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# Effectiveness of Mobile Assisted Language Learning Based on Speech Recognition in Learning How to Learn Model to Improve Speaking Skill

*Tristania Handikaningtyas, Dedi Kuswandi, dan Agus Wedi*
State University of Malang, Indonesia
E-mail: tristania.handikaningtyas.2401218@students.um.ac.id

**ABSTRACT**

This study explores the effectiveness of Mobile Assisted Language Learning (MALL) based on speech recognition in the Learning to Learn method on improving EFL speaking skills. This research was conducted using systematic literature review method on 9 selected literatures obtained from Google Scholar database. The results showed that speech recognition-based MALL significantly improved learners' pronunciation, fluency, intonation, and speaking rhythm through detailed real-time feedback and color-coded visualization to help learners identify errors. The use of this speech recognition-based MALL also increases learners' intrinsic motivation and confidence, and reduces public speaking anxiety. With interactive features such as daily challenges, leaderboards and contextual simulations, learners get a relevant, adaptive and fun learning experience. However, constraints such as dependency on internet connection, device compatibility, and lack of social and technical support still pose challenges in its implementation. This research recommends the integration of speech recognition-based MALL with conventional learning methods to create a holistic approach that supports lifelong learning.



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## 1. INTRODUCTION

The language learning paradigm has changed with the massive development of technology, one of which is the Mobile Assisted Language Learning (MALL) which focuses on the use of mobile devices in learning process. According to Kim (2017), MALL was first introduced by Chinnery in 2006 as an advanced theory of Computer Assisted Language Learning (CALL) that has been developed previously. Chinnery (2006) stated that mobile learning is a development of e-learning, where MALL comes as a form of applied integration of mobile learning and language learning. Since its emergence, MALL has become a trend among teachers and learners as a technology that can be integrated into the language learning process (Ridwan, 2019). In this context, MALL is an English learning method adapted to the learning situation integrated with technology that focuses on accessibility and universality (Putri and Degeng, 2024). By using MALL, learners can learn anytime and anywhere flexibly without being tied to formal classes (Wulandari et al., 2024). The effectiveness of using MALL in English language learning is supported by the research of Nur et al. (2022) regarding the implementation of MALL in English language learning which is considered effective in providing positive implications for learning, especially in terms of learner enthusiasm. In addition, the implementation of MALL in English language learning can provide benefits in the form of increased student motivation and engagement in learning process (Widiananda et al., 2023).

In today's rapidly evolving technological landscape, the integration of speech recognition systems into educational methodologies has attracted much attention. This innovation presents a unique opportunity to improve student competency, especially in mastering spoken English. The technology comes with advanced algorithms and the involvement of Artificial Intelligence (AI) to interpret spoken language with a high degree of accuracy, as well as provide immediate feedback to learners on pronunciation and fluency. The potential for immediate correction and reinforcement serves as a powerful motivator, fostering a supportive environment where learners can develop their speaking skills without the stigma often associated with traditional classroom settings. In addition, the adaptability of speech recognition tools caters to diverse learning styles and paces, whereas all the learning process depends on the various learners' preferences. By using MALL, the learners can learn through pronunciation practice, conversation practice, or vocabulary acquisition. This statement supported by Metruk's research (2024) that the use of MALLs with speech recognition features can improve pronunciation acquisition and overall speaking skills. The speech recognition based-MALL provides a customized experience that can accelerate language acquisition. As a result, individualized approach not only improves linguistic ability but also increases confidence among learners. This speech recognition-based MALL can create an immersive learning environment conducive to practicing speaking skills by accommodating engaging learning experiences. Not only does it support the implementation of learning to learn, the speech recognition-based MALL can also function as a diagnostic tool that helps learners identify weaknesses in certain specific skills, such as intonation or rhythm. It can provide a personalized learning experience according to their challenges so as to improve overall linguistic skills (Plutino et al., 2019). The integration of MALL and speech recognition in this Learning to Learn method can shape language learning and foster active communication skills effectively.

