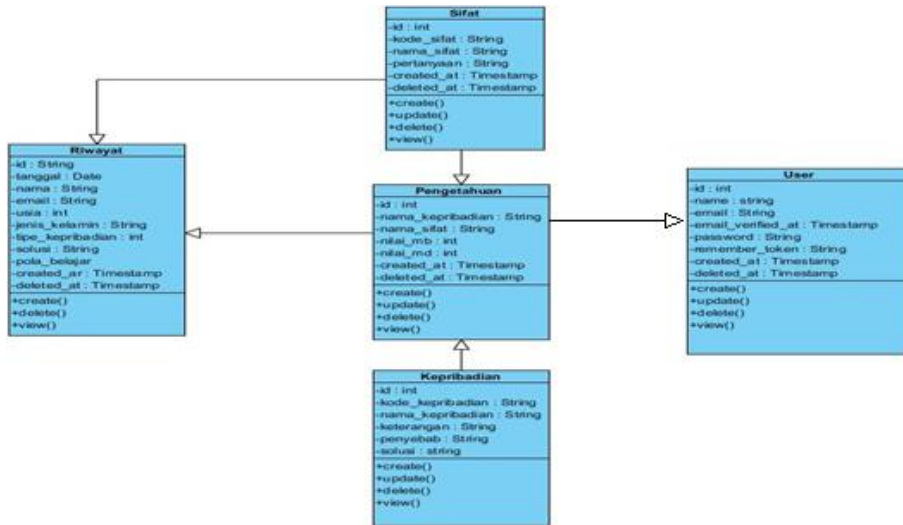
Figure 10. Class Diagram of Expert System

3.3.5. User interface

Figure 11 below is the design of the start page of this system:
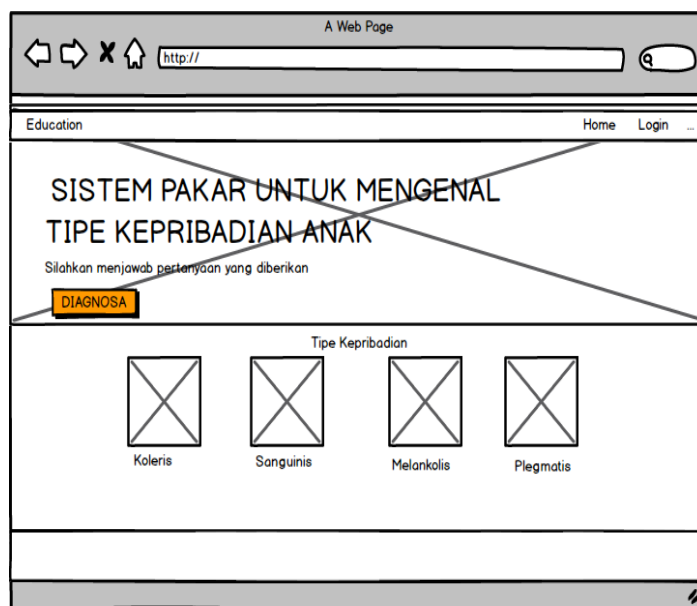
Figure 11. Main Page Display Input Design

Figure 12 below is a design login page to this system:
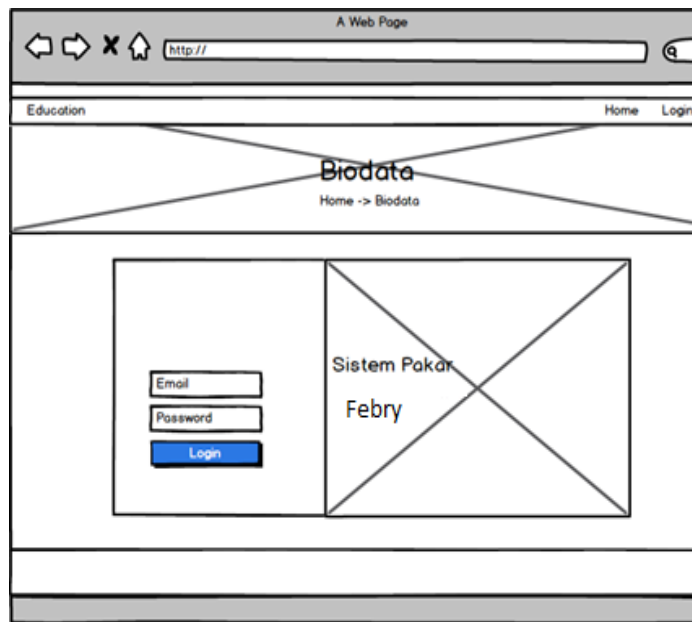
Figure 12. Admin Login Display Input Design

