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CHATBOT IMPLEMENTATION TO SUPPORT MOBILE LEARNING DURING NCOVID19 PANDEMIC

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Abstract

This paper presents the results of chatbot implementation to support mobile learning in higher education. The goal of the chatbot implementation in this study, among others, is to address high interest of higher education in Indonesia toward online learning support mainly during the resent NCOVID19 pandemic in which most of learning process are implemented using online learning mode. The proposed chatbot prototype has been tested in the University of Andalas, Sumatera, Indonesia. The chatbot is designed using standard software engineering method and implemented using Android-based mobile application flatform. Respondents for the chatbot evaluation are chosen based on purposive random sampling among students of Department of Sociology as sampling population. The data collecting is implemented using survey method with self administered questionnaires. The overall evaluation results showed that the designed and implementation has met the students' expectation. Interestingly most of the respondents showed their interest to use the chatbot.

Keywords: Chatbot, Mobile Learning, E-Learning, Education, COVID19

INTRODUCTION

Mobile learning is a new term which has gained popularity in the last ten years refers to a new way to access learning content using mobile devices, such as smartphone. Whilst, e-learning is a term refers to learning mode supported by electronic technologies to access learning materials such as reading materials and exercises outside of a traditional classroom. In this paper, mobile learning and e-learning will be used interchangeably. The increasing use of E-Learning in many educational institutions has gained wide attention from lecturers in higher education institution especially during COVID19 pandemic in which most of universities rely on online learning as major learning mode. E-Learning mode makes it possible for students to study a particular subject of their interest in adherence to their learning style and time availability thanks to the advent of smartphone technology that provides platform for educators to designed learning materials and applications. Portability, easy of use, and affordability have made smartphone become platform of choice for mobile learning application. Despite its potentials to support mobile learning, a mobile-based application implemented in smartphone exhibits a number of potential limitations for developing E-Learning applications due to its limited power, screen area, and computation resources such as memory and processor capacity.

Chatbot is one application which can be implemented in a smartphone as a mobile learning applications that can be applied for education purpose. The application of Chatbot can make mobile learning applications more communicative and

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potentially enjoyable for students. Although can be designed using multimedia technology, a typical chatbot is an application uses text-based user interface possibly with addition such as audio output as main communication interface with its users. The goal of chatbot is in education domain. is typically to answer or provide responses to frequent questions posed by students related to administration issues of basic concepts of particular course.

The wide potential applications of chatbot has gained research attention from various research communities (see Table 1). Research by Goel et al. in 2015 [1], for example, showed some evidences on the use of chatbot as educational assistants. In particular, application of chatbot on mobile learning has improved learning material deliveries.

According to Colace et al. in 2018 [2], chatbot technology can be considered as an important innovation for e-learning. The authors further claimed that it is the most innovative solution in filling the gap between technology and education. The implications of chatbots create interactive learning experiences for students/ students as interactions with one another with the instructor.

Source	Method of Software Developing	Evaluation Result
(Pilato, Augello, & Gaglio, 2012)[3]	**AIML** *(Artificial Intelligence Markup Language)*	The dialog analyzer extracts context information (topics, objectives, linguistic actions, etc.)
(Colace et al, 2018) [2]	**AIML** (*Artificial Intelligence Markup Language*)	Chatbot accepts requests, describes them and answers to students by sending attached material or through textual insights on the subject.
(Abdul-Kadeer&Woods, 2015) [4]	**AIML** (*Artificial Intelligence Markup Language*)	Chatbots designed for dialogue systems in selected studies are, in general, limited to certain applications
(PHAM, PHAM, & NGUYEN, 2018) [5]	**Waterfall**	Overall, interactions between humans and chatbots have potential technology that can be applied in learning a foreign language.
(Wirawan,Sukarsa & Bayupati, 2019) [6]	**Waterfall**	Accuracy results for input and output from the developed chatbot application have a percentage close to 100%

Table 1. Literature Review

In Indonesia, recently Wirawan, Sukarsa & Bayupati [6] publisehed their study report on application of chatbot line for learning and discuss about the History of Bali.

