Combining Chatbot and Social Media: Enhancing Personal Learning Environment (PLE) in Language Learning

Nuria Haristiani*, Mumu Muhamad Rifa’i

Department of Japanese Language Education, Universitas Pendidikan Indonesia, Dr. Setiabudhi St. No.229, Bandung 40154
Correspondence E-mail: nuriaharist@upi.edu

ABSTRACT

Transformation of the global learning landscape in twenty-first century is shaped by the uptake of digital technology and social network applications, along with students’ alteration of characteristics, needs, and demands. As an attempt to integrate digital technology and social network application, this study aimed to develop a chatbot-based application integrated with social media LINE to enhance language learning, specifically for learning Japanese grammar. The application, namely Gengobot, is a chatbot-based grammar application, consisting of Japanese Language Proficiency Test Level 5 and Level 4 (N5 and N4) grammar materials in three language: Indonesian, English, and Japanese. This study applied design-based research method with Waterfall application development procedure, and a questionnaire to gather feedbacks from fifty-three students regarding Gengobot features and contents. Gengobot application was successfully developed using code igniter framework, MySQL database, and webhook to integrate Gengobot application with LINE messaging API. Application testing confirmed that Gengobot is successfully developed and operated properly. The students agreed that Gengobot materials and features considered to be adequate, useful, user friendly, and suitable to support language learning. Gengobot is also highly accessible since it is integrated to social media LINE, allowing students to adjust its use to their own learning preference and needs, which is suitable to enhance students’ personal learning environment.

ARTICLE INFO

Article History:
Submitted/Received 26 Apr 2020
First revised 15 Jun 2020
Accepted 30 Sep 2020
First available online 2 Oct 2020
Publication date 01 Dec 2020

Keywords:
Chatbot, Grammar learning, Language learning, Personal Learning Environment (PLE), Social media.

© 2020 Tim Pengembang Jurnal UPI
I. INTRODUCTION

Industrial revolution 4.0 urged education field to be able to keep up with the technology developments (Harkins, 2008; Puncreobutr, 2016), which required lecturers and educational practitioners to incorporate modern technology in their teaching (Hussin, 2018). Modern technology (including smartphone technology, artificial intelligence (AI), and technology of social media platforms) provides both challenges and opportunities for educational practitioners to utilize these technologies in developing advance learning media (Haristiani & Danuwijaya, 2019). In the latest decades, artificial intelligence utilization to develop applications is massively conducted, and its products is used in almost every aspects of people life (Thurlow et al., 2004). One form of technology that uses artificial intelligence is chatbot or chatterbot (also called as talkbot, chatterbot, Bot, IM bot, interactive agent, or artificial conversational entity). Chatbot is a computer program or artificial intelligence that facilitates interactions through audio or text (Shevat, 2017), and converses with users in a particular domain or topic by giving intelligent responses in natural language (Abdul-Kader & Woods, 2015; Azwary et al., 2016). Chatbot interacts with users by providing responses in the form of comments, answers, completing sentences, goal-oriented dialog, chit-chat dialogue, visual dialogue, or starting new topics (Goyal et al., 2018; Huang et al., 2007). Moreover, more sophisticated chatbot like Lingubot and Lucy is available as 3D character, able to conduct conversation with users in reading or writing to external systems, or the combination of these (Kerlyl, 2006; Wang and Petrina, 2013).

Being free and online, chatbots could provide opportunities for learners from all parts of the globe to actively use it in their learning (Fryer & Carpenter, 2006), as their presence on the internet continues to grow faster than ever (Dale, 2016). Chatbot-based application have been developed to support learning and teaching in various fields, such as in psychology learning and teaching (Heller et al., 2005), science and technology (Hobert, 2019; Danforth et al., 2009; Bii, 2013), language (Jia, 2004, 2009; Fryer et al., 2006, 2017, 2019; Wang & Petrina, 2013; Krassmann et al., 2018; Palasundram et al., 2019; Haristiani, 2019), as well as the utilization of chatbot in social media (Smutny, P., & Schreiberova, 2020; Haristiani, 2019). A chatbot named Freudbot was developed to enhance student-content interaction in distance education for psychology students (Heller et al., 2005), while Cleverbot and CSICE (Computer Simulation in Educational Communication) are developed and utilized to support language learning and teaching (Fryer and Carpenter, 2006; Fryer et al., 2017; Fryer et al., 2019; Goda et al., 2014; Jia, 2009). Chatbot is also used and compared to humanoid robot in assisting science lecture class, proven that the visualization using chatbot helped students to understand the lecture effectively (Matsuura & Ishimura, 2017). In language learning and teaching, chatbot has been developed in the form of web-based chatbot system to support foreign language teaching as English and Germany (Jia, 2004). Chatbot is utilized as a partner in English courses for students (Fryer & Carpenter, 2006). It is also used as a chatbot-based computer assisted English learning to improve textual knowledge and reasoning (Jia, 2009), a pre-discussion tool that used before online EFL discussion to improve critical thinking (Goda, 2014), and compared with human task partners in English learning (Fryer et al., 2017). Chatbot is effective to support distance education (Heller et al., 2005; Song et al., 2017).
Chatbot also successfully provides opportunities for students to improve their skills with instant, content-related, and quality interactions between learners and chatbot (Danforth et al., 2009; Song et al., 2017). This system improved students’ confidence and motivation when interacting with chatbot than when interacting with human tutors (Jia, 2004, 2009; Fryer & Carpenter, 2006; Hobert, 2019).

