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Digital Educational Games to Improve Numerical Literacy of Elementary School Students

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Abstract

This study was motivated by the low results of the first grade students' beginning reading skills. The purpose of this study was to determine the effect of mobile applications on beginning reading skills in grade I SDN Bonang 1 Panyingkiran District, Majalengka Regency, West Java Province. The research method used was quasi experiment. The samples in this study were grade IA students and grade IB students of SDN Bonang 1 in the 2024/2025 school year with research subjects as many as 20 experimental class students and 20 control class students determined through purposive sampling. Data collection techniques in this study were through student beginning reading skills tests. This study uses quantitative data analysis techniques on pretest and posttest data. The results of the analysis showed that there was a significant difference in beginning reading skills between students who learned using mobile applications and students who learned using textbooks. The conclusion is proven by the Independent Sample T-test which shows a significance value of 0.022 which is smaller than the significance value limit of 0.05. Based on the data obtained, the use of mobile applications has a greater impact than the use of textbooks. This means that students who learn with mobile apps have better beginning reading skills compared to students who learn with textbooks.

Keywords: beginning reading, mobile application, students.

INTRODUCTION

Learning math is often a big challenge for many students at the elementary school level. The main problems often faced by students in learning mathematics are low motivation and understanding of basic concepts. This often leads to difficulties in solving numerical problems that seem abstract and difficult to understand. Many students feel frustrated and lose interest in the subject, which in turn has a negative impact on students' academic performance (Park, 2022). The slow improvement in mathematics achievement in many countries suggests that there are fundamental problems in the learning approaches used in many schools (Prestridge, 2023).

Effective mathematics learning is one of the important aspects in shaping students' knowledge base at the primary school level. However, many students find it difficult to understand abstract mathematical concepts, which often leads to a decrease in learning

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motivation. In this case, a more innovative and contextual approach is needed to improve the quality of mathematics learning in Indonesia. Fun and interactive learning can help students be more engaged and excited in understanding mathematics, which in turn will support improved student academic outcomes (Wahyuningsih et al., 2024).

The dominant conventional math learning methods, such as lectures and practice problems, are often monotonous and not interactive. This causes students to feel bored and uninvolved in the learning process (Maharjan et al., 2024). Meanwhile, low numerical literacy can affect students' ability to face future challenges, both in the academic world and in everyday life. In a recent UNESCO report, about 250 million school-age children worldwide fail to reach basic levels in reading and math skills. This suggests the need for new approaches in education to increase students' motivation and ability to understand math more effectively and interestingly (Lewis et al., 2020).

On the other hand, technological developments provide great opportunities to create more engaging learning solutions. To overcome the difficulties in studying mathematics, for instance, educational games can be a useful substitute. Educational games enable students to learn in an engaging manner by fusing aspects of entertainment and education. Educational games can help make learning more engaging and fun, which can boost student interest and comprehension of the arithmetic content being taught, according to research (Botes, 2024).

The importance of innovation in mathematics learning methods is strongly emphasized in various recent educational studies. The usage of digital educational games in the teaching and learning process is one innovation that shows promise. These instructional games use gaming aspects to make learning more enjoyable and interesting for pupils. Research shows that educational games can not only increase student motivation, but are also effective in strengthening the understanding of difficult mathematical concepts (Nurhikmah et al., 2024). Educational games facilitate a more interactive learning experience, where students can learn through exploration and conversation, and get immediate feedback. This approach can help change students' perception of math from something difficult to something more interesting and fun.

The integration of educational games in math learning also provides an opportunity to introduce technology-based learning methods that support collaboration and creative problem solving. In more traditional learning, students often do not have many opportunities to learn independently or explore math concepts through hands-on experiences. By giving students a place to explore, fail, and succeed in a more appropriate and realistic setting, educational games offer a way around these restrictions (Xilang, 2023).

Furthermore, prior research has demonstrated that incorporating technology into the classroom helps draw pupils and accommodate a variety of learning preferences (Mariscal et al., 2023). For instance, in a research by Fachruroji et al. (2025), the use of educational games to teach fundamental math concepts demonstrated notable gains in student learning outcomes when compared to traditional learning techniques. These results suggest that technology, especially educational games, can be a very effective tool in improving students' understanding and motivation to learn mathematics (Juhaeni et al., 2023).

Therefore, this research has strong relevance in the context of education in Indonesia. By designing educational games that can be adapted to the educational curriculum and learning needs of elementary school students, it is hoped that a more effective and enjoyable learning method can be created. In addition, the use of educational games is expected not only to have a positive impact on the understanding of mathematical concepts, but also to increase students' interest in learning, improve their academic results, and provide a more in-depth and meaningful learning experience (Kurniawan et al., 2024).