Figure 13 below is a design page for filling in the user's biodata:
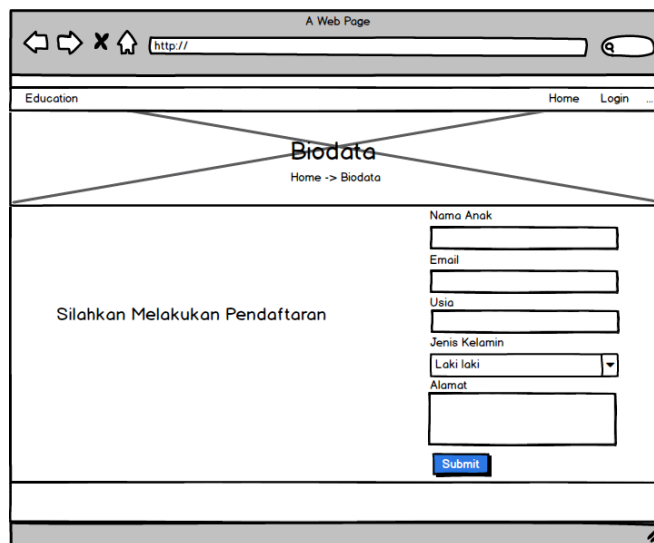
Figure 13. Biodata Form Design

Figure 14 below is an administrator's data page design:
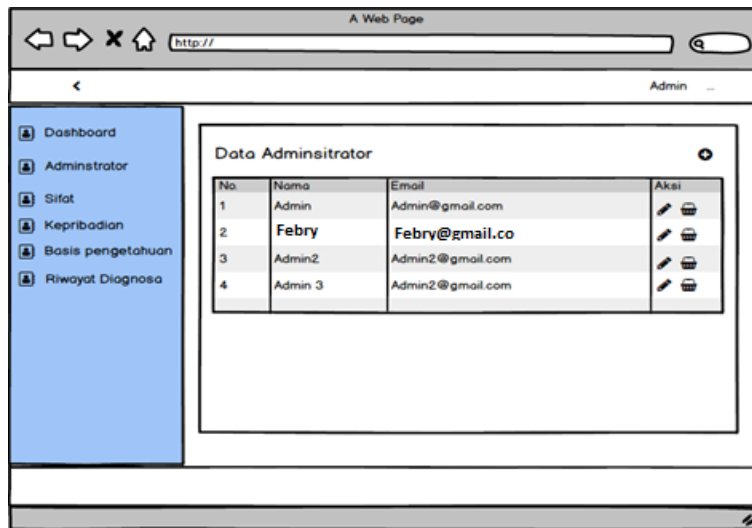
Figure 14. Administrator Data Page Design

Figure 15 below is the design of the trait data page:
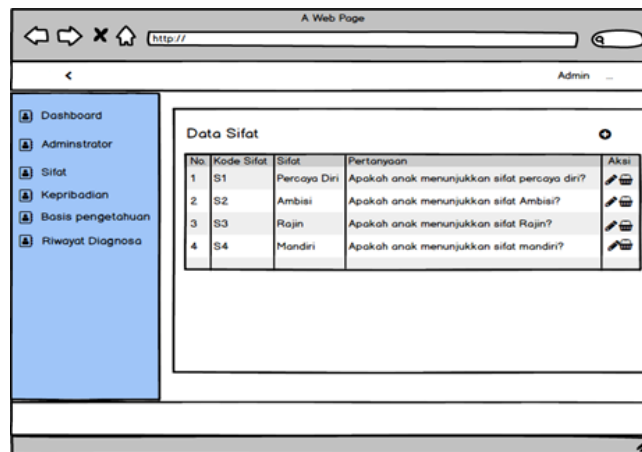
Figure 15. Nature Data Page Design