On the other hand, the rise of Web 2.0 tools made social media very popular all over the world, and many people are spending hours using social media, made it became a major part of our lives (Eren, 2012; O’Reilly, 2007). Social media create a dynamic, complex information infrastructure that enables easier, faster, and more widespread information sharing (Hemsley & Mason, 2013), which caused researchers all over the world to examine the possibility to emphasize social media utilization in teaching and learning (Tilfarlioglu, 2011). Among social media services, Mobile Instant Messaging (MIM) is popularly chosen to be the primary means of communication method on smartphones (Quan-Haase & Young, 2010; Schwarz, 2011; Tang & Hew, 2017), and studies into the use of MIM for language learning have found positive results (Rosell-Aguilar, 2018). Moreover, learning in the context of social media reported to be a highly self-motivated, autonomous, and informal, as well as an integral part of formal learning (McLoughlin & Lee, 2010; Smith et al, 2003; Solomon & Schrum, 2007). Social media also claimed to have an enormous role for a high quality education corresponding to the social settings of learning and fostering critical thinking in students (Mason, 2006). It also suggested to have potential to enhance students’ way of learning from an inactive participation in classroom learning, to a superior teaching (Ziegler, 2007). Social media also enables students to not only seek information regarding their learning, but also to strategically use it to share information (Dabbagh & Kitsantas, 2012), proven as a media platforms that offers unlimited communicative opportunities in the virtual world, and effectively used as supplement for language learning (Fewell, 2014). Social media is also reported successfully to facilitate the creation of Personal Learning Environments (PLE) that helps learners aggregating and sharing resources, learning achievements, participating in collective knowledge generation, and managing their own meaning making (Dabbagh & Reo, 2011).

A PLE is a new construct in the e-learning literature that is premised on social media and steadily gaining ground in the e-learning field as an effective platform for student learning (Dabbagh & Kitsantas, 2012). Researches on social media to improve students’ PLE included using blogging platforms to the develop students’ e-portfolios as an assessment tool (Rosen & Nelson, 2008), Twitter to stimulate student engagement in the classroom (Rankin, 2009), and wiki software to engage students in collaborative projects (Hazari et al., 2019). These researches found out that PLEs proficiently empower students to take charge of their own learning, prompting them to select tools and resources to create, organize and package learning content to learn effectively and efficiently (Rosen & Nelson, 2008; Rankin, 2009; Hazari et al., 2009; McLoughlin & Lee, 2010). PLE also suggested to be inherently self-directed placing the responsibility for organizing learning on the individual (Rubin, 2010). The 2010 ECAR study showed that students are integrating social media in their academic experience both formally and informally (Educause Learning Initiative, 2007; McLoughlin & Lee, 2010), and there is more growing evidences that social media is increasingly supporting students’ PLE (Selwyn, 2007).

Despite many studies reported that social media and chatbot contributed significantly
in learning and teaching, as well as in students’ personal learning environment, the development on application (combining both technologies) is still difficult to find (Haristiani & Danuwijaya, 2019). Hence, this study aimed to develop an application that combine both chatbot and social media technologies, and develop a chatbot-based application, namely Gengobot. Gengobot is a chat robot (chatbot)-based application which developed to support language learning, specifically Japanese grammar learning. While learning Japanese grammar is very difficult (Hidayat et al., 2016; Destiari, 2017; Oktaviany et al., 2020), the existence of Gengobot can increase level of students’ understanding. The initial version of Gengobot has been developed and successfully operated (Haristiani & Danuwijaya, 2019). However, several developments were still necessary, and have been added to recent version of Gengobot application. The improvements were including refinement of application design, functions, and additional features. Gengobot application is integrated to one of the most popular social media worldwide, namely LINE. LINE is a Mobile Instant Messaging (MIM) service used by 90 Million active users in Indonesia, with user age range from 18 to 25 years old, which can be estimated that LINE users are mainly highschool and college students (Tehusijarana, 2018). Hence, LINE was selected as platform for Gengobot application in this study, since its utilization as a learning medium considered to be adequate, and expected to be potential to support students’ personal learning environment (Widiaty et al., 2020).

2. METHODS AND MATERIALS

This study applied design-based research method with waterfall application development procedure consisting requirements analysis, system design, coding, testing, and operations (Royce, 1970; Balaji & Murugaiyan, 2012; Chari & Agrawal, 2018). Requirements analysis was conducted by analyzing the hardware and software required for application development, while the detailed explanation of system design, coding, testing, and operations of Gengobot application as reported further in Results and Discussion section.

Other than application development, this study also employed a questionnaire to examine and evaluate the developed Gengobot application. The questionnaire involves 24 items in a five-point Likert type from 1 (Strongly Disagree/SD) to 5 (Strongly Agree/SA), and aims to measure students’ feedback regarding three aspects: 1) Gengobot application and features (5 questions), 2) Gengobot material contents (6 questions), and 3) Gengobot application and its’ effect on students’ learning environment (13 questions). The questionnaire was administered to 53 beginner level Japanese language learners in one of the public universities located in Bandung, West Java, Indonesia. The data obtained from the questionnaires were then analyzed descriptively using simple descriptive statistics (frequencies and mean scores), and tabulated to identify students’ evaluation and feedbacks towards Gengobot application.

Materials for Gengobot application development including software and hardware. Software for Gengobot development was MySQL database management system, web hosting with 5 GB capacity of storage, and domain including SSL certificate for application web-hook, LINE social media as a chatbot platform, and Adobe Illustrator CC for application designing purposes. The hardware was in the form of PC units, laptops, and smartphone with special specifications.
3. RESULTS AND DISCUSSION

3.1. Application development

Gengobot has 5 main components, namely the LINE messenger application programming interface (API), user interface, database, webhook, and application server. Gengobot development employed code igniter framework. Code igniter is a PHP-based application development framework used for application development to be more systematic and dynamic (Lancor & Katha, 2013; Pandey, 2016). By using this framework, developers do not need to write the coding from scratch, because code igniter has provided the libraries needed for PHP-based application development (Hustinawati et al., 2014).

