Date of publication MAR-30, 2022, date of current version AUG-22, 2021.
www.computingonline.net / computing@computingonline.net

Print ISSN 1727-6209
Online ISSN 2312-5381
DOI 10.47839/ijc.21.1.2516

Implementation of Chatbot in Online Classes using Google Classroom

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ABSTRACT Chatbot can be utilized as an interactive learning media for students. It can be implemented using modular system by dividing the courses into several modular based on the course contents. The proposed program contributes positively to the integration of object-oriented programming into Google classroom by broadening the service without being limited by space, time and number of students, and also helps in increasing students' interest in learning. The proposed model was meant to establish interactive conversation to understand the concept of Oracle Academy Java Foundation material based on students' level of understanding when organizing exercise items. The program was applied in three different classes and found to have increased the final exam results with an average difference of 0.60 points from the scale of maximum 10 points from the conventional learning group. The value of post-test was also observed to have increased by 0.39 points from the given pre-test. In general, implementation of chatbot could improve the quality of learning.

KEYWORDS Google Classroom; Chatbot; Java programming language; object-oriented programming; organising exercise items.

I. INTRODUCTION

THERE is a great potential of education chatbot for complementing teachers. For instance, students who need help with some problems that they have when they miss a class can be assisted by chatbot for education which provides 24/7 service [1-3]. Nowadays, conventional face-to-face learning in classrooms is being supported by online class or virtual learning media. This allows teachers and students to share materials, provide announcements, instructions, and feedback, as well as engage the students in assessments through tasks and quizzes without time and space constraints [4]. In one of public vocational high schools in Indonesia, SMK Telkom Malang, online classes with the use of Google Classroom platform is implemented, especially in object-oriented programming course (OOP). This platform has features that allow teachers to form a collaborative team teaching and give access to students to talk with the teachers privately. There should be a program which allows teachers to individually respond to information or questions personally sent by students [5]. Google Classroom recently added a new feature which allows teachers and students to perform classroom activities, such as communicating with one and another, viewing presentation or videos, interacting with other participants, and utilizing resources in group projects. This new feature is called virtual classroom [6]. In addition, Google Classroom accommodates learning activities that compliment both the teachers' teaching approaches and methods and the students' perception, comprehension, and engagement in different teaching objectives [7].

The shortcoming of Google Classroom is that it cannot assist students who need to consult their problems during the learning process. For this reason, a chatbot is proposed to assist teachers to answer student questions. Most of the students have similar learning problems, such as having difficulty in understanding the course material. The chatbot is supported with information database that can be accessed to answer students' questions. This method is implemented so that students can ask their questions any time.

Cloud-based chat platforms like Facebook Messenger have been rapidly developed with the help of bots or chatbots equipped with artificial intelligence (AI) and expert system models that process natural language or natural language processing (NLP) [8-10]. Chatbot can be integrated with interactive course material and quiz as a learning media for students [11, 12]. This can be achieved by using modular system by dividing the courses into several blocks based on its contents. The implementation of question answering system with NLP and reasoning is done by performing quizzes via chatbot [13-16]. In addition, the system is only answer- questions related to a particular field based on structured information sources, such as databases that are used to answer various types of questions by exploring unstructured text collections [17].

The rapid implementation of cloud-based framework platforms for chatbot is due to its simplicity, in which it does not require any code or combination with certain programming language. Chatfuel, a chatbot builder framework, has been used by several world-class companies because Chatfuel-built chatbot only takes a short time in answering queries from many users at once. There are various plugins for this program with JSON API being the most useful to get users' input for building database and data analysis. In addition, it has built-in capabilities, such as introducing a welcome note, asking for user profile details, and having useful menus that can help in user's navigation, such as broadcast features and analysis modules. By building chatbot via Chatfuel, administrator allows setting up custom AI algorithms on the IF-THEN logic block rule and integrating bots with a number of third-party services such as Google Custom Search API and Google Map API, or Yahoo Map API and Bing Search API [18, 19].

Organizing exercise items (OEI) algorithm is used to develop chatbot for presenting quiz in Java programming language. This algorithm has been previously applied in web-based learning evaluation application for calculus course in Digital Telecommunication Networking Study Program of State Polytechnic of Malang. The presentation of quizzes is divided into three block level; easy (Level 1), medium (Level 2) and difficult (Level 3). Each item of the quiz is chosen according to students' understanding level as observed from the pre-test score in each section [20].

