

Utilization of mobile learning in improving arabic vocabulary in elementary schools



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ARTICLE INFO

ABSTRACT

Received May 26, 2024
Revised October 13, 2024
Accepted November 20, 2024

Keywords

Arabic Vocabulary;
Elementary Schools;
Mobile Learning

Technological developments are indispensable in the world of education. Many schools are required to utilize mobile learning in the learning process. Educators can be more creative and innovative in using mobile learning to improve Arabic vocabulary at various levels, including elementary schools. This study aimed to determine the multiple benefits of mobile learning in improving Arabic vocabulary in elementary schools. This research method uses quantitative data from interviews and questionnaire dissemination. The questionnaire dissemination process is carried out online. The results showed that learning with mobile learning improves Arabic vocabulary in elementary schools. From the study, it can be concluded that mobile learning in improving Arabic vocabulary in elementary schools has proven effective and efficient. This is evidenced by the results of research that many elementary school students master increasing Arabic vocabulary. The limitation of this study is that researchers only research mobile learning, even though many other learning media can be used as alternatives in increasing Arabic vocabulary in elementary schools. Researchers hope that future researchers can conduct research related to increasing Arabic vocabulary by utilizing other learning media. This study also recommends further researchers to make research as a reference in improving Arabic vocabulary in elementary schools using mobile learning.



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1. Introduction

The rapid development of technology has dramatically affected education in Indonesia [1]. Many positive impacts are obtained by varied learning media [2]. Educators will be more competent and more easily educated by utilizing technological advances. The information obtained also varies. Even from various desired fields with effortless access [3]. Long distances are no longer an obstacle to communication. Video calls on Android can provide easy access to communication [4]. This can be done when the user has internet access. Various activities supporting self-ability can also be easily accessed online [5]. It even makes it easier to increase income through selling online. This can raise the economic level of the community [6]; competitiveness with foreign communities can also be achieved through technological sophistication. Internet technology, which continues to develop, can influence various other aspects of life. It is even one of the primary needs that must be met. Especially when the COVID-19 pandemic hit the world, requiring everyone to use digital devices in all activities. Moreover, it is undeniable that internet technology has increased after the end of this pandemic. With so

many exciting features in various applications, it can make users not feel bored [7]. Without the internet, many adverse effects will occur. One of them is in the field of Education [8]. Such as the lagging mastery of science that continues to grow. Especially students who live in villages [9]. Suppose you do not take advantage of this available mobile learning. Then, it will be far behind with students residing in the city [10]. It is possible that students who live in remote areas can be superior in their abilities—namely, mastering knowledge by utilizing technology to the maximum. Mobile learning utilizes technology and mobile devices [11]. Such devices can be PDAs, cell phones, laptops, tablet PCs, etc. Its use has an excellent impact on the world of Education [12]. Progress in various fields can be achieved easily [13]. However, it does not only rely on existing technology. Regarding human resources, they must also be able to work well together [14]. In order to realize a common ideal, civilization is increasingly advanced [15]. All parties involved need to receive support. Moreover, he is a very influential educator in educating his students. Those who will be the nation's successors and preserve culture [16]. Various demands in order to be able to use existing technology. Utilizing mobile learning in the learning process improves learning outcomes [17]. Students must also be able to use it to fulfill the assigned tasks [18]. It is even required to have some mobile for learning purposes. As well as improving students' ability to master science and technology.

Maximum use of mobile learning by educators is expected to make it easier to convey knowledge. Various creative and innovative ways continue to be carried out [19]. Especially for elementary school-age children who quickly feel bored following learning [20]. Mobile learning is needed, especially in Arabic subjects [21]. There are four skills that students must master, namely writing skills, reading skills, speaking skills, and listening skills [22]. Improving the Arabic vocabulary of elementary school students can be easy. They are done by utilizing learning technology with mobile [23]. They will have fun learning, and their memory of new vocabulary will speed up. It even makes students addicted to learning with enthusiasm [24]. Moreover, it is supported by unique and exciting learning games. With all its sophistication, Mobile Learning can support the various needs of students and teachers. Meet almost all needs in the teaching and learning process. Success in Education cannot be separated from the role of educators. In addition to having extensive knowledge, teachers must also master technology and digital competitions, which are more highly qualified than students [25]. To create a pleasant learning atmosphere, educators can combine learning materials with evolving technology [26]. Like making a picture guessing game with Arabic vocabulary on a smartphone. In a very accessible way, anywhere and anytime. The reality is that elementary school students prefer to learn while playing. Using mobile learning correctly can sharpen students' brains in remembering and memorizing Arabic vocabulary [27]. Mobile learning is very suitable for use to support success in improving Arabic vocabulary. Many ways are more interesting than memorizing using book media. Innovation that continues to grow makes many mobile choices to suit your needs.