This study applied code igniter, considering that it has several advantages such as its opensource framework which is free to use and modify. The size of code igniter is more compact compared to other frameworks. Code igniter also uses the Model-View-Controller (MVC) concept which facilitates the program to call the required database (Blanco & Upton, 2009; Fayyaz & Munir, 2014). The process of how the code igniter works in Gengobot application is shown in Figure 1. The model in Figure 1 serves as a central application database setting. The controller functions to handle requests from the application, and pass them to the model to get the required database and then pass them back to the application. MVC mode allows the programmer to manually configure routes and redirect requests to the appropriate controller and method (Prokofyeva & Boltunova, 2016). The MVC concept in this framework support the program writings of Gengobot application to be more structured and systematic (Jacyntho et al., 2002).

3.1.1. LINE messaging API

API provides a set of functions for application developers to build software programs that automatically detect, download, and install desired software updates (Chow et al., 2011). API also enabled programmers to understand how a software works to be developed or integrated with other software. Meanwhile, LINE messaging API also provides programmers with an access to import applications to LINE short message application. When a LINE user writes a message/command on LINE messaging service, the message will be sent via API to the application server. Then, the application server processes the message and respond to the message based on the program created. The flow of LINE messaging API and its structure is as shown in Figure 2.

![Figure 1](image-url)  
Figure 1. Structural work of Chatbot using code igniter (CI)
3.1.2. Gengobot user interface

Gengobot user interface has 4 main menus, namely, Grammar Dictionary menu, Exercise menu, Index menu, and Knowledge menu. Gengobot user interface coding process conducted using sublime 3.0 text editor application Figure 4, while the display design of the user interface is made using Adobe Illustrator CS6 (see Figure 5).

3.1.3. Gengobot Database

The database system used for Gengobot is MySQL. MySQL is a licensed relational database system, which is faster, more reliable, flexible, and better-than any other database system (Kofler, 2001). The database created for Gengobot application including: (1) User database, including name, language being used, training score, etc.; (2) Grammar database, consists of JLPT N5 and N4 grammar materials; (3) Exercise database, including questions and answers database. The database input processes conducted through several stages, including inputting the database into Excel, saving the database input results in CSV form, and imported the data into the MySQL database system.

Grammar database as the main database in Gengobot application consists of grammar materials based on internationally recognized Japanese Language Proficiency Test (JLPT/Nihongo Nouryoku Shiken) beginner levels, which are level 5 (N5) and level 4 (N4).

The database consists of grammar categories such as Tenses, Objectives, Adversative conjunctions, Conditions, and Comparisons, while the grammar pattern entries including 280 patterns for both levels in total.

The grammar database in this application consists of Japanese grammar, meaning in Indonesian and English, examples and their meanings, and explanations see Figure 6. Grammar database sources in Gengobot taken from several sources.

3.1.4. Webhook and Application Server

The final component of the development of the Gengobot application is the webhook and application server. Webhooks is an HTTP callback for applications to provide commands and information to other applications (Goyal et al., 2018; Ristemi et al., 2019). In Gengobot, webhook functioned to connect LINE messaging API and Gengobot application as seen in Figure 7, while webhook activation process for Gengobot can be seen in Figure 8. After LINE messaging API and Gengobot were integrated, intents or commands were input into a dialog flow, so when a user sends a message/command to Gengobot application, it will answer to the user automatically.

![Figure 2. The structure of LINE messaging API](http://dx.doi.org/10.17509/ijost.v5i3.2868)
Figure 3. User interface of Gengobot application

Figure 4. Gengobot interface coding process
Figure 5. Gengobot interface design process

Figure 6. Gengobot database

Figure 7. Webhook application for Gengobot
3.2. Gengobot as language learning medium

3.2.1. Gengobot navigation pages and contents

Gengobot main navigation page includes four main menus, namely Menu (Menu), Bantuan (Help), Bahasa (Language), and Kontak (Contact) see Figure 7. Under ‘Menu’, there are three sub-menus including Latihan (Exercise), Indeks (Index), and Pengetahuan (Knowledge) as shown in Figure 9. Under ‘Help’ menu, user can find step-by-step instructions on how to use Gengobot and available features. While in ‘Language’ menu, users are able to access contents in three languages, which are Indonesian, English, and Japanese, and choose one preferable language. When a user chooses English as language preference, ‘English→Japanese’ and ‘Japanese→English’ translations will appear. And when a user chooses ‘Indonesian’ as language preference, the translation options appear are ‘Indonesia→Jepang’ and ‘Jepang→Indonesia’, while choosing ‘Japanese’ as language preference will show Indonesian and English translations automatically. Lastly in ‘Contact’ menu, user can find several guidance how to use the application and features available. ‘Contact’ also contains developer’s website address, Instagram account, and email address.

Furthermore, under ‘Exercise’ sub-menu, users will be directed to two options of exercise levels, namely N5 and N4. There are two types of exercise in each level, and each type of exercise contains 5 sessions. Each question in ‘Exercise’ sub-menu is provided with four options of answers, while one exercise session consists of ten questions. After users complete one session of exercise, the result will be shown as score ranging from 0 to 100 as seen in Figure 10. Under ‘Index’ sub-menu, users can find the list of all grammars that consists in Gengobot database. While under the ‘Knowledge’ sub-menu, users will be provided with general knowledge about Japanese language consisting Aisatsu (greetings), list of Keigo (Japanese honorific style), and list of Japanese Katakana and Hiragana characters.

