





Artificial intelligence (AI)-based mobile learning in ELT for EFL learners: The implementation and learners' attitudes

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ABSTRACT

Mobile learning powered by artificial intelligence (AI) is a promising vision for transforming education by introducing tutoring systems that can personalize learning. It is being developed to ensure that all learners have the opportunity to be autonomous and to advance collaborative learning. NovoLearning was used in this study to implement mobile learning powered by artificial intelligence (AI). NovoLearning's mobile learning platform powered by artificial intelligence (AI) provides a pleasurable experience and practical language learning for English as a Foreign Language students. Each NovoLearning level includes meaningful learning objectives in the areas of vocabulary, grammar syntax, listening, pronunciation, and role-playing. The purpose of this study was to examine the improvement of English as a Foreign Language (EFL) University students at Universitas Lambung Mangkurat in Indonesia who studied the subject of English using artificial intelligence-based mobile learning. This study used a pretest-posttest non-equivalent control group design, recruiting two groups: one as the control group, which did not use artificial intelligence-based mobile learning, and another as the experimental group, which did. The result indicates that the t critical value (6.373) is greater than the t table, as indicated by the positive values of the lower score (4.4928) and upper score (8.5195). It is less than 0.05 in the Sig (2-tailed) row. Then it can be concluded that the experimental group's English competence was significantly greater than the control group's. Students' positive attitudes toward AI-based mobile learning encompassed two outcomes: (1) increased opportunities for learning for students and (2) NovoLearning areas for improvement during implementation.

KEYWORDS

Artificial Intelligence (AI)-based mobile Learning; EFL students' competence; NovoLearning

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Introduction

Artificial Intelligence (AI) is a trending technological domain in education. Artificial Intelligence (AI) is now introduced as a new teaching and Learning solutions in many different contexts. In education area, Artificial Intelligence (AI) has faced many obstacles to develop since education system is reluctant to technological changes. Nowadays, it is inevitable that Artificial Intelligence (AI) is beginning to be seen as a tool to promote personalization and better learning outcomes. It is now believed that Artificial Intelligence (AI) technologies are developed to ensure an inclusive access to the education field since it provides people as general an access to the opportunity in educating themselves. AI apps and embodied social robots are used as teachers' aids, teachers and peer learning experts in schools around the world (Vasagar et al., 2017; cited in Edwards et al., 2018). Moreover, Artificial Intelligence (AI) is able to promote advance collaborative learning as well as personalize learning in many ways. It can be seen from the way it is creating a better professional surrounding for educators to deal with more learners with difficulties. A new curriculum for a digital and artificial intelligence framework is now widely opened. In the context of a future society undergone AI, it is highly suggested to develop new skills to create digital competencies. These competencies include software-based hardware, information and data literacy, communication and collaboration, creation of digital content, security, how to solve a problem skill, and competencies related to career (UNESCO, 2019).

According to the International Telecommunication Union, more than 60% of people use mobile phones, with 4.1 billion subscriptions each year. The numbers also show that the number of mobile phone users has increased by

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roughly one billion since 2002, which is more than three times that of personal computers (PCs). In certain nations, such as Malaysia, smartphone ownership is even higher than 100 percent (Ismail et al., 2010). Students today are referred to be "digital natives" (Prensky, 2007) or the "Net-Generation" (Oblinger, 2003); in other words, they have grown up with computers and the Internet, and they are the generation that teachers are dealing with today (Bayne & Ross, 2007). Those theories related that smartphone, technology and today's generation cannot be separated.

Using AI for supporting the students' learning will get so many impacts. Regarding all of the beneficial impacts of digital competencies and Artificial Intelligence (AI), the education system is now ready to cope in the use of artificial Intelligence based mobile learning, especially for language learning. Novo Learning is one of the example of Artificial Intelligence that used for the students in Lambung Mangkurat University. This application is used to help the students from Non-English Education major for improving their English skills. Novo Learning is an AI-based mobile learning application developed to enhance the English competence of the users. It is aimed to help the users in improving their English competence by encouraging autonomous learning. EFL learners in this digital era are mostly dependent to mobile phones which enable them to access the application anytime without concerning whether the places. This supports the student-centered learning independently by offering more challenges yet lessen the fear and reluctance in learning English (Manurung & Supiatman, 2020). Hence, this Artificial Intelligence-based mobile learning can also help to arouse the students' enthusiasm as well as motivation for continuous Learning (Uktolseja et al., 2020). The previous study stated that AI supports students' independent learning because the students can access the material wherever they want. It also supports that AI can make the students getting more motivation to learn. Whether in this current study is to investigate the significant effect of the use of Novo Learning as an AI-based mobile learning application to elevate the English as a Foreign Language students' competence.