The reality is that there are many mobile learning users in various circles, especially children who cannot be separated from smartphones [28]. Cooperation between educators and parents is needed to supervise their use. Smartly, you can turn existing features in mobile learning into education for students. To be more productive and have a positive impact. With the creation of Arabic games to improve vocabulary mastery. The first step is to change Indonesian vocabulary to Arabic. Then, please make a picture and guess it using Arabic vocabulary [29]; alternatively, choose the correct vocabulary to fill in clumped sentences. You can also open a card containing new vocabulary and make it into a perfect sentence. There are many ways that mobile learning can be utilized with effortless access [30]. Educators can choose it according to the needs of teaching materials delivered to students. Various mobile learning tools can also facilitate learning activities at school or home. Students' ability to answer all challenges in the field of education continues to be utilized [31], such as filling out exam answers by simply collecting documents online, asking permission by e-mail, studying various knowledge quickly, and so on. All of that can be done quickly and easily with one smartphone. Many applications and form plates are free [32]. Train students' ability to use it and utilize it intelligently. Using mobile learning to improve Arabic vocabulary has excellent goals and benefits for achieving learning targets. Among them is to make the teaching and learning process fun so that students do not get bored in receiving lessons. It can also foster students' enthusiasm for memorizing new Arabic vocabulary. As well as practicing concentration to improve memorization.

Malik *et al.*, stated in their research entitled Design and Implementation of Mobile Learning as an Effort to Improve Arabic Learning in School that this study aims to determine the benefits of using mobile learning that varies in improving Arabic language learning [33]. According to [34] in their research entitled Development of Arabic Teaching Materials based on Mobile Learning, this study aims to determine the benefits of using mobile learning that continues to grow in educational institutions. Meanwhile, according to [35], in his research entitled Utilization of Interactive Game Digital Media in Learning Arabic Vocabulary, this study aims to determine the benefits of digital media in students' mastery of Arabic vocabulary. The difference between this research and previous research is the use of technology in the form of mobile learning in the modern learning process. In contrast, the previous one still uses simple and manual methods. Researchers are trying to re-research the use of mobile learning in improving the Arabic vocabulary of elementary school students. Utilizing mobile learning, students are expected to improve their Arabic vocabulary mastery quickly. I also want to feel happy and relaxed in memorizing it to achieve the goals of learning that have been set. Educators can also evaluate learning outcomes more practically and efficiently. Based on the explanation above, there is a need for action to master problems in learning Arabic, so researchers use mobile learning to increase the Arabic vocabulary of elementary school students so that students increasingly like to explore Arabic learning in exciting and varied ways.

2. Method

This study used quantitative methods. They are used for mobile learning to improve the Arabic vocabulary of elementary school students [36]. Quantitative research methods are efforts by a researcher to find knowledge by providing data in the form of numbers. The numbers obtained are used to perform information analysis. Alternatively, it can be interpreted as scientific research compiled systematically into parts. As well as finding the causality of the relationship [37]. This study aims to make measurements to help see the fundamental relationship between empirical observations and quantitative data results [38]. Another goal is to help determine the relationship between variables in a population. The steps needed in quantitative research are making sentence problem formulations and asking specific and relevant questions. As well as being new and original. The next step is determining the theoretical basis for finding the answer to the problem statement. Then, a temporary answer hypothesis can be formulated in research obtained from theoretical studies. After that, data, as well as essential and relevant data, will be collected and analyzed. The last step is to conclude from the results of hypothesis testing. Quantitative research is an approach that presents positivism. Relates to numbers analyzed using statistics. The collection method uses population and samples. Population is a collection of research subjects. Kalua sample is the object of research to be carried out. The characteristic of quantitative research is that it is specific, clear, and detailed. Shows the relationship between variables. It uses deductive flows and collects data using surveys and questionnaires.

This research was conducted to build hypotheses about phenomena around us. As well as measurement as a research center. Because the study results will produce a fundamental relationship between empirical observations and the results of quantitative research data, this research also helps determine the relationship of variables in a population. It also highlights problems, more specific problems that are used as the focus of research. Fig. 1 is Population and Quantitative Research Sample. The time and place of research to collect data is in elementary schools. The object of this research is the use of mobile learning in improving Arabic vocabulary in elementary schools. This research was conducted at a school institution that aimed to see the benefits of mobile learning. Data collection is carried out by distributing questionnaires to students to determine the percentage of benefits obtained. They also carried out observations that aimed to know the knowledge first, the object to be observed, the purpose of the problem to be made, prepare the observation, determine the secondary data needed, and record the observation results, for example, by making observations in elementary schools. The technique carried out by researchers in collecting data containing numbers is to collect information that is measured for authenticity, calculated, and compared on a statistical scale. The process of collecting data collected from observation respondents is a technique of quantitative research data analysis. For example, the data processing process is based on the type of respondent; after that, the object is made, and the hypothesis test is calculated from the data obtained. Statistical

tests complement quantitative research in the form of inferential statistical tests; they are used when random data collection techniques are used and when the required sample is evident. There is also descriptive, which is used to analyze data by drawing and describing data collected without changing the source of the data obtained.