Figure 8. Webhook activation for Gengobot
3.2.2. Gengobot Testing

The initial version of Gengobot application was developed and successfully implemented (Haristiani & Danuwijaya, 2019). However, based on the feedbacks, more improvement of the features and functions was necessary. Hence, further developments were conducted in current version of Gengobot application. The improvement of the current version of Gengobot application including refinement on application design, additional features such as types of exercise, adding leaderboard on Exercise feature, improvement on grammar materials contained in application database, additional features in the Help menu, etc. After the improved version of Gengobot application was completed, several tests were performed to check whether each feature is running as expected.

Figure 9. Gengobot user interface display

Figure 10. Gengobot ‘Latihan’ (Exercise) display and contents
The tests also conducted to give reference for further improvement and development of each features and functions. Based on the test results, eight main components of Gengobot application were successfully functioned as expected, and ready to be implemented as seen in Table 1.

### 3.2.3. Gengobot and Students’ Personal Learning Environment

Gengobot is a chatbot-based application which integrated to LINE social media platform to provide a language learning medium that is highly accessible, user friendly, and compelling. The testing process of Gengobot application was conducted and showed successful results as reported in previous sub-section. However, this study also aims to find out students’ feedback and evaluation of Gengobot application, which surveyed through a questionnaire. The feedbacks are regarding three aspects, namely 1) Gengobot applications and features, 2) Database material contents, and 3) Gengobot application and its’ effect on students’ learning environment. The questionnaire used Likert scale ranged from 1 (Strongly Disagree/SD) to 5 (Strongly Agree/SA).

The questionnaire results of students’ feedback and evaluation for Gengobot application and features is shown in Table 2.

### Table 1. Gengobot application testing

| Components         | Expected results                                                                                                                                                                                                 | Test results | Ratification |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------|
| Add account        | After user add Gengobot account, a greeting message and main navigation page appear.                                                                                                                         | confirmed    | ✓            |
| Language Menu      | Linked to language options, which are Indonesian, English and Japanese.                                                                                                                                          | confirmed    | ✓            |
| Help Menu          | Linked to four steps help options, including ‘language options’, ‘grammar search feature’, ‘exercise feature’, and ‘index feature’.                                                                               | confirmed    | ✓            |
| Menu               | Connected to translation options display, ‘Exercises’, ‘Index’, and ‘Knowledge’ sub-menus.                                                                                                                                 | confirmed    | ✓            |
| Translation Menu   | Connected to the choices of contents, which are ‘All’, ‘N5’, and ‘N4’. The options directed users to chat interface with a space for user to type a grammar and its translation in chosen language.                       | confirmed    | ✓            |
| Index              | Linked to three language options (Indonesian, English, and Japanese. Language options directed users to level options (N5/N4), which direct users to all grammar contents consisted in database according to the level chosen. | confirmed    | ✓            |
| Exercises          | Linked to level options (N5/N4). Level option directed users to two types of exercise available. Each type of exercise directed users to five sessions of exercise, which each session containing ten questions.          | confirmed    | ✓            |
| Knowledge          | Linked to Aisatsu (greetings), Keigo (Japanese honorific style) and list of Katakana and Hiragana letters.                                                                                                                                 | confirmed    | ✓            |

### Conclusion

Table 2.
As presented in **Table 2**, the feedback and evaluation on Gengobot application and features consists of five questions. From **Table 2**, 82% respondents agreed that Gengobot is user friendly and useful, as well as the practicality of Gengobot as grammar learning medium. While related to application design, 89% of respondents strongly agreed that Gengobot is interesting and innovative, and strongly agreed that Gengobot features were useful. However, 84% respondents agreed that Gengobot still need improvements in terms of application and its features. Eventhough the majority of respondents answered that Gengobot still needs to be developed further, the overall results regarding Gengobot application and its features indicated that Gengobot is user friendly, interesting, and features available is useful and practical for language learning (Fryer, 2006; Goda et al., 2014; Dahiya, 2017; Alman et al., 2020).

Further, the results of students’ feedback and evaluation of Gengobot contents is presented in **Table 3**. As shown in **Table 3**, students’ feedbacks according to the contents of Gengobot application were containing six questions, and the results showed that the respondents generally agreed that Gengobot contents is very good (84%). The results showed that 86% of respondents strongly agreed that the grammar contents in Gengobot is adequate to JLPT N4 and N5 materials, the explanations of the grammar contents are easy to understand, and that the explanation given in Exercise feature is easy to understand. Moreover, 84% respondents agreed that the Exercise materials given is adequate to JLPT N4 and N5 materials. However, only 78% respondents agreed that the grammar content is comprehensive, which corresponds to the result that 84% of respondents felt that the grammar and exercise contents still need to be developed. From these results, even though generally the contents of Gengobot database is fairly adequate and easy to understand, the contents still need to be developed further.

Lastly, students’ feedback on the relation between Gengobot application and students’ learning environment is summarized in **Table 4**, which consisted of thirteen questions. As presented in **Table 4**, the results showed that the respondents highly agreed that Gengobot application is suitable for self-study (90%), along with 88% respondents who agreed that Gengobot is compatible for learning grammar.