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The Learning to Learn method refers to the learner's ability to develop learning skills independently and effectively. This method includes the ability to recognize individual learning needs, identify resources, implement learning strategies, and evaluate learning outcomes to support lifelong learning. Specifically, the Learning to Learn method aims to provide in-depth, applicable and relevant understanding of various knowledge with diverse contexts (Wirth & Perkins, 2013). The Learning to Learn approach, as explained by Wirth and Perkins, emphasizes the importance of developing the ability to learn independently. There are several concepts that are closely related to Learning to Learn, namely intelligence, problem-solving, and learning strategies (Hoskins & Fredriksson, 2008). Hoskins and Fredriksson said that the concept of Learning to Learn was developed through two research paradigms, including the cognitive psychology paradigm and the socio-cultural paradigm. The cognitive psychology perspective examines how individuals can process information and construct knowledge in terms of cognition. Then the socio-cultural perspective examines the social processes that occur in learning. Learning to Learn is a complex learning concept that is closely related to long-life learning that positions the learner as the central of learning in balancing their short-term targets in formal or informal learning environment settings Higgins (2014). In the context of speech recognition- based MALL, this method encourages learners to take an active role in their learning process. By utilizing the feedback provided by the speech recognition-based application, learners can identify their weaknesses and design learning strategies that suit individual needs. This is in line with the concept of self-directed learning, which is one of the pillars in the Learning to Learn method, where learners are able to evaluate their learning needs, choose appropriate strategies, and measure their success. The effectiveness of this combination of MALL and speech recognition lies in its ability to integrate advanced technology with active learning principles, thus creating an adaptive and meaningful learning experience to improve speaking skills.

Technological advances in education have had a significant impact on the way learning takes place, especially in language learning. One prominent innovation is the use of Mobile Assisted Language Learning (MALL), which utilizes mobile devices to support language learning in a flexible and adaptive manner. This technology is further enhanced by the integration of speech recognition features, which allows learners to practice speaking skills independently by receiving immediate feedback. In the context of technology-based learning, the Learning to Learn approach provides a relevant framework by emphasizing the learner's ability to independently recognize learning needs, select appropriate strategies, and evaluate learning outcomes. The combination of speech recognition-based MALL and Learning to Learn method offers great potential to improve learners' speaking skills through an interactive and personalized approach.

This work seeks to investigate the voice- recognition-based MALL has shown great potential. To investigate this, therefore, the following questions will be considered. The research questions are

(i) How effective the use of Mobile Assisted Language Learning based on speech recognition in learning how to learn method in improving speaking skills?
(ii) What are the obstacles faced by learners in using Mobile Assisted Language Learning based on speech recognition in learning speaking skills?

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(iii)What are the differences in speaking skills of learners before and after using speech recognition-based MALL with learning to learn approach?

## 2. METHODS

This study uses the systematic literature review (SLR) method by reviewing several relevant literatures guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) to identify, select, assess and synthesize studies (Page et al., 2021). The main purpose of SLR is to provide a comprehensive overview of the available evidence, identify research gaps, and provide a basis for evidence-based decision making. In its implementation, SLR uses a structured approach with clear stages, such as determining research questions, setting inclusion and exclusion criteria, identifying literature from relevant sources, evaluating the quality of research, and synthesizing reliable results. The use of PRISMA guidelines in this research method provides a standardized guide to ensure that the literature review process is conducted in a transparent and structured manner. This article review aims to provide a comprehensive overview of the effectiveness of gamification-based Mobile Assisted Language Learning (MALL) on improving vocabulary acquisition through self-directed learning. In the identification process, the authors used Google Scholar database using the keywords Effectivity; Mobile Assisted Language Learning; Speech recognition; Learning to Learn Method; Speaking Skill. In the identification of literature, the author uses Zotero as a reference management that collects all the collected literature. In screening literature, there is screening to ensure the relevance of data to the research topic through inclusion and exclusion criteria. In the process of selecting relevant literature, there are inclusion and exclusion criteria in Table 1 below.