Although a vast number of publications on chatbot for education in general has been published; to the best of our knowledge, only a few reports has been published on the use of chatbot to support mobile learning for higher education in Indonesia

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METHOD

Evaluation Stage of Acceptance by User Interface

The form of the evaluation stage of acceptance by the user is carried out on 2 Types of Methods, namely the Evaluation Method in terms of the User Interface and the Evaluation Method in terms of User Experience. In evaluating through the questionnaire, the user will also be the overall respondent on the questions in the questionnaire to see the results of the evaluation of acceptance by the user

Heuristic Evaluation Method is a method used in assessing the usefulness of a software based on the design of the user interface [9] Usability contained in this method are:

Visibility of System Status

A condition where the user knows what is happening in the system or in other words the system provides information that is happening to the user both that is being done, what are the parts being and what is happening to the chatbot application.

Match between system and the real world

The system provides information that is easy to understand and familiar to users, for example by using everyday language so as to give the impression of intimacy and trust for users of chatbot applications.

User Control and Freedom

The system is able to provide convenience and freedom to the user in using the interface. Users can easily undo actions that are not intentionally performed

Consistency and Standard

The system uses information and images that do not have changes and according to their functions, making it easier for users to recognize chatbot software in mobile learning applications

Error Prevention

The system should handle errors or bugs in the system by giving an error message in the form of design.

Recognition Rather than Recall

To overcome doubts about the use of applications by users, the design of the software created must be easily remembered by the user.

Flexibility and Efficiency of Use

Display interface must be flexible transforming itself for new users and advanced users

Aesthetic and Minimalist Design

Featuring a layout design that is comfortable to look at using good color contrast, suitable position and harmony. The information displayed on the page is relevant to the appropriate layout and does not include elements that are not used.

Help user Recognize, Diagnose and Recover from Errors

Chatbot system gives an error message in simple language and provides a solution for solving the problem.

Help and Documentation

To help users in using the software it is necessary to provide help features and documentation of possible errors in use of chatbot menu

Evaluation Stage of Acceptance by User

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Experience
In this aspect there is a linkage with principles that need attention [11], namely:

Branding
Consists of all aspects of design and aesthetics that are included in the software. In the application of chatbot in mobile learning applications, the design provided should be a special attraction for users so that users will more easily understand the system. Branding on the chatbot application is also adjusted to the customization of the campus identity.

Usability
Includes requirements for components, features, navigation, and accessibility of websites and mobile-based applications that are easy to use by users in a chatbot system in a mobile learning application.

Functionality
Aspects that discuss the processes and techniques of a work procedure in a system. In the case it is expected that users can access and install the chatbot application can be done in an easy way.

Content
Contains a content that refers to the information and structure presented. Such as images, multimedia, text and documents.

Likert Scale
Likert scale is used to measure the attitudes, opinions, and perceptions of a person or group of people about social phenomena [12].

Category	Scale
Strongly Disagree	1,0
Disagree	2,0
Neutral	3,0
Agree	4,0
Strongly Disagree	5,0

Table 2. Likert Scale

RESULT AND DISCUSSION

Softtware Development Results for the Chatbot System

Chatbot Program Development is done by adding chatbot software that has been created in the e-learning application menu used. The application is converted to mobile media and then customized by adding chatbot software to the mobile learning application. Chatbot access is done in the form of apk files that can be downloaded by students. The specifications of the mobile learning application and chatbot used in this study:

Chatbot application is developed through basic dialogflow so that it can be integrated in mobile-based moodle applications through client access tokens and developer access tokens.

The mobile learning application has an integrated chatbot so the addition of the dataset will automatically update automatically on the chatbot menu located on the mobile learning application

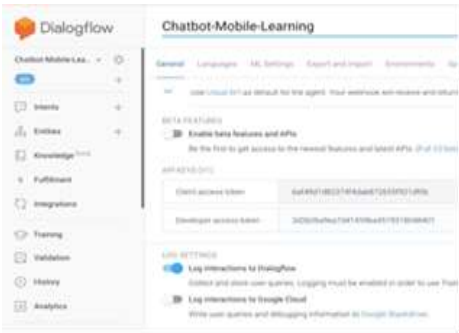

Figure 1. Dialogflow

The following is the display result of the chatbot menu integration in the mobile learning application:

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Figure 2. Chatbot menu on Mobile Learning Application

Figure 2 shows the chatbot menu appearing at the bottom of the lecture topic in the mobile learning application.

The following is the display result of adding chatbot to the mobile learning application:

Figure 3 . Chatbot Application

The chatbot application is accessed via a Moodle type mobile learning application which can be downloaded in the form of an apk file on an android-based smartphone.

Figure 4. Using Chatbot

Based on the results of the use of the application, Chatbot used can have a response from questions asked by users about things about lecture material. Each question that can be responded to by chatbot (dataset), previously inputted by the admin and lecturer based on the needs of the courses needed in the backflow dialog section.