II. LITERATURE REVIEW

AI-based chatbot on Facebook Messenger uses several cloud platform service tools such as Microsoft Azure and BoT Framework with Chatfuel integration and Language Understanding Intelligent Service (LUIS). It is developed based on the combination of Chatfuel and MS LUIS Azure, merged by API.ai, a chatbot builder, to translate human language into appropriate keywords and verbs. The keywords are then sent to Microsoft Azure Cloud for finding the related answers. Next, Azure calls API to provide answers in the form of text or image. An example of bot implementation in business sector can be seen in PseudoBank, an online-based bank that uses free development tool. It offers several common bank information like types of available loans, saving options, new bank account set up, current currency rate, etc. On the other hand, it can also send broadcast messages to its users via the administrative web interface, Chatfuel [21].

Chatfuel is a component in creating chatbots that focuses on versatility and automation. Drag and drop interface is the common method to create a chatbot. Chatfuel bot creates a block of content that will appear in Messenger. Users can create chatbot block by block according to their needs. Chatfuel chatbot contains cards which have plugins that direct users to the next flow and export user data [22]. This way, users can create bots easier and faster. Additionally, users can access all advanced features in Chatfuel to create bots for up to 50 users free of charge and no credit card required. However, to access all advanced features and expand user allowance, the service charges $15 per month [23]. Other than Chatfuel, KARAKURI is another chatbot building service equipped with AI. There are several services on KARAKURI, such as Chatbot and Smart FAQ managed with Chatbot.. KARAKURI uses a special deep learning algorithm developed by the Artificial Intelligence Research Team at the University of Tokyo. Furthermore, users can negotiate with KARAKURI to find the best calculation of cost to be incurred [24].

Developers, Facebook Messenger apps, and business sector are now collaborating to build new environments due to the invention of chatbot [22, 23]. The same program can be developed for several purposes, such as shopping, customer service, food orders, news updates, reservations, and more. However, most of the cloud platforms have different features and functions, meaning that there are several efficient and interactive chatbots that have been developed [24].

This paper implements chatbots to deepen students' understanding on certain subjects. The proposed tools should suit the needs of the students. A survey which considers the effective features of the previous software was conducted to identify learner's difficulties and the type of assistance needed when interacting with the OOP support tool [25]. It was found that certain features also serve as an e-assessment that let users know their level of capability. Beginners can monitor their progress and take proper action. Therefore, students will be encouraged to be more involved and motivated to learn at their own pace.

One of the many methods to evaluate test results is OEI method. In [20], the author proposed OEI method implemented in web-based mathematical exercises designed to facilitate students learn mathematics based on their competence levels, which are divided into three levels, Low (Level 1), Medium (Level 2), and High (Level 3). Figure 1 shows that the exercise items are designed in blocks starting from the easiest to the most difficult. When students answer incorrectly, the computer will report it as incorrect and give the student another chance to submit the correct answer. Evaluations are mapped out to observe student activities by tracking their practice frequency and records including completed exercise items, timing of practice, and undisclosed scores.

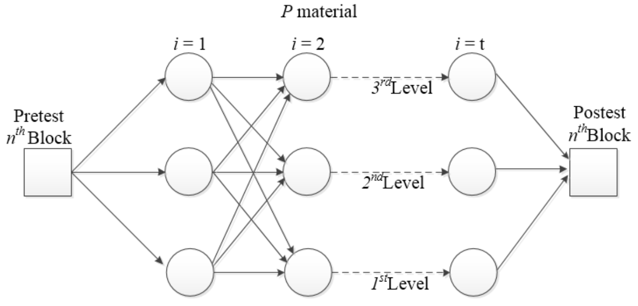

Figure 1. Flow diagram of the purposed method [20].

The implementation of online learning media has been developed to support the conventional teaching method. One of the popular free platforms to accommodate online class is Google Classroom [6]. Its features, simplicity, and potential used as the platform for teaching have made teachers interested in using this platform instead of other platforms.

III. METHODS

The chatbot is implemented to assist students learn Java programming language. Students can access the chatbot using their Facebook Messenger account. Figure 2 shows the process diagram of chatbot building for Facebook Messenger users.