**Table 1.** Inclusion and Exclusion Criteria

| Criteria | Inclusion Criteria | Exclusion Criteria |
|---|---|---|
| Year of Publication | Published in the 2019-2024 years range | Not published in the 2019-2024 years range |
| Accessibility | Accessible | Not accessible |
| Types of Literature | Article | Undergraduate Thesis, Theisis, Dissertation, Book |
| Research Method | Using quantitative, qualitative, and mixed-methods research methods. | Using other method |
| Study Focus | Using gamification-based Mobile Learning | Not using gamification-based Mobile Learning |
| Field of Study | MALL implemented on education, especially in English language learning | MALL that not applied in the education field and English language learning |

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| | | |
|---|---|---|
| Language Compentences | Speaking skills, pronunciation, and fluency | Other competencies except speaking skills, pronunciation, and fluency |
| Target | English as Foreign Language (EFL) learners and English as Second Language (ESL) | English as native language |

In the initial search on Publish or Perish using predetermined keywords, a total of 200 articles were found in the Google Scholar database. In the identification stage, there were exclusions made before the screening stage, namely exclusions based on duplicated articles and the range of publication years. At the screening stage there are several exclusion criteria, including literature that cannot be accessed in the amount of 22 literature, and literature sourced from Thesis, Thesis, Dissertation and Books in the amount of 17 literature. Furthermore, a total of 89 pieces of literature remained which would go through the screening stage again through article criteria, which excluded 14 literature review articles. This left a total of 60 articles to be assessed for eligibility based on the inclusion and exclusion criteria as shown in Table 1. A total of 66 articles were excluded with 32 articles that did not focus on speech recognition-based MALL, 25 articles that did not focus on speaking skills, and 9 articles that did not focus on EFL and ESL learners. The final result of this comprehensive analysis process using the PRISMA method found a total of 9 articles that met the inclusion and exclusion criteria.

The PRISMA guidelines are designed to increase transparency in SLR reporting through stages that include identification, screening, eligibility and selection of relevant articles. This process is often depicted in the form of a PRISMA flow chart, which shows the number of articles found, screened and finally analyzed. PRISMA also specifies the items that should be covered in the SLR report, such as research background, literature search methods, article screening process, evaluation of study quality, and synthesis of results. By following these guidelines, researchers can minimize selection bias, ensure that all steps taken are well documented, and produce conclusions that are evidence-based and accountable. The use of PRISMA is essential to maintain the credibility and validity of research, especially in topics that require integration of evidence from multiple sources.

To understand the research trends in Mobile Assisted Language Learning (MALL), we used VOSviewer to visualize the relationship between some of the main keywords that appear in selected literature. Bibliographic data was retrieved from Google Scholar with the help of Publish or Perish software and 200 literatures were found. Figure 2 below is a visualization from VOSviewer that illustrates the relationship between keywords based on bibliometric analysis of selected literature. The keywords “mobile assisted language” and “speech recognition technology” are the core of two large interrelated clusters. There is a red cluster that focuses on language learning applications that use mobile technology, while the blue cluster focuses on speech recognition technology. Identifiable in the figure, there is a relationship shown by a line that indicates the correlation of two connected keywords. For example, the keyword “student” has a correlation with several keywords such as “application” and “speaking skill”, this shows the relevance of using technology in applications that learners use to improve their speaking skills. In green, there are specific

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mentions of applications such as "Elsa" and "Cake" that support the technology-based learning process. This illustrates that technology, apps and language learning are interrelated in this study.

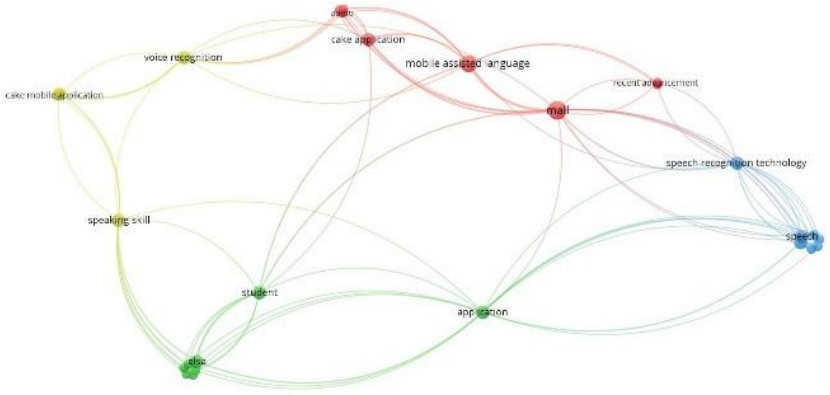


**Figure 1.** Bibliography Visualization

## 3. RESULTS AND DISCUSSION

The results of the systematic review of all selected articles show that the use of Mobile Assisted Language Learning (MALL) based on speech recognition in the Learning to Learn method is effective for improving speaking skills. The integration of cutting-edge technology in language learning provides flexibility, accessibility, and universality for learners in the learning process. The massive development of digital technology today has presented several speech recognition-based MALL applications and platforms that can be utilized in the English learning process as classified in Figure 2 below.

