

INDONESIAN NON-ENGLISH MAJOR STUDENTS' VIEWS AND EXPERIENCES: DUOLINGO FOR LEARNING ENGLISH

Ainu Zumrudiana, Nurul Intan Syafitri, Iin Widya Lestari, Moh. Zainuddin
Universitas Nahdlatul Ulama Sunan Giri

ainunnachrawi@unugiri.ac.id, nurulintans2020@gmail.com, widya.lestari@unugiri.ac.id,
zainuddin@unugiri.ac.id

Submitted: 2024-8-14

Accepted: 2024-8-14

Abstract: The research investigated non-English major students' views and perspectives on learning English through Duolingo. Qualitative methods were used, with 30 questionnaire items and 15 interview prompts to gather data on students' perception of using Duolingo to learn English, as well as the difficulties and obstacles they encountered. The participants were 41 undergraduate students in the sixth semester of the Early Childhood Education major at a university in Bojonegoro. This research focused on using Duolingo as a learning tool to enhance the teaching and learning process, considering the impact of technological advancements in education. The results showed that nearly 99% of participants viewed Duolingo as useful and functional. Challenges and obstacles in using the application for English learning were categorized into internal factors (mood, laziness, lack of knowledge, and time constraints) and external factors (network issues, smartphone usage, and application errors).

Keywords: Duolingo application; learning English; English learning application; English learning media

INTRODUCTION

Technology's rapid progress is present in various aspects of our lives, benefiting sectors like business, healthcare, and education. Language and technology have had a close relationship since the advent of writing 5000 years ago (Chun *et al.*, 2016). In Indonesia, technology is significantly impacting education, improving the learning environment and instructional methods. The integration and utilization of technology in the curriculum need reassessment to enhance student learning (Eady & Lockyer, 2013). Technology has become crucial in shaping and implementing education, particularly in teaching, and learning. Consequently, it has gained attention from teachers, especially in subjects such English (Suharti *et al.*, 2022).

Incorporating English into the curriculum has led to progress in English skills and technological advancements (Zumrudiana, 2022). English and technology have a strong correlation in education, with technology being used progressively as supplementary tool in English language instruction This demonstrates the crucial role that technology plays in educators' instructional methods and in motivating students' (Gilakjani & Branch, 2016).

The use of educational tools is beneficial for teachers and learners as it enhances learning outcomes and teaching effectiveness. By presenting information in engaging and understandable ways, educational tools aid in the learning process (Ginting *et al.*, 2022). Teachers should create and use innovative media that align with students' needs and curriculum. Media positively impacts teaching

methods and learning techniques and serves as a valuable tool for education, including the use of Mobile-assisted Language Learning (MALL). MALL is an educational approach that utilizes social media to facilitate language skill acquisition among students (Pratiwi et al., 2020). Additionally, Mobile Assisted Learning (MAL) refers to using mobile devices to access language learning applications, significantly impact on the learning process (Dehkordi, 2018). The use of mobile applications for language learning offers multiple benefits, allowing students to complete a various tasks and providing easy access for both English teachers and students to learn, research, and teach remotely (Lestari et al., 2022). The implementation of Mobile-Assisted Language Learning has evolved into a range of strategies that greatly enhance the teaching and learning of English for educators and learners (Zainuddin & Zumrudiana, 2022).

Another form of media, such as Duolingo, can assist in learning English. This language-learning application is available on desktop computers, smartphones and tablets. Released on May 29, 2013, Duolingo quickly gained popularity. According to Mauricio Méndez Bermudez & Giovanni Marmolejo Diaz (2017), the Duolingo Android application became the most downloaded educational app in the Google Play Store just three weeks after its release. With over one million downloads, learners can utilize Duolingo to enhance their language skills and accelerate their English learning journey.

Duolingo integrates learning and games to enhance engagement and interest in language acquisition. In addition, Duolingo employs a comprehensive vocabulary and a synchronous linguistic approach that incorporates audio, visual, and contextual elements to optimize clarity and fluency (Loewen et al., 2019). This facilitates improvement in learners' vocabulary, pronunciation, listening skills, and sentence structure. Moreover, Duolingo's testing modules assess the English proficiency of non-English speakers (Laffair & Settles, 2019). It caters to undergraduate students and individuals seeking to obtain an English proficiency score. Duolingo effectively enhances learners' language acquisition abilities, especially in English.