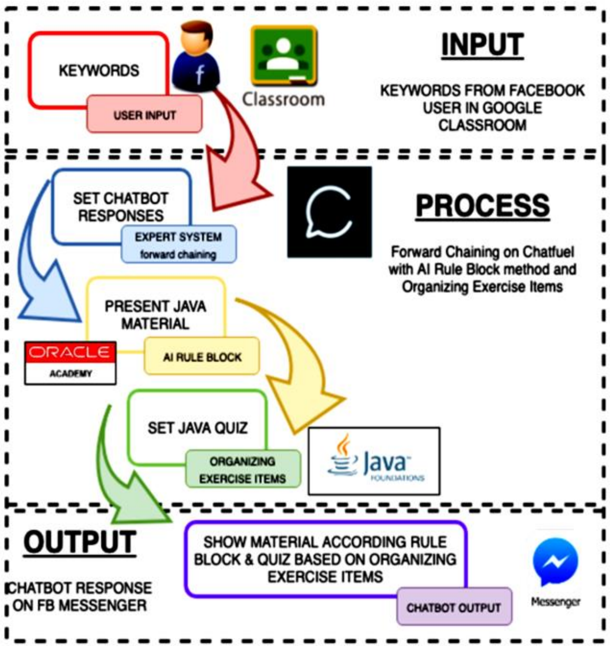

Figure 2. Chatbot building process [25].

The chatbot on Facebook Messenger is integrated in Google Classroom on OOP subjects for second grade students of Software Engineering study program. Students can log in to the classroom with their personal school email account. On the chatbot builder, Chatfuel, the previous administrator has determined the response through the Forward Chaining technique using AI Rule Block method and OEI. AI Rule Block is applied according to NLP and expert system while OEI is used in determining the order of questions in the quiz. During the planning stage, materials and questions included in the knowledge base are identified. The appropriate method of question orders based on user's competence level are then chosen and sorted. In the analysis stage, all the needs associated with the building and development of the chatbot are fulfilled in order to be accepted by the users.

A. DESIGN

The design stage formulates the content and display of the chatbot in the chatbot builder. The aim is to develop an interesting and exciting chatting interaction. To attract users, chat appearance is adjusted to vocational high school students' preferences. The design should be in accord with the initial planning. In addition, the integration of OEI method in chatbot builder features should be in accordance with the process and implementation of Chatfuel. The chatbot is then connected to Facebook Messenger and it is set to interact with students.

1. Pre-test: Eight questions are given during pre-test. The following blocks are created on pre-test group:
   a. Eight pre-test questions.
   b. Correct answer status
   c. Wrong answer status
   d. Score aggregator
   e. Next level question controller
   f. Score bank
   g. Final position of questions
2. Quizzes: Quizzes were given three times; each consists of five questions in three different levels. The following blocks were required in quiz sections:
   a. 5 questions in level 1
   b. 5 questions in level 2
   c. 5 questions in level 3
   d. Correct answer status
   e. Wrong answer status
   f. Score aggregator level 1
   g. Score aggregator level 2
   h. Score aggregator level 3
   i. Next question controller level 1
   j. Next question controller level 2
   k. Next question controller level 3
   l. Score bank level 1
   m. Score bank level 2
   n. Score bank level 3
   o. Final position of questions level 1
   p. Final position of questions level 2
   q. Final position of questions level 3

B. TESTING

The last step of chatbot development was done to evaluate the design result before the final version is implemented. Verification, validation, and software effectiveness using ISO/IEC 25010 standard was done to test the proposed chatbot program.

1. *Verification:* This test is intended to determine whether the program has correctly interpreted user input or not. Whitebox testing and blackbox testing are activities for verification that refer to a set of tasks to ensure that the software correctly implements the specified function.
2. *Validation:* This test is intended to evaluate the suitability of system functions, whether or not bot functions in this system can be fulfilled by providing input and analysing outputs or whether the responses given are as desired. In the validation test, the response results given by bots are compared with responses given by users based on statements or answers related to words or phrases given by users. Collecting questionnaire data from the users refers to a different set of tasks by ensuring the software can be tracked based on what the user expects.
3. *Standard ISO/IEC 25010 (software product quality):* This is the latest ISO model based on international consensus. In this ISO software product quality model, there are eight categories of characteristics; functional suitability, performance efficiency, usability, compatibility, reliability, security, maintenance, and portability. Each characteristic consists of a set of related sub-characteristics.