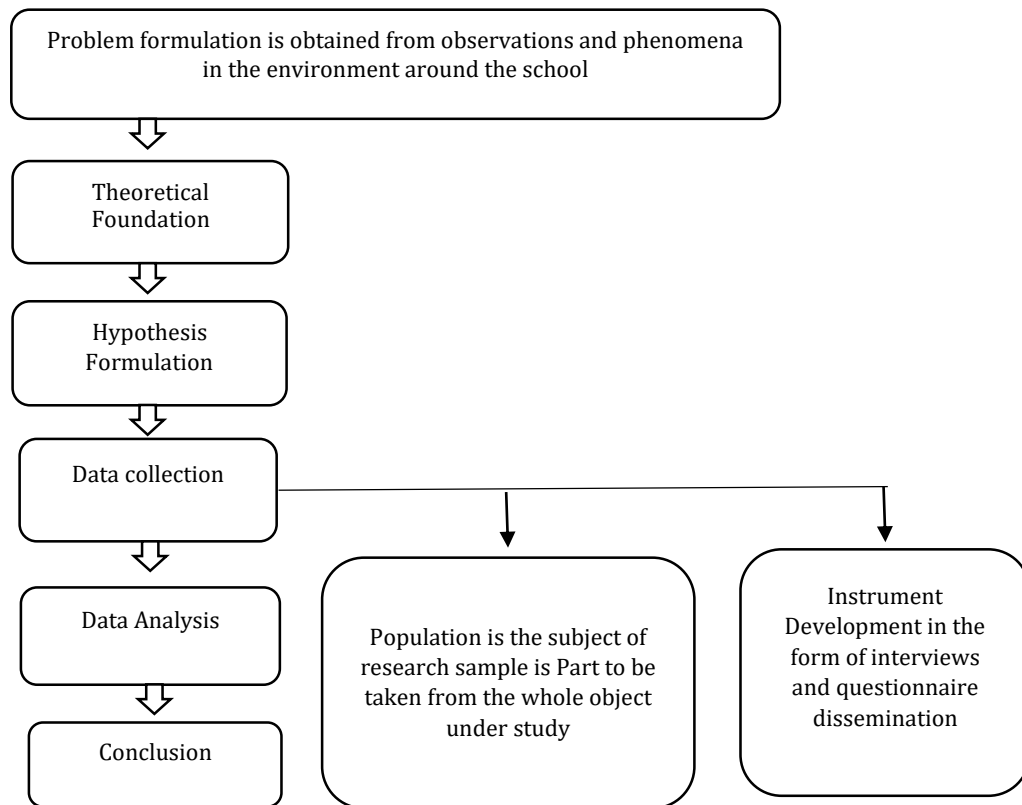


Fig. 1. Population and Quantitative Research Sample

3. Results and Discussion

Learning media that utilize mobile learning using quantitative research methods. Quantitative methods are part of the systematic investigation of phenomena by collecting data. Mathematical or computational statistical techniques will then measure this. The quantitative data collection process is known as questionnaire, interview, and observation data collection techniques. Research in the form of numerical and numbers that can be calculated is also called quantitative research. Quantitative research methods are obtained through questionnaires as a research tool, or questionnaires can be used. According to Wiratna Sujarweni, research produces findings that can be achieved using statistical procedures or other means of quantification. Quantitative methods are divided into two, namely inferential methods and descriptive methods. One example of quantitative research is using mobile learning to improve elementary school students' Arabic vocabulary. This quantitative method is systematic scientific research. Causality relationships develop and use mathematical models, theories, and hypotheses related to events or phenomena in parts and phenomena. The advantage of quantitative data analysis is that statistical analysis can interpret the data. It is based on mathematical principles. So, the quantitative approach is seen as objective and rational. Data collection techniques can be through interviews, questionnaires, or observations. This quantitative research helps determine the relationship between variables in a population. It also helps determine the design of the study. Quantitative research design has two forms, namely descriptive studies and experimental studies. In the Table 1, there are statements of several questions in mobile learning that researchers examined in elementary schools. The statements generated from several questions are conducive for researchers to examine the use of mobile learning in elementary school students. The questions tested in this study were 15 statements about mobile learning, the benefits, objectives, and functions of using mobile learning for students in elementary schools.

Table 1. Results of Questionnaire Distribution

Statement	Agree	Agree	Disagree	Strongly Disagree
The use of mobile learning in improving the Arabic vocabulary of elementary school students is beneficial and runs effectively	82%	39%	5%	0%
The existence of mobile learning varies, so teachers can choose what is suitable for teaching	50%	63%	3%	0%
The material combined in mobile learning is exciting and easy to understand	65%	45%	10%	3%
The material presented in mobile learning can be done easily	70%	55%	25%	0%
The material presented in mobile learning varies, so students do not get bored	85%	55%	30%	2%
The use of mobile learning in improving the vocabulary of elementary school students is beneficial and makes it easier for educators	30%	44%	15%	0%
Mobile learning can increase student attractiveness in learning	62%	78%	5%	0%
The use of mobile learning in learning can increase student motivation in memorizing vocabulary	30%	68%	1%	0%
The use of mobile learning can save time in the learning process	78%	82%	25%	0%
Examples of research in the use of mobile learning are obvious	85%	45%	35%	0%
Trusted and accurate questions in mobile learning	94%	10%	7%	0%
The material in mobile learning is by the learning taught	80%	10%	0%	0%
Mobile learning makes it easier for users to advance and compete in the world of education	68%	32%	10%	0%
Mobile learning that is easy to operate makes students like to learn while playing	88%	44%	5%	0%
Mobile learning is essential for students, especially when learning Arabic	66%	68%	0%	0%