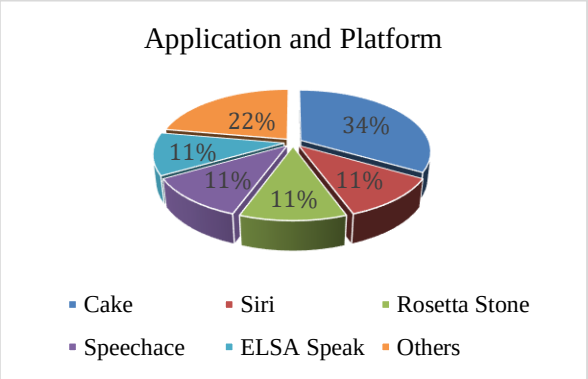


**Figure 2.** Application and Platform used

### The Effect of Mobile Assisted Language Learning (MALL) based on speech recognition in Learning to Learn method on Speaking skill improvement.

The integration of speech recognition-based MALL into language learning offers significant advantages in developing speaking skills, especially for non-native English speakers. Abdilah (2024) in his research conveyed that the use of speech recognition-based MALL in the Learning to Learn method has a positive effect on improving speaking skills, there are several main effects, including increasing motivation and confidence through real-time feedback that helps learners regarding mistakes without worry and embarrassment about criticism in front of their peers. This is in line with Dorji &

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Sakulwongs' (2024) research which showed reduced learner anxiety in practice because they can practice without fear of being evaluated directly by the teacher in front of their peers. It can be concluded that the use of speech recognition-based MALL provides a pressure-free learning experience. The use of speech recognition-based MALL is also able to increase learner engagement with interesting learning compared to traditional setting, it also encourages learners to have self-awareness to learn continuously (Chen, 2022). Therefore, the interactive features can make learning more interesting and fun, thus indirectly generating learners' intrinsic motivation. The use of a fun speech recognition-based MALL with an interactive user-interface can keep learners engaged in learning, the presence of humorous and varied answers in speech recognition-based MALL can provide motivation and interest in learners (Alharthi, 2024). The interactive features of speech recognition-based MALL allow learners to practice speaking in various situations that provide real communication experiences and accommodate learners to express their ideas fluently (Chaniago & Rahman, 2024). The presence of leaderboards and achievement ratings makes learners feel motivated because of the feeling of pride in their achievements, it also encourages them to continue practicing and be consistent in English speaking practice (Liu et al., 2022). The use of this speech recognition-based MALL in addition to encouraging independent learning is also able to encourage continuous and lifelong learning as well as the Learning to Learn method is expected to change learner habits (Tamala & Artini, 2023).

The speech recognition-based MALL can personalize exercises based on individual performance, guiding learners through challenges tailored to their language acquisition preferences. As learners engage with this voice-recognition-based MALL, they gain confidence, not only from their ability to communicate more effectively, but also from engaging in a more interactive and engaging learning environment, encouraging independent learning in the form of flexible access to content and exercises that can be done anytime, anywhere. Speech recognition in the MALL provides an opportunity for learners to determine their own learning pace, where they can listen, repeat, and correct their mistakes according to the learner's wants and needs (Dorji & Sakulwongs, 2024). The daily challenges with graded difficulty levels provide progressive speaking practice which is in line with the Learning to Learn principle of gradual mastery through repeated practice (Abdilah, 2024). In speaking skill mastery, speech recognition-based MALLs help learners to identify their mistakes independently and are given immediate feedback in a clear and comprehensive manner, even if the mistakes are only in accents and other minor errors (Alharthi, 2024). With constructive and concrete feedback, the learner is able to understand the material through an applicative process that does not only emphasize theory (Chaniago & Rahman, 2024). One of the main advantages of speech recognition-based MALLs is the provision of detailed feedback, covering aspects of phoneme, intonation, and rhythm. This feedback is presented visually through a color-coded system, which makes it easier for users to identify specific errors in their pronunciation (Tamala & Artini, 2023). The use of speech recognition-based MALL can make learners aware of their own learning progress which encourages them to continue their practice outside formal classes (Chen, 2022). The advantages of voice-recognition-based MALL are able to provide objective assessment and reduce bias as well as human judgment. The use of speech recognition in MALL is able to identify the weaknesses of each learner and provide targeted practice based on the evaluation results (Liu et al., 2022). This is in line with the principles of the Learning to Learn method which