IV. IMPLEMENTATION

Chatbot implementation is done in three steps; problem analysis, system planning, and system design.

A. PROBLEM ANALYSIS

Online classes supported by chatbot as a virtual media assistant in learning OOP concepts of Java programming language can help deepen the students' understanding on Java desktop application development. The supporting materials included in online classes were obtained from the Oracle Academy Java Foundation, such as Java Software Development, software development process, understanding of program code flow, and the concept of OOP [26].

OEI method has been previously used in learning mathematics through web application online class for first year students of Telecommunication Digital Network of State Polytechnic of Malang. The method can be applied and developed on the chatbot knowledge base block via Chatfuel with IF-THEN rule to determine which questions are displayed to students according to each student's comprehension score. Thus, students are given the questions based on their level of understanding. There are four main items in building a chatbot for quiz on Chatfuel, namely:

a. Questions: problems to be solved by the students.
b. Section: title of the material.
c. Level: difficulty level of the problem.
d. Score: value obtained to determine the level of next questions.

B. SYSTEM PLANNING

At this stage, chatbot specification planning stages are stated as follows:

a. Knowledge base
   1. Sub-knowledge base on academic information
   2. Sub-knowledge base on basic material of Java programming and OOP concept and tutorial on providing PDF material on Java Software Development.
   3. Knowledge base serving as sources of information to be used as a response or output to users when the keyword is inputted. This is obtained from ilearning.oracle.com and included in the Chatfuel block according to the Java Foundation group section.
b. Sub-system model; make use of the OEI method, namely: the name of the bot; group block; set up AI; exercise; section; levels; and score.
c. Sub-system end user interface (UI) involves the visualization of chatbot in order to ensure ease in using the interface.

C. SYSTEM DESIGN

C.1 UI CHATBOT

The design of expressions in the form of images and text is formed through the card in the chatbot reply block when interacting with users, both during chat or in appreciation of quiz answers. The answer data are obtained from the user's attribute that stores the contents of the user and is used for the reply condition that will be given by the chatbot to the user.

In Figure 3, it appears that the input data from the user's answers will be checked if it is correct, then a Text/Image containing congratulatory sentences will be presented. If it is incorrect, then what is displayed is a reply in the form of appreciation and expression indicating errors.

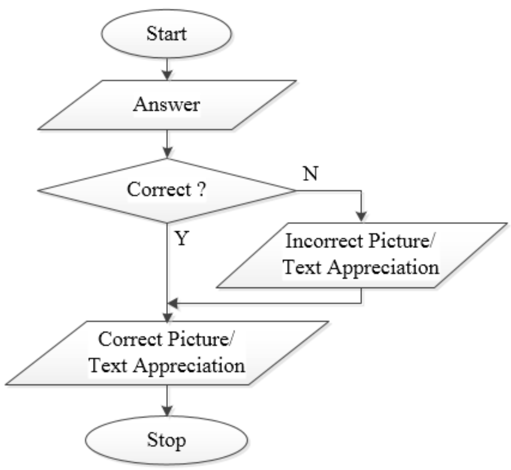

Figure 3. Flowchart of bot expression (appreciation)

C.2 SEQUENCE DIAGRAM DESIGN

At the beginning of making chatbot, admin visited the Chatfuel home page. Authentication or login is required before entering and setting up chatbots on Chatfuel. After Admin was authenticated and since the admin had created a chatbot before, in this case named Bombi, then Admin could immediately choose the corresponding chatbot and connect it to the Facebook Messenger Channel. After that the admin set "Automate" in chatbot which is a number of response blocks, and "Set Up AI" to set the key words to be installed in several blocks. Figure 4 shows the testing step on Facebook Messenger.

Figure 5 shows the user testing sequence diagram. The user initiates the interaction with chatbot by logging in to Facebook. In this stage, error message is shown if there is a mistake in inputting the account and password combination or the user is not registered yet. After the user can log in successfully, the user can start giving text input to Messenger, namely Bombi chatbot, which is already available when opening a URL link in Google Classroom or directly typing the URL address of the chatbot in the browser. After providing input, the user gets a response from the chatbot in accordance with the previously set keywords in the AI rule step in Chatfuel.