Previous research has shown that Duolingo can enhance English proficiency. Nurul Inayah, Qismullah Yusuf, and Nurul Fibula (2020) have reported significant improvements in language skills and positive feedback on the language learning experience with Duolingo. However, there is a gap in the literature, and this study aims to examine the impact of Duolingo's interactive features on language learners and their perceptions. This study is inclusive and includes all students, regardless of their field of study or level of interest in English, making it accessible to individuals of all ages. This study investigates the effects of incorporating the Duolingo application into the Early Childhood Education study at UNUGIRI Bojonegoro during the sixth semester. The research project seeks to examine the perceptions of non-English major students regarding their English learning experience through the Duolingo application.

The authors' research indicates that the Duolingo application can serve as a resource for teachers to support English language learning. Duolingo provides a diverse array of user-friendly and appropriate

features that cater to students of varying proficiency levels. This research endeavor aims to examine the following inquiries: 1) How do students majoring in fields other than English perceive the experience of learning English through the Duolingo application? 2) What obstacles and difficulties arise when utilizing Duolingo as a platform for English language instruction?

METHOD

The study used a descriptive qualitative approach to assess the effectiveness of Duolingo as a tool for English language learning among non-proficient English students. Data were collected from university students and focused on their views of using the Duolingo application for learning English as well as identifying obstacles and difficulties encountered. The study was conducted from May 16th to June 5th, 2023, at a private university in Bojonegoro involving sixth-semester early childhood students. A total of 41 students participated, all of whom were enrolled in the early childhood education major and taught English using Duolingo. Data were collected through questionnaires, participant interviews, and direct observation. The researchers used a checkmark symbol during observations to assess the classroom environment. Questionnaires were distributed using Google Forms and interview sessions were conducted to validate survey data. A questionnaire with 30 questions divided into different sections was used as the research instrument. The interviews focused on the participants' views of the Duolingo application, and the challenges encountered when using it for English learning.

The researchers also considered needs analysis, which involves gathering information to define and validate curriculum processes that address students' language learning needs within the institutional context.

FINDINGS AND DISCUSSION

The main goal of the initial findings is to evaluate non-English major students' perspectives on learning English with the Duolingo app. The findings are divided into three main areas: the effectiveness of Duolingo in acquiring English skills, the app's potential as a motivating tool, and the language practice feature.

Table 1. The Benefits of Using the Duolingo Application for Learning English

No	Questions	Agree		Disagree	
		Answer	Percentage (%)	Answer	Percentage (%)
1	The Duolingo is easily accessible and user-friendly	41	100	0	0
2	The Duolingo is a valuable tool for learning English	41	100	0	0
3	The Duolingo has attractive and diverse features	40	97,6	1	2,4
4	The Duolingo can be used independently without assistance from others	40	97,6	1	2,4
5	The Duolingo can be accessed conveniently from anywhere and at any time	41	100	0	0

The data in Table 1 show the benefits of using Duolingo for learning English. All 41 participants agreed that Duolingo is easily accessible, user-friendly, valuable for learning English, and can be accessed conveniently from anywhere. Additionally, 40 participants agreed that Duolingo has attractive

and diverse features and can be used independently, with only 1 participant disagreeing. This highlights Duolingo's effectiveness, accessibility, and convenience as a language learning tool.

The data is reinforced with interview data to enhance the findings. The most significant data relates to accessibility and usability. The statement with the lowest score is associated with the features being considered attractive and varied, and capable of being used independently.

P1: "Duolingo has many functions and helps us to improve our English language skills."

P2: "This application is helpful because it can be used anywhere when there is free time."

R4: "During my time using the Duolingo application, I saw improvement in learning English."

Based on the data, it can be concluded that all participants find Duolingo to be a useful tool for learning English. Furthermore, all participants agree that Duolingo is easily accessible and can be utilized from any location. Additionally, an overwhelming majority of participants find Duolingo's features attractive and varied, enabling them to navigate the application independently. The Duolingo application proves to be beneficial for beginners, as it facilitates comprehension of the material and contributes to English language acquisition in both academic and professional contexts.

