

Developmental Research: An Android-Based Arabic Language Learning Application as a Means to Improve Middle School Students' Learning Outcomes

Yusra Al amin and Zughrofiyatun Najah

To cite this article: Y. Al Amin and Z. Najah, “Developmental Research: An Android-Based Arabic Language Learning Application as a Means to Improve Middle School Students’ Learning Outcomes,” *Lang. Technol. Soc. Media*, vol. 1, no. 1, pp. 52–64, 2023. DOI: <https://doi.org/10.70211/ltsm.v1i1.26>

To link to this article:



Published online: 30 June 2023



Submit your article to this journal



View crossmark data



Developmental Research: An Android-Based Arabic Language Learning Application as a Means to Improve Middle School Students' Learning Outcomes

Yusra Al amin* and Zughrofiyatun Najah

Received: 16 April 2023

Revised: 30 May 2023

Accepted: 29 June 2023

Online: 30 June 2023

Abstract

This study aims to develop and evaluate an Android-based interactive learning application for Arabic language instruction for eighth-grade students. The objectives are: (1) to design an engaging Android-based learning tool for Arabic; (2) to assess the feasibility of the tool; (3) to examine the tool's effectiveness in enhancing the learning process; and (4) to determine the impact on student learning outcomes before and after using the application. Employing a Research and Development (R&D) methodology, the ADDIE model was used for product development. The research results indicate that the developed application is accessible across all Android versions and has been validated by subject matter and media experts, achieving scores of 89.2% and 86.5%, respectively, confirming its high feasibility for classroom use. Effectiveness testing revealed moderate effectiveness, with small-scale and large-scale trials achieving effectiveness rates of 61.82% and 69.16%, respectively. Additionally, a paired T-test analysis showed a significant improvement in students' learning outcomes, with pre-test and post-test scores differing significantly ($t = 21.03845 > t_{critical} = 1.699$, $p < 0.05$). The results support the conclusion that the Android-based interactive media significantly improves Arabic language learning outcomes among eighth-grade students.

Keywords: Android; Interactive Learning Media; Learning Outcomes.

Publisher's Note:

WISE Pendidikan Indonesia stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



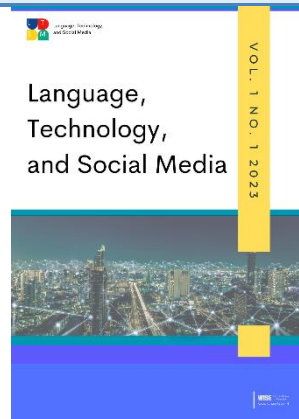
Copyright:

©

2023 by the author(s).

License WISE Pendidikan Indonesia, Bandar Lampung, Indonesia.

This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY 4.0) license (<https://creativecommons.org/licenses/by/4.0/>).



INTRODUCTION

To generate maximum learning outcomes, it is necessary to have media that align with the current times. Nowadays, the use of learning media such as printed books is considered less suitable to be consistently applied in the era of technological advancements. Educators who tend to be text-book oriented have an impact on the difficulty of students in understanding academic concepts [1], [2], [3]. This also affects the monotonous nature of the learning process [4], [5], [6]. Furthermore, limited study hours make educators less effective in delivering learning materials.

To address the problem of limited study hours that hinder educators from delivering learning materials effectively, we can leverage various modern learning media. One effective solution is the use of technology in education [1], [4], [7], [8], [9]. Learning media plays a crucial role in the modern education process, enabling the delivery of information and learning concepts in a more interactive, visual, and engaging manner [10], [11], [12]. With the assistance of technology, such as videos, applications, and educational software, learning media not only enhances students' understanding of the material but also enables diverse teaching and personalization according to each student's learning style [13], [14], [15]. In an ever-evolving educational environment, learning media becomes a very important tool to improve the quality of education, increase student engagement, and prepare them for future challenges.

One of the modern learning media that can be utilized in interactive learning is Android. Android provides inspiration and additional insights, while Photomath assists students in solving mathematical problems. By utilizing these Android applications, educators can tackle the challenge of time limitations effectively, provide students with access to various learning resources that support their development in various fields, and deliver more engaging and interactive learning. This is a crucial step in enhancing the quality of learning in this digital era.