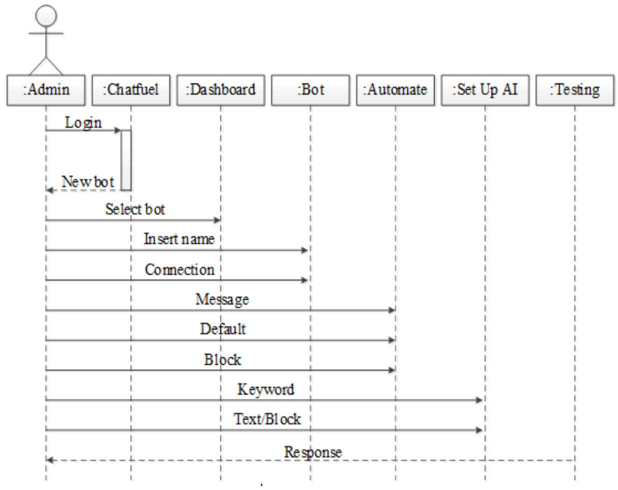

Figure 4. Diagram of chatbot building sequence on Chatfuel

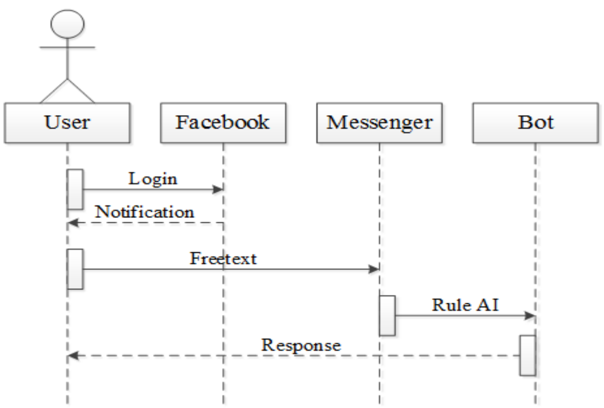

Figure 5. Sequence diagram of user interaction with Chatbot

V. RESULTS AND DISCUSSION

A. SOFTWARE REQUIREMENTS ANALYSIS

Building a chatbot requires specified supporting applications that are adaptable to technological developments. Facebook is one of these applications because it has as an option for chatbot platform through its messaging application, named Messenger, and the recent inclusion of a separate URL. It is also effective because it is already widely used among students. Chatfuel is also the right option for bot builder because it works without encodings. This makes it easier and faster for developer to develop and implement an interaction when a chatbot is connected to the chat application. It has several block features that support IF-THEN program logic for implementing OEI method.

B. SOFTWARE MODELLING ANALYSIS

The design was coded and built through the integration of Chatfuel and Facebook Messenger application [27]. This resulted in a chatbot that was ready to be tested and used through the use of appropriate hardware and software according to the requirement specifications.

Chatfuel provides an empty bot or a template type and integrates them into Facebook Messenger on the Facebook Page. Once connected, Chatfuel allows the Set up AI, Group and addition of Rule in its bot settings. The conversation scenario was added by the developer, i.e., keyword and bot reply i.e., response which can be either a text or a block that has been made before. The process of determining the response can be put up for trial on Facebook Messenger.

C. TESTING AND RESULTS

To find out the quality of this program, several tests were carried out that represented the results of the analysis of the chatbot design requirements and its implementation of scenarios on learning. There were two types of testing process, verification and validation, including whitebox and blackbox testing, which is an activity for verification that refers to a set of tasks that ensures that the software correctly implements the specified function. The verification obtains user responses by using a questionnaire, which is an activity to validate a set of tasks by ensuring that the software is tracked based on what the user expect. Verification and validation activities can be carried out through a number of stages, namely:

1. Unit testing
   Checking software development through chatbot flowchart on Chatfuel.
2. Integration testing
   Blackbox testing is implemented in this stage.
3. Validation testing
   Checking whether the conditions from user questionnaires are validated against chatbot.
4. Unit testing
   Whitebox testing is done based on flow graph, shown in Figure 7 that refers to chatbot flowchart in Figure 6. Flow graph is an explanation of program flow that contains

circles as nodes and arrows that describe the stages of program flow. The number of processes contained in the node can have one or more processes, i.e., the numbers in the node. The numbers in the nodes in flow graph indicate the stage number in the flowchart, and the edge of the flow graph illustrates the possible flow stages. There are 17 nodes, which are explained in Table 1 and 25 edges.