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At a more practical level, a number of preliminary experimental studies have developed simple prototype educational games, which show great potential in increasing student engagement in mathematics learning (Bulbul & Akdogan, 2023). With challenges that are suitable for their skill level, these prototype games are intended to give students an enjoyable educational experience. Some experiments have also successfully shown that educational games can improve students' understanding of mathematical concepts through more fun and effective ways (Sittichai & Wichaidit, 2024).

Additional studies have demonstrated that using instructional games in the classroom can significantly enhance kids' mathematical abilities. Compared to students who exclusively use standard teaching techniques, students who use educational games demonstrate a greater knowledge of math subjects (Rahmadhea, 2024). In addition, educational games allow students to practice without feeling pressured by time or rigid rules, which is usually the case with traditional learning. This provides an opportunity for students to delve deeper into mathematical concepts in a fun and non-boring way.

These studies provide a strong basis for the development of educational games that are more innovative and better adapted to the Indonesian education curriculum. In this context, the current project aims to develop a prototype math education game that not only integrates the results of previous research but also incorporates the latest innovations to meet the needs and learning preferences of elementary school students in Indonesia. The game to be developed is expected to provide a richer and deeper learning experience, which not only focuses on understanding math concepts, but also pays attention to aspects of student motivation and engagement (Risalah et al., 2023).

Given the enormous potential of educational games for math learning, this study used a quasi-experimental research design to assess how well educational games might boost primary school pupils' motivation and mathematical comprehension. It is intended that by taking this strategy, more solid proof of the advantages of adopting educational games in the Indonesian classroom will be gathered.

METHOD

This study's methodology is a quasi-experiment. The Nonequivalent Control Group Design is used in this study. Students in grade 1 at SDN Bonang 1 during the 2024–2025 academic year made up the study's population. 40 students made up the study's samples, which included 21 students in the experimental class and another 21 students in the control group. The experimental class was treated using Digital Educational Games, while the control class was treated using Textbooks. Purposive sampling was employed in the sampling procedure. The SPSS program was used for both quantitative and descriptive data analysis. However, a numerical literacy exam was employed as the data gathering method in this study. The Independent Sample T-test is used to test hypotheses, and a significance result of less than 0.05 indicates that there is a difference between the experimental and control classes in terms of students' average numerical literacy. On the other hand, if the significance value is more than 0.05, it indicates that the experimental and control groups' average levels of numerical literacy are identical.

RESULT AND DISCUSSION

Results

Data were collected through pretest and posttest activities of students' numerical literacy given to experimental and control courses, based on the findings of research done at SDN

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Bonang 1. Data was gathered from the study outcomes of the two groups that were put to the test: the control group, which used textbooks, and the experimental group, which used digital educational games. The following is a presentation of the findings from the descriptive statistical analysis:

Table 1. Results of Pretest and Posttest Descriptive Statistics of Experimental Classes

	Number of Students	Min	Max	Mean	Std. Deviation
Pretest Experiment	21	30	65	47.14	10.071
Posttest Experiment	21	75	100	85.95	7.684

The experimental class pretest data from 21 students yielded a minimum value of 30 and a maximum value of 65, with an average value of 47.14 and a standard deviation of 10,071, according to the data description in the above table. In contrast, 21 students' posttest results from the experimental class had an average score of 85.95, a standard deviation of 7.687, and a minimum score of 75 to a maximum score of 100. This indicates that the experimental class posttest's average score is higher than the experimental class pretest's average score.

Table 2. Results of Descriptive Statistics of Pretest and Posttest of Control Class

	Number of Students	Min	Max	Mean	Std. Deviation
Pretest Control	21	25	60	37.38	9.568
Posttest Control	21	60	85	73.33	6.171

According to the data description in the above table, the pretest results for 21 students in the control class had an average of 37.38, a standard deviation of 9,568 and a minimum value of 25 to a maximum value of 60. In contrast, 21 students' posttest results for the control class had an average score of 73.33, a standard deviation of 6.171, and a minimum score of 60 to a maximum score of 85. This demonstrates that the control class posttest's average score is higher than the control class pretest's average score.

Table 3. Experimental Class Data Normality Test Results

Pretest Experiment	0.506
Posttest Experiment	0.077

It can be inferred from the preceding table that the experimental class pretest and posttest data have a normal distribution as the experimental class pretest value's Shapiro-Wilk value is 0.506 and the experimental class posttest value is 0.077.