The statement, which contains the benefits of using mobile learning to improve the Arabic vocabulary of elementary school students, obtained a percentage of 60%, with the category strongly agreeing. The statement that mobile learning varies significantly in use obtained a percentage of 50%, with the category strongly agreeing. This study also examines the material available in mobile learning, which is very interesting and easy to understand, obtaining a strongly agreed category of 45%. This statement on mobile learning states that using mobile learning can save time in the learning process by 50% and obtained the category of strongly agree. The statement that the use of mobile learning greetings can increase the attractiveness and motivation of students in memorizing Arabic vocabulary obtained a percentage of 55%, with the category strongly agreeing. The statement stating that mobile learning makes it easier for users to advance and compete with various groups gets a category of 40% agree. Likewise, other statements get the category of strongly agree. The table above shows that mobile learning is very popular with students, so obtaining the highest category strongly agrees with a percentage of 65%, and obtaining the category strongly agrees with the lowest percentage of 40%. Research using mobile learning can make it easier for students to learn.

Statements on using mobile learning in learning can save time, with a percentage of 78% in the strongly agreed category and 82% in the agreed category. I also got a 25% percentage in the disagree category. On the question that research in the use of mobile learning is clear, getting a percentage of 85% of categories strongly agree. In the agreed category, a percentage of 45% is obtained. Moreover, the category of disagree gets a percentage of 35%. Furthermore, the statement of material in mobile learning by the learning taught gets a percentage of 80% of the category strongly agrees. In the agree category, get a percentage of 10%, and in the disagree category, get a percentage of 0%. Moreover, in the category strongly disagreed, it got a percentage of 0%. The question of whether mobile learning makes it easier for users to advance and compete in the world of education gets a percentage of 88% in the category strongly agrees. In the agree category, get a percentage of 44%, and in the disagree category, get a percentage of

5%. Moreover, in the category strongly disagreed, it got a percentage of 0%. Furthermore, the statement that mobile learning is needed by students, especially in Arabic language learning, gets a percentage of 66% in the category strongly agrees. In the agreed category, the percentage is 68%, and in the disagreed category, the percentage is 0%. Moreover, in the category strongly disagreed, it got a percentage of 0%.

The statement of material combined in mobile learning is interesting and easy to understand, with a percentage of 65%. Getting the category strongly agrees. In the agreed category, a percentage of 45% is obtained. Furthermore, the disagree category gets a percentage of 10%, and the strongly disagree category gets a percentage of 3%. The material presented in mobile learning is indeed beneficial. Many educators find assessing their students' cognitive development helpful, as the percentage above explains that 65% of the material combined is exciting and easy to understand. So, it is easy to do it until it is done well. As for those who use the previous method, it seems they will be far behind the people in the city. Moreover, I agree to get a 45% percentage in this matter. The statement that mobile learning can increase student engagement in learning is getting a percentage of 62%, a category strongly approved. In the agreed category, a percentage of 78% was obtained. Moreover, the disagree category gets a percentage of 5%. While in the category strongly disagree, get a percentage of 0%. Students are thrilled if they learn by using learning media. Like mobile learning, it is not easily boring and easy to understand. Moreover, teachers can easily evaluate the tasks given to students. More and more convenience is obtained from using learning media such as mobile learning. Mobile learning helps advance civilization. It will be easy to compete in developing knowledge. In the Fig.2 there is a graph of mobile learning.