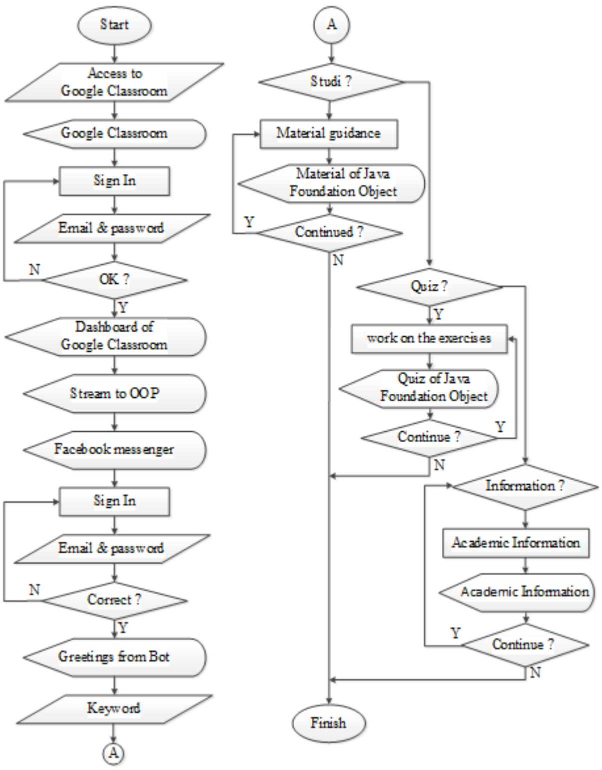

Figure 6. Flowchart of Chatbot operation procedures

Based on whitebox testing result, application could work properly as the proposed design.

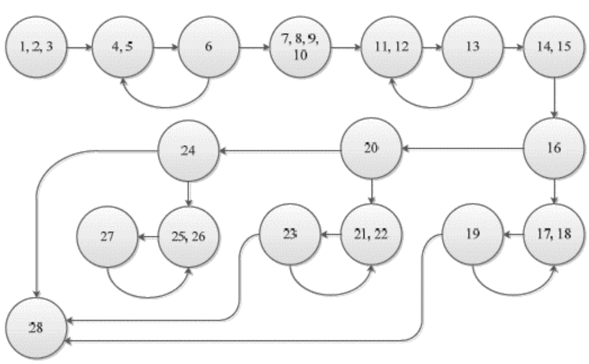

Figure 7. Chatbot flow graph

Table 1. Node explanation

No	Process
1	Start
2	User accesses Google Classroom
3	Classroom page loaded
4	User sign-in
5	User inputs email and password
6	Is email and password combination correct?
7	If email and password are correct, user is redirected to dashboard
8	User chooses OOP course in Classroom
9	Facebook Messenger page loaded
10	User sign-in
11	User input email and password
12	Is email and password combination correct?
13	If correct, user starts interaction with chatbot
14	Chatbot greeting loaded
15	User inputs keywords
16	Are keywords contain ‘study’?
17	If keywords contain ‘study’, then Java learning materials loaded
18	Chatbot presents Java learning material responses
19	Do keywords contain ‘learning Java’?
20	Does user input keyword ‘quiz’?
21	Quiz is presented
22	Questions are given using OEI method
23	Does user input keyword ‘quiz’ again?
24	Does user input keyword ‘information’?
25	Process of chatbot presenting Java application learning material
26	Information on Java application learning material are given
27	Does user input keyword ‘information’ again?
28	Finish

5. Integration testing
Blackbox testing is a series of integration testing to determine the response of the program when tested and compared with the design. Test results show that all actions were done correctly, and thus it can be concluded that all functions can run well according to the design.

6. Validation testing
This test aims to get the validation of media and material experts and software engineering experts related to the level of eligibility of the chatbot as a learning media. Table 2 shows the test results from 20 experts. Five is the highest score and one is the lowest. The percentage is obtained by calculating the score divided by the highest score multiplied by 100%. The percentage obtained is 85.5%, which means it is ‘very eligible’ to be used as a learning medium.