Literature review

Nowadays, information technology (IT) progresses at such a quick pace that educational institutions are compelled to employ mobile computing devices for academic purposes (Gikas & Grant, 2013; Hamuddin et al., 2020; Mitran & Bajcsy, 2002). Artificial Intelligence (AI) is a new way of thinking about cognition that is having a big impact on language research. (Goldstein & Papert, 1977). English as a foreign language (EFL) gives impacts to the language learning process. The impacts are: 1) the difficulties of the English teacher to make learner speak fluently and to have good skill for communicating using English; 2) the difficulties of learners to translate their L1 to L2 then becoming FL (English). 3) The difficulties of teacher making their students to be able to have good English competence. That difficulties are the challenges for the teacher to design or to make good strategy and approach for the teaching and learning process. It is relevant to the statement that the challenge is described as any situation that makes it difficult to see the progress or to achieve a goal (Aslandogan et al., 1997; Ghavifekr et al., 2016; Schoepp, 2005). Technology-based EFL communication environments hold considerable promise for improving the speaking skills of young EFL learners, who have been found to experience lower levels of stress when communicating in these environments than in ordinary face-to-face communication (Mostafavi & Vahdany, 2016; Peterson & Soberón, 2012; Sun et al., 2017). The study from Sun et al said that using technology can improve student's communication skill. This theory also supports that today's education cannot be separated from technology. The researchers try to make a research about the implementation of AI in ELT for EFL learners in ULM.

Student's competence is a student's ability. The competence means the ability that students have for doing communication using foreign language. Communication is part of life. A success EFL learner is reflected in the way they can communicate using English. The students must have skill that make them can communicate using this language. (Al-Jamal et al., 2013; Stryker & Leaver, 1997) oncluded that communication is very close to learning to ride a bike or learning to play an instrument. Given to this, it is widely understood that the best way to master these skills is by practicing them, and not only by learning them or do exercises and simulations. Building student's competence in EFL means the process of learning English is not only based on the classroom activities, but also through learner's daily life.

Nowadays, most of the learners have mobile phone for communicating. Mobile phone or smartphone could not be separated from learners' daily life. Mostly with greatly increased mobile devices belonging, people are searching for new ways to improve their awareness and understanding with mobile technology in out-of-school environments, which is distinctly different from how such technology are used in school ((Avci et al., 2021; Sefton-Green et al., 2009). Research suggests that mobile technologies can promote the learning process in both formal and informal contexts through facilitating collaborative activities (Arslan et al., 2013; Avci et al., 2021; Sharples et al., 2005). Based on this condition, the teacher can use mobile phone as a facility for teaching and learning process since the use of technology for teaching is one of good approach to be implemented. Learning EFL on mobile devices has become a trending issue for scholars and has been the subject of many studies (van den Hoogen et al., 2013; Zhang et al., 2011). Mobile-assisted language learning (MALL) is an evolving advanced technology that facilitates personal and learner-centered learning opportunities through open and versatile practices (Castañeda & Cho, 2016; Hwang et al., 2016; Nik-Zainal et al., 2016; Wang et al., 2013) as cited in (Sun et al., 2017). Mobile Assisted Language Learning (MALL) refers to the use of mobile technology for language learning where mobile settings can provide specific advantages (Bull & Wasson, 2016; Kukulska-Hulme, 2013). The theories are also supported by (Avci et al., 2021; Rieth et al., 2013) who stated that in EFL contexts, one of the major issues is that non-native English speakers typically experience a lack of access to reliable

outlets for real-life communicative purposes. As a result, the majority of EFL learners have insufficient exposure to target language in real-world environments. In this context, language learning may be more "authentic, accessible, meaningful and accurate" in terms of recognition and combination with global communication resources. Considering the flexibility of m-learning, it encourages learners to engage in authentic learning. Authentic tasks have a positive impact on the acquisition of second-language learners, especially in the context of Web 2.0 and/or m-Learning (Goncharenko et al., 2010; Shah et al., 2009).