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emphasizes self-directed learning, and speech recognition technology accommodates this without the dependence on formal classes and teacher involvement.

In recognizing the diverse abilities and learning styles among learners, customization of learning experiences serves as an important strategy in improving educational outcomes. In the use of speech recognition-based MALL, learners can practice language in real contexts. This can be seen from the learner being able to practice in relevant situations. This provides relevant, meaningful, and applicable learning to be applied in daily life (Abdilah, 2024). Speech recognition-based MALL accommodates learners through contextual scenarios relevant to real communication situations (Alharthi, 2024). The use of speech recognition-based MALL utilizes an immersion method that accommodates learners to learn directly through an audio-visual context that provides a focus on word and sound associations that stimulate natural responses (Chaniago & Rahman, 2024). It allows learners to practice through simulated conversations with native speakers through repetition of sentences that pay attention to intonation, rhythm, and natural pronunciation patterns (Nurbaiti Ali, 2023). In the presentation of results, it is often found that speech recognition-based MALLs contain gamification features in the form of leaderboards and levels that can strengthen learners' engagement in learning which can improve their speaking skills and learning time efficiency (Harahap & Dalimunthe, 2024).

Consistent interaction with advanced algorithms can facilitate adaptive learning experiences, track individual progress, and customize exercises to address specific weaknesses in pronunciation and fluency. Abdilah (2024) in his research conveyed that improving pronunciation and fluency through speech recognition technology helps learners hear and imitate intonation and rhythm of pronunciation gradually and accurately. The implementation of voice-recognition-based MALL facilitates self-correction through a transcription feature that shows pronunciation errors which can then be reflected upon by the learner in line with the Learning to Learn method (Alharthi, 2024). In the Learning to Learn method, self-learning and repeated practice make learners naturally understand pronunciation rules without having to memorize explicitly (Chaniago & Rahman, 2024). The combination of features such as word and sentence pronunciation, fluency tests, and exercises with narration can help learners improve their speaking skills in a holistic and meaningful way (Harahap & Dalimunthe, 2024).

## The Obstacles of Mobile Assisted Language Learning (MALL) based on speech recognition on Speaking skill learning

In the implementation of voice-recognition-based MALL in learning speaking skills, there are several obstacles that can be identified. Therefore, further implementation needs to be complemented with other strategies to optimize learning. Abdilah (2024) in his research identified a potential dependence on technology that affects the lack of real social interaction, this can limit the learner's ability to cope with unexpected conditions and situations later. The voice-recognition-based MALL focuses on individual development, so its implementation does not accommodate two-way interactions such as live conversations, which may limit learners' experience in authentic communication situations (Harahap & Dalimunthe, 2024). In addition, the limitations of feedback in speech recognition technology and technical constraints on device compatibility and internet access are obstacles that need to be considered by learners (Alharthi, 2024). These conditions indirectly affect learners' internal motivation. Technical problems, financial constraints, and lack of environmental support are obstacles that learners often

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face in the training process (Chaniago & Rahman, 2024). There are several voice-recognition-based MALL applications that require premium features to access some content, and this can be an obstacle for learners who have financial limitations (Tamala & Artini, 2023). In providing feedback, there are potential inaccuracies in speech recognition, such as background noise that interferes with the app accurately recognizing the words the learner is speaking (Chen, 2022). This is consistent with Liu et al.'s (2022) research on the use of speech recognition-based MALLs that depend on conducive environmental conditions, where noisy and unsettled situations can affect the accuracy of speech recognition. These constraints show how important it is to adapt learning technology tailored to the needs of learners who support personal conditions to deal with the various learning barriers they face. In the adaptation process, there are often obstacles where learners are less familiar with the technology and need time to adjust such as in the operation of features and understanding of speech recognition (Dorji & Sakulwongs, 2024). Obstacles do not only come from internal factors, but also external factors, where in some cases the lack of parental support and teacher guidance in the use of speech recognition-based MALLs can reduce the effectiveness of self-directed learning (Nurbaiti Ali, 2023).