Figure 5. Dataset Entry

Figure 6. Login Application of Mobile Moodle

Before accessing chatbot, users can login to the mobile-based moodle application.

Evaluation of User Acceptance of Application of Chatbot Application

Evaluation procedures for accepting applications by users are carried out in the form of evaluation stages with 2 types of methods, namely evaluation methods in terms of the user interface and evaluation methods in terms of user experience. The object of the study was obtained through

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the results of the distribution of questionnaires after respondents made use of the chatbot application that was applied to the mobile learning application.

The chatbot application process on i-Learning was also assessed by respondents and conducted. The distribution of questionnaires was carried out directly and randomly by 26 respondents where the results of the questionnaire distribution were further processed for analysis. Data processing results of the questionnaire to conduct data evaluation testing is used using the IBM SPSS Statistics 6 application.

The following are the results of the calculation of the validity test questionnaire evaluating the use of the Chatbot Application by the User :

Correlations

		Q1	Q2	Usability Evaluation by User
Q 1	Pearson Correlation	1	,310	,803**
	Sig. (2-tailed)		,123	,000
	N	26	26	26
Q 2	Pearson Correlation	,310	1	,816**
	Sig. (2-tailed)	,123		,000
	N	26	26	26
Usability Evaluation by User	Pearson Correlation	,803**	,816**	1
	Sig. (2-tailed)	,000	,000	
	N	26	26	26

**. Correlation is significant at the 0.01 level (2-tailed).

Table 3. Validity Testing

The validity of testing each questionnaire question is indicated by the evaluation column of application usage by the user. Based on r table, the minimum Pearson Correlation value is 0.4785 because it uses 26 respondents (N) with a limit of 0.01. You can see all Pearson correlations for each item above 0.4785

With results like this it is certain that this questionnaire is valid.The next step is to see the results of the calculation of the validity of the evaluation questionnaire using Chatbot Software by the User

Correlations

		Q3	Q4	Q5	Q6	Usability Software Evaluation
Q3	Pearson Correlation	1	-,083	,192	,192	,390*
	Sig. (2-tailed)		,686	,346	,346	,049
	N	26	26	26	26	26

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Correlations						
Q4	Pearson Correlation	-,083	1	,192	,192	,390*
	Sig. (2-tailed)	,686		,346	,346	,049
	N	26	26	26	26	26
Q5	Pearson Correlation	,192	,192	1	1,000**	,948**
	Sig. (2-tailed)	,346	,346		,000	,000
	N	26	26	26	26	26
Q6	Pearson Correlation	,192	,192	1,000**	1	,948**
	Sig. (2-tailed)	,346	,346	,000		,000
	N	26	26	26	26	26
Usability Software Evaluation	Pearson Correlation	,390*	,390*	,948**	,948**	1
	Sig. (2-tailed)	,049	,049	,000	,000	
	N	26	26	26	26	26
*. Correlation is significant at the 0.05 level (2-tailed).						
**. Correlation is significant at the 0.01 level (2-tailed).						

Table 4. 2nd Validity Testing

The validity of testing each questionnaire question is indicated by the evaluation column of application usage by the user. Based on r table, the minimum Pearson Correlation value is 0.3172 because it uses 26 respondents (N) with a limit of 0.05 and the Pearson Correlation Minimum value is 0.4785 with a limit of 0.01. You can see all Pearson correlations for each item above 0.4785 and 0.3172. With results like this it is certain that this questionnaire is valid.

The following are the results of the calculation of the reliability test of the questionnaire evaluating the use of the Chatbot Application by the User

Reliability Statistics	
Cronbach's Alpha	N of Items
,473	2

Table 5. 1st Reliability Testing of Using Chatbot

Item-Total Statistics				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q1	4,6538	,235	,310	.

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Q2	4,3077	,222	,310	.