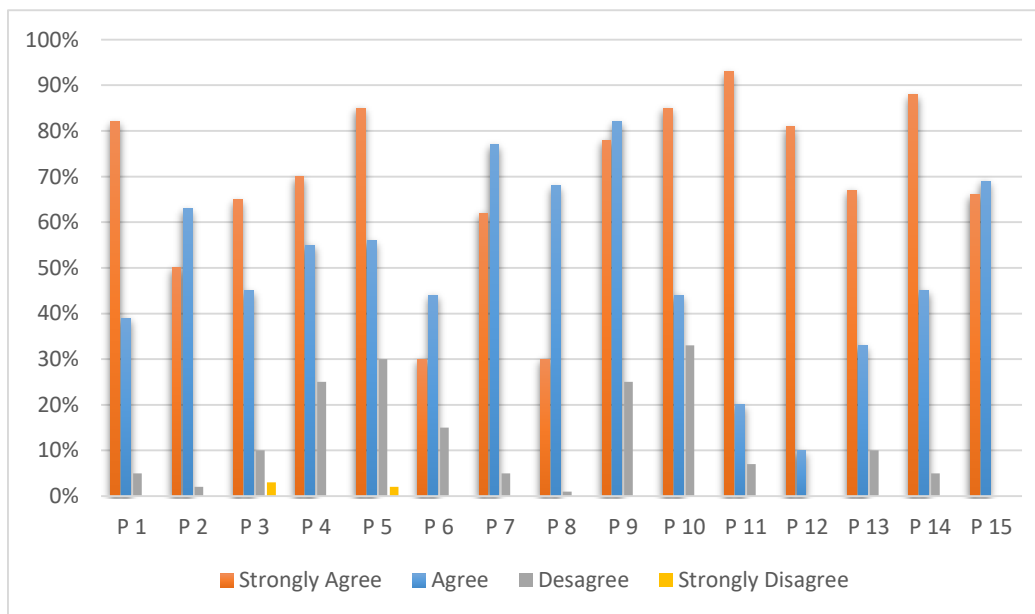


Fig. 2. Percentage of Audience Opinion on the Use of Smartphones in Learning

The data from the results of testing questions on mobile learning is as follows: 30 students are the object of this study. Researchers used 15 questions to assess students' ability to answer mobile learning questions in the research process. The highest research results obtained a percentage of 92%, and based on the study results, the category strongly agreed (SS). The second highest percentage of research results was obtained at 88%, with the category enormously agreeable (SS). In the third highest research results, a percentage of 85% was obtained, with the category strongly agreeing. The lowest mobile learning research results obtained by the category strongly disagree with a percentage of 0%. The results of the second lowest mobile learning research obtained by the category strongly disagree with a percentage of 3%. This shows that the category strongly agrees as the highest category. Moreover, the results of mobile learning research tests on elementary school students in the era of education 5.0 can be explained as follows: in the category of strongly agree there is the highest percentage gain of 92%; the category strongly agrees, this category strongly agrees this is the highest percentage gain of several existing categories. While the lowest percentage in the category

strongly agreed to get a percentage of 30%. The second percentage gain is with the agreed category, with the highest percentage gain of 82%, while the lowest gain in the agreed category gets a percentage of 10%. The next category is the strongly disagree category, which has the highest percentage of 4%, while the lowest is 0%. Based on the overall result, the highest percentage was 92%. Elementary school students who disliked mobile learning questions gained 8%.

In the Fig 3, one of the uses of mobile learning is for learning, namely Android-based smartphones. The form of this mobile learning is a game that involves guessing Arabic vocabulary from the images that have been provided. Questions are usually provided to elementary school students during the teaching process. The use of Android-based mobile learning greatly influences students in increasing their Arabic vocabulary. Because this educational game makes it easier for students to add new vocabulary in a fun and not tedious way, this mobile learning also helps educators because it is easy to quickly improve the vocabulary skills of elementary school students, not manually anymore. They are making it easier to access learning at school. The characteristics of this learning media are that the material in mobile learning is provided, answers questions specifically, the purpose of using mobile learning is clear, instructions for using media exist, and the flow of learning is evident. Nowadays, mobile learning is essential because students often use the internet instead of answering questions manually; using mobile phones will quickly find answers from their exams, which will be more helpful, especially for teachers with mobile learning. The use of this media has its appeal for elementary school students. The positive impact is that it makes it easier for students to access learning anywhere and anytime. Therefore, students must be able to use mobile learning properly and correctly so that students can improve their Arabic vocabulary.



Fig. 3. Vocabulary Learning via Smartphone

The result of this study is the use of mobile learning to improve the Arabic vocabulary of elementary school students. The use of mobile learning is to make it easier for students to improve their ability to increase vocabulary quickly and easily. The use of mobile learning also makes it easier for educators to evaluate the development of their students. Mobile learning is very suitable for students, especially when improving Arabic vocabulary. Mobile learning is very suitable for students to improve their ability to memorize vocabulary quickly. The advantages of mobile learning are that it can be accessed with enough internet, but some games can be accessed without the internet. The use of mobile learning is very influential on students because initially, students are not enthusiastic about memorization, and with the existence of mobile learning, they are becoming more addicted to learning. Research examining the use of mobile learning for education shows that many students like learning using mobile learning. The method used in his research is the quantitative method. It uses numbers or numerics containing numbers in them or a study. This research method is obtained by collecting all the many things

obtained by researchers by going into the field. When directly at the place of research, the aim is to find research data that comes from the source and valid truth. By using quantitative methods that contain original data from the research conducted. Researchers can explain how much data has been studied in the field. This method also makes it easier for researchers to do scientific work using tables, bar charts, pie charts, and line charts in scientific papers, using data that knows the source and provisions based on what is in the place of research. The purpose of this study is to facilitate teachers and students in the teaching and learning process. Most schools have taken advantage of this mobile learning existence. But there are also those who have not used it optimally due to internet network problems in remote villages that are difficult to reach. In the industrial era 5.0, it is a loss and will be left behind if it does not maximize the existence of this widespread mobile learning. Easy to use for all circles, anywhere and anytime makes this media very popular. Especially in the world of Education to improve the skills of learning Arabic vocabulary. So it is expected that the government can provide adequate facilities, especially remote villages. In order to be able to compete healthily with those in the city.