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Table 4. Control Class Data Normality Test Results

Pretest Control	0.062
Posttest Control	0.163

The control class pretest and posttest data have a normal distribution, as indicated by the above table, which also reveals that the control class pretest value's Shapiro-Wilk value is 0.562 and the control class posttest value is 0.163.

Table 5. Results of Pretest Homogeneity Test for Experimental and Control Classes

Levene Statistic	Sig.
0.020	0.887

Table 5 shows that the significance is 0.199. Since the homogeneity test's significance value is more than 0.05, it can be said that the data has the same variance (homegen).

Table 6. Results of Posttest Homogeneity Test for Experimental and Control Classes

Levene Statistic	Sig.
1.393	0.245

The sig value for the posttest of the experimental class and control class is 0.245, as shown in the above table, indicating that all of the study's data variants are identical.

Table 7. Independent Sample T-test Results

Experimental Class and Control Class	Independent Sample T-test
	Sig. (2-tailed)
Posttest Exsperiment	< 0.001
Posttest Control	

Based on table 7 above, the results of the independent sample t-test test in the form of posttests of experimental and control classes show a significance value (2-tailed) of 0.001 which is less than 0.05 (sig <0.05) so that Ho is rejected and Ha is accepted. This means that there is a significant difference in students' numerical literacy results between the experimental class treated with Digital Educational Games and the control class treated with Textbooks.

Discussion

The purpose of this study is to determine whether or not students' numerical literacy is significantly impacted by playing digital instructional games. The posttest between the

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experimental and control groups yielded a significant value (2-tailed) of 0.001, which is less than the designated significance limit of 0.05 (sig<0.05), according to the results of the Independent Sample t-test. This shows that the alternative hypothesis (H_a) is accepted and the null hypothesis (H_0) is rejected. In other words, pupils who utilized digital educational games and those who used textbooks showed significantly different results in terms of numerical literacy.

This result is consistent with research by Putra et al. (2024) that demonstrates how using educational games to teach mathematics can enhance students' comprehension of the subject matter. Putra et al., (2024) suggested that educational games can accelerate the learning process because of the interactive elements present in the game, which encourage active student involvement. For example, in digital educational games, students not only receive information passively, but they are also faced with challenges that require them to use their numerical knowledge in solving problems. This enhances students' understanding of the material more effectively compared to traditional learning methods, such as the use of textbooks that only rely on a one-way approach.

Additionally, digital educational games give pupils the chance to study in a more applicable and contextualized manner. Students can immediately use numerical ideas in a variety of more entertaining and relevant gaming scenarios in educational games. According to the results of his research, games can not only boost student engagement but also offer a more meaningful learning experience through practical application (Rahmadhea, 2024). As a result, digital educational games give kids the chance to learn numbers in a more relevant and engaging setting.

Educational games also contain motivational elements that are often lacking in textbook-based learning. For example, in digital educational games, there are reward elements such as points, levels and challenges that motivate students to keep trying to achieve learning goals. Research conducted by (Juneidi, 2023) supports these findings by showing that competitive and reward elements in games can increase students' motivation to learn, as they feel rewarded for their efforts and progress. When students feel rewarded for their progress, this can strengthen their engagement in the learning process, as opposed to textbooks which often do not offer direct rewards for student achievement.

It is important to note that while digital educational games are proven to be effective in improving numerical literacy, the right game design factors are crucial. According to research conducted by (Maemunah & Mas'ud, 2024), educational games must be well designed so that the elements in the game can optimally support learning objectives. Games that are designed without paying attention to good pedagogical aspects may not have a significant impact. Therefore, while digital educational games can be very effective, it is important to consider the quality and relevance of the games used in learning.

In educational game-based learning, students also have the freedom to learn at their own pace. Research conducted by (Saad, 2021) shows that giving this freedom can have a positive effect on student understanding. Students who learn using educational games can revisit material they find difficult without feeling rushed, which increases their chances of deepening their understanding of mathematical concepts. This not only improves students' learning outcomes, but also makes them feel more confident in facing challenges.

Furthermore, the integration of technology in learning through educational games also helps support different learning styles in the classroom. A study conducted by (Tuttle & Carter, 2023) revealed that digital educational games are able to cater to a wider range of learning needs, from more visual students to those who are more kinesthetic. This technology also opens up opportunities to introduce collaborative learning, where students can work

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together in solving in-game challenges, thus developing their social and teamwork skills in a fun context.

Overall, the results of this study support the findings of previous studies which suggest that digital educational games can have a positive impact on learning outcomes, particularly in numerical literacy. Educational games offer a more interactive, practical and fun learning experience, which can encourage students' motivation to learn more actively. In addition, the use of games in learning provides opportunities for students to learn at their own pace, review difficult material and improve their understanding of numerical material.