Table 6. 1st Chatbot UsabilityStatistic

It can be judged that the Reliability value on the user use chatbot application testing questionnaire has a moderate degree of Reliability because it has a score of 0.473. The next step is to see the results of the reliability test calculation of the Chatbot Software usability evaluation questionnaire by the User.
The following are the results of the questionnaire reliability test calculation

Reliability Statistics	
Cronbach's Alpha	N of Items
,687	4

Table 7. 2nd Reliability Testing of Using Chatbot

Item-Total Statistics				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q3	13,4615	1,058	,154	,767
Q4	13,4615	1,058	,154	,767
Q5	12,8462	,455	,852	,284
Q6	12,8462	,455	,852	,284

Table 8. 2nd Chatbot Usability Test Statistics

It can be assessed that the value of Reliability on the questionnaire testing the use of chatbot applications by users has a high degree of Reliability because it has a score of 0.687

The following are research data using a Likert scale:

Age	Gender	Q1	Q2	Q3	Q4	Q5	Q6
19th	Woman	4	4	4	4	4	4
19 th	Woman	4	5	4	4	5	5
19 th	Woman	4	4	4	4	4	4
19 th	Woman	4	5	4	4	5	5
19 th	Woman	5	5	4	4	5	5
19 th	Man	4	4	4	4	4	4
19 th	Woman	4	5	4	4	5	5
19 th	Man	4	4	4	4	4	4
19 th	Woman	4	5	5	4	5	5
19 th	Woman	4	5	5	4	5	5
19 th	Man	4	5	4	5	5	5
19 th	Man	4	4	4	4	4	4
19 th	Woman	5	5	4	4	5	5
19 th	Woman	4	5	4	4	5	5
19 th	Woman	4	4	4	4	4	4
19 th	Man	5	5	4	4	5	5

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Age	Gender	Q1	Q2	Q3	Q4	Q5	Q6
19 th	Man	4	4	4	4	5	5
20 th	Man	5	4	4	4	4	4
20 th	Woman	5	5	4	4	5	5
19 th	Man	5	5	4	5	5	5
19 th	Man	4	5	4	4	5	5
19 th	Man	5	5	4	4	5	5
19 th	Woman	4	5	4	4	5	5
21 th	Man	4	5	4	4	5	5
21 th	Woman	4	4	4	4	4	4
19 th	Man	5	5	4	4	5	5

Table 9 . Likert Scale Research Questionnaire Data

Information of Table :
Q1 = Question 1, Q2 = Question 2, Q3 = Question 3 Q4 = Question 4, Q5 = Question 5, Q6 = Question 6

Age of Respondent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	19 th	22	84,6	84,6	84,6
	20 th	2	7,7	7,7	92,3
	21 th	2	7,7	7,7	100,0
	Amount	26	100,0	100,0	

Table 10. Percentage Of Respondent Data Based On Age

The Following are the results of the Likert scale percentage for question 1

1st Question

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4,0	18	69,2	69,2	69,2
	5,00	8	30,8	30,8	100,0
	Amount	26	100,0	100,0	

Table 11. Likert Scale Percentage Of 1st Question

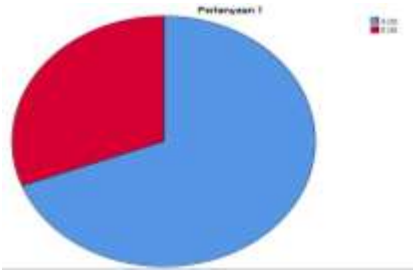

Figure 7 . Pie Chart of 1st Question

On 1st question, it can be concluded as many as 30.8% strongly agree and 69.2% agree that the chatbot application can provide important information in online lectures using the E- learning application

2nd Question

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4,00	9	34,6	34,6	34,6
	5,00	17	65,4	65,4	100,0
	Amount	26	100,0	100,0	

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Table12. Likert Scale Percentage of 2nd Question

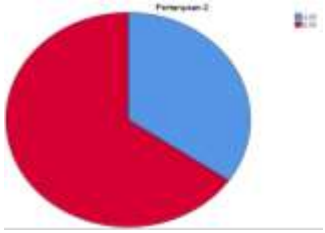

Figure 8. .Pie Chart of 2nd Question

On 2nd Question it can be concluded as many as 34.6% agree and 65.4% strongly agree that the chatbot application can provide ease of understanding information for users on the mobile learning application.

3rd Question					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4,00	24	92,3	92,3	92,3
	5,00	2	7,7	7,7	100,0
	Amount	26	100,0	100,0	

Table 13. Likert Scale Percentage of 3rd

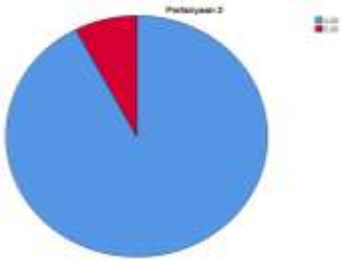

Figure 8. Pie Chart of 3rd Question

In 3rd, Question it can be concluded as many as 7.7% strongly agree and 92.3% agree that the chatbot application has no constraints to be accessed for its use