Table 2. Media expert test results

No	Statement	Assessment level					
		5	4	3	2	1	%
1	Facebook is the proper chatbot channel	5	6	4	5	-	71
2	Font size is proper so that the letters can be read clearly	10	9	-	1	-	88
3	Line spacing is appropriate	7	11	2	-	-	85
4	Text colour is appropriate	8	11	1	-	-	87
5	The background colour is appropriate	10	9	1	-	-	89
6	The background design is appropriate	10	7	3	-	-	87
7	The combination of text and background is appropriate	10	7	3	-	-	87
8	Image placement position is appropriate	6	12	2	-	-	84
9	The image size is appropriate	6	12	2	-	-	84
10	The picture is clear	8	12		-	-	88
11	Colour selection for the button is appropriate	9	9	2	-	-	87
12	The size of the button is appropriate	9	11	-	-	-	89
Average							85.5

Table 3. Material expert testing

No	Statement	Assessment level					
		5	4	3	2	1	%
1	Presents basic explanations and rules of Java programming	21	12	-	-	-	92
2	Provides an explanation of the OOP concept of inheritance	23	9	1	-	-	93
3	Provides OOP concept about polymorphism	20	11	2	-	-	91
4	Presents an explanation of the OOP concept about encapsulation	21	10	2	-	-	92
5	Presents an explanation of the OOP concept about abstraction	20	11	2	-	-	91
6	Provides Java software development course material	24	8	1	-	-	94
7	Provides Java Software Development – Course Material Development Process	22	10	1	-	-	93
8	Provides Java Software Development – Course Material Program Running Process	23	8	2	-	-	93
9	Provides Java Software Development – Introduction to Object Oriented Programming Concept course material	22	10	1	-	-	93
Average							92.4

Material expert testing involved 33 respondents to test chatbot as learning media. Table 3 presents the results of the expert material test with the lowest value = 1 and the highest value = 5, where the lowest total value = 4 and the highest total value = 20. Thus, the average percentage is 92.4%, which means the program is 'very eligible' to be used as a learning medium.

Software engineering expert testing involving 28 respondents show results as illustrated in Table 8. Table 4 shows that the percentage obtained by the proposed chatbot is 96%, which means that the proposed program is very eligible to be implemented in supporting learning process.

Table 4. Software engineering expert testing

No	Action	Desired output	Achieve-ment
1	Navigation	Chatbot menu is well delivered	100%
2	Login	Users can log in by following the rules and directions	100%
3	Logout	Users can log out and leave the page	92.9%
4	Input	Conversation Users can type conversation input according to their function	100%
5	View course material	Users can read the programming material presented by chatbot	96.4%
6	Start quiz	Users can start Java foundation quiz, starting from pre-test	100%
7	Save conversation	Chatbot can save conversation input from users	96.4%
8	Save consultation history	Chatbot can issue input from user	82.1%
9	Greetings and closing statements	Chatbot can give users greetings and opening greetings at the beginning and closing of a conversation	96.4%
Average			96%

7. System testing

The chatbot test on the delivery of academic information and OOP programming course, especially on Java Foundation topic obtained results which were used to formulate the efficiency level analysis. There were six types of testing carried out in this phase.

1. *Functionality Suitability:* It was carried out to determine the feasibility of the chatbot system. Measurement results of eligibility level were collected from questionnaires. The results show that:
   a. The media feasibility of chatbot is very good with it being installed on Facebook Messenger as the media which is easily operated by users, especially students.
   b. The application feasibility of the chatbot can be seen from the highly rated user responses, that is, from the ease of obtaining information and quizzes since the chatbot is assisted with the navigation button as a response input option.
   c. The material eligibility that is presented by chatbot is also very relevant to the OOP course. There are varieties of material that can be obtained by users, especially students, including the basics of Java programming, OOP concepts, and all sections of the Java Foundation. Students are greatly helped in accessing material easily via chatbot rather than Oracle Academy website.
2. *Performance efficiency:* Efficiency testing was carried out to determine the response time needed in accessing the pages in the application. An average time of four seconds was needed to open several application pages

that were required in learning OOP, including chatbot. Based on the statistics on time load, it was shown that not more than 35% of users patiently waited for the application to load if the loading time is more than five seconds. This is because users will be bored and move to access other pages. However, some pages could be opened in under five seconds, and the chatbot was very responsive in answering user input questions. Therefore, it can be concluded that users could intensely access the application and have conversation with chatbot.