The small sample size and the fact that this study only examined one kind of digital instructional game in relation to numerical literacy are some of its drawbacks. To go deeper into the findings, more research could be done using a larger sample size and various kinds of educational games. In addition, further research also needs to examine the long-term effects of using digital educational games in numerical literacy and examine other factors that may have an effect, such as differences in student characteristics.

It is anticipated that the findings of this study will be used as a guide for the creation of technology-based teaching strategies, namely the usage of online learning games, to enhance student learning outcomes, particularly in the area of numerical literacy. It also opens up opportunities to utilize technology as an effective and fun tool in supporting the achievement of educational goals.

CONCLUSION

The alternative hypothesis (H_a) is accepted and the null hypothesis (H_0) is rejected based on the Independent Sample t-test findings, which indicate a significance value (2-tailed) of 0.001, which is less than the designated significance threshold (0.05). This suggests that the experimental class, which received instruction through digital educational games, and the control group, which used textbooks as learning materials, differed significantly in their numerical literacy outcomes. Therefore, it can be said that, in comparison to traditional textbook-based learning techniques, the use of digital educational games significantly improves students' numerical literacy. Digital educational games not only increase students' engagement and motivation, but also accelerate their understanding of the numerical concepts taught. This research demonstrates the important potential of technology, particularly digital educational games, in improving learning effectiveness, particularly in the area of numerical literacy. These results can serve as a basis for further development in the integration of learning technology in the classroom.

REFERENCES

Akcay, A., & Coskun, B. K. (2023). Examining The Prediction of Digital Game Addiction Awareness on Digital Educational Game Usage. *Journal of Learning and Teaching in Digital Age*, *8*(1), 71–81. https://doi.org/10.53850/joltida.1098602

Botes, W. (2024). Demonstrating Pedagogical Content Knowledge Through the Development of Educational Science Board Games. *European Journal of STEM Education*, *9*(1), 1–16. https://doi.org/10.20897/ejsteme/14136

Bulbul, S. O., & Akdogan, E. M. (2023). The Effect of Educational Digital Games Designed by Students on the Teaching of the 6th Grade Effective Citizenship Learning Area in Social Studies Course. *International Journal of Contemporary Educational Research*, *10*(3), 618–634. https://doi.org/10.52380/ijcer.2023.10.3.460

DOI: https://doi.org/10.61487/jiste.v3i2.146

Choi, E., & Park, N. (2022). IT Humanities Education Program to Improve Digital Literacy of the Elderly. *Journal of Curriculum and Teaching*, *11*(5), 138–145. https://doi.org/10.5430/JCT.V11N5P138

Dewi, R., & Verawati, I. (2022). The Effect of Manipulative Games to Improve Fundamental Motor Skills in Elementary School Students. *International Journal of Education in Mathematics, Science and Technology*, *10*(1), 24–37. https://doi.org/10.46328/ijemst.2163

Emadi, A., & Hosseini, S. (2024). Evaluating the Integration of Digital Literacy Components in ELT Coursebook Design. *The Electronic Journal for English as a Second Language*, *28*(1), 1–20. https://doi.org/10.55593/ej.28109a7

Fachruroji, F., Auliana, S., Pratama, G. U., Halim, A., & Aryono, G. D. P. (2025). Perancangan Game Edukasi Matematika Dasar Berbasis Construct 3 Dalam Meningkatkan Pemahaman Siswa Terhadap Konsep Matematika Secara Efektif. *JATI (Jurnal Mahasiswa Teknik Informatika)*, *9*(1), 1799–1805.

Gole, M. O., & Temel, Z. F. (2024). The Effect of Digital Game-Based and Different Education Programs Quality preschool education affects children ' s school success in primary school and further education levels . The most important factors affecting literacy success in primary school are. *Journal of Theoretical Educational Science*.