Artificial Intelligence (AI) is a trending computing sector capable of altering any part of our social experiences. AI has developed new teaching and learning technologies in education, which are now undergoing testing in various contexts (UNESCO, 2019). AI technologies are used to simulate human Intelligence and provide problem-solving and decision-making assistance. AI has been used and is still used in a number of areas, such as economics, engineering, law, science, medicine and manufacturing (Shehab et al., 2017; as cited in Dost et al., 2020). Artificial Intelligence can be called artificial methods. Using artificial methods to achieve machine intelligence (computer) (Goncharenko et al., 2010). This means that Artificial Intelligence (AI) is programmed to improve human Intelligence and enhancement capabilities. Artificial Intelligence related to its interaction with the program. This research focuses on Novo Learning as an application for Mobile Learning in EFL-based Artificial Intelligence. Novo Learning is an application of Artificial Intelligence-based Mobile Learning designed in Netherland. Novo learning can be accessed by any specification of gadget such as smart phone, laptop, or tablet as its gadget has connected to the Internet. In addition, Novo Learning system has two actors: students as a player of this game, and teacher as administrator (Uktolseja et al., 2020). The players or students can access Novo Learning application through app store then downloading it to their smartphone, gadget or tablet. The performance of Novo Learning in player's gadget is similar to a game. It has several levels that must be finished by the player one by one. Thus, when the students currently finish the first level, they can unlock the next level. Each level has many tasks to do by students. It includes grammar, speaking, listening and reading which also has different degree of difficulties. The more level students get, the more level of difficulties students to solve. In the end of the program, the students are required to do the last test or final test to get the average score of their learning activities using Novo Learning.

The first previous study was from Uktolseja et al. (2020) stated that there is a positive relationship between the use of NovoLearning and self-directed Learning of English skills in non-English students at Victory Sorong University. It means that Novo Learning is proven to be successful as Artificial Intelligence-based Mobile Learning for EFL Learners. Next previous study was conducted by Yan et al. (2018) which states that social networking combined with mobile technology may have a positive effect on EFL oral results, especially in the low levels of elementary school. In addition, the next previous study was conducted by Avci et al. (2021) which showed that studying English in an authentic environment where students used the target language for a real reason can improve their language learning, develop their communication skills and knowledge of vocabulary, and make them understand colloquial English. It is also relevant with previous study which stated that using a mixed-method approach, including content analysis, theme modeling, and sentiment analysis, Vergeer examines both the importance of AI and its themes, as well as main concepts and attitudes towards technology over time Xie et al. (2020). It means that the learning process using authentic environment is possible to increase the students' EFL skill than classroom activities since the process of learning in classroom activities has limited time and place. This problem is probably no longer a concern when the learners are able to use mobile learning in which the activities of learning can be done anytime simultaneously. Thus, there are two research questions addressed in this study:

- (1) Is an artificial intelligence-based mobile learning (NovoLearning) able to elevate EFL students' competence significantly?
- (2) How is the students' attitude toward the use of Artificial Intelligence (AI)-based mobile learning (NovoLearning)?

Methods

Research design

This is a quasi-experimental study, which is determined to examine whether the use of an artificial intelligence based in the form of NovoLearning, which is an existing system available in Play Store and App Store, can elevate the EFL students' competence. In order to evaluate the participants' progress in English skills, a pretest-posttest non-equivalent control group design was implemented in this study. The pretest and posttest was designed to assess the students' competence in English skills and components.

Table 1. A pretest-posttest non-equivalent control group design

Groups	Pretest		Posttest
Experimental Group	O1	X	O3
Control Group	O2	-	O4

Setting

The setting of this study was in Universitas Lambung Mangkurat, which is one of the leading universities in Indonesia that employs NovoLearning as an artificial intelligence based mobile application to assist the English as a Foreign Language teaching and learning process.

Participants

This study administered 1000 students, both male and female in the first semester of their study at university, who came from 21 departments and enrolled an English course of Teacher Training and Education Faculty and required them to have pretest. After the pretest, the control group and the experimental group were randomly selected. From the selection, 100 students were chosen as a control group and 100 students were selected as the experimental group. Both of the groups are not significantly different in English competence as can be seen from the mean of the pretest score: 68.1 for the control group and 69.2 for the experimental group.

Research instruments

This research employed tests and interview as research instrument to collect the data. The procedures of the intervention started in the beginning of the semester of 2019. All of the participants were given a pretest. Then, after the groups have divided into control and experimental randomly, all the learning material and assignment were prepared, which is similar to both groups. The control group was given a Blended English course that consists of face-to-face interaction and using E-learning during the teaching and learning process. Meanwhile, the experimental group was given NovoLearning as their learning tool in English Course. Before conducting the research, the experimental group was given training on using and operating the AI-based mobile learning. NovoLearning consists of three different levels in general English; level 1 to 3. All the students in the experimental group are required to finish all the levels in order to complete the program. The materials in English course and NovoLearning are basically similar. It discussed and practiced all English skills and components thoroughly. The research was conducted in one semester to both the experimental and control groups. The post-test was administered to both control and experimental groups at the end of the semester. It assessed the English as a Foreign Language students' competence in language skills and components. Guttman Split-Half Coefficient assessed the reliability of independent group of the research and it resulted $0.919 > 0.1966$ (value from r table) and dependent group of the research was assessed using Guttman Split-Half Coefficient in which the result is $0.920 > 0.1966$ (value from r table). Both scores indicated that the research scores are reliable since they are higher than the r table.

In addition, the interview revealed the answer to several questions related to the student's attitude toward using AI-based mobile phones were formulated in the interview to answer the second research question. The interview questions were given randomly to 20% of the participants orally.

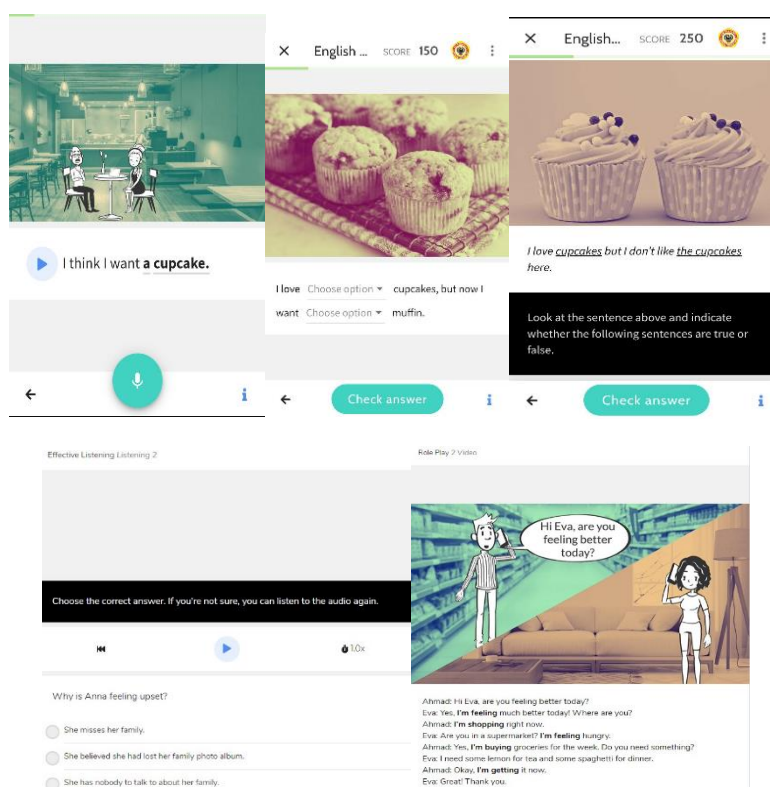


Figure 1. Features in NovoLearning mobile application

Data analysis

The research findings are used to determine if there is a significant difference between the two groups; experimental and control groups. This study employed two-sample t-tests, which are used to compare both tested groups' means statistically. Then, the independent t-test compares the means and standard deviations of the experimental and control groups to investigate whether there is a significant difference. The data in this study were tested using the SPSS version 25 with a significance level of $\alpha = 0.05$.

Thus, there are two hypotheses in this study:

- (1) The null hypothesis (H0) means that there is no significant difference between the means of the experimental and control group; and
- (2) The alternative hypothesis (H1) means that there is a significant difference between the means of the experimental and control group.