3. *Compatibility:* Compatibility refers to the extent to which the system can exchange information. From the results obtained, chatbot on Chatfuel was able to receive information from users and the system was able to send information requested by users. Furthermore, users were able to login with username and password input, type input conversations according to their functions, read programming material presented by chatbots, and start basic Java quizzes and the pre-test. While the system was able to display the Java foundation quiz, the chatbot successfully issued input from user, greeted users, and displayed greetings at the beginning and closing of a conversation.
4. *Usability:* It was carried out to determine the quality of chatbot conversation system in providing information and during delivering quizzes. The user interface was easily understood and used by students, as well as provided ease in understanding how to interact with the chatbot. Furthermore, the interface also allowed materials to be studied easily, both in terms of how to obtain information or course material, and the interaction operability with chatbot. Questionnaire results show that students could well interact with chatbot, which was evidently found from the high level of satisfaction on using chatbot as learning media. Even though the results of using quizzes employing OEI method were not too significant, chatbot could help teachers in distributing learning material to students, and students were enthusiastic when interacting with chatbots. Thus, students' interest in learning programming increased compared to the classical teaching model.
5. *Reliability:* Reliability testing was carried out to determine the reliability of chatbot in responding to several users at the same time. Chatfuel is equipped with an Analyse menu that provides information on users that are interacting with the chatbot. During testing, 873 users were asked to interact with chatbot and 97% of these users could be reached and responded to. The most sought after keywords was 'classroom', inputted from 127 users, followed by Java course material entries, with 'public' as the keyword with 97 input from users.
6. *Maintainability:* Maintainability testing was done to measure system maintenance, in this case, the creation and design of chatbot on Chatfuel. First, error handling testing with blackbox method happens when admin provides an additional block with the name ID. The second is testing display consistency on additional AI Rules which ensures that keywords and response replies are filled. The third is a test that measures the ease of repair if errors are found. During block arrangements, notification in coloured numbers will be shown clearly in Group Block
7. *Portability:* Portability testing measures the ability of the application to be run on multiple browsers. The test was done by running the application on five different browsers at the same time and using a browser tester, all of which were successfully carried out without errors. The result was obtained with good connection on WiFi or data connection network and using the latest version of browser tester. However, it is highly recommended to use Google Chrome which comes from the same developer with Google Classroom.

This research developed a system model which allows student-users to interact and discuss problems related to Oracle Academy Java Foundation using Organizational Excercise Items (OEI) based on Chatbot. Chatbots that implement the OEI algorithm can assist self-learning so that students who thrive through independent learning can readily learn with the appropriate resources.

VI. CONCLUSION AND SUGGESTIONS

Based on a series of tests and assessments conducted, it can be concluded that:

1. The design of Java learning chatbot in this OOP course can provide a good and fast conversational response for students, both at the initial presentation of the conversation to the Oracle Academy Java Foundation and during the Java Software Development topic quiz.
2. The application of knowledge blocks to present different levels of questions on chatbot can be built with Chatfuel as bot builder.
3. Chatbot channel platform can be installed on Facebook FanPage Messenger with the consideration that all students have an account and the assumption that the presentation of quiz items with OEI method matches the students' level of understanding. In other words, with the OEI method, teachers are helped because students can learn independently.
4. The analysis of chatbot achieved 100% accuracy in responding to the problem with OEI method.
5. From the analysis of ISO 25010 system testing, the chatbot has met the criteria of effectiveness in the following aspects; functionality suitability, usability, reliability, performance efficiency, maintainability, and portability, which all are the indicators of effectiveness in using chatbots in OOP learning. Thus, learning method that uses chatbot as a media to deliver course material and quizzes can help teachers in assisting students and provide interesting experiences for students in learning the materials.

It is suggested that further research uses a combination of keywords and more varied responses. The use of measuring values for each student answer and combining existing methods with several other methods to add synonyms of words and response answers with text and emotional icons on the database system is recommended in order to obtain better and interesting results. Chatbot implementation can be conducted on subjects other than OOP with content response data according to the material and using Chatfuel as bot builder.

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