Figure 16 below is the design of the personality data page:
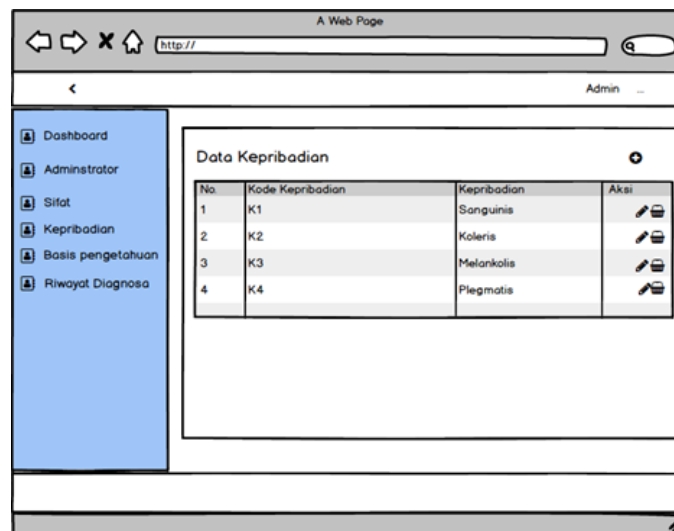
Figure 16. Personality Data Page Design

Figure 17 below is the design of the knowledge base data page:
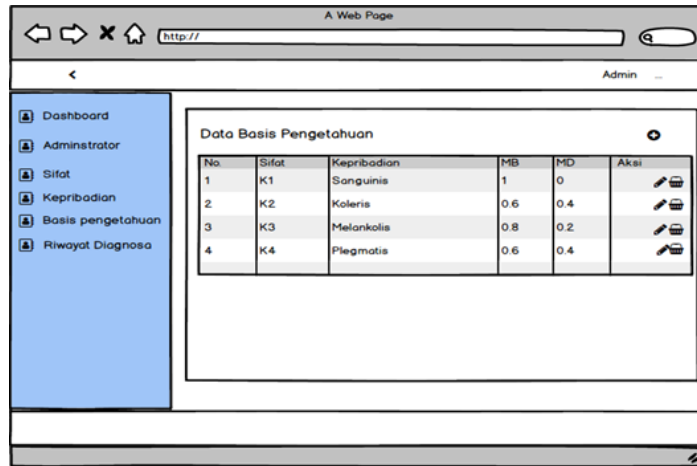
Figure 17. Knowledge Base Page Design

Figure 18 below is the design of the diagnostic history data page:
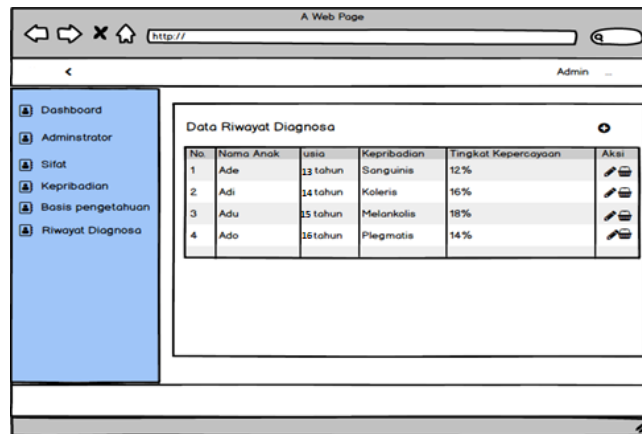
Figure 18. Diagnostic History Page Design

Figure 19 below is a display of the system start page:

Figure 19. Home Page

Figure 20 below is a biodata page view:

Figure 20. Biodata Pages

Figure 21 below is a question page display:

Figure 21. Question Pages

Figure 22 below is a display of the diagnostic results page:

Figure 22. Diagnostic Results Page

Figure 23 below is the admin login page view:
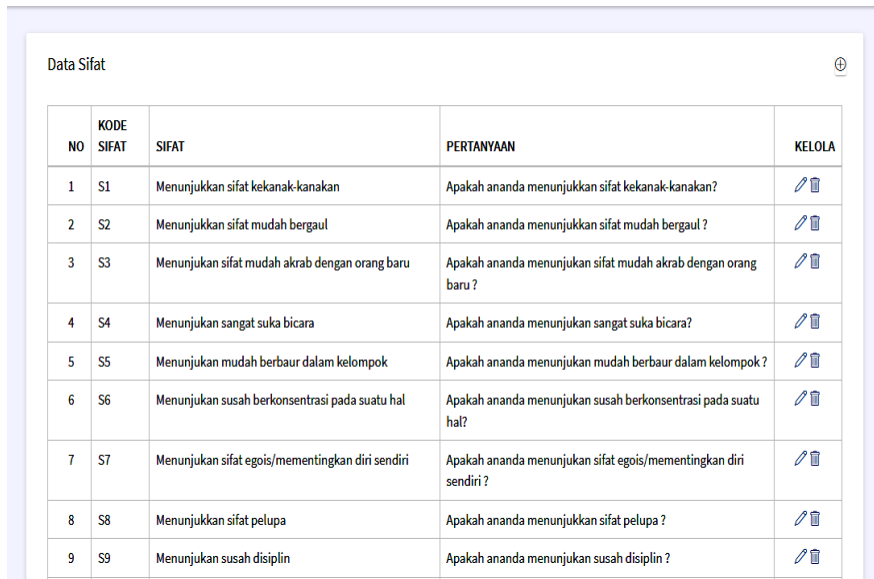
Figure 23. Admin Login Page

Figure 24 below is a display of the properties data page:

Figure 24. Properties Data Page

Figure 25 below is a display of the personality type page:

Figure 25. Personality Type Page

Figure 26 below is a knowledge base view:

NO.	SIFAT	KEPRIBADIAN	MB	MD	KELOLA
1	Menunjukkan sifat kekanak-kanakan	Sanguinis	0.8	0.2	✎ 🗑
2	Menunjukkan sifat mudah bergaul	Sanguinis	0.8	0.2	✎ 🗑
3	Menunjukan sifat mudah akrab dengan orang baru	Sanguinis	0.9	0.1	✎ 🗑
4	Menunjukan sangat suka bicara	Sanguinis	0.8	0.2	✎ 🗑
5	Menunjukan mudah berbaur dalam kelompok	Sanguinis	0.8	0.3	✎ 🗑
6	Menunjukan susah berkonsentrasi pada suatu hal	Sanguinis	0.9	0.2	✎ 🗑
7	Menunjukan sifat egois/mementingkan diri sendiri	Sanguinis	0.7	0.3	✎ 🗑
8	Menunjukkan sifat pelupa	Sanguinis	0.7	0.4	✎ 🗑
9	Menunjukan susah disiplin	Sanguinis	0.6	0.3	✎ 🗑
10	Menunjukan sifat membesar-besarkan masalah	Sanguinis	0.7	0.4	✎ 🗑
11	Menunjukan sifat leadership(mampu memimpin)	Koleris	0.8	0.2	✎ 🗑
12	Menunjukan sifat mudah mengambil keputusan	Koleris	0.8	0.2	✎ 🗑

Figure 26. Knowledge Base Page

Figure 27 below is a diagnostic history display:

Nama Anak	Email	Usia (Tahun)	Jenis Kelamin	Alamat	Tipe Kepribadian	Tingkat Kepercayaan	KELOLA
kefly	kefly@gmail.com	12 Tahun	Laki-Laki	jendral sudirman	Sanguinis	99 %	🗑
bambang	bambang@gmail.com	12 Tahun	Laki-Laki	kandis	Sanguinis	99 %	🗑
obi	obi@gmail.com	12 Tahun	Laki-Laki	kandis	Koleris	77 %	🗑
tahu	tahu@gmail.com	12 Tahun	Laki-Laki	kandis	Koleris	98 %	🗑
amri	amri@gmail.com	13 Tahun	Laki-Laki	medan	Koleris	77 %	🗑

Figure 27. Diagnostic History Page

3.4. Construction

At this stage, the program code is made using the PHP programming language. The database used is MySQL.

3.5. Deployment

At this stage, the implementation of the system at the research site is carried out. The distributed system has been tested.

Testing using black box testing. Table 3 below is the result of black box testing:

Table 3. Test Results Using Black Box Testing

		Test Result Data Case		
No	Input Data	Expected reaction	Observation	Conclusion
1	Dashboard page or Main Menu	The function of displaying the dashboard is running correctly	Show dashboard page	Success
2	Biodata Page	The function of displaying student data filling	Show student data filling	Success
3	Queestion Page	Function displays questions to identify children's interests & talents	Show question page	Success
4	Diagnostic Results Page	The function displays the results of children's interests and talents	Show the results of your interests and talents	Success
5	*Log-in Page*	Function displays admin login	Show admin login	Success
6	Administrator Page	Function to display administrator data	Show administrator data	Success
7	Properties page	Function to display property data	Show properties data	Success
8	Personality Page	Function to display personality type	Show personality type	Success
9	Knowledge Base Page	Function to display knowledge base	Show knowledge base	Success
10	Diagnostic History Page	Function to display diagnostic history	Show diagnostic history	Success
11	Menu Recognize	Function to enter the data entry stage	Show data entry	Success
12	Home Menu	Function to return to main menu	Show to main menu	Success
13	Log out menu	The function of logging out of the account is whether it matches correctly	Return to dashboard page	Success
14	Take diagnostic results	Function to print diagnostic results	Show the diagnostic results page	Success

3.6.   Product Test

3.6.1.   Functional conformity testing

Functional conformity testing is performed by two validators who are experts in their fields and are familiar with the stages of software development. Table 4 contains a list of functional suitability testers.