4. Conclusion

The most significant finding of this research is that mobile learning significantly improves Arabic vocabulary acquisition among elementary school students. Students who used mobile learning applications demonstrated notable increases in vocabulary retention and overall language proficiency compared to those who relied on traditional learning methods. Mobile learning apps' interactive and engaging features, such as games and multimedia content, played a crucial role in enhancing student motivation and learning outcomes. These results indicate that mobile learning can be an effective tool for language education in young learners. This study contributes valuable insights into the application of mobile technology in elementary education. The research highlights the practical benefits of using mobile learning apps, which include increased student engagement, flexibility in learning, and the ability to provide personalized feedback. Mobile learning offers a modern and accessible approach to language education that can complement traditional teaching methods. This innovative approach supports vocabulary acquisition and encourages autonomous learning and technological literacy among young students. The limitations of this study include the relatively short duration of the intervention and the specific focus on vocabulary acquisition, which may not capture the full potential of mobile learning in language education. Further research with extended study periods and more prominent, more diverse student populations is necessary to validate these findings and understand the long-term effects of mobile learning on language proficiency. Additionally, the study did not explore the impact of mobile learning on other language skills, such as reading comprehension, speaking, and writing, which are essential components of language learning. Future research should address these limitations by conducting longitudinal studies that evaluate the sustained impact of mobile learning on various aspects of language acquisition. Expanding the scope to include different educational settings and diverse learner groups will provide a more comprehensive understanding of the effectiveness of mobile learning. Integrating mobile learning with other educational technologies and instructional strategies could also offer valuable insights into creating a more holistic and practical language learning environment for elementary school students.

Acknowledgment

The author would like to thank the Universitas Universitas Negeri Islam Mahmud Yunus Batusangkar the granted support.

Declarations

- Author contribution** : All authors contributed equally to the main contributor to this paper. All authors read and approved the final paper
- Funding statement** : None of the authors have received any funding or grants from any institution or funding body for the research
- Conflict of interest** : The authors declare no conflict of interest
- Additional information** : No additional information is available for this paper

References

- [1] M. Kouhizadeh, S. Saberi, and J. Sarkis, "Blockchain technology and the sustainable supply chain: Theoretically exploring adoption barriers," *Int. J. Prod. Econ.*, vol. 231, p. 107831, Jan. 2021, doi: [10.1016/j.ijpe.2020.107831](https://doi.org/10.1016/j.ijpe.2020.107831).
- [2] S. (Sam) Kim, J. Kim, F. Badu-Baiden, M. Giroux, and Y. Choi, "Preference for robot service or human service in hotels? Impacts of the COVID-19 pandemic," *Int. J. Hosp. Manag.*, vol. 93, p. 102795, Feb. 2021, doi: [10.1016/j.ijhm.2020.102795](https://doi.org/10.1016/j.ijhm.2020.102795).
- [3] M. Stoyanova, Y. Nikoloudakis, S. Panagiotakis, E. Pallis, and E. K. Markakis, "A Survey on the Internet of Things (IoT) Forensics: Challenges, Approaches, and Open Issues," *IEEE Commun. Surv. Tutor.*, vol. 22, no. 2, pp. 1191–1221, 2020, doi: [10.1109/COMST.2019.2962586](https://doi.org/10.1109/COMST.2019.2962586).