Android is one of the comprehensive, open, and free platforms [15], [16], [17], [18]. In education, Android can be developed as the basis for learning media. Calimag in Ellistya stated, "The use of Android as a learning media is one of the implementations of learning models in the 21st century" [3], [18], [19]. Furthermore, the use of Android-based learning media can lead to improvements in a student's learning outcomes in terms of motivation and cognition.

The utilization of Android or smartphones as a medium in the learning process allows students to grasp academic concepts more quickly and make a lasting impression [20], [21], [22]. By using Android-based learning media, a student's learning experience will enhance as they receive not only textual information but also real-life experiences through visual elements.

The use of Android as an educational tool is highly relevant in the digital era. Applications like Google Classroom enable educators to overcome time constraints by providing an online platform for uploading learning materials and effective communication with students. Additionally, apps like Khan Academy offer access to various learning resources, including instructional videos and practice questions, to assist students in self-directed learning. Duolingo and similar apps can help students learn foreign languages interactively. Quizlet and Edmodo provide useful tools for creating engaging learning materials and interacting with students online.

Effectively harnessing Android media can significantly improve students' learning outcomes. Learning outcomes refer to the abilities possessed by students after going through the phases of the learning process [20], [23], [24]. During the teaching and learning process, students are entitled to support and guidance from teachers to achieve success in their learning endeavors. Learning outcomes encompass actions, values, understandings, appreciative attitudes, and skills

[16], [18], [25], [26], [27]. Based on the above, it can be concluded that learning outcomes serve as evidence of a student's achievement through a series of learning processes, which can then be used as an evaluation tool to measure the attainment of learning objectives.

The subject of Arabic language is aimed at guiding, encouraging, developing, and fostering skills in cultivating a positive attitude toward the Arabic language, whether in receptive or productive aspects. Building a positive attitude toward the Arabic language is crucial as it aids in understanding the religious teachings of Islam, including the Quran and Hadith, as well as the writings of scholars, all of which are predominantly in Arabic. Efforts towards learning are perceived as a form of education, activities that encourage students to learn something effectively and efficiently. Language, on the other hand, serves as a means of communication used to interact with others, facilitating the exchange of ideas both orally and in writing.

Based on preliminary research conducted by the author in an educational institution through direct interviews with Arabic language teachers, it was found that students enjoy learning methods that incorporate Android-based media. They tend to be more participative in the learning process. However, some challenges related to the features of these applications have occasionally led to a return to traditional teaching methods.

In conclusion, the author proposes the development of a more innovative Android-based learning application with more attractive and comprehensive features, considering the high level of student participation compared to conventional teaching methods. This development is also expected to improve students' achievements/learning outcomes and create a conducive and effective learning environment. Overall, this research explores the development of interactive Android-based media in its usefulness as an alternative for self-directed learning and achieving better learning outcomes for students.

METHODS

This research is categorized as Research & Development, following the ADDIE development model. Ali Maksum suggests that the term "product" in this context can be interpreted as hardware or software, such as interactive learning models, guidance models, and so on. This study is an educational research and development project with the aim of developing a supportive learning product, which is an interactive Android-based learning media for the Arabic language subject intended for eighth-grade students in junior high school. Through this development research, the researcher endeavors to create a more innovative, effective, and efficient learning media that can be utilized in the teaching and learning process.

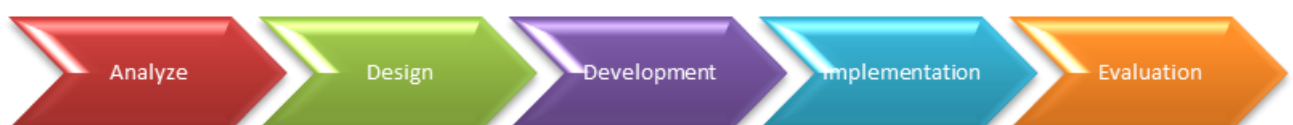


Figure 1. Research Phases

Research Objectives

The objective of this Research and Development (R&D) method is to create an interactive Arabic language learning media product using an Android-based Arabic Language Learning Application for eighth-grade students at the junior high school level. This research aims to evaluate the media's feasibility, gather student feedback on the media, and test the effectiveness of the developed product.