Table 2. Using the Duolingo application as a tool for motivation in Learning English

No	Questions	Agree		Disagree	
		Answer	Percentage (%)	Answer	Percentage (%)
12	I feel more motivated to enhance my English language skills through the use of Duolingo	41	100	0	0
13	Duolingo encourages me to spend more time learning English outside the classroom	41	100	0	0
14	Duolingo is a great way for me to have fun while learning English	41	100	0	0
15	Learning English with Duolingo helps me become more actively engaged in language learning	41	100	0	0
16	Duolingo supports independent English language learning	41	100	0	0
17	Duolingo assisted me in enhancing my English skill	41	100	0	0
18	Learning English through Duolingo enhances my understanding of English learning materials	41	100	0	0
19	Duolingo enhances the enjoyment and engagement of learning English	41	100	0	0
20	Learning English with Duolingo helps me use my English skills in everyday life	41	100	0	0
21	Practicing English with Duolingo app on my smartphone is more enjoyable than in a traditional classroom	35	85,4	6	14,6

The data in Table 2 demonstrates the motivational impact of using Duolingo for learning English. All 41 participants (100%) agreed that Duolingo increases their motivation, encourages more study time outside the classroom, makes learning fun, enhances engagement, supports independent learning, and improves understanding and enjoyment of English materials. Notably, 85.4% of participants agreed that practicing English with the Duolingo app is more enjoyable than traditional classroom learning, while 14.6% disagreed. This data underscores Duolingo's strong role in motivating and engaging learners in their English language studies.

Additionally, the statement data above supports the interview data, further reinforcing the research.

P2: "Duolingo application has many interesting features that make learning English not boring."

P3: “Duolingo application is designed like a game-like system. So, the more you learn with this application, the more addictive it becomes.”

P5: “ Duolingo application is interesting, so it can be more motivating to learn English.”

Based on the data, it can be concluded that the Duolingo application effectively enhances motivation in learning English. Participants reported numerous instances of real-life learning on Duolingo, making it a straightforward method that only requires the use of the smartphone application without the need for books or dictionaries. The gamified system of Duolingo also contributes to increased motivation to learn English.

Furthermore, all participants agree that Duolingo is effective in enhancing various aspects of English language proficiency, such as vocabulary acquisition, improvement in listening and reading comprehension, enhancement of writing skills, development of speaking abilities, practice of translation, and refinement of pronunciation. The data indicates that 97.6% of respondents agree that Duolingo effectively helps in comprehending grammar and language structure. Hence, Duolingo is an effective tool for enhancing vocabulary, listening skills, reading comprehension, writing proficiency, understanding of English grammar, and pronunciation in the English language.

Table 3. Practice Exercise for Learning English with the Duolingo Application

No	Questions	Agree		Disagree	
		Participant	Percentage (%)	Participant	Percentage (%)
22	Duolingo helps to enhance my vocabulary in English	41	100	0	0
23	Duolingo helps to enhance my listening skills in English	40	97,6	1	2,4
24	Duolingo helps to enhance my reading skills in English	40	97,6	1	2,4
25	Duolingo helps to enhance my writing skills in English	40	97,6	1	2,4
26	Duolingo helps to enhance my speaking skills in English	40	97,6	1	2,4
27	Duolingo enhances my English translation skills through practice exercises, that involve translating words and sentences	40	97,6	1	2,4
28	Duolingo enhances my grammar skills in English	40	97,6	1	2,4
29	Duolingo helps to enhance my pronunciation skills in English	41	100	0	0
30	I am proficient in constructing English sentences using Duolingo	40	97,6	1	2,4

The data in Table 3 indicates that the Duolingo application is highly effective in enhancing English language skills among participants. For vocabulary and pronunciation, all 41 participants (100%) agreed on its effectiveness. For listening, reading, writing, speaking, translation, grammar, and sentence construction skills, 40 participants (97.6%) agreed, while only one participant (2.4%) disagreed in each category. This near-unanimous agreement highlights Duolingo's positive impact across multiple aspects of language learning, suggesting that it is a valuable tool for improving English proficiency and it is supported by the interview data below.

P1 : “We can learn new vocabulary, how to pronounce, how to arrange sentences, and many more.”

P7 : “I am getting better at pronouncing English words.”

P9 : “Vocabulary additions, how to pronounce, listen, write, and read.”

The study found that participants had a positive view of using Duolingo to quickly learn English at home. Specifically, they found the app helpful in improving their vocabulary and

understanding of the subject matter. Participants used Duolingo to enhance various language learning goals, such as vocabulary, listening, writing, speaking, and pronunciation. In general, the Duolingo app has had a significant influence on different aspects of acquiring the English language, specifically in terms of pronunciation and vocabulary acquisition.