- [4] A. Khan, S. Gupta, and S. K. Gupta, "Multi-hazard disaster studies: Monitoring, detection, recovery, and management, based on emerging technologies and optimal techniques," *Int. J. Disaster Risk Reduct.*, vol. 47, p. 101642, Aug. 2020, doi: [10.1016/j.ijdrr.2020.101642](https://doi.org/10.1016/j.ijdrr.2020.101642).
- [5] N. Govil, N. Raol, C. S. Tey, S. L. Goudy, and K. P. Alfonso, "Rapid telemedicine implementation in the context of the COVID-19 pandemic in an academic pediatric otolaryngology practice," *Int. J. Pediatr. Otorhinolaryngol.*, vol. 139, p. 110447, Dec. 2020, doi: [10.1016/j.ijporl.2020.110447](https://doi.org/10.1016/j.ijporl.2020.110447).
- [6] Y. Kwon, Y. Yi, and S. Kim, "Perceived economic mobility increases subjective well-being when perceived social support opens the door for others," *Int. J. Consum. Stud.*, vol. 46, no. 6, pp. 2429–2444, Nov. 2022, doi: [10.1111/ijcs.12796](https://doi.org/10.1111/ijcs.12796).
- [7] R. Huang, S. Zheng, Z. Liu, and T. Y. Ng, "Recent Advances of the Constitutive Models of Smart Materials — Hydrogels and Shape Memory Polymers," *Int. J. Appl. Mech.*, vol. 12, no. 02, p. 2050014, Mar. 2020, doi: [10.1142/S1758825120500143](https://doi.org/10.1142/S1758825120500143).
- [8] S. Nurfaidah, A. R. S. Tambunan, F. Yonata, D. Kurniawati, and R. P. D. Lestariyana, "International Students' Perceptions of Virtual Service Learning Program Amidst COVID-19 Pandemic," *J. Int. Stud.*, vol. 10, no. S3, pp. 198–208, Nov. 2020, doi: [10.32674/jis.v10iS3.3207](https://doi.org/10.32674/jis.v10iS3.3207).
- [9] A. Amrina, A. Mudinillah, and M. Y. Al Ghazali, "Utilization of Audacity Media in the Lesson of Maharah Istimah," *EDUKATIF J. ILMU Pendidik.*, vol. 4, no. 1, pp. 1575–1583, 2022. doi: [10.31004/edukatif.v4i1.2433](https://doi.org/10.31004/edukatif.v4i1.2433)
- [10] M. Zotova, T. Likhouzova, L. Shegai, and E. Korobeynikova, "The Use of MOOCS in Online Engineering Education," *Int. J. Eng. Pedagogy IJEP*, vol. 11, no. 3, p. 157, May 2021, doi: [10.3991/ijep.v11i3.20411](https://doi.org/10.3991/ijep.v11i3.20411).
- [11] W. Y. B. Lim *et al.*, "Federated Learning in Mobile Edge Networks: A Comprehensive Survey," *IEEE Commun. Surv. Tutor.*, vol. 22, no. 3, pp. 2031–2063, 2020, doi: [10.1109/COMST.2020.2986024](https://doi.org/10.1109/COMST.2020.2986024).
- [12] L. Liu, J. Zhang, S. H. Song, and K. B. Letaief, "Client-Edge-Cloud Hierarchical Federated Learning," in *ICC 2020 - 2020 IEEE International Conference on Communications (ICC)*, Dublin, Ireland: IEEE, Jun. 2020, pp. 1–6. doi: [10.1109/ICC40277.2020.9148862](https://doi.org/10.1109/ICC40277.2020.9148862).
- [13] D. Kuriakose and Z. Xiao, "Pathophysiology and Treatment of Stroke: Present Status and Future Perspectives," *Int. J. Mol. Sci.*, vol. 21, no. 20, p. 7609, Oct. 2020, doi: [10.3390/ijms21207609](https://doi.org/10.3390/ijms21207609).
- [14] C. Corvalan *et al.*, "Towards Climate Resilient and Environmentally Sustainable Health Care Facilities," *Int. J. Environ. Res. Public Health*, vol. 17, no. 23, p. 8849, Nov. 2020, doi: [10.3390/ijerph17238849](https://doi.org/10.3390/ijerph17238849).
- [15] B. Grešš Halász, L. Dimunová, I. Rónayová, V. Knap, and L. Lizáková, "Advanced Practice Nursing in Cardiology: The Slovak Perspective for the Role Development and Implementation," *Int. J. Environ. Res. Public Health*, vol. 18, no. 16, p. 8543, Aug. 2021, doi: [10.3390/ijerph18168543](https://doi.org/10.3390/ijerph18168543).
- [16] W. Wu and A. Plakhtii, "E-Learning Based on Cloud Computing," *Int. J. Emerg. Technol. Learn. IJET*, vol. 16, no. 10, p. 4, May 2021, doi: [10.3991/ijet.v16i10.18579](https://doi.org/10.3991/ijet.v16i10.18579).
- [17] D. Mulyadi, T. D. Wijayatingsih, R. E. Budiastuti, M. Ifadah, and S. Aimah, "Technological Pedagogical and Content Knowledge of ESP Teachers in Blended Learning Format," *Int. J. Emerg. Technol. Learn. IJET*, vol. 15, no. 06, p. 124, Mar. 2020, doi: [10.3991/ijet.v15i06.11490](https://doi.org/10.3991/ijet.v15i06.11490).