Research Phases

The ADDIE development model is a commonly used model by training developers. In the ADDIE development model, there are several stages, including:

1. Analysis: This involves conducting a needs analysis, identifying problems, determining the appropriate target product, and conceptualizing the product to be developed.
2. Design: In this stage, a concept for the product to be developed is designed.
3. Development: Development is the process of translating the earlier design into a tangible form.
4. Implementation: This involves testing the product as a practical step in applying the developed product.
5. Evaluation: Evaluation is the assessment of the product that has been developed [28].

Participant Characteristics

The subjects of this research are eighth-grade students at the junior high school level. This research involves two stages of testing: a small-scale pilot test with 10 students and a large-scale pilot test with 30 students.

Data analysis technique

The analysis of the media's feasibility based on the assessment of validators is conducted using percentages and then described. Student responses are also analyzed using percentages and then analyzed and described. The data analysis technique for the effectiveness of the media in this research involves using a paired T-test with two samples, namely pre-test and post-test data.

The validation process includes discussions with experts about improvements that should be made to the design of the learning media. Then, the learning media is evaluated by competent individuals (validators). If the validators declare the product valid, the researcher is authorized to proceed with effectiveness testing.

In this stage, data is collected using a Likert scale assessment questionnaire to obtain criticism, suggestions, or input for improvements to the developed media. Data processing from this analysis involves describing all opinions, suggestions, and feedback from the validators, while numerical data is analyzed using percentages.

The resulting product can be said to be suitable for use in the learning process if the feasibility percentage reaches $> 60\%$. The following is an assessment table of the product suitability results.

Table 1. Qualification Level Eligibility

Percentage	Category	Eligibility Criteria
81% - 100%	Very Suitable	No Revision

Percentage	Category	Eligibility Criteria
61% - 80%	Suitable	No Revision
41% - 60%	Moderately Suitable	Requires Revision
21% - 40%	Not Suitable	Revision
0% - 20%	Not at All Suitable	Revision

Research Design

Analysis Stage

The analysis stage is the stage of collecting information that is used as initial data for product creation. The analysis stages are divided into three stages, namely:

- Needs analysis: Analysis is intended to identify products that meet targets.
- Analysis of learning materials: This analysis includes determining the learning materials that will be developed in the form of applications or learning media as well as analyzing the curriculum that applies at school.
- Environmental analysis: The analysis carried out is in the form of identifying the learning environment and delivery strategies for learning.

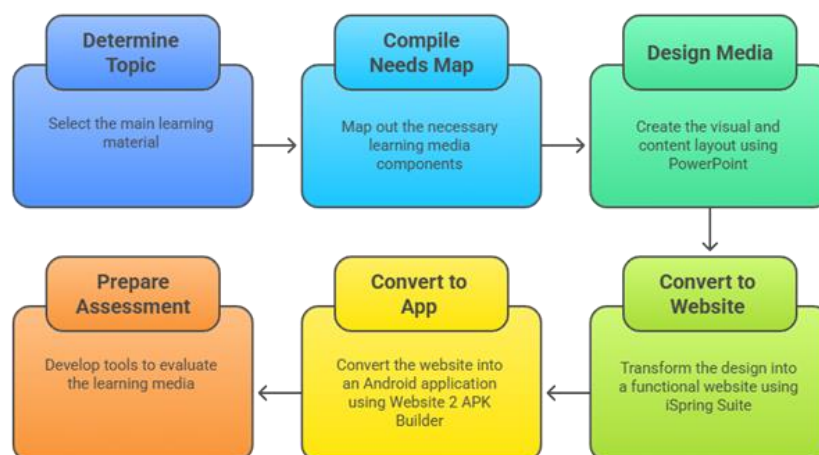


Figure 2. Research Phases Overview

Design Stage

After gathering information and data through the analysis stage, the researcher proceeds to create the initial product of Android-based interactive learning media. The steps involved in the creation of this product are as follows:

- Determine the topic or main learning material based on the references that have been prepared.
- Compile a map of learning media needs.
- The development of the learning media needs map is based on the predetermined content, specifically the Arabic language curriculum for the second semester of grade VIII.
- Designing the appearance and content of Android-based interactive learning media using Microsoft Power Point.
- Converting PowerPoint design results to a website using the iSpring Suite software.
- Converting a website into an Android application using the Website 2 APK Builder software.
- The preparation of assessment instruments.

Development Stage

In this stage, which is the product development stage, the product is developed based on the previous design stage. Once the product has been developed, it will first be validated by content experts and media experts to assess its suitability. Then, the product will be revised based on the input from these validators.

Implementation Stage

This stage is conducted when the product has already met the criteria of being suitable or good from the evaluation by experts. The implementation stage involves testing the developed product to assess its usability with users or students. Product testing is carried out through a small group of 10 student respondents from the eighth grade and field testing involving 30 respondents. After undergoing testing, the product will be evaluated in terms of its appearance, language, content presentation, and utility through student response questionnaires.

Evaluation Stage

In this stage, the researcher conducts formative evaluation related to the data collection at each applied stage. This is done to review and refine the developed product. Thus, the evaluation stage is for measuring the effectiveness and efficiency of the instructional media developed in the learning process, to determine its suitability for use.

In this stage, the researcher also analyzes student responses to assess the extent of learning outcomes obtained after using instructional media through the analysis of pretest and posttest scores.

RESULTS AND DISCUSSION

Description of Development Research Results

Analysis

The initial step conducted by the researcher before developing instructional media is needs analysis. These steps include analyzing the characteristics of the learners, analyzing the environment, and then determining what the learners' needs are.

Design

The second stage is the design stage. This stage is dedicated to establishing a prototype in the development of Android-based interactive learning media. The steps in this stage include:

a) Development of learning materials

The materials to be included in this instructional media refer to the Competency Standards and Basic Competencies of the ISMUBA 2017 curriculum, as outlined in the competency and material analysis above. The content includes the following topics: Daily Life, School Environment, The Book of Allah, and Ramadan.

b) Initial design

In this stage, the researcher designs the initial format of the product that will be produced. The initial format design of the product is as follows:



Figure 3. (a) Media cover design; (b) Menu page; (c) Qoidah learning page; (d) Interactive evaluation

Development

The development stage is the next phase after the product has been designed. This stage includes validation tests by media experts and content experts. The media validation test is conducted with two validators, one being a media expert from a university lecturer and the other being a media expert from a school teacher. Similarly, the content validation test is carried out with two validators, one being a content expert validated by a university lecturer and the other being a content expert from a school teacher.

Implementation

The product, which has been successfully validated by media experts and content experts and categorized as "highly suitable," will proceed to the implementation or application phase in the learning process. During this phase, the product will receive feedback from teachers through a teacher response questionnaire and will undergo two stages of testing: a small-scale test with 15 eighth-grade students from Muhammadiyah Junior High School Sekampung Udik Udik and a large-scale test with 30 students. After conducting the product testing, the researcher will distribute questionnaire sheets to gather feedback from both students and teachers regarding their responses to the research product.

Evaluation

The evaluation stage is the final step in the ADDIE model, but in this case, the researcher conducts evaluations at every activity, starting from the first stage to the last. The researcher conducts evaluations by analyzing data. These evaluations include evaluation at the analysis stage, which involves interviews with educators and school principals related to the characteristics of students and Arabic language learning in the 8th-grade class at SMP Muhammadiyah. In the design stage, the researcher evaluates product design up to the final product design. Subsequently, in the development stage, the researcher assesses the assessment by validators of the research product, which is Android-based interactive learning media that has been developed. And in the implementation stage, evaluation is carried out by seeking feedback from students and educators

and measuring the suitability of Android-based interactive learning media for use in the learning process.

Description and Analysis of Trial Results Data

Analysis of student questionnaire data

The data on teacher responses to the research product was collected through a teacher response questionnaire filled out by the relevant subject teacher, who is the 8th-grade Arabic language teacher at Muhammadiyah Junior High School Sekampung Udik Udik, namely Ms. Zeny Purwati, S.Pd.I. The data on student responses was collected through a student questionnaire.

Table 2. Student Response

Assessment Aspect	Item/Question	Percentage	Criteria
Components of Formulation and Learning Objectives	1,2	100 %	very eligible
Matter Components	3,4,5	88,5 %	very eligible
Language Components	9	80 %	very eligible
Media Utility Components	6,7,10,11	90 %	very eligible
Total Percentage		89,7 %	
Overall Criteria			very eligible

Based on [Table 2](#), the accumulated percentage of student responses at 89.7%, it can be concluded that this research product has received a high level of acceptance from the students. Therefore, based on the feedback from teachers and students regarding the research product, this product is highly suitable for use in the learning process.

Effectiveness Test

In the effectiveness test, a small-scale trial was conducted with 15 eighth-grade students at Muhammadiyah Junior High School Sekampung Udik. Additionally, a large-scale trial was carried out with 30 students.

Table 3. Pretest And Posttest Data Calculation Results From A Small-Scale Trial

	N	Ideal Score	Minimum Score	Maximum Score	Average
<i>Pretest</i>	15	100	50	65	56
<i>Posttest</i>	15	100	75	90	83

Based on the data in [Table 3](#), the minimum score on the pretest is 50, and the minimum score on the posttest is 75. Meanwhile, the maximum score on the pretest is 65, and the maximum score on the posttest is 90. Therefore, the average score on the pretest is found to be 56, and the average score on the posttest is 83. The recapitulation of N-gain scores can be seen in the following table:

Table 4. Summary of N-Gain Values In The Pretest & Posttest of Small-Scale Trial

	N	Ideal Score	N-Gain Score	N-Gain Percentage
<i>Pretest and Posttest</i>	15	100	0,62	61,82 %

Based on the data in [Table 4](#), it is found that the N-gain score calculation is 0.62. This can be interpreted as the N-gain value falls within the range smaller than 0.7 and greater than 0.3, categorizing the research product as "Moderately Effective" in the small-scale trial. Furthermore, the N-gain percentage was found to be 61.82%, which falls within the range of 56-75%, categorizing the product as "Sufficiently Effective" in the small-scale trial. These results suggest that the research product, when tested on a small scale, is moderately effective and is considered sufficiently effective for the purpose of the trial.

Table 5. Pretest And Posttest Data Calculation Results From A Large-Scale Trial

	N	Ideal Score	Minimum Score	Maximum Score	Average
<i>Pre-test</i>	30	100	40	75	53
<i>Post-test</i>	30	100	75	95	86

Based on the data in [Table 5](#), the minimum score on the pre-test is 40, while the minimum score on the post-test is 75. The maximum score on the pre-test is 75, and the maximum score on the post-test is 95. Therefore, the average score on the pre-test is 53, and the average score on the post-test is 86. The recapitulation of N-gain scores can be seen in the following table:

Table 6. Summary Of N-Gain Values in Large-Scale Pilot Test Pretest & Posttest

	N	Ideal Score	N-Gain Score	N-Gain Percentage
<i>Pretest dan Posttest</i>	15	100	0,69	69,16 %

Based on the data in [Table 6](#), it is found that the N-gain score calculation is 0.69. This can be interpreted as the N-gain value falls within the range smaller than 0.7 and greater than 0.3, categorizing the research product as "Moderately Effective" in the large-scale trial. Furthermore, the N-gain percentage was found to be 69.16%, which falls within the range of 56-75%, categorizing the product as "Sufficiently Effective" in the large-scale trial. These results suggest that the Android-based interactive learning media used in the eighth-grade Arabic language learning activities have shown moderate effectiveness and are considered sufficiently effective in the large-scale trial.

T-Test Paired Sampel

The Paired Sample T-Test was conducted to determine whether there was an improvement in students' learning outcomes based on the results of the pre-test and post-test. In this test, if the significance value is less than 0.05, there is no significant difference or improvement, while if the significance value is greater than 0.05, there is an improvement. Based on the T-Test calculation results, it is evident that there is a significant difference between the pre-test and post-test results. Furthermore, when looking at the average scores between the pre-test and post-test, $X_2 = 86 > X_1 = 53$, this indicates that the post-test scores are better than the pre-test scores. Therefore, it can be concluded that learning activities in Arabic language using Android-based interactive learning media in the eighth grade can improve students' learning outcomes.

CONCLUSION

The Android-based Interactive Arabic Language Learning Media Product for eighth-grade junior high school students is intended to serve as a tool to support the teaching and learning process in school and to be an engaging learning tool for students. Development is carried out in stages, including needs analysis, material concept development, product design, and conversion into an Android-based application. The features in this product include Arabic language materials for eighth grade, including vocabulary (mufradat), dialogues (hiwar), rules (qowaid), recitation (qiroah), and exercises (tamrin), which encompass various language skills. The cumulative validation results from two media experts indicate that this product received a percentage of 86.5% with an overall rating of "Very Suitable." Furthermore, the cumulative validation results from two content experts yielded a percentage of 89.2% with an overall rating of "Very Suitable." Based on the above description, the product developed by the researcher is deemed suitable for use as a learning tool in the classroom. Additionally, the response from students resulted in a cumulative percentage of 88.4%. Therefore, based on the feedback from teachers and students, this product is highly suitable for use in the learning process.

The research product was tested for its effectiveness through the N-gain test and the T-test. The N-gain calculation for the small-scale trial resulted in a value of 0.62, which indicates that the N-gain value falls within the range smaller than 0.7 and greater than 0.3, categorizing the research product as "Moderately Effective" in the small-scale trial. Meanwhile, the N-gain percentage was found to be 61.82%, which falls within the range of 56-75%, categorizing the product as "Sufficiently Effective" in the small-scale trial. In the large-scale trial, the N-gain score was calculated to be 0.69, which falls within the same range as the small-scale trial, categorizing the research product as "Moderately Effective" in the large-scale trial. Additionally, the N-gain percentage was found to be 69.16%, indicating that the product is "Sufficiently Effective" in the large-scale trial. The T-test was conducted to determine whether there was an improvement in students' learning outcomes before and after using the product. The T-test calculation yielded a significance value greater than the calculated t-value, $21.03845 > 1.699 = 0.05$, meaning that the use of Android-based interactive learning media in the eighth grade can improve students' learning outcomes. Furthermore, the average scores between the pretest and posttest, $X_2 = 86 > X_1 = 53$, indicate that the posttest scores are better than the pretest scores.

AUTHOR INFORMATION

Corresponding Authors

Yusra Al amin – Department of Arabic Education, Universitas Islam Negeri Raden Intan Lampung (Indonesia);

orcid.org/0009-0008-7611-473X

Email: yusraalamin@gmail.com

Authors

Yusra Al amin – Department of Arabic Education, Universitas Islam Negeri Raden Intan Lampung (Indonesia);

orcid.org/0009-0008-7611-473X

Zughrofiyatun Najah – Department of Arabic Education, Universitas Islam Negeri Raden Intan Lampung (Indonesia);

orcid.org/0009-0001-6331-3034

CONFLICT OF INTEREST

"The authors declare no conflict of interest."

REFERENCES

- [1] J. Radianti, T. A. Majchrzak, J. Fromm, and I. Wohlgenannt, "A systematic review of immersive virtual reality applications for higher education: Design elements, lessons learned, and research agenda," *Comput. Educ.*, vol. 147, p. 103778, Apr. 2020. <https://doi.org/10.1016/j.compedu.2019.103778>.
- [2] H. F. Amilia, S. Sumanto, and E. Untari, "Pengembangan Media Pembelajaran Lectora Inspire pada Tema 3 Subtema 7 dengan Penguatan Karakter Rasa Ingin Tahu Kelas IV SDN Karangtengah 1 Kota Blitar," *J. Pembelajaran, Bimbingan, dan Pengelolaan Pendidik.*, vol. 1, no. 3, pp. 213-224, Jul. 2021. <https://doi.org/10.17977/um065v1i32021p213-224>.
- [3] J. Fang, Q. Guo, and S. Guan, "A Study on Competence of Teaching or Scientific Projects Research for Primary and Secondary School Teachers Based on Blockchain Technology," *Int. Trans. Electr. Energy Syst.*, vol. 2022, pp. 1-11, Sep. 2022. <https://doi.org/10.1155/2022/3920877>.
- [4] E. Oztemel and S. Gursev, "Literature review of Industry 4.0 and related technologies," *J. Intell. Manuf.*, vol. 31, no. 1, pp. 127-182, Jan. 2020. <https://doi.org/10.1007/s10845-018-1433-8>.
- [5] R. M. Ryan and E. L. Deci, "Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions," *Contemp. Educ. Psychol.*, vol. 61, p. 101860, Apr. 2020. <https://doi.org/10.1016/j.cedpsych.2020.101860>.
- [6] D. Yanti, S. M. Ayu, and M. Aridan, "Reward 's Impact on Motivation to Learn Arabic," *Aphorisme J. Arab. Lang. Lit. Educ.*, vol. 4, no. 1, pp. 36-54, 2023. <https://doi.org/10.37680/aphorisme.v4i1.3042>.
- [7] Y. K. Dwivedi et al., "Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy," *Int. J. Inf. Manage.*, vol. 57, p. 101994, Apr. 2021. <https://doi.org/10.1016/j.ijinfomgt.2019.08.002>.
- [8] C. J. Wang, C. Y. Ng, and R. H. Brook, "Response to COVID-19 in Taiwan," *JAMA*, vol. 323, no. 14, p. 1341, Apr. 2020. <https://doi.org/10.1001/jama.2020.3151>.

- [9] S. Banabilah, M. Aloqaily, E. Alsayed, N. Malik, and Y. Jararweh, "Federated learning review: Fundamentals, enabling technologies, and future applications," *Inf. Process. Manag.*, vol. 59, no. 6, p. 103061, Nov. 2022. <https://doi.org/10.1016/j.ipm.2022.103061>.
- [10] D. R. Afghani, "Kreativitas pembelajaran daring untuk pelajar sekolah menengah dalam pandemi covid-19," *J. Informatics Vocat. Educ.*, vol. 3, no. 2, Jan. 2021. <https://doi.org/10.20961/joive.v3i2.43057>.
- [11] Amrina, M. Rezi, A. Mudinillah, C. Geofani, and D. Hikmah, "Pemanfaatan Aplikasi Audacity Pada Pembelajaran Istimā' Untuk Madrasah Ibtidaiyyah Negeri Satu Sungai Tarab," *Al Mi'yar J. Ilm. Pembelajaran Bhs. Arab dan Kebahasaaraban*, vol. 5, no. 1, p. 117, 2022. <https://doi.org/10.35931/am.v5i1.729>.
- [12] U. Hijriyah, M. Aridan, A. N. Mizan, A. Dealintang, and L. Yuniarti, "Development of Digital Comic Media for Learning Qira'ah for Fifth Grade Students of Madrasah Ibtidaiyyah," *Arab. J. Bhs. Arab*, vol. 6, no. 2, p. 693, Nov. 2022. <https://doi.org/10.29240/jba.v6i2.4361>.
- [13] T. Alanzi, "A Review of Mobile Applications Available in the App and Google Play Stores Used During the COVID-19 Outbreak," *J. Multidiscip. Healthc.*, vol. Volume 14, pp. 45-57, Jan. 2021. <https://doi.org/10.2147/JMDH.S285014>.
- [14] P. Mäder et al., "The Flora Incognita app - Interactive plant species identification," *Methods Ecol. Evol.*, vol. 12, no. 7, pp. 1335-1342, Jul. 2021. <https://doi.org/10.1111/2041-210X.13611>.
- [15] B. Munthe, Herman, A. Arifin, B. S. Nugroho, and E. Fitriani, "Online Student Attendance System Using Android," *J. Phys. Conf. Ser.*, vol. 1933, no. 1, p. 012048, Jun. 2021. <https://doi.org/10.1088/1742-6596/1933/1/012048>.
- [16] Azzahrah, I. A. Budiman, Y. D. Haryanti, and M. Mahpudin, "Development of Android Application Learning Media Using Ispring Suite 9 To Increase Student Learning Motivation," *EduHumaniora | J. Pendidik. Dasar Kampus Cibiru*, vol. 14, no. 2, pp. 121-126, 2022. <https://doi.org/10.17509/eh.v14i2.41994>.
- [17] M. I. Serfia, T. J. Pattiasina, and E. M. Trianto, "Visual Novel Interaktif Cerita Fabel Kelinci Dan Kura-Kura Pada Smartphone Berbasis Android Dengan Memanfaatkan Framework Fungus," *Teknika*, vol. 8, no. 2, pp. 133-141, Oct. 2019. <https://doi.org/10.34148/teknika.v8i2.230>.
- [18] Y. N. Deda, N. Nasruddin, I. B. Nyoman Pascima, A. B. Liunokas, A. Ndandara, and R. Supardi, "Development of Android-Based Learning Media in Indonesia: A Systematic Literature Review," *SAR J. - Sci. Res.*, pp. 110-117, Jun. 2023. <https://doi.org/10.18421/SAR62-08>.
- [19] Z. Y. Liu, Z. A. Shaikh, and F. Gazizova, "Using the concept of game-based learning in education," *Int. J. Emerg. Technol. Learn.*, vol. 15, no. 14, pp. 53-64, 2020. <https://doi.org/10.3991/ijet.v15i14.14675>.
- [20] L. Jiang, "Virtual Reality Action Interactive Teaching Artificial Intelligence Education System," *Complexity*, vol. 2021, pp. 1-11, Apr. 2021. <https://doi.org/10.1155/2021/5553211>.
- [21] F. Beierle et al., "What data are smartphone users willing to share with researchers?," *J. Ambient Intell. Humaniz. Comput.*, vol. 11, no. 6, pp. 2277-2289, Jun. 2020. <https://doi.org/10.1007/s12652-019-01355-6>.
- [22] N. Golenhofen, F. Heindl, C. Grab-Kroll, D. A. C. Messerer, T. M. Böckers, and A. Böckers, "The Use of a Mobile Learning Tool by Medical Students in Undergraduate Anatomy and its Effects on Assessment Outcomes," *Anat. Sci. Educ.*, vol. 13, no. 1, pp. 8-18, Jan. 2020. <https://doi.org/10.1002/ase.1878>.
- [23] K. Koderi, M. Aridan, and A. B. Muslim, "Pengembangan Mobile Learning Untuk Penguasaan Mufrodlat Siswa MTs," *Arab. J. Bhs. Arab*, vol. 4, no. 2, p. 265, Nov. 2020. <https://doi.org/10.29240/jba.v4i2.1769>.

- [24] T. Dwiputra and A. M. R. Pratama, "Pengembangan Novel Visual Berbasis Android Untuk Meningkatkan Minat Baca," *Automata*, vol. 2, no. 2, 2021. <https://journal.uii.ac.id/AUTOMATA/article/view/19508>.
- [25] S. Ennouamani, Z. Mahani, and L. Akharraz, "A context-aware mobile learning system for adapting learning content and format of presentation: design, validation and evaluation," *Educ. Inf. Technol.*, vol. 25, no. 5, pp. 3919-3955, Sep. 2020. <https://doi.org/10.1007/s10639-020-10149-9>.
- [26] N. T. Tarigan, "Pengembangan Buku Cerita Bergambar Untuk Meningkatkan Minat Baca Siswa Kelas IV Sekolah Dasar," *J. Curere*, vol. 02, no. 02, pp. 141-152, 2019. <http://www.portaluniversitasquality.ac.id:5388/ojsystem/index.php/CURERE/article/view/157>.
- [27] N. Cholid and H. Ambarwati, "Pengembangan Media Pembelajaran Berbasis Android Kodular Materi Zakat Mata Pelajaran Fikih Untuk Meningkatkan Motivasi Di Madrasah Ibtidaiyah," *J. Stud. dan Sos.*, vol. 8, no. 2, 2021. <https://doi.org/10.21580/wa.v8i2.9530>.
- [28] D. L. Espelage et al., "Development of Online Professional Development for School Resource Officers: Understanding Trauma, Social-Emotional Learning, Restorative Discipline, and Cultural Diversity," *J. Police Crim. Psychol.*, vol. 37, no. 4, pp. 737-751, Dec. 2022. <https://doi.org/10.1007/s11896-020-09404-z>