---

**Tabel 2. Students’ feedback and evaluation on Gengobot application and features**

| No | Statements                                      | SA | A  | N  | D  | SD | Mean | %  |
|----|-------------------------------------------------|----|----|----|----|----|------|----|
| 1  | *Gengobot* application is user friendly and useful. | 17 | 28 | 6  | 1  | 1  | 4.11 | 82 |
| 2  | The design of *Gengobot* application is interesting and innovative. | 31 | 18 | 3  | 0  | 1  | 4.47 | 89 |
| 3  | The features in *Gengobot* application are useful. | 28 | 22 | 2  | 0  | 1  | 4.43 | 89 |
| 4  | *Gengobot* is a practical grammar learning medium. | 21 | 19 | 10 | 2  | 1  | 4.08 | 82 |
| 5  | *Gengobot* application still need to be improved. | 26 | 16 | 9  | 0  | 2  | 4.21 | 84 |

| Mean distribution number | 22 | 21 | 7.8 | 1.3 | 1.1 | 4.16 | 83 |
**Tabel 3. Students’ feedback and evaluation on Gengobot application contents**

| No | Statements                                                                 | SA   | A   | N   | D   | SD  | Mean | %  |
|----|-----------------------------------------------------------------------------|------|-----|-----|-----|-----|------|----|
| 1  | The grammar contents included in *Gengobot* application are adequate to JLPT N4 and N5 level materials. | 23   | 22  | 8   | 0   | 0   | 4.28 | 86 |
| 2  | The grammar contents in *Gengobot* application is comprehensive according to JLPT N4 and N5 level materials. | 15   | 22  | 13  | 3   | 0   | 3.93 | 78 |
| 3  | The explanation of grammar contents provided in *Gengobot* application is easy to understand. | 24   | 20  | 9   | 0   | 0   | 4.28 | 86 |
| 4  | The explanation of answers in ‘Exercise’ feature is easy to understand.      | 23   | 25  | 4   | 1   | 0   | 4.32 | 86 |
| 5  | The questions in ‘Exercise’ feature are adequate to JLPT N4 and N5 level materials. | 20   | 23  | 10  | 0   | 0   | 4.19 | 84 |
| 6  | Grammar contents and exercises still need to be improved.                   | 23   | 17  | 10  | 1   | 2   | 4.09 | 82 |

**Mean distribution number**

| 21 | 22 | 9  | 0.8 | 0.3 | 4.18 | 84 |

**Tabel 4. *Gengobot* application and students’ learning environment**

| No | Statements                                                                 | SA   | A   | N   | D   | SD  | Mean | %  |
|----|-----------------------------------------------------------------------------|------|-----|-----|-----|-----|------|----|
| 1  | *Gengobot* application is useful and practical for learning medium.         | 24   | 18  | 11  | 0   | 0   | 4.25 | 85 |
| 2  | *Gengobot* application is suitable as a medium for learning Japanese grammar. | 26   | 22  | 5   | 0   | 0   | 4.40 | 88 |
| 3  | *Gengobot* application is suitable for self-study.                          | 32   | 15  | 6   | 0   | 0   | 4.49 | 90 |
| 4  | *Gengobot* application can increase motivation to learn Japanese grammar.   | 19   | 26  | 8   | 0   | 0   | 4.21 | 84 |
| 5  | The grammar material contained in *Gengobot* application makes it easy for me to learn Japanese grammar. | 23   | 24  | 6   | 0   | 0   | 4.32 | 86 |
| 6  | The exercises contained in Gengobot application strengthen my understanding of Japanese grammar. | 18   | 25  | 10  | 0   | 0   | 4.15 | 83 |
| 7  | I compared my score with my friend.                                        | 13   | 9   | 19  | 9   | 3   | 3.38 | 68 |
| 8  | I want to be first in the leaderboard.                                      | 14   | 9   | 21  | 5   | 4   | 3.45 | 69 |
| 9  | I repeated exercising with *Gengobot* application if my practice results were unsatisfactory. | 12   | 19  | 18  | 2   | 2   | 3.70 | 74 |
| 10 | I repeated exercising with *Gengobot* application if my score defeated by a friend. | 7    | 14  | 23  | 4   | 5   | 3.26 | 65 |
| 11 | The exercises in *Gengobot* application are more fun than the exercises on paper questions. | 12   | 19  | 18  | 3   | 1   | 3.72 | 74 |
| 12 | My Japanese grammar skills improved after using *Gengobot* application.     | 12   | 20  | 18  | 2   | 1   | 3.76 | 75 |
| 13 | I will use *Gengobot* application again to learn/practice Japanese grammar. | 16   | 23  | 11  | 2   | 1   | 3.96 | 79 |

**Mean distribution number**

| 18 | 19 | 13 | 2.1 | 1.3 | 3.93 | 79 |
Moreover, the majority of respondents answered that Gengobot help them learn Japanese grammar easier (86%), practical and useful as learning medium (85%), and helped them improved their motivation in learning grammar (84%). 83% respondents also agreed the exercise menu in Gengobot helped them understand the grammar materials better. Further, 74% of the respondents agreed to use Gengobot repeatedly if their exercise score is unsatisfactory, as well as the respondents that felt that Gengobot is more fun than paper exercise. While Gengobot provide leaderboard feature to show users’ scores from Exercise menu, respondents showed slightly lower interest in the feature. Respondents agreed that they want to be the first in the leaderboard (69%), and compare their score with their friends (69%). Moreover, only 65% of respondents answered that they will repeat exercising if their score defeated by other friends, showing that the possibility of users’ repentance in using exercise feature is probably lower than expected.

From above results, Gengobot application is generally considered suitable to support language learning (Fryer, 2006; Goda et al., 2014; Dahija, 2017; Alman et al., 2020; Fewell, 2014; Haristiani & Danuwijaya, 2019), specifically for grammar learning. The ubiquitous aspect of Gengobot application which can be adjusted to each students’ learning speed, needs, and demands also considered to be supportive for students’ personal learning environment (Mc Loughlin & Lee, 2010; Dabbagh & Reo, 2011). The features provided also considered to be adequate, useful, and the grammar contents and exercise is relevant to the JLPT N4 and N5 grammar materials. The exercise feature in Gengobot also helps improve users’ Japanese grammar skills (Danforth et al., 2009; Song et al., 2017), and can be used as an alternative for JLPT level N4 and N5 exercise tool. In addition, the scoring system and leaderboard feature expected to increase users’ confidence and motivation (Jia 2004, 2009; Fyer & Carpenter, 2006; Hobert, 2019) to compete to get higher score, leading to users’ recurrence in practicing their Japanese grammar skills using Gengobot. Furthermore, Gengobot which is a chatbot based application is very suitable because it is integrated to LINE chat application which is highly accessible (Heller et al., 2005; Song et al., 2017) and often used by users, especially students. Nevertheless, there are several aspects of Gengobot application that needs to be developed. The respondents expect additional contents of higher levels JLPT, audio feature, kanji learning feature, and improvements in the existing grammar explanations. Hence, the present chatbot-based Gengobot application is successfully developed as a practical, interesting and innovative application as a medium for learning Japanese grammar to support students’ personal learning environment.