- [18] L. Zhang, X. Zeng, and P. Lv, "Higher Education-Oriented Recommendation Algorithm for Personalized Learning Resource," *Int. J. Emerg. Technol. Learn. IJET*, vol. 17, no. 16, pp. 4–20, Aug. 2022, doi: [10.3991/ijet.v17i16.33179](https://doi.org/10.3991/ijet.v17i16.33179).
- [19] G. Zhu, D. Liu, Y. Du, C. You, J. Zhang, and K. Huang, "Toward an Intelligent Edge: Wireless Communication Meets Machine Learning," *IEEE Commun. Mag.*, vol. 58, no. 1, pp. 19–25, Jan. 2020, doi: [10.1109/MCOM.001.1900103](https://doi.org/10.1109/MCOM.001.1900103).
- [20] S. Modgil, R. K. Singh, and C. Hannibal, "Artificial intelligence for supply chain resilience: learning from Covid-19," *Int. J. Logist. Manag.*, vol. 33, no. 4, pp. 1246–1268, Oct. 2022, doi: [10.1108/IJLM-02-2021-0094](https://doi.org/10.1108/IJLM-02-2021-0094).
- [21] M. A. Alobaidy and S. K. Ebraheem, "Application for Iraqi sign language translation on Android system," *Int. J. Electr. Comput. Eng. IJECE*, vol. 10, no. 5, p. 5227, Oct. 2020, doi: [10.11591/ijece.v10i5.pp5227-5234](https://doi.org/10.11591/ijece.v10i5.pp5227-5234).
- [22] S. S. A. Zaidi, M. S. Ansari, A. Aslam, N. Kanwal, M. Asghar, and B. Lee, "A survey of modern deep learning based object detection models," *Digit. Signal Process.*, vol. 126, p. 103514, Jun. 2022, doi: [10.1016/j.dsp.2022.103514](https://doi.org/10.1016/j.dsp.2022.103514).
- [23] S. Georganos *et al.*, "Geographical random forests: a spatial extension of the random forest algorithm to address spatial heterogeneity in remote sensing and population modelling," *Geocarto Int.*, vol. 36, no. 2, pp. 121–136, Jan. 2021, doi: [10.1080/10106049.2019.1595177](https://doi.org/10.1080/10106049.2019.1595177).
- [24] V. J. Lambert *et al.*, "Religious Leaders as Trusted Messengers in Combatting Hypertension in Rural Tanzanian Communities," *Am. J. Hypertens.*, vol. 34, no. 10, pp. 1042–1048, Oct. 2021, doi: [10.1093/ajh/hpab080](https://doi.org/10.1093/ajh/hpab080).
- [25] B. Shneiderman, "Human-Centered Artificial Intelligence: Reliable, Safe & Trustworthy," *Int. J. Human-Computer Interact.*, vol. 36, no. 6, pp. 495–504, Apr. 2020, doi: [10.1080/10447318.2020.1741118](https://doi.org/10.1080/10447318.2020.1741118).
- [26] M. Zhao and W. Fu, "The resilience of parents who have children with autism spectrum disorder in China: a social culture perspective," *Int. J. Dev. Disabil.*, vol. 68, no. 2, pp. 207–218, Mar. 2022, doi: [10.1080/20473869.2020.1747761](https://doi.org/10.1080/20473869.2020.1747761).
- [27] Y. K. Dwivedi *et al.*, "Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy," *Int. J. Inf. Manag.*, vol. 57, p. 101994, Apr. 2021, doi: [10.1016/j.ijinfomgt.2019.08.002](https://doi.org/10.1016/j.ijinfomgt.2019.08.002).
- [28] A. Abd-Alrazaq, D. Alhuwail, M. Househ, M. Hamdi, and Z. Shah, "Top Concerns of Tweeters During the COVID-19 Pandemic: Infoveillance Study," *J. Med. Internet Res.*, vol. 22, no. 4, p. e19016, Apr. 2020, doi: [10.2196/19016](https://doi.org/10.2196/19016).
- [29] C. P. Garg, "Modeling the e-waste mitigation strategies using grey-theory and DEMATEL framework," *J. Clean. Prod.*, vol. 281, p. 124035, Jan. 2021, doi: [10.1016/j.jclepro.2020.124035](https://doi.org/10.1016/j.jclepro.2020.124035).
- [30] M. A. de F. Farias, M. G. de M. Neto, M. Kalinowski, and R. O. Spínola, "Identifying self-admitted technical debt through code comment analysis with a contextualized vocabulary," *Inf. Softw. Technol.*, vol. 121, p. 106270, May 2020, doi: [10.1016/j.infsof.2020.106270](https://doi.org/10.1016/j.infsof.2020.106270).
- [31] H. Kopnina, "Education for the future? Critical evaluation of education for sustainable development goals," *J. Environ. Educ.*, vol. 51, no. 4, pp. 280–291, Jul. 2020, doi: [10.1080/00958964.2019.1710444](https://doi.org/10.1080/00958964.2019.1710444).
- [32] L. Corti and C. Gelati, "Mindfulness and Coaching to Improve Learning Abilities in University Students: A Pilot Study," *Int. J. Environ. Res. Public Health*, vol. 17, no. 6, p. 1935, Mar. 2020, doi: [10.3390/ijerph17061935](https://doi.org/10.3390/ijerph17061935).
- [33] A. R. Malik *et al.*, "Exploring Artificial Intelligence in Academic Essay: Higher Education Student's Perspective," *Int. J. Educ. Res. Open*, vol. 5, p. 100296, Dec. 2023, doi: [10.1016/j.ijedro.2023.100296](https://doi.org/10.1016/j.ijedro.2023.100296).
- [34] A. Amrina and A. Mudinillah, "Pemanfaatan Aplikasi Audacity pada Pembelajaran Istima'Kelas XI MAS Madinatun Najjah," *EL-IBTIKAR J. Pendidik. Bhs. Arab*, vol. 10, no. 2, pp. 139–155, 2021. doi: [10.24235/ibtikar.v10i2.9182](https://doi.org/10.24235/ibtikar.v10i2.9182)
- [35] M. L. Hakim, "Pemanfaatan media pembelajaran game interaktif dalam pembelajaran kosakata bahasa arab," *Arabi J. Arab. Stud.*, vol. 2, no. 2, p. 156, Mar. 2018, doi: [10.24865/ajas.v2i2.56](https://doi.org/10.24865/ajas.v2i2.56).

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- [36] Y. Ben, C. Fu, M. Hu, L. Liu, M. H. Wong, and C. Zheng, "Human health risk assessment of antibiotic resistance associated with antibiotic residues in the environment: A review," *Environ. Res.*, vol. 169, pp. 483–493, Feb. 2019, doi: [10.1016/j.envres.2018.11.040](https://doi.org/10.1016/j.envres.2018.11.040).
- [37] T. Li, A. K. Sahu, A. Talwalkar, and V. Smith, "Federated Learning: Challenges, Methods, and Future Directions," *IEEE Signal Process. Mag.*, vol. 37, no. 3, pp. 50–60, May 2020, doi: [10.1109/MSP.2020.2975749](https://doi.org/10.1109/MSP.2020.2975749).
- [38] J. Paul and A. R. Criado, "The art of writing literature review: What do we know and what do we need to know?," *Int. Bus. Rev.*, vol. 29, no. 4, p. 101717, Aug. 2020, doi: [10.1016/j.ibusrev.2020.101717](https://doi.org/10.1016/j.ibusrev.2020.101717).