Hofmeyr, M. (2023). Attitudes towards digital game-based language learning among Japanese university students. *JALT CALL Journal*, *19*(1), 26–52. https://doi.org/10.29140/jaltcall.v19n1.681

Irwanto, I., Cahyana, U., Ayuni, N. P. S., & Wijayako, R. S. (2024). Exploring high school students' attitudes towards digital game-based learning: A perspective from Indonesia. *Journal of Education and E-Learning Research*, *11*(1), 1–7. https://doi.org/10.20448/jeelr.v11i1.5272

Ivgin, A. B., & Akcay, H. (2024). The Impact of Using Educational and Digital Games on Middle School Students Science Achievement. *International Journal of Technology in Education*, *7*(3), 386–416. https://doi.org/10.46328/ijte.781

Juhaeni, J., Cahyani, E. I., Utami, F. A. M., & Safaruddin, S. (2023). Pengembangan Media Game Edukasi dalam Meningkatkan Hasil Belajar Matematika Kelas III Siswa Madrasah Ibtidaiyah. *Journal of Instructional and Development Researches*, *3*(2), 58–66. https://doi.org/10.53621/jider.v3i2.225

Juneidi, S. J. (2023). Engineering Courses' Assessment: Rubrics Added Value Using Time Factor. *International Conference on Studies in Education and Social Sciences*, 216–225. www.istes.org

Jung, J., Choi, S., & Fanguy, M. (2024). Exploring Teachers' Digital Literacy Experiences. *International Review of Research in Open and Distributed Learning*, *25*(2), 41–59. https://doi.org/10.19173/irrodl.v25i2.7572

Kurniawan, H., Purwoko, R. Y., & Setiana, D. S. (2024). Integrating cultural artifacts and tradition from remote regions in developing mathematics lesson plans to enhance mathematical literacy. *Journal of Pedagogical Research*, *8*(1), 61–74. https://doi.org/10.33902/JPR.202423016

Lewis, B., King, M. S., & Schiess, J. O. (2020). *Language Counts*. Bellwether Education Partners.

Maemunah, M., & Mas'ud, H. (2024). Pengembangan Game Education Dengan Materi Pengenalan Penjumlahan Sederhana Untuk Sekolah Dasar Menggunakan Aplikasi Construct 2. *Pedagogika: Jurnal Pedagogik Dan Dinamika Pendidikan*, *10*(1), 12–17.

Maharjan, B., Manandhar, N. K., Pant, B. P., & Dahal, N. (2024). Meaningful engagement of preschoolers through storytelling pedagogy. *Pedagogical Research*, *9*(2), em0187. https://doi.org/10.29333/pr/14144

Mariscal, L. L., Albarracin, M. R., Mobo, F. D., & Cutillas, A. L. (2023). Pedagogical Competence Towards Technology-driven Instruction on Basic Education. *International Journal of Multidisciplinary: Applied Business and Education Research*, *4*(5), 1567–1580. https://doi.org/10.11594/ijmaber.04.05.18

Marmoah, S., Poerwanti, J. I. S., Suharno, & Gestiardi, R. (2023). The Quality Management of Education in Elementary Schools in Improving Teachers' Digital Literacy in the Era of Online Learning. *Pegem Journal of Education and Instruction*, *14*(1), 32–40. https://doi.org/10.47750/pegegog.14.01.04

Meliana, M., Suwindia, I. G., & Winangun, I. M. A. (2025). Efektivitas Media Pembelajaran Digital terhadap Kemampuan Literasi Numerasi Siswa. *JIIP (Jurnal Ilmiah Ilmu Pendidikan)*, *8*, 862–867.

Muengsan, S., & Chatwattana, P. (2024). The Game-based Learning (GbL) Platform with Generative AI to Enhance Digital and Technology Literacy Skills. *Higher Education Studies*, *14*(1), 46. https://doi.org/10.5539/hes.v14n1p46

Munajah, R., Sumantri, M. S., & Yufiarti, Y. (2023). Teachers' perceptions on the need to use digital storytelling based on local wisdom to improve writing skills. *South African Journal of Childhood Education*, *13*(1), 1–8. https://doi.org/10.4102/sajce.v13i1.1314

Naila, I., Ridlwan, M., & Nurdianah, L. (2022). Using ECL Media to Improve Information Literacy of Islamic Elementary School Students. *Mimbar Sekolah Dasar*, *9*(2), 289–302. https://doi.org/10.53400/mimbar-sd.v9i2.44819

Ninsiana, W., Septiyana, L., & Suprihatin, Y. (2024). Introducing eco-literacy to early childhood students through digital learning. *Journal of Education and Learning*, *18*(1), 89–96. https://doi.org/10.11591/edulearn.v18i1.20678

Nisa, M. A., & Susanto, R. (2022). Pengaruh Penggunaan Game Edukasi Berbasis Wordwall Dalam Pembelajaran Matematika Terhadap Motivasi Belajar. *JPGI (Jurnal Penelitian Guru Indonesia)*, *7*(1), 140. https://doi.org/10.29210/022035jpgi0005

Nurhikmah, Rustiani, S., & Nurdin. (2024). Literature Review : Media Game Edukasi Interