Artificial Intelligence (AI) *Chatbot* as Language Learning Medium: An inquiry

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Abstract. In facing industry revolution 4.0, utilizing advanced information and computer technology in educational environment is crucial. One of the advanced computation technologies that can be used for learning, especially language learning, is *chatbot*. *Chatbot* is a computer program based on artificial intelligence that can carry out conversations through audio or text. This study intends to find out and analyze the types of artificial intelligence in the form of *chatbots* and the possibility of their use as language learning medium. The data in this study obtained from literature review on *chatbot* researches, and from observation results on *chatbot*-based language learning medium developed by the author. The results indicated that *chatbots* have a high potential to be used as a language learning medium, both as tutor in practicing language, and as independent learning medium. Moreover, research results revealed that language learners are interested in using *chatbots* because they can be used anytime and anywhere, and they are more confident in learning languages using *chatbots* than when dealing directly with human tutors.

1. Introduction

The industrial revolution 4.0 has an impact on the urgency of education field to be able to keep up with these developments, which later brought the term Education 4.0 [1, 2, 3]. In embodying Education 4.0, one of the most required ability from educators and educational practitioners is to be able to integrate modern technology in their teaching [3]. The rapid development of smart phone technology, social media, and artificial intelligence (AI), provide challenges for educational practitioners to utilize these technologies in developing advance learning media. In latest decades, artificial intelligence utilization to develop applications is massively conducted, and its products used in almost every aspects of our life. This type of communication which occurs through digital technology rather than in person is called computer-mediated communication (CMC) [4]. CMC forms including instant messaging, email, chat rooms, online forums, social networks, and *chatbot* or *chatterbot* [5, 6]. *Chatbot* is a computer program or artificial intelligence which carries out conversations through audio or text [7], and interact with users in a particular domain or topic by giving intelligent responses in natural language [8, 9]. *Chatbot* for general purposes and for educational purposes have been developed [4,10,11]. However, despite *chatbots*' unlimited possibility to enhance language teaching and learning, the concept of *chatbot* including its advantages as language learning medium is not yet widely known. Therefore, the purpose of this study is to analyze the types of artificial intelligence in the form of *chatbots* and the possibility of their use as language learning medium. This study also aims to observe a *chatbot* constructed as Japanese language learning medium developed by the author and team, and reports its' results as an inquiry to find out further about the possibility of *chatbot* to enhance language learning and teaching.

2. Method

This study is a descriptive method study. The data collection in this study conducted through literature reviews on previous researches about *chatbot* and its' use. Literature reviews performed to identify the type of *chatbots*, especially those developed for educational purposes including language learning, as well as to identify their advantages/disadvantages in language teaching and learning. This study also include a report on observation results on *chatbot*-based language learning medium developed by the author and team, namely *Gengobot*.

3. Findings and Discussion

The basic mechanism of *chatbot* begins with the message sent by the user. The message then processed by NLP (Natural Language Processing), and *chatbot* responded by replying to the message according to the existing database (see figure 1). For example, when a user sent "how are you?" message, *chatbot* will look for answers that match this question in the database such as "I am fine", "Great!" etc.

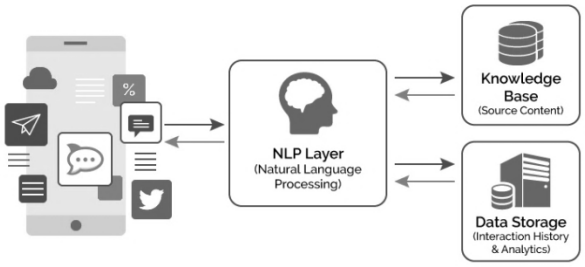

Figure 1. The mechanism of *chatbot.*

3.1. The types of Chatbot

The type of *chatbot* found in this study can be categorized into three types based on its' structure, purpose, and audience. The sub-categories and their functions is concluded in table 1.

Table 1. Types of *chatbot.*

Category	Sub-category	Function
Structure	Flow *chatbot*	A tree-based *chatbot*. This *chatbot* has fixed responds set by the developer, and only responds to questions that are already in the database. Flow chatbots include buttons, keywords, and catchphrases instead of free writing to drive the client down the predefined path.
	Artificially intelligent	Chatbot with artificial intelligence has the ability update their knowledge and perception from previous conversations and users' experience, letting the users engage more freely.
	Hybrid	This type of chatbot combines the concepts of Flow and AI chatbots. This chatbot can understand and communicate with users, but remains in the pattern determined by the developer.
Purpose	Functionality	This chatbots have certain functions depends on the developer (i.e. chatbot for learning, personal assistant, reminder, online shop assistant, etc.)
	Fun	Chatbot that intended only for entertainment (i.e. games, *funbot*, etc.).
Audience	Generalist	This chatbot has general knowledge that we can ask directly. I.e. Siri developed by Apple ,and Cortana developed by Microsoft. Both Chatbots can help us solve common problems such as searching for restaurants, locations and more.
	Specialist	This chatbot focus on one constrained thing and do *that one thing* extremely well (i.e. chatbots that used to serve customers online when ordering items).

Table 1 shows that *chatbot* has several categories and can be developed according to the developer's necessity. However, *chatbots* that are developed for educational purposes tend to use artificially intelligence structure. Artificially intelligent *chatbot* for general purpose such as MILABOT has also been developed [10]. MILABOT is a deep reinforcement learning chatbot which capable of conversing with humans on popular small talk topics through both speech and text. The system consists of an ensemble of natural language generation and retrieval models, including template-based models, bag-of-words models, sequence-to-sequence neural network and latent variable neural network models [10]. *Chatbots* that developed for educational purposes, especially for language learning, are described further in the following sub-section.

3.2. Chatbot in Language Learning and Teaching

Chatbots development to utilize learning and teaching have been conducted. *Freudbot* has been developed for psychology students to find out about student-content interaction in distance education. The results shows that the basic analysis of the chatlogs indicated a high proportion of on-task behavior. The findings also suggests that *chatbot* technology may be promising as a teaching and learning tool in distance and online education [12]. *Chatbot* use is also compared with humanoid robot in science lecture class, and reported that the visualization using *chatbot* was helpful for students to understand the lecture smoothly [13]. However, researches on *chatbot* use and development to enhance language learning rather difficult to find. This study identified researches on language teaching and learning as seen in table 2.

Table 2. Chatbot researches on language learning.

First author (year)	Chatbot name	Subject	Focus	Sample	Research type
Jia (2004)	-	English, Germany as Foreign Language	Application of a Web-based Chatbot system on foreign language teaching	1256	Experiment
Fryer (2006)	Cleverbot	English as Foreign Language	Chatbot as *English* language learning tools	211	Experiment & survey
Jia (2009)	CSIEC *chatbot*	English Learning	A computer assisted English learning *chatbot* based on textual knowledge and reasoning	1783	Experiment, survey & questionnaire
Goda (2014)	Cleverbot	English as Foreign Language	The use of Chatbot before online EFL discussion and The effect on critical thinking	130	Comparison based (Experimental & Control group)
Fryer (2017)	Cleverbot	English as Foreign Language	Comparison of chatbot and human task partners in English learning	122	Comparison based (Pre-test & Post-test)

Table 2 shows that *chatbot* researches were mainly found in English language learning [14,15,16,17,18]. Research reported that the dialogs using *chatbot* are mostly very short because the users find the computer is much less intelligent as a human, since the responses from the computer are often repeated and irrelevant with the topics and the context. However, the results also indicates that

many participants are very interested in using *chatbot* as chatting partner in speaking foreign language, since it is accessible anywhere and anytime, while it is not easy to find native speakers as human chatting partner. The learners also more confident communicating with *chatbot* which is obviously less intelligent as the human themselves. It would be pedagogically attractive for the learner to chat with a system of artificial intelligence which could "really" understand the natural language and communicatively generate the natural language to form a human-like dialog [14].

Further, the main *chatbot* used in language learning researches as seen in Table 2 is *Cleverbot*, which developed by British AI scientist Rollo Carpenter in 1986 and went online on 1997. The results of researches of using *Cleverbot* reported that most students enjoyed using this *chatbot* [15,17]. They also generally felt more comfortable conversing with the bots than a student partner or teacher. However, the results also suggest that *chatbots* are generally only useful for advanced and/or very keen language students. Language teachers also need to get involved and bring *chatbot* technology into the foreign language learning classroom as a permanent tool for language practice [15]. Research reported that preceding conversation before classroom discussion with a *chatbot* lead to an increase in the number of contributions that students made to discussion [17]. Moreover, pre-discussion with a *chatbot* also could increase the students' awareness of critical thinking and enable them to form inquiring mindsets [17]. However, the result of comparisons in speaking task with *chatbot* and human partner indicated a significant drop in students' task interest with *chatbot*, but not human partner. The reason of drop in task interest with chatbot was caused by novelty effect [18]. On the other hand, CSIEC chatbot reported successfully helped students with course unit review, make the students more confident, and improved students' listening ability, as well as enhanced students' interest in language learning. The comparison of examination results before and after the using *chatbot* showed great improvement of students' performance [15].

From above results, it is understood that the use of *chatbot* gave many advantages in language learning and teaching, as in enhancing classroom motivation and learning [15,19]. However, chatbot also reported to have flaws comparing to human partner, especially in the novelty aspect [18]. Several researches and *chatbot* development for English language learning have been conducted, but *chatbot* development and researches in other languages teaching and learning is still difficult to find. As an attempt to answer this challenge, the author and team tried to develop a *chatbot*-based multi-language grammar application, namely *Gengobot*, which will be introduced further in the next sub-section.

3.3. Gengobot as Japanese Language Learning Medium

Gengobot is a *chatbot*-based dictionary application about multi-language grammar developed by the author, using CodeIgniter (CI) framework. CI is a PHP framework that can be used to develop PHP-based website application without the necessity to write all the code from the beginning. CI framework was chosen because it is an opensource framework and free to modify, smaller than other framework, and uses MVC (Model-View-Controller) concept that functioned in programming process to call needed databases easily. The main purpose of *Gengobot* development is to provide a Japanese grammar learning medium for beginner level of Japanese language learners. However, to broaden its' use, the application also equipped with grammar contents in English and Indonesian, and integrated with social media LINE. LINE official account has Messaging API feature that allows an account to run *chatbot* that has been created (see figure 2). The database system used in *Gengobot* is MySQL (see figure 3 and figure 4). MySQL was chosen because it is free licensed, and the database structure used in MySQL is in table form which is flexible and easy to use. The database created for this chatbot including: (1) Database of user data storage, including name, language, training score, etc.; (2) Grammar database in three languages; (2) Questions database and their answer (for 'Exercise' feature).

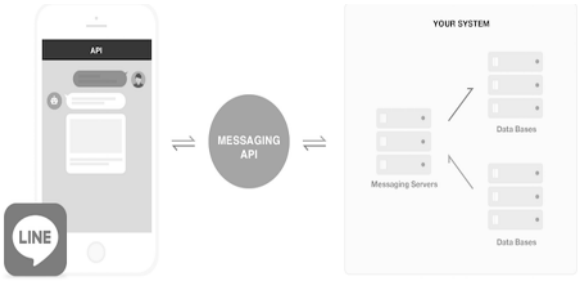

Figure 2. LINE Messaging API and *chatbot* mechanism.

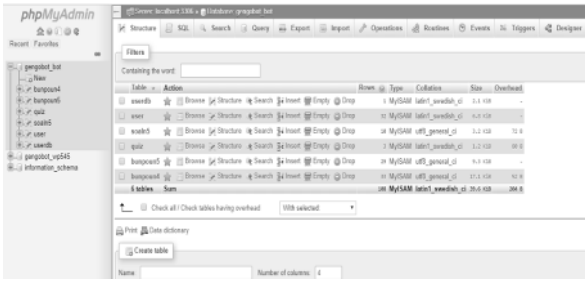

Figure 3. *Gengobot* database creation using MySQL.

Figure 4. The process of importing database using MySQL.

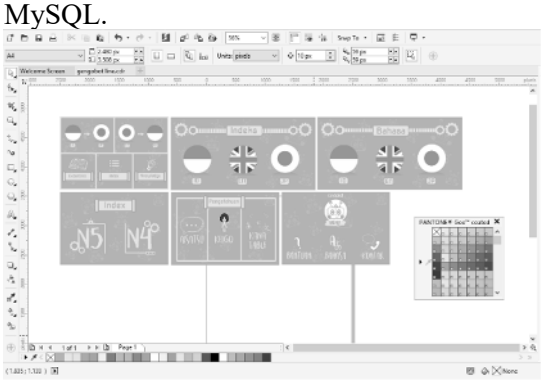

Figure 5. *Gengobot* interface designing process.

Gengobot consists of fixed responds including buttons, keywords, and catchphrases set as database. The buttons includes several menus as 'Menu', 'Help', 'Language', and 'Contact' option as shown in figure 5, as well as several sub-menus that developed under each menu. From observation and evaluation results, *Gengobot* was successfully developed as a language learning medium, especially to support students' learning about Japanese grammar with description available in English and Indonesian. *Gengobot* also considered user friendly since it could be accessed through social media LINE. The features in *Gengobot* also includes 'Exercise', so the students not only able to learn about Japanese grammars, but also able to test their knowledge about grammars they have learned. However, *Gengobot* is a flow *chatbot*, so the interaction between users/students and *chatbot* still very limited to the inputted database. Although as grammar learning application it is still considered sufficient, to improve its' use for enhancing language learning, as well as other language skills teaching and learning, *Gengobot* still need to be developed further in its' technology and features.

4. Conclusion

This study aimed to analyze the types of *chatbots* and the possibility of their use as language learning medium. From the results, it is known that *chatbot* can be categorized into three types, and has advantages and disadvantages. As the advantages, *chatbot* is reported can help language learners through six ways: (1) students tend to feel more relaxed talking to a computer than to a person; (2) *chatbots* are willing to repeat the same material with students endlessly; (3) many *bots* provide both text and synthesized speech, allowing students to practice both listening and reading skills; (4) *Bots* are new and interesting to students; (5) students have an opportunity to use a variety of language structures and vocabulary that they ordinarily would not have a chance to use; (6) *chatbots* could potentially provide quick and effective feedback for students' spelling and grammar [15]. However, *chatbot* also reported to have a flaw on its novelty aspects and need to be improved. This study also observed a *chatbot*-based Japanese language learning medium developed by the author, namely *Gengobot*. As the results, *Gengobot* have a high potential to be used as a Japanese language learning medium especially in learning grammar, yet need to be developed further in its' technology and features.

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