The independent t-test was calculated on the data from both tested groups to determine any significant differences between the posttest results. The independent t-test groups' statistics were computed in Table 2 below.

Table 2. Independent t-test groups statistics

	Groups	N	Mean	Std. Deviation	Std. Error Mean
Result	Experimental	100	81.192	6.37197	0.6372
	Control	100	74.6858	7.97688	0.79769

In addition, several questions related to the student's attitude toward using AI-based mobile phones were formulated in the interview to answer the second research question. The interview questions were given randomly to 20% of the participants individually. The content analysis of the responses from the students interview was read several time until achieve the saturation data.

Results

Inferential statistics

The results of the study are presented in inferential statistics. As shown in Table 2, the table provides basic information about the group. In this study, 100 students were given treatment (Using AI-based mobile learning) and 100 not. Basic statistics display for the control group's mean score was 74.7 and for the experimental group was 81.2. However, an independent t-test is needed in order to compare the means of two independent groups (experimental and control) for determining whether there is statistical evidence associated with population means are significantly different or not. In Table 3 below the computation of two groups (experimental and control) is presented.

Table 3. Independent t-test of mean difference scores between experimental group and control group

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Result	Equal variances assumed	12.358	0.001	6.373	198	0.000	6.50620	1.02094	4.49288	8.51952
	Equal variances not assumed			6.373	188.785	0.000	6.50620	1.02094	4.49228	8.52012

Then, as can be seen from the computation in Table 3, the t-test for the means of equality provides the result of the independent t-test. The result showed t critical value (6.373) is higher than t table, then the confidence interval does not include 0 that, can be seen from lower score (4.4928) to upper score (8.5195) in which both scores are positive. It follows the value in the Sig (2-tailed) row, which is less than 0.05. Therefore, the experimental group means are statistically significantly different.

Attitudes

Students' attitudes towards using NovoLearning have been used to describe students' relationship to AI-based mobile learning. The findings showed that their attitudes could be divided into two categories: (1) more opportunities to learn and (2) areas of improvement.

More learning opportunities explore large EFL students in Indonesia who usually learn in the big class, whereas one teacher would handle more than 30 students. The classroom environment could affect students learning process. They rarely received feedback sufficiently from the English teacher. However, AI-based mobile learning provides more

opportunities for EFL students to learn. These opportunities came from each lesson in the course were able to repeat it. One of the students said, "I often doubted my pronunciation, so I try it several times and gladly the NovoLearning check it directly." Most of the students were new users of NovoLearning, and then, the students found the app was interesting and helpful. The students could practice their pronunciation several times. As another student stated, "anytime I can use the NovoLearning, not only in the morning but also in the evening, sometimes I learned while laying down on my bed." However, to complete one level of NovoLearning, the time limitation is three months in which the material in each week has to be passed. Therefore, students should organize and plan their learning time to meet the schedule of NovoLearning. Another student reported: "I am afraid to make mistakes if I say something wrong in class, I feel embarrassed, I feel relaxed when I talk to my handphone." Learning by mobile learning application experienced the students to have a personal tutor. Moreover, as we all know, almost all students cannot be separated from their mobile phones. Thus, they could learn at anytime and anywhere.

In addition to Learning for quite a long time with their mobile, the instruction must be clear. One of the students said, "I noticed the picture is simple, and the icons have their color; for example, the icon for recording my voice has green color." Another student stated, "I understood the instruction from NovoLearning, audio and written form is easy to follow. Then, the user interface of the NovoLearning was simply and attracted configuration.

Meanwhile, students also revealed some issues to be improved for the areas of improvement. They mostly gave complaints that related to minor malfunction of the application. A student said, "I already pushed the record button, but at the end, my recording audio was unsaved, either the connection or loading process, I did not know." Another student noted, "some of the audios were not working, I tried several times, but it does not have any sound." As one of the students said, "I dislike the loading process. I have to wait for it". Another student remarked: "I have to wait in the evening because it is silence at night. When I record my voice at noon, the speech recognition is distracted by noises around me".

An interesting point that emerged from these interviews is that the AI based mobile phones application is easy to use due to the simple instructions. The students felt that they gained and understood more from the application. Using the application to practice the pronunciation is need to be reviewed relating the surrounding noise in the background. However, it could perform well to assess students voice with ease.

Discussion

The data analysis findings showed that the control and experimental groups both have significantly different results on the learners' English competence. The difference in the students' competence in this study can be attributed to two factors of learning to use artificial intelligence-based mobile learning: supporting learning environment and reducing anxiety. In order to gain more opportunities in learning, artificial intelligence-based mobile learning could provide a supportive environment to be focused. It aligns with Yan et al. (2018) that an SNS environment could encourage students to practice their English skills. The students who moved forward to the next course were driven by their self-motivation.

Moreover, collaborative learning also can be enhanced using artificial intelligence-based mobile learning. Interestingly, this finding follows Pallas et al. (2019), who stated that a significant skill developed in communication skill could be developed through the social networking site. The most important aspect of intelligence-based mobile learning-supported collaborative learning is that the learners are not physically supposed to be in a particular classroom. It provides the students' feasibility to encourage autonomous learning.

This study shows that artificial intelligence-based mobile learning is feasible to conduct autonomous learning, as Cash et al. (2012) supported, who states that smartphones may develop learners' learning autonomy as one way of integrating technology on language learning. In addition, Avci et al. (2021) stated that the widespread use of mobile devices affects teaching and learning by allowing more versatile environments in which learners can study and practice anywhere and at any time. It is also related to Nerenberg et al. (2018), who stated that AI and social robot teachers would change the way people learn our content-in and out of the classroom. In addition, competencies are mentally defined (e.g., competence to find food, to escape from predators) and will require at least some flexibility and capacity to learn (Miracchi, 2019). Based on those theories, it can be concluded that students' psychologies when they feel free to learn (flexible in time and place) will influence their achievement. Thus, in this current research, NovoLearning as AI to learn language makes the students feel comfortable, so they are highly motivated to learn about language because motivation is related to human psychology.

In comparison to learning in the classroom, artificial intelligence-based mobile learning takes less time to check each student's pronunciation or understanding due to many students. It is supported by UNESCO (2019), which states that, given the enormous amount of time spent on grading tests and homework, artificial Intelligence can be used as an assessment tool to learn how to grade the teacher and thus free the teacher's time. Moreover, the student could not ask the teacher to focus on giving attention or correcting mistakes in pronouncing the words or sentences since the number of students in the classroom is quite large. It is also relevant with (Rieth et al., 2013; cited in Avci et al., 2021) in EFL environments, one of the common difficulties is that non-native English speaker typically face a lack of access to authentic sources for a real-life communicative intent. As a result, most EFL learners have restricted exposure to the target language in real-world environments. In this regard, language learning could be more "authentic, accessible, appropriate, and accurate" in identifying and aligning with global mobile technologies. Thus, artificial intelligence-based mobile learning facilitates the student to try several times until they satisfy with their

pronunciation. The more advantage of having artificial intelligence-based mobile learning is that the students are less nervous and tend to relax and give their best performance in doing exercises through mobile phones. It is also supported by Xie et al. (2020) stated that AI technology provides substantially more advanced features to enable human-like communication than conventional computer software approaches, and human users will respond to AI agents as if they are interacting with other human beings.

Conclusion

Based on the result of the research, it can be concluded that NovoLearning as Artificial Intelligence (AI)-based mobile learning has significantly elevated the students' English competence. NovoLearning as AI-based mobile learning has proven to give great impacts to students' English competence since the students are able to get more opportunities to learn. In addition, Novo learning is found to support learning environment by making learning activities more flexible to be conducted in which the activities can be done anytime and anywhere. Therefore, Novo Learning experiences the students to be less nervous, and they find it is enjoyable to complete exercises through AI-based mobile learning. The condition makes the learners to be more confidence, and it affects the students' intrinsic motivation that is resulted in giving their best effort to complete Novo Learning courses. Thus, the use of NovoLearning in English as a Foreign Language courses is suggested, especially for large number of students in the classroom.

To improve student's motivation from Non-English Department for learning English language in Lambung Mangkurat University, NovoLearning is one of AI based mobile that can used for its purpose. The students can access NovoLearning anywhere and anytime to improve their language skill. The application is very helpful for students from Non-English department because they can learn language not only in the classroom but also in anywhere as long as they have an internet connection.

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