Another negative perception associated with the use of the Duolingo application for learning English is the students concerns about the issues and obstacles they encountered while using the app. One major problem they highlighted was the internet connection. During the pandemic, when students were studying from home or attending online classes, the Duolingo app was their go-to resource for language learning. However, due to the diverse locations of the students, some areas experienced poor network connectivity, making it difficult to use the application effectively. The study also identified another issue-errors in the Duolingo application. According to the interview data, many participants reported experiencing errors while using the app. These errors included sudden exits from the program, which required restarting the learning process. This was perceived as a significant drawback by the students. Furthermore, some students argued against using smartphones as a means of acquiring knowledge, especially in subjects like English. They believed that smartphones posed inherent challenges that hindered their learning experience.

The researchers faced internal challenges related to the findings. Laziness is a common issue among students when it comes to acquiring knowledge or skills. Another important factor is mood, which greatly affects motivation. Fluctuations in mood can result in a lack of motivation to engage in the learning process and make students view learning English as boring. Leisure time is also a factor to consider. Since the participants include working individuals and housewives of various ages, they often have limited availability for non-specialized learning opportunities due to engaging in other activities. Finally, a knowledge deficiency is another challenge encountered. This causes students to feel distressed when trying to acquire new information. As a result, participants have expressed that the more difficult the subject matter becomes, the more complex it seems.

Table 4. Challenges and Obstacles in Utilizing Duolingo as an English Learning Tool

No	Questions	Agree		Disagree	
		Answer	Percentage (%)	Answer	Percentage (%)
6	Installing Duolingo can be challenging	2	4,9	39	95,1
7	Duolingo takes up a lot of storage on my mobile phone	6	14,6	35	85,4
8	Using Duolingo to learn English is boring experience	5	12,2	36	87,8
9	Duolingo is less effective for learning in a classroom environment	7	17,1	34	82,9
10	Using Duolingo without an internet connection is challenging	23	56,1	18	43,9
11	I find it challenging to learn English with Duolingo	2	4,9	39	95,1

The data in Table 4 outlines challenges in using Duolingo for learning English. The majority of participants disagreed with most challenges: 95.1% disagreed that installing Duolingo is challenging, and the same percentage found learning English with Duolingo unchallenging. Additionally, 85.4% disagreed that Duolingo takes up too much storage, and 87.8% disagreed that it is a boring experience.

However, 56.1% agreed that using Duolingo without an internet connection is challenging, and 17.1% found it less effective for classroom learning. These responses suggest that while Duolingo is generally well-received, connectivity and classroom integration are notable issues. The interview data provided below further supports the obstacles and challenges of using the Duolingo application.

P1 : “The challenge is timing, because there are many other activities at home. Keep in the mood too, because when studying you have to be in a good mood so you can focus.”

P3 : “The obstacles are more on the network, and sometimes the application also exits by itself.”

P6 : “The application has a little error, maybe there is a problem with the server.”

P10 : “I think it's because of internal factors, like mood and free time to learn English itself. If you are not disciplined, you will have no time to learn.”

Based on the data, it is clear that some participants faced difficulties while using the Duolingo app for learning English. These challenges were primarily related to the app's usability without an internet connection. However, not all participants had concerns about this issue. Additionally, the difficulties in using Duolingo are also influenced by personal factors like English proficiency, motivation, mood, and time constraints.

The study used data from undergraduate students specializing in early childhood education at a private university in Bojonegoro during their sixth semester. Data collection involved questionnaires and interviews. 41 individuals completed the questionnaire, and interviews were conducted with 10 participants. The research aimed to examine the perspectives of non-English major students on using the Duolingo program for learning English. The analysis was conducted in an English class in the fourth semester. The researchers aimed to determine the effectiveness of Duolingo and identify challenges encountered when using it for English language acquisition.

Several topics were discussed during the session, including the efficacy of Duolingo as a tool for learning English, the motivation derived from using the Duolingo application for English language learning, the enhancement of English skills through the use of the Duolingo application, and the challenges and obstacles encountered throughout the process of learning English with Duolingo. It can effectively help students acquire vocabulary. It is accessible at any time and location and seamlessly integrates into instructional activities. According to Table 3, all participants surveyed agreed that they could access Duolingo without any constraints regarding time or location. The absence of any negative responses suggests that students can use Duolingo in various settings, both inside and outside the classroom. Duolingo Application can be accessed from multiple locations, thereby allowing teachers to incorporate it into offline and online educational environments. Therefore, as a language acquisition tool, it enables students to study anytime and anywhere as long as they have an internet connection.

According to Inayah (2020), Duolingo is recognized as a valuable resource for improving English language proficiency, especially in vocabulary development. Munday (2016) states that Duolingo is user-friendly despite its core lessons not prioritizing communicative competence. The application

incorporates components, like mobile device accessibility features, gamification elements, and diverse tasks. This study uses Duolingo as the learning medium and relies on previous studies for knowledge.

The researchers primarily encountered internal challenges related to the findings. Students often exhibited laziness and mood fluctuation, leading to a lack of motivation to participate actively in the learning process. Limited availability of leisure time for non-specialized learning was also a challenge for participants from diverse age ranges. A lack of knowledge caused distress among students when acquiring new information. As the difficulty level increases, students may encounter challenges in comprehending and completing quizzes. The research findings suggest that integrating the Duolingo application settings improves students' vocabulary acquisition. This study focuses on college students who are not English majors and utilize Duolingo, which is different from previous research that mainly focused on vocabulary enhancement. Additionally, this research examines the impact of Duolingo on various language skills. Both this study and prior studies highlight that the primary obstacle of using Duolingo for English language learning is network connectivity. Users encounter difficulties accessing the application when the network connection is slow or of poor quality. This study also identifies difficulties that may arise as a result of networking issues or other types of errors.

Based on the previous explanation, the researchers conclude that the Duolingo application can significantly impact students' English language proficiency. The application's user-friendly interfaces and visually engaging elements enhance students' learning experiences, helping them acquire new vocabulary and improve their understanding of word meanings. Consequently, this boosts students' interest and enthusiasm for developing their English language skills. Empirical data collected through interviews and questionnaires demonstrate that students can achieve a high level of English language proficiency at their convenience, regardless of time and location, avoiding potential monotony in the learning process. This study explores the challenges encountered when using Duolingo to acquire English proficiency, which can be categorized into two groups: internal and external influences. Internal factors include affective states, diminished motivation, and cognitive deficits, whereas the external factor relates to the quality of the internet connection and technical issues within the application itself. Integrating the Duolingo app into the process of learning English would offer numerous benefits and serve as a valuable tool for acquiring language skills.

CONCLUSION

Using the Duolingo app for language acquisition improves various linguistic skills. Word game programs within the app help students acquire and retain vocabulary, enhancing their knowledge of words. The app also provides pronunciation exercises that improve articulation skills. Additionally, students develop a comprehensive understanding of grammar rules. Teachers also play a crucial role in enhancing students' proficiency in speaking, listening, reading, and writing. While Duolingo is a helpful application for developing English skills, it should not be solely relied upon. To optimize language

acquisition, students should seek and integrate supplementary resources such as media or other educational materials.

The challenges of using the Duolingo application for English language acquisition can be divided into two factors: internal and external. Internal factors, such as students' personality traits, activity levels, and knowledge can influence the difficulties faced. Students often feel bored during the process of acquiring English skills, especially at the basic level, due to limitations in their existing knowledge base. Additionally, the time constraint of the app can be challenging for individuals with various daily activities. External factors, such as poor internet connectivity and application errors, also create challenges for using Duolingo. Participants' perceptions indicate that a significant majority find Duolingo difficult to use without an internet connection. As a mobile application, Duolingo requires internet access to operate, and the quality of network conditions varies in different locations. In regions with suboptimal networking infrastructure, students may turn to using the Duolingo program as an alternative means of accessing English language learning resources when network availability is limited or errors occur.

Based on the data provided, it can be concluded that Duolingo is a beneficial application for learning English. It offers easy access, allowing users to learn anytime and anywhere. Duolingo can enhance students' motivation and improve their understanding of English materials through its various features. Moreover, it also offers benefits in enhancing writing, listening, reading, speaking, vocabulary, and pronunciation skills. However, there are challenges and obstacles that should be considered, both internally and externally. Internally, factors such as mood, laziness, lack of knowledge, and time constraints can hinder progress. Externally, challenges arise from network issues, smartphone usage, and occasional application errors.

REFERENCES

- Chun, D., Smith, B., & Kern, R. (2016). Technology in Language Use, Language Teaching, and Language Learning. *Modern Language Journal*, 100, 64–80. <https://doi.org/10.1111/modl.12302>
- Dehkordi, M. E. (2018). Iranian Male and Female EFL Learners' Perceptions toward the Use of Mobile Assisted Language Learning. *Journal of Applied Linguistics and Language Research*, 5(3), 56–66.
- Eady, M. J., & Lockyer, L. (2013). *Tools for learning: technology and teaching strategies*. <https://ro.uow.edu.au/asdpapers/403>
- Gilakjani, A. P., & Branch, L. (2016). *English Pronunciation Instruction: A Literature Review*. 1(1), 1–6.
- Ginting, D., Fahmi, F., Barella, Y., Hasbi, M., Kadnawi, K., Rojabi, A. R., & Zumrudiana, A. (2022). Students' perception on TPACK practices on online language classes in the midst of pandemic. *International Journal of Evaluation and Research in Education (IJERE)*, 11(4), 1995-2009.
- Inayah, N., Yusuf, Q., & Fibula, N. (2020). Exploring Undergraduate Students' Perception Toward the Use of Duolingo in Learning English. *Humanities & Social Sciences Reviews*, 8(3), 76–85. <https://doi.org/10.18510/hssr.2020.839>

- Laflair, G. T., & Settles, B. (2019). Duolingo English Test: Technical Manual. *Duolingo Research Report*.
- Lestari, I. W., Sa'idah B, S., Zumrudiana, A., & Fatoni, M. (2022). Pre-Service English Teachers' Perceptions on the Integration of Mobile Assisted Language Learning (MALL) during Virtual Teaching Internship. *ELite Journal : International Journal of Education, Language, and Literature*, 2(2), 2022. <https://journal.unesa.ac.id/index.php/elite>
- Loewen, S., Crowther, D., Isbell, D. R., Kim, K. M., Maloney, J., Miller, Z. F., & Rawal, H. (2019). Mobile-assisted language learning: A Duolingo case study. *ReCALL*, 31(3), 293–311.
- Munday, P. (2016). *The Case for Using DUOLINGO as Part of The Language Classroom Experience Duolingo Como Parte Del Curriculum De Las Clases De Lengua Extranjera*. 19(1), 83–101.
- Natanael Mauricio Méndez Bermudez Bayron Giovanni Marmolejo Diaz, by, Mauricio Méndez Bermudez, N., & Giovanni Marmolejo Diaz, B. (2017). *Duolingo: A Useful Complementary Mobile Tool to Improve English as A Foreign Language Learning and Teaching*.
- Pratiwi, N. P. A., Nariyati, N. P. L., & Sudirman, S. (2020). EFL pre-service teachers' perception toward the use of mobile assisted language learning in teaching English. *International Journal of Language Education*, 4(1), 38–47. <https://doi.org/10.26858/ijole.v4i2.10052>
- Suharti, D.S., Suwardi, E., Zumrudiana, A., Indrasari, N., Lestari, I. W., & Rahayu, N. (2022). Negotiating the dual identities of the student-teacher as both a curriculum technician and a curriculum maker. *Electronic Journal of Foreign Language Teaching*, 19(1), 206–221.
- Zainuddin, M., & Zumrudiana, A. (2022). Implementasi Pembelajaran Bahasa Inggris Menggunakan MALL dalam Menyambut Kurikulum Merdeka Belajar. *Jurnal Pendidikan Edutama*, 9(1), 147-158.
- Zumrudiana, A., Susanti, A., & Aslamiyah, M. (2022). Nationality Value Depicted in When English Rings a Bell Textbook: Content Analysis. *Indonesian EFL Journal: Journal of ELT, Linguistics, and Literature*, 8(1), 47-56.

Disclaimer: The article has been reviewed by a team from the Indonesian English Lecturers Association at the 2nd Hybrid International Conference on Global Trends in English Language Pedagogy: Navigating New Horizons.

Copyright © 2024 Dian Agustina Purwanto Wakerkwa. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY-SA). The use, distribution, or reproduction in other forums is permitted, provided the original author(s) and copyright owner(s) are credited and that the original publication in this journal is cited in accordance with accepted academic practice. No use, distribution, or reproduction is permitted that does not comply with these terms.