3. CONCLUSION

Gengobot is a chatbot-based application that developed with objectives as a learning tool to support Japanese language learning and to enhance students’ personal learning environment. The contents and features in Gengobot application can be accessed in three languages, namely Indonesian, English, and Japanese. Gengobot is developed and equipped with several menus including grammar database index, exercise features, and information regarding Japanese basic knowledge. The results of Gengobot application showed that all the features were operated successfully. Feedbacks from the students showed that Gengobot is practical, user-friendly, innovative, and useful in supporting students’ Japanese language learning.

DOI: http://dx.doi.org/10.17509/ijost.v5i3.2868 | p- ISSN 2528-1410 e- ISSN 2527-8045 |
learning, specifically Japanese grammar learning. Gengobot integrated to LINE social media is highly accessible, indicated to be able to improve students’ motivation in learning Japanese grammar, and adequate to enhance students’ personal learning environment. However, according to respondents, Gengobot needs to be developed further regarding its’ contents and additional features, such as audio and kanji learning features to maximize its’ function to support students’ personal learning environment.

4. ACKNOWLEDGEMENTS

5. AUTHORS’ NOTE

We acknowledged the Directorate of Research and Community Service, Ministry of Research, Technology and Higher Education, Republic of Indonesia for the financial support for this research (Grant: Penelitian Dasar Unggulan Perguruan Tinggi (PDUPT)).

The author(s) declare(s) that there is no conflict of interest regarding the publication of this article. The authors confirm that the data and the paper are free of plagiarism.

6. REFERENCES

Abdul-Kader, S. A., & Woods, J. C. (2015). Survey on chatbot design techniques in speech conversation systems. *International Journal of Advanced Computer Science and Applications*, 6(7), 72-80.

Alman, A., Balder, K. J., Maggi, F. M., & Van der Aa, H. (2020). Declo: A chatbot for user-friendly specification of declarative process models. *Available from Business Process Management Demos* https://hanvanderaa.com/wp-content/uploads/2020/07/BPMDemos2020-Declo.pdf, Retrieved on 20 August 2020.

Azwary, F., Indriani, F., & Nugrahadi, D. T. (2016). Question answering system berbasis artificial intelligence markup language sebagai media informasi. *Klik-Kumpulan Jurnal Ilmu Komputer*, 3(1), 48-60.

Balaji, S., & Murugaiyan, M. S. (2012). Waterfall vs. v-model vs. agile: A comparative study on sdlc. *International Journal of Information Technology and Business Management*, 2(1), 26-30.

Bii, P. (2013). Chatbot technology: A possible means of unlocking student potential to learn how to learn. *Educational Research*, 4(2), 218-221.

Blanco, J. A., & Upton, D. (2009). *CodeIgniter 1.7*. Birmingham: Packt Publishing.

Chari, K., & Agrawal, M. (2018). Impact of incorrect and new requirements on waterfall software project outcomes. *Empirical Software Engineering*, 23(1), 165-185.

Chow, C. Y., Kumar, K. N., Showman, K. A., & Vincent, J. (2011). *United States Patent No. 7,987,459*. Washington, DC: United States Patent and Trademark Office.

Dabbagh, N., & Kitsantas, A. (2012). Personal learning environments, social media, and self-regulated learning: A natural formula for connecting formal and informal learning. *The Internet and Higher Education*, 15(1), 3-8.
Dabbagh, N., & Reo, R. (2011). Back to the future: Tracing the roots and learning affordances of social software. *Web 2.0-Based E-Learning: Applying Social Informatics for Tertiary Teaching* form IGI Global https://www.igi-global.com/chapter/web-based-learning/45014, Retrieved on 20 August 2020.

Dahiya, M. (2017). A tool of conversation: Chatbot. *International Journal of Computer Sciences and Engineering*, 5(5), 158-161.

Dale, R. (2016). The return of the chatbots. *Natural Language Engineering*, 22(5), 811-817.

Danforth, D. R., Procter, M., Chen, R., Johnson, M., & Heller, R. (2009). Development of virtual patient simulations for medical education. *Journal for Virtual Worlds Research*, 2(2), 4-11.

Destiari, S. (2017). Metode Dediscerta Meningkatkan Kemampuan Membaca Pemahaman Siswa. *Japanedu: Jurnal Pendidikan dan Pengajaran Bahasa Jepang*, 2(1), 53-67.

Educause Learning Initiative (ELI). (2007). The seven things you should know about. *Available from* http://www.educause.edu/7Things, Retrieved on 15 January 2008.

Eren, Ö. (2012). Students’ attitudes towards using social networking in foreign language classes: A Facebook example. *International Journal of Business and Social Science*, 3(20), 288-294.

Fayyaz, A. R., & Munir, M. (2014). Performance evaluation of PHP frameworks (CakePHP and Codeigniter) in relation to the object-relational mapping, with respect to load testing. *Available from* https://www.diva-portal.org/smash/get/diva2:831439/FULLTEXT01.pdf, Retrieved on 20 August 2020.

Fewell, N. (2014). Social networking and language learning with twitter. *Research Papers in Language Teaching and Learning*, 5(1), 223.