Table 4. Functional Suitability

No	Function	Expected results		Total	Maximum score
		Respondent			
		1	2		
1	Dashboard page or Main Menu	1	1	2	2
2	Biodata Page	1	1	2	2
3	Queestion Page	1	1	2	2
4	Diagnostic Results Page	1	1	2	2
5	*Log-in Page*	1	1	2	2
6	Administrator Page	1	1	2	2

7	Properties page	1	1	2	2
8	Personality Page	1	1	2	2
9	Knowledge Base Page	1	1	2	2
10	Diagnostic History Page	1	1	2	2
11	Menu Recognize	1	1	2	2
12	Home Menu	1	1	2	2
13	Log out menu	1	1	2	2
14	Take diagnostic results	1	1	2	2
	Total	**14**	**14**	**24**	**24**

Functional Conformity Testing above, obtained the percentage score of feasibility as follows:

$$Eligibility\ Percentage\ (\%) = \frac{score\ obtained}{score\ maximum} x\ 100\%$$

$$= \frac{24}{24} \times 100\%$$

$$= 100\%$$

The functional suitability assessment yielded a score of 100%. Based on the above considerations, the quality of the functional suitability application with the category "Highly Qualified" was determined.

3.6.2. Co-existence aspect compatibility test results

The formula to find the results of the coexistence test is used to see the effect with other applications. Based on the Compatibility Table above, the percentage score of eligibility is obtained as follows:

$$Eligibility\ Percentage\ (\%) = \frac{score\ obtained}{score\ maximum} x\ 100\%$$

$$= \frac{7}{7} \times 100\%$$

$$= 100\%$$

The result of conformity assessment is 100%. the results based on the above considerations, the application quality of the high compatibility category is "Highly Qualified".

3.6.3. Usability test result

Usability testing was conducted on two IAIN Bukittinggi lecturers. During this stage of testing, the user immediately tries the expert system. After the user is given a questionnaire in the form of a questionnaire, and the responses are in accordance with the responses and perceptions of the system used. Table 5 summarizes the findings of the expert system usability testing:

Table 5. Usability Test Result

Respondent	Usefulness	Ease of Use	Easy of Learning	Satisfaction	Total Value	Score Maximum
1	34	48	16	28	126	150
2	35	49	18	31	133	150
		Total			**259**	**300**

From the Usability Table above, seeing the feasibility is obtained from the % score as follows:

$$Pskor = \frac{Skor\ total}{i\ X\ r\ X\ 5} \times 100\%$$

$$= \frac{259}{30 \, X \, 2 \, X \, 5} \times 100\%$$
$$= 86,3\%$$

To calculate the calculation of the feasibility of the Usability test is 86.3%. From the results of the search for the percentage of eligibility above, the quality of the system in terms of usability is in the "Very Eligible" category.

3.6.4. Material result test

The focus of this material is on meeting the needs of user based on the type of data privacy that exists. As a result, the material is validated by a single person. To determine the feasibility of testing the material, 81%. According to the findings of the feasibility study, the system's material quality is "Very Eligible".

3.6.5. Language result test

This linguistic test is in order to pay attention to whether language is in accordance with the KBBI (Big Indonesian Dictionary) or not [10]. The calculation results from the results of linguistic testing feasibility were obtained at 87.5%. The system's linguistic quality receives the "Very Eligible" designation.

4. Conclusion

Based on the findings of their research, the authors were able to create this research product with the results of the functional suitability test results from two experts obtaining a feasibility value of 100%, which was declared Very Fair, and the compatibility test results obtaining a feasibility value of 100%, which was declared Very Eligible, and the usability test obtaining a feasibility score of 86.3%, which was declared Very Eligible, and the mate test obtaining a feasibility score of 100%, which was declared Very Eligible. This research aims to develop a validated and operational expert system for identifying children's interests and talents.

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