4th Question					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4,00	24	92,3	92,3	92,3
	5,00	2	7,7	7,7	100,0
	Amount	26	100,0	100,0	

Table 14. Likert Scale Percentage of 4th

Question

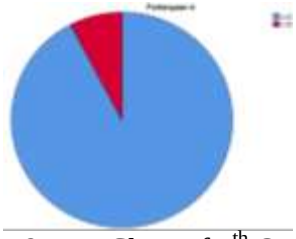

Figure 9. Pie Chart of 4th Question

On 4th Question it can be concluded as many as 92.3% agree and 7.7% strongly agree that the chatbot application used is easy to recognize when starting to access on a mobile learning application.

5th Question					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4,00	8	30,8	30,8	30,8
	5,00	18	69,2	69,2	100,0
	Amount	26	100,0	100,0	

Table 15. Likert Scale Percentage Of 5th Question

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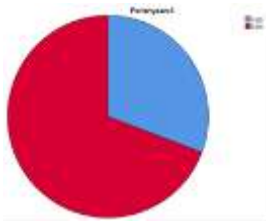

Figure 10. Pie Chart of 5th Question

On 5th question it can be concluded as many as 30.8% agree and 69.2% strongly agree that the Chatbot Application Menu can improve the quality of communication services in learning application.

6th Question

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4,00	8	30,8	30,8	30,8
	5,00	18	69,2	69,2	100,0
	Amount	26	100,0	100,0	

Table 16. Likert Scale Percentage of 6th

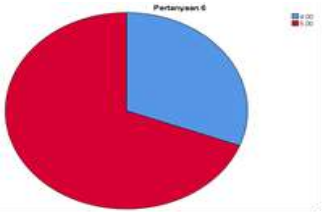

Figure 11. Pie Chart of 6th Question

On 6th Question it can be concluded as many as 30.8% agree and 69.2% strongly agree that the Chatbot application can be suggested for use in the long term for the foreseeable future.

The results of the software development show that users can use e-learning applications to become mobile learning applications and have a chatbot menu as a feature to provide more communicative services in the learning process.

Based on the design of the application menu structure developed, the results of software development show compatibility with software development methods and flowchat from chatbot development that has been previously designed. With the implementation of chatbot on mobile learning applications, users can easily access learning applications more efficiently.

Access to mobile learning applications also does not have obstacles in the installation and also there are no unwanted errors so that the response responses entered from the dataset in the dialog flow are in accordance with the keyword questions that have been inputted by the user through the chatbot menu on the mobile learning application.

Based on the usability of the use of chatbot applications on mobile learning applications it can be seen that respondents agree that the chatbot application has a standard that is in accordance with the Heuristic Evaluation Method in terms of the user interface from several assessment points namely [5].

Visibility of System Status
Chatbot which is applied to mobile learning applications can provide information that is in accordance with the input provided by the user.

Match between system and the real world
Chatbot that is applied does not make it difficult for users to understand one of them in terms of the form of response when users use chatbot

Error Prevention
Chatbot has no errors when the user uses it.

Aesthetic and Minimalist Design
The chatbot display adapts to the theme of the mobile learning application so that it doesn't confuse the user in using it.

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Consistency and Standard
Chatbot application used can be easily recognized by the user and in accordance with the main function as an interactive service for students in using mobile learning applications.

Based on the usability (user experience) of using the chatbot application on a mobile learning application it can be seen that respondents agree that the chatbot application has a standard that is in accordance with the Heuristic Evaluation Method in terms of user experience from several assessment points namely:

Usability
Chatbot application features have components that are easy to use by users because the chatbot application remains integrated in the mobile learning application and does not have a separate application

Functionality
Installing the mobile learning application is easy to do because it can be accessed through the campus academic website in the form of an apk file and there is no need for more configuration.

CONCLUSION

Based on the results of the research that has been done, several conclusions can be drawn, The results of the study indicate that the application of the Chatbot Menu on the Mobile Learning Application used can be a learning service application solution to be more interactive and communicative for students. The development of chatbot software in this study on mobile learning applications that have been done can be customized according to the needs of the campus, especially in terms of the dataset of questions in each topic of lecture material. Based on the evaluation results by the user of the chatbot application that has been developed in this study it can be concluded that the user has no problems in using the chatbot menu. Research results from processing questionnaire data based on statistical tests show that Users do agree that the Application of Chatbot on Mobile Learning Applications can be applied by the campus in the long term to support learning application services

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