Fryer, L. K., Ainley, M., Thompson, A., Gibson, A., & Sherlock, Z. (2017). Stimulating and sustaining interest in a language course: An experimental comparison of chatbot and human task partners. *Computers in Human Behavior*, 75, 461-468.

Fryer, L. K., Nakao, K., & Thompson, A. (2019). Chatbot learning partners: Connecting learning experiences, interest and competence. *Computers in Human Behavior*, 93, 279-289.

Fryer, L., & Carpenter, R. (2006). Bots as language learning tools. *Language Learning and Technology*, 10(3), 8-14.

Goda, Y., Yamada, M., Matsukawa, H., Hata, K., & Yasunami, S. (2014). Conversation with a chatbot before an online EFL group discussion and the effects on critical thinking. *The Journal of Information and Systems in Education*, 13(1), 1-7.

Goyal, P., Pandey, S., & Jain, K. (2018). Developing a chatbot. *Available from* Deep Learning for Natural Language Processing, Apress, Berkeley, CA https://doi.org/10.1007/978-1-4842-3685-7_4, Retrieved on 20 August 2020.
Haristiani, N. (2019). Artificial Intelligence (AI) chatbot as language learning medium: An inquiry. *Journal of Physics: Conference Series, 1387*(1), 012020. IOP Publishing.

Haristiani, N., & Danuwijaya, A. A. (2019). Gengobot: A chatbot-based grammar application on mobile instant messaging as language learning medium. *Journal of Engineering Science and Technology, 14*(6), 3158-3173.

Harkins, A. M. (2008). Leapfrog principles and practices: Core components of education 3.0 and 4.0. *Futures Research Quarterly, 24*(1), 19-31.

Hazari, S., North, A., & Moreland, D. (2019). Investigating pedagogical value of wiki technology. *Journal of Information Systems Education, 20*(2), 187-198.

Heller, B., Proctor, M., Mah, D., Jewell, L., & Cheung, B. (2005). *Freudbot: An investigation of chatbot technology in distance education.* Waynesville, North Carolina: Association for the Advancement of Computing in Education (AACE).

Hemsley, J., & Mason, R. M. (2013). Knowledge and knowledge management in the social media age. *Journal of Organizational Computing and Electronic Commerce, 23*(1-2), 138-167.

Hidayat, R., Sugihartono, S., & Danasasmita, W. (2016). Model penggunaan media power point dalam pengembangan pola kalimat bahasa jepang tingkat dasar (Penelitian terhadap mahasiswa tingkat I Departemen Pendidikan Bahasa Jepang tahun 2015/2016). *Japanedu: Jurnal Pendidikan dan Pengajaran Bahasa Jepang, 1*(2), 121-134.

Hobert, S. (2019). Say hello to ‘coding tutor’! design and evaluation of a chatbot-based learning system supporting students to learn to program. *Available from Association for Information Systems eLibrary https://aisel.aisnet.org/icis2019/learning_environ/learning_environ/9/,* Retrieved on 20 August 2020.

Huang, J., Zhou, M., & Yang, D. (2007). Extracting chatbot knowledge from online discussion forums. *International Joint Conferences on Artificial Intelligence, 7,* 423-428.

Hussin, A. A. (2018). Education 4.0 made simple: Ideas for teaching. *International Journal of Education and Literacy Studies, 6*(3), 92-98.

Hustinawati, H., Kurnia Himawan, A., & Latifah, L. (2014). Performance analysis framework Codeigniter and CakePHP in website creation. *International Journal of Computer Applications, 94*(20), 6–11.

Jacynthe, M. D., Schwabe, D., & Rossi, G. (2002). A software architecture for structuring complex web applications. *Journal of Web Engineering, 1*(1), 37-60.

Jia, J. (2004). The study of the application of a web-based chatbot system on the teaching of foreign languages. *Society for Information Technology and Teacher Education International Conference.* Atlanta, Georgia, United States of America: Association for the Advancement of Computing in Education (AACE).
Jia, J. (2009). Computer simulation in educational communication: A computer assisted English learning chatbot based on textual knowledge and reasoning. *Knowledge-based Systems, 22*(4), 249-255.

Kerlyl, A., Hall, P., & Bull, S. (2006). Bringing chatbots into education: Towards natural language negotiation of open learner models. *International Conference on Innovative Techniques and Applications of Artificial Intelligence*, 179-192.

Kofler, M. (2001). What is mySQL? *Available from MySQL* https://doi.org/10.1007/978-1-4302-0853-2_1, Retrieved on 20 August 2020.

Krassmann, A. L., Paz, F. J., Silveira, C., Tarouco, L. M. R., & Bercht, M. (2018). Conversational agents in distance education: Comparing mood states with students’ perception. *Creative Education, 9*(11), 1726-1742.

Lancor, L., & Katha, S. (2013). Analyzing PHP frameworks for use in a project-based software engineering course. *Available from Proceeding of the 44th ACM Technical Symposium on Computer Science Education* https://dl.acm.org/doi/abs/10.1145/2445196.2445350, Retrieved on 20 August 2020, 519-524.

Mason, R. (2006). Learning technologies for adult continuing education. *Studies in Continuing Education, 28*(2), 121-133.

Matsuura, S., & Ishimura, R. (2017). Chatbot and dialogue demonstration with a humanoid robot in the lecture class. *Available from International Conference on Universal Access in Human-Computer Interaction* https://link.springer.com/chapter/10.1007/978-3-319-58700-4_20, Retrieved on 20 August 2020, 233-246.

Mcloughlin, C., & Lee, M. J. (2010). Personalised and self-regulated learning in the web 2.0 era: International exemplars of innovative pedagogy using social software. *Australasian Journal of Educational Technology, 26*(1), 28-43.