**The Differences in Speaking skills of learners before and after using speech recognition-based MALL with Learning to Learn approach.**

The integration of speech recognition technology into English language learning shows potential implications for pronunciation and fluency development. By utilizing this technology, learners receive immediate and tangible feedback on their speaking performance, which is essential for refining their articulation and rhythm. For example, speech recognition can identify phonetic discrepancies and suggest corrective actions, thus equipping learners to recognize and correct their mistakes in real-time. This feedback results in a decrease in word transcription errors, indicating improved pronunciation mastery in the learner (Chen, 2022). The use of speech recognition-based MALL provides measurable and targeted learning, which can be seen before the use of speech recognition-based MALL that learner's face limitations in understanding and predicting their ability levels (Liu et al., 2022).

According to Abdilah (2024) there are significant changes in learners before and after using this speech recognition-based MALL, including increased improvement in pronunciation, fluency and intonation, increased self-confidence, reduced anxiety and fear of making mistakes, increased self-awareness to learn independently as evidenced in time management skills and consistency of practice. The implementation of Learning to Learn in learning provides independence to learners, including in increasing confidence and ability to speak English actively in various contexts (Dorji & Sakulwongs, 2024). In English speaking practice, learners are often not fluent in pronouncing sentences, such as there are many pauses and hesitations in pronunciation, this can be assessed the difference after the use of speech recognition-based MALL where learners are able to speak more fluently with a more natural speaking rhythm (Nurbaiti Ali, 2023). The existence of comprehensive practice and feedback provides a significant assessment of learner pronunciation, including aspects of phonemes, intonation and rhythm that can make them practice and show pronunciation results that are close to native speakers (Tamala & Artini, 2023).

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The use of voice-recognition-based MALLs encourages a more immersive practice environment, where learners can repeatedly perform speaking exercises without fear of judgment as is common in conventional classrooms. This is in line with the speech recognition-based MALL which motivates learners to practice more frequently and consistently (Alharthi, 2024). This difference can also be found in Chaniago & Rahman's (2024) study which found significant differences in learner speaking skills where the Learning to Learn approach was able to improve complex English language skills, including pronunciation, vocabulary, grammar, fluency, and learner confidence. The complexity of skills that learners can achieve in using this speech recognition-based MALL has led researchers to recommend the integration of technology with conventional learning methods where the role of technology is present as an effective supporting tool utilized to practice outside of formal classroom learning (Harahap & Dalimunthe, 2024).

## 4. CONCLUSION

The use of speech recognition-based MALL in Learning to Learn method creates an interactive, self-directed, and context-based learning approach that is able to improve speaking skills effectively through fun and meaningful learning. The use of speech recognition-based MALL gives significant results in the aspects of pronunciation, fluency, intonation, and confidence. The use of voice-recognition-based MALL application is able to construct a pressure-free learning environment, where learners can learn without fear of evaluation delivered by the teacher in front of peers. The integration of gamification features in the voice-recognition-based MALL motivates and enhances learner engagement through interactive features such as color-coding system, leaderboard, and daily challenges through relevant and fun approaches. However, in its implementation there are several obstacles such as potential dependence on technology, premium features, and limited direct social interaction. This condition needs to be anticipated by integrating the learning process with other learning resources and methods to support the improvement of English language skills efficiently, independently, and support lifelong learning.

## 5. AUTHORS' NOTE

This research is the author's original work. This article has never been published in journals, proceedings, or other publication media, either in whole or in part. The authors also guarantee that this article is free from all forms of plagiarism. All citations and references have been properly mentioned in accordance with the ethical standards of scientific publications.

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