DEVELOPMENT OF CHATBOT APPLICATION "MIDWIFY" BASED ON ANDROID AS A SUPPORTING MEDIA TO LEARN MEDICAL SCIENCE IN STIKES BHAKTI KENCANA BANDUNG

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ABSTRACT

Sekolah Tinggi Ilmu Kesehatan (STIKes) Bhakti Kencana Bandung is the institute of health education in the city of Bandung with one of the available study programs namely D3 Midwifery. As for the background of the research, it is difficult for students to get information along with explanations on each midwifery term that must be understood by a midwife student at STIKes Bhakti Kencana Bandung. Then the limited space, time, until the understanding of each student towards the material provided using conventional question and answer teaching methods also makes students difficult to get knowledge. The purpose of this study is to help students in obtaining information on midwifery terms and can be accessed anytime and anywhere. The software development method used is Interactive Multimedia System Design and Development which is divided into four main stages, namely system requirements analysis, design considerations, implementation, and evaluation. The application of the technology used is firebase technology as database authentication and storage. Google Voice Recognition and Dialogflow technology that makes bots understand the questions posed by users. The results of the study indicate that the system can be used by female students as a supporting media in the learning process regarding midwifery terms that can be used anytime and anywhere.

Keywords: Dialogflow, Firebase, Google Speech Recognition, Chatbot, midwife's term

1. INTRODUCTION

Sekolah Tinggi Ilmu Kesehatan (STIKes) Bhakti Kencana Bandung is one of the institute engaged in providing health education in the city of Bandung. STIKes Bhakti Kencana has three types of education, namely diploma, bachelor, and profession. One of the study programs available at this institute is D3 Midwifery. One of the courses taught in this Midwifery D3 study program is midwifery care (askeb) 1. Askeb 1 course is an introductory and compulsory subject for all midwifery students and is learned in semester 1.

Based on the results of interviews with Mrs. Novita Sari as a midwifery lecturer, the process of learning activities currently underway still has problems, especially during midwifery care learning 1. The limitations of the number of books provided by the library are not comparable to the number of midwifery students available. The limited titles of supporting books, especially for the lectures on midwifery care (askeb) 1 available also make it difficult for students to get material or references during the learning process. This is also supported by the results of questionnaires submitted to female students online using google form and filled out by 18 respondents. It was found that 66.7% of respondents had difficulty obtaining information about askeb 1 material, while 88.9% of respondents had difficulty understanding the material for askeb 1, then 88.9% admitted difficulties in the chapter on changes in anatomy and physiology of pregnant women and 72.2% of difficulties in the chapter of factors that influence pregnancy, then 100% of respondents agree with the construction of midwifery learning assistance media applications.

Furthermore, the teaching-learning process uses the question and answer method which is one of the methods carried out in the learning process at STIKES Bhakti Kencana. With the question and answer process allows direct communication that is two-way and at that time there is mutual communication between lecturers and female students. But the problems that often occur from the conventional question-answer method are the limitations of time, space and level of understanding of each student so that it becomes an obstacle to the ineffectiveness of the teaching-learning process.

Chatbot or bot conversation is an artificial intelligence application that is able to simulate intelligent conversations, in accordance with the knowledge provided [1]. Chatbot is an intelligent agent that can mimic the ability of humans to be able to have conversations with users, namely humans. Development of chatbots can be done using an approach from the Question and Answering field. Chatbot can be implemented in the fields of commercial, educational, entertainment, and public service sectors [2].

There is a research on chatbot as a learning aid medium for high school students, namely "Developing an Intelligent Chat-bot Tool to assist high school students for general knowledge subjects" [3] where chatbots act as student assistants for help in learning general subjects . Chatbot is built using several platforms namely Dialogflow.com (Api.ai), Wit.ai, Luis.ai, and Pandorabots.com. This study compares the performance of each chatbot platform based on the Natural Language Processing (NLP) capability [4] and the ability to develop complex features. Based on the results of the evaluation conducted, it was found that Dialogflow.com (Api.ai) showed the best results.

The need for new innovations as learning media in the form of conversation agents (chatbots) or chat robots as a tool for distance learning media that supports the performance of lecturers to deliver knowledge so that it can be a solution to the smooth teaching and learning process. As well as the need for learning media that can be accessed by female students wherever and whenever.

2. THEORY

2.1 Institution Profile

Bhakti Kencana Bandung School of Health Sciences (STIKes) was established on January 2, 2002 based on the Decree (SK) of the Directorate General of Higher Education No.1 / D / 0/2002 and recommendations from the Ministry of Health of the Republic of Indonesia No.KS.02.1.5.4327 under the Adhi Foundation Guna Kencana Bandung in accordance with the notary deed of Tien Norman Lubis, SH No. 19 dated December 28, 1998 [5]. This institute has five (5) study programs, including the D3 Midwifery program, D3 Nursing, S1 Nursing, S1 Public Health, and Professional Profession.

2.2 Chatbot

Chatbot is a combination of three units, of which three units will build a chatbot [2], above are:

a) User Interface
The interface contained in the chatbot serves as a media link between bots and interacting users. With text-based messaging applications and other media. Through the interface, chatbots are expected to provide users with a better and more enjoyable experience when interacting with bots.

b) Artificial Intelligence
Artificial Intelligence will make bots in the chatbot application understand and understand every ongoing interaction with users [6]. Chatbot handles problem solving using predetermined rules in the decision tree.

c) Integration
Integration with other systems will add to the wealth of features and complexity contained in a chatbot application. Through the process of integrating chatbot into other systems it can provide

additional information or knowledge. In this way chatbot is able to provide richer knowledge to users, as in this study which will implement chatbot on supporting media for midwifery learning.

2.3 Firebase Technology

Firebase is a technology and also known as cloud-based back-end as a service (BaaS) developed by Google. Firebase technology provides a variety of services, including the authentication feature called firebase authentication and realtime database storage called the firebase realtime database. Firebase Authentication provides services so that application developers can provide authentication features such as logins on Android devices. Firebase Realtime Database provides database storage features that can be accessed in realtime on users' android devices [7].

2.4 Google Speech-to-Text Technology

Google Speech-to-Text or commonly known Google speech recognition is a part of the virtual keyboard input that is available in the Android system package known as Google voice typing. Google voice typing can be set via the settings menu on each Android device, such as language input. For the Midwify chatbot application, input the language used is Indonesian [8].

By default, Google Speech Recognition Technology is included in the Android SDK package. To use this library, an interface is needed called RecognizerIntent. RecognizerIntent is used to get the conversion results from the user's voice input into another form, String [9].

2.5 Dialogflow API Technology

Dialogflow API or formerly API.AI and Speaktoit are developers of computer and human interaction technology [10]. Dialogflow API technology is one of the technologies used in the development of useful midwify chatbot applications as storage templates and science training from midwify bots. This knowledge contains conversational information about midwifery terms in 1 midwifery care course (pregnancy).

3. RESEARCH METHODOLOGY

The research methodology used in this research is descriptive research method, this method aims to compare the results of the picture of all data which is then compared to the ongoing reality to be able to provide solutions to the problem [11]. The research framework is an adaptation of the Interactive Multimedia System Design and Development method from Dastbaz [12] which can be seen in Figure 1.
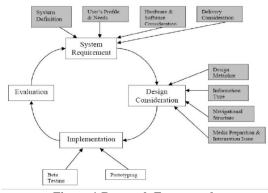
Figure 1 Research Framework

4. RESULTS AND DISCUSSION

Stages of results and discussion consist of a general overview of the system, analysis and system design. The last step is to do a test so that conclusions can be made.

4.1 System Architecture

The system to be built is an Android-based application using Android native programming. The system architecture that will be built can be seen in Figure 2.
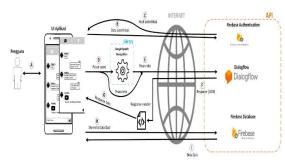

Figure 2 System Architecture

The system will request or authenticate data requests to firebase authentication via the internet, when it has obtained authentication data from firebase authentication, the system will display the main page when the authentication is successful. In the Midwify question menu, the system sends a text message called a query to the Dialogflow API. When you get an answer from Dialogflow, the system parses the response given and then displays it on the chat page.

Then on the Midwify Voice menu, the system sends voice messages to the Google Voice Recognition library first. When you get an audio synthesis in the form of a string, the system will forward the message to the Dialogflow API. When you have received an answer from Dialogflow, the system parses the response given and then displays it on the chat page. Next in the quiz menu, the system requests or requests to the Firebase Realtime Database to obtain data quizzes that contain questions, choice of answers, and correct answers. On

the statistics menu, the system requests the Firebase Realtime Database to get user data or quiz scores in the past one (1) week.

4.2 Analysis of Firebase Technology

Firebase technology is used in the Midwify chatbot application, Firebase Authentication and Firebase Realtime Database. Firebase Realtime Database technology is used as a tool to help access information that has been stored in real time. Firebase Authentication to give authentication to each user who will use the Midwify chatbot application. While the Firebase Realtime Database is used as a storage place for the Midwify Application database. This technology is applied on the Android platform, with the aim of making it easy for users to access the application.

4.3 Analysis of Google Speech-to-Text Technology

Google Speech-to-Text technology is used to be able to synthesize voice or audio input from users. The audio synthesis results obtained from the Google Speech-to-Text library are strings that can be used as queries and then forwarded to the Dialogflow API.

4.4 Analysis of Dialogflow Technology

Dialogflow API (Application Programming Interface) technology is one of the technologies used in the construction of the midwify chatbot application to store midwify bot knowledge. This knowledge contains conversational information about midwifery terms studied by midwifery students. The following is the process flow of Dialogflow technology which can be seen in Figure 3.
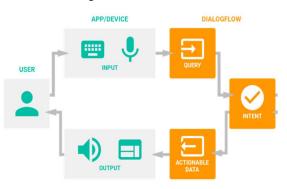

Figure 3 Dialogflow Technology Process Flow

4.5 Analysis of Input Data

Analysis of input data aims to define the type of input data to be received by the Midwify chatbot application. Input data for this application consists of input data in the form of text and input data in the form of sound. The Midwify chatbot application contains information on terms in midwifery. The number of midwifery terms used as a knowledge base on the Midwify chatbot application is 500 terms. The following are the stages based on the input data received by the application to produce a response output from Dialogflow Fire, including:

a) Text Input

Input in the form of text consists of 3 (three) stages, namely retrieving the query from the questions asked, matching with intents by Dialogflow Api, and receiving the response results as an answer. Query retrieval is the process by which all sentences (questions) are given by the user and sent to Dialogflow Fire. Questions given by the user are obtained through input in the form of text. Input in the form of text is stored as a String. Then the query received by Dialogflow Api is matched with each intent that has been defined on the Dialogflow Fire console. Matching these queries with intent results in Intent Detection Confidence. Intent Detection Confidence is a scale of confidence from the detection of intent that has been done by Dialogflow Api. The Intent Detection Confidence scale is 0 (zero) to 1 (one). Then the system receives the response sent by Dialogflow Api in JSON format. This response contains sent queries, parameters, fulfillment Messages or fulfillment messages. Fulfillment messages are answers to user-asked questions and will be displayed as answers to Midwify bots.

b) Voice Input

Sound Form Input consists of 4 (four) stages, namely user voice retrieval, query retrieval from the results of the first stage, matching with intents by Dialogflow Api, and acceptance of the response results as an answer. Before the message is sent to Dialogflow, the question is first forwarded to the Google Speech-to-Text library which will produce a sentence in the form of a String. Then the query will be made by the process of matching the intent form of knowledge by Dialogflow. After obtaining a suitable intent as an answer, then the answer will be sent to the application. Then the system receives a response. This response contains sent queries, parameters, and fulfillment Messages or fulfillment messages. This fulfillment message will be used as an answer to the user's question and will be displayed in the chat view as an answer to the Midwify bot.

4.6 User Analysis

User analysis is part of the analysis that emphasizes the side or aspects of the user who will use the application. Based on the analysis conducted, there is one user who has the user characteristics described in table 1.

Table 1 Characteristics of Application Users

Type of User	Responsibility	Skill Level
Midwifery Student	- Learning midwifery care material 1 (pregnancy). - Practice by answering the questions.	Has the ability to read.

4.7 System Analysis

System analysis discusses some general descriptions of system analysis between Use Case. Use diagrams consist of login, registration, chat,

voice chat, exercise quizzes, display statistics, and provide answers, Use case diagrams can be seen in Figure 4.
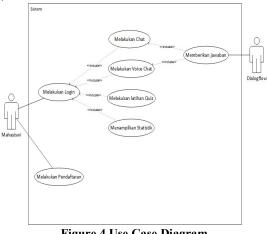
.

Figure 4 Use Case Diagram

4.8 System Implementation

The implementation of several discussions included the implementation of hardware, software and interfaces.

a) Hardware Implementation

The hardware used to build applications on Android devices. The minimum hardware for building the Midwify chatbot application can be seen in Table 2.

Table 2 Hardware Implementation

No	Hardware	Minimum Specs.	Smartphone Specs.	Conclusion
1	Processor	Quad-core 1.5 GHz	Octa-core 1.8 GHz	[√] Accepted [ ] Rejected
2	Screen Res.	480 x 854 pixel	1080 x 2160 pixel	[√] Accepted [ ] Rejected
3	Screen size	4.5"	5.99"	[√] Accepted [ ] Rejected
4	Memory	2 GB	3 GB	[√] Accepted [ ] Rejected
5	Screen	Capacitive	Capacitive	[√] Accepted [ ] Rejected

b) Software Implementation

Implementation Software is a process carried out to build applications. Software implementation includes the operating system and supporting applications for the construction of the Midwify chatbot application. Minimal Implementation of Software Requirements can be seen in Table 3.

Table 3 Software Implementation

No.	Minimum Computer Software	Computer Software Implementation	Conclusion
1	Operating System Windows 10	Operating System Windows 10	[√] Accepted [ ] Rejected
2	Android Studio	Android Studio	[√] Accepted [ ] Rejected

No.	Minimal Smartphone Software	Implementation of Smartphone Software	Conclusion
1	Operating System Android 4.1 *Jelly Bean*	Operating System Android 4.1 *Jelly Bean*	[√] Accepted [ ] Rejected

c) Technology Implementation

1. Firebase Technology

To apply firebase authentication technology to the user authentication process, the userLogin method is applied which can be seen in Figure 5.

```
private void userLogin() {

 String email =
editTextEmail.getText().toString().tri
m();

 String password =
editTextPassword.getText().toString().
trim();

mAuth.signInWithEmailAndPassword(email
, password).addOnCompleteListener(new
OnCompleteListener<AuthResult>() {
  @Override
  public void onComplete(@NonNull
Task<AuthResult> task) {

  if (task.isSuccessful()) {
if(mAuth.getCurrentUser().isEmailVerif
ied() == true) {
    finish();
    Intent intent = new
Intent(Login.this,
MainActivity.class);
intent.addFlags(Intent.FLAG_ACTIVITY_C
LEAR_TOP);
    startActivity(intent);

  }else {
    Toast.makeText(Login.this,"Email
Anda belum terverifikasi. Email
verifikasi sudah terkirim ke "+
mAuth.getCurrentUser().getEmail(),
Toast.LENGTH_SHORT).show();

mAuth.getCurrentUser().sendEmailVerifi
cation();
    }

  }else {
Toast.makeText(getApplicationContext()
,task.getException().getMessage(),
Toast.LENGTH_SHORT).show();
    }
   }
  }
 );
}
```
Figure 5 Firebase Implementation

2. Google Speech-to-Text Technology

Google Speech-to-Text technology is included in the Android operating system package. In its use the author makes the MidwifySuara class and applies the RecognizerIntent interface. But this interface requires that MidwifySuara implement a callback function, namely onActivityResult() which is used to get the results of audio synthesis, which is a String that can be seen in Figure 6.

```
public class MidwifySuara extends
AppCompatActivity implements
View.OnClickListener {

    @Override
    public void onActivityResult (int
requestCode, int resultCode, Intent data)
{
        }
        ...
}
```
Figure 6 Method OnActivityResult

3. Dialogflow Technology

To apply dialogflow technology to the Midwify chatbot application, this technology has provided classes and methods that aim to simplify during the application process. These classes include AIResult, AIDataService, and AIConfiguration. To get the response from dialogflow, the AIResponse and onActivityResult classes are used as shown in Figure 7.

```
@Override
protected AIResponse doInBackground(final
String... params) {
 final AIRequest request = new
AIRequest();
 String query = params[0];
 String event = params[1];
 String context = params[2];
 RequestExtras requestExtras = null;
 if (!TextUtils.isEmpty(context)) {
  final List<AIContext> contexts =
Collections.singletonList(new
AIContext(context));
  requestExtras = new
RequestExtras(contexts, null);
 }
 try {
  return aiDataService.request(request,
requestExtras);
 } catch (final AIServiceException e) {
  aiError = new AIError(e);
  return null;
 }
}
public class AiTask extends
AsyncTask<String, Void, AIResponse> {
 public AiTask(){
 }
 @Override
 protected AIResponse
doInBackground(final String... params) {

 @Override
 protected void onPostExecute(final
AIResponse response) {
 }
}
@Override
    public void onActivityResult (int
requestCode, int resultCode, Intent data)
```

```
{
super.onActivityResult(requestCode,
resultCode, data);
 if (requestCode == 10) {
  if (resultCode == RESULT_OK && data !=
null) {
   ArrayList<String> result =
data.getStringArrayListExtra(RecognizerIn
tent.EXTRA_RESULTS);
   hasil = result.get(0);
  }
 }
}
```

Figure 7 AIResponse Class

d) Interface Implementation

Interface implementation is the stage of implementing the interface from the interface design that has been done. Implementation of the interface from the system design that has been implemented becomes a display.

i. Login and registration interface

The login and registration interfaces are the first interface users access, both to gain access to the application and to register access to the application.
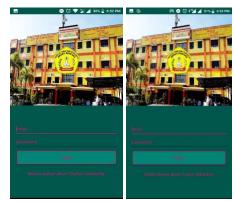

Figure 8 Login and Registration Interface

In Figure 8, shows the login display and registration display. The login view is useful for getting user access rights to enter the application while the registration display is useful for registering user access rights on the application.
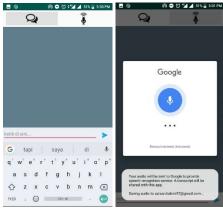
ii. Chat and Voice Chat Interface

Figure 9 Chat dan Voice Chat Interface

In Figure 9, shows conversations with bots using text messages. And also bot conversations use voicemail or audio. When doing voice chat, the application will direct the virtual input device using google voice typing which is available on each Android device.

4.9 System Testing

System testing aims to find possible shortcomings and errors in the application system being tested. System testing is divided into two (2) stages, namely Alpha testing and beta testing. In alpha testing using the black-box method while beta testing is focused on the assessment of users of applications built using the questionnaire method.

a) Alpha Testing

The black-box method is used in the alpha testing process and focuses on the functional requirements of the application. The following is a list of alpha tests performed which can be seen in Table 4.

Table 4 Alpha Test List

Test Item	Test Data	Test Type
Login	Enter email and password	black box
Pendaftaran	Enter email and password	black box
Chat	Type the message	black box
Voice Chat	Say a message	black box
Latihan Quiz	Choose answer options	black box
Statistik	Displays statistics on quiz scores	black box

The results of alpha testing on chat test items can be seen in Table 5.

Table 5 Chat Test Alpha Item Test Results

Cases and Test Results (Message Recognized)			
Input Data	**Expectation**	**Observation**	**Conclusion**
Type the message "apa ya yang dimaksud anemia?"	Receive a reply to the answer from Dialogflow accordingly	Showing the answer "kondisi dimana kekurangan sel darah merah (eritrosit)"	[√] Accepted [ ] Rejected
Cases and Test Results (Message Recognized)			
Input Data	**Expectation**	**Observation**	**Conclusion**
Type the message "apa ya yang dimaksud xxx?"	Receive a reply to the answer from Dialogflow accordingly	Showing the answer "Saya tidak dengar Anda bilang apa. Bisa ulangi lagi?"	[√] Accepted [ ] Rejected
Cases and Test Results (Message Recognized)			
Input Data	**Expectation**	**Observation**	**Conclusion**
Mengetikkan pesan "apa ya yang dimaksud anemia?"	Receive a reply to the answer from Dialogflow accordingly	Showing the answer "koneksi internet tidak tersedia"	[√] Accepted [ ] Rejected

b) Beta Testing

Beta testing is a test conducted objectively and carried out directly on users who will later use the Midwify chatbot application, namely the Midwifery Student Study Program at STIKes Bhakti Kencana Bandung. This test uses a questionnaire method.

The results of the Midwifery student questionnaire with respondents as many as 18 people conducted at STIKes Bhakti Kencana Bandung in January 2019 can be seen in Table 6.

Table 6 Student Questionnaire Results

No	Question					Result
1	Apakah Anda setuju bahwa perangkat lunak ini dapat mendukung kegiatan belajar Anda mengenai mata kuliah asuhan kebidanan 1?					(25+40+9+0+0)/90 * 100% = 82,2%
	SS	S	RR	TS	STS	
	5	10	3	0	0	
2	Apakah Anda setuju bahwa perangkat lunak ini dapat membantu anda dalam mendapatkan informasi istilah kebidanan?					83,3%
	SS	S	RR	TS	STS	
	6	9	3	0	0	
3	Apakah Anda setuju bahwa perangkat lunak ini menyediakan penjelasan istilah kebidanan dengan lengkap?					87,7%
	SS	S	RR	TS	STS	
	9	7	2	0	0	
4	Apakah Anda setuju bahwa perangkat lunak ini sudah menyediakan informasi yang sesuai dengan pertanyaan yang Anda ajukan?					90%
	SS	S	RR	TS	STS	
	10	7	1	0	0	
5	Apakah Anda setuju bahwa Anda dapat menggunakan perangkat lunak ini dimana pun Anda membutuhkannya?					93,3%
	SS	S	RR	TS	STS	
	12	6	0	0	0	
6	Apakah Anda setuju bahwa perangkat lunak ini dapat digunakan kapan pun Anda membutuhkannya?					84,4%
	SS	S	RR	TS	STS	
	7	8	3	0	0	

The average final result of the questionnaire is as follows: (82,2+83,3+87,7+90+93,3+84,4)/6 = 86,82%

Based on the calculation of the average questionnaire results from alpha testing, it was obtained at 86.82% which can be concluded that the Midwify chatbot application can help assist students to obtain knowledge about midwifery terms and this application can be accessed anytime and anywhere.

c) Chatbot Accuracy Testing

The accuracy of chatbot testing is done to find out how much the accuracy of the response or reply to answers given by the bot for the questions raised by the application user. This test is done by the way users chat directly with bots. Then do the matching reply answers given by the Midwify bot with the knowledge that has been given before.

The results of the chatbot accuracy test, obtained that the bot in the application can answer 45 of the 48 questions submitted correctly and in accordance with the knowledge base that has been stored and trained. Therefore, it can be concluded that the Midwify application is capable of handling questions or sentences with different patterns on the same topic with an accuracy rate of 93.75%.

d) Voice Input Testing

Voice input or voice testing is done to find out how influential the noise or interference with the accuracy of the sound capture performed by Google Speech-to-Text and the synthesis results in the form of audio into a text sentence. In this test, the parameters used as well as a reference are the level of ambient sound intensity (environment) in decibels (dB). Tests are carried out based on three levels of environmental sound intensity, namely 34-37 dB, 55-60 dB, and 69-73 dB.

The results of the voice input test, obtained that Google voice recognition technology in this application can recognize 25 of the 30 voicemail submitted correctly and produce the correct answer. 5 of the 30 voice messages that were not successfully synthesized correctly were caused by the relatively high sound intensity of the surrounding environment (ranging from 69 to 73 dB). Therefore, it can be concluded that the Midwify chatbot application can recognize questions / sentences with different patterns and with different levels of environmental sound intensity, with an accuracy rate of 83.3%.

5. CONCLUSION AND SUGGESTION

5.1 Conclusion

The conclusion that can be obtained in this study is that the Midwify chatbot application can help D3 midwifery students from STIKes Bhakti Kencana in getting information on terms in midwifery by utilizing bot roles as a medium for delivering messages. Furthermore, the Midwify chatbot application is quite easy for Midwifery students to do the learning process that can be done anytime as long as internet access is available on each student Android smartphone available.

5.2 Suggestion

The suggestions given to the development of this chatbot application in the future are the addition of firebase storage technology and webhook so that it can accommodate learning materials with more variety. This application still has a shortage of user errors when typing questions (typographical errors) which are based on the results of chatbot testing, therefore it can be done adding technology that can reduce bot errors in interpreting questions containing incomplete words.

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