Oktaviany, F., Philiyanti, F., & Prasetio, V. M. (2020). Implementation of Active Knowledge Sharing Strategy in Intermediate Level Dokkai through Scientific Approach. *Japanedu: Jurnal Pendidikan dan Pengajaran Bahasa Jepang, 5*(1), 9-14.

O'reilly, T. (2007). What is web 2.0: Design patterns and business models for the next generation of software. *Communications and Strategies, 1*(65), 17.

Palasundram, K., Sharef, N., M., Nasharuddin, N., Kasmiran, K., & Azman, A. (2019). Sequence to sequence model performance for education chatbot. *International Journal of Emerging Technologies in Learning (IIET), 14*(24), 56-68.

Pandey, S. (2016). Development of a web application (iDomain) in the Codeigniter framework: Hosting accounts management system development. *Available from* https://www.theseus.fi/bitstream/handle/10024/109032/Pandey_Sujan.pdf?sequence=1&isAllowed=y, Retrieved on 20 August 2020.

DOI: http://dx.doi.org/10.17509/ijost.v5i3.2868 | p- ISSN 2528-1410 e- ISSN 2527-8045 |
Prokofyeva, N., & Boltunova, V. (2016). Analysis and practical application of PHP frameworks in development of web information systems. *Procedia Computer Science, 104*(2017), 51-56.

Puncreobutr, V. (2016). Education 4.0: New challenge of learning. *St. Theresa Journal of Humanities and Social Sciences, 2*(2), 92-97.

Quan-Haase, A., & Young, A. L. (2010). Uses and gratifications of social media: A comparison of Facebook and instant messaging. *Bulletin of Science, Technology and Society, 30*(5), 350-361.

Rankin, M. (2009). Some general comments on the “Twitter Experiment”. *Available from http://www.utdallas.edu/~mar046000/usweb/twitterconclusions.htm*, Retrieved on 20 August 2020.

Ristemi, I., Trpkovska, M. A., & Cico, B. (2019). MyGitIssues web application as a solution in dealing with issues on GitHub. *Available from Mediterranean Conference on Embedded Computing (MECO) https://ieeexplore.ieee.org/abstract/document/8760175*, Retrieved on 20 August 2020.

Rosell-Aguilar, F. (2018). Autonomous language learning through a mobile application: a user evaluation of the busuu app. *Computer Assisted Language Learning, 31*(8), 854-881.

Rosen, D., & Nelson, C. (2008). Web 2.0: A new generation of learners and education. *Computers in the Schools, 25*(3-4), 211-225.

Royce, W. (1970). Software project management. *The Software Lifecycle Model (Waterfall Model)*. New Delhi: Person Education in South Asia.

Rubin, N. (2010). Creating a user-centric learning environment with campus pack personal learning spaces: PLS webinar. *Available from Learning Objects Community http://community.learningobjects.com/Users/Nancy.Rubin/Creating_a_UserCentric_Learning*, Retrieved on 20 August 2020.

Schwarz, O. (2011). Who moved my conversation? Instant messaging, intertextuality and new regimes of intimacy and truth. *Media, Culture and Society, 33*(1), 71-87.

Selwyn, N. (2007). Web 2.0 applications as alternative environments for informal learning-a critical review. *CERI-Keris International Expert Meeting on ICT and Educational Performance, 16*, 1-10.

Shevat, A. (2017). *Designing bots: Creating conversational experiences*. Gravenstein Highway North, Sebastopol: O’Reilly Media, Inc.

Smith, B., Alvarez-Torres, M. J., & Zhao, Y. (2003). Features of CMC technologies and their impact on language learners’ online interaction. *Computers in Human Behavior, 19*(6), 703-729.

Smutny, P., & Schreiberova, P. (2020). Chatbots for learning: A review of educational chatbots for the Facebook messenger. *Computers and Education, 151*, 2-11.

Solomon, G., & Schrum, L. (2007). *Web 2.0: New tools, new schools*. Washington, DC: International Society for Technology in Education (ISTE).
Song, D., Oh, E. Y., & Rice, M. (2017). Interacting with a conversational agent system for educational purposes in online courses. *Available from International Conference on Human System Interactions (HSI)* [https://ieeexplore.ieee.org/abstract/document/8005002](https://ieeexplore.ieee.org/abstract/document/8005002), Retrieved on 20 August 2020.

Tang, Y., & Hew, K. F. (2017). Is mobile instant messaging (MIM) useful in education? examining its technological, pedagogical, and social affordances. *Educational Research Review, 21*, 85-104.

Tehusijarana, K. (2018). LINE launches dedicated news app for Indonesian users. *Available from* [https://www.thejakartapost.com/news/2018/06/29/line-launches-dedicated-news-app-for-indonesian-users.html](https://www.thejakartapost.com/news/2018/06/29/line-launches-dedicated-news-app-for-indonesian-users.html), Retrieved on 16 August 2020.

Thurlow, C., Lengel, L., & Tomic, A. (2004). *Computer mediated communication*. London: Sage Publication Ltd.

Tilfarlioglu, F. Y. (2011). An international dimension of the student’s attitudes towards the use of english in web 2.0 technology. *Turkish Online Journal of Educational Technology-TOJET*, 10(3), 63-68.

Wang, Y. F., & Petrina, S. (2013). Using learning analytics to understand the design of an intelligent language tutor–chatbot Lucy. *Editorial Preface, 4*(11), 124-131.

Widiaty, I., Riza, L. S., Abdullah, A. G., & Mubaroq, S. R. (2020). Multiplatform application technology–based heutagogy on learning batik: A curriculum development framework. *Indonesian Journal of Science and Technology*, 5(1), 45-61.

Ziegler, S. G. (2007). The (mis) education of generation m. *Learning, Media and Technology, 32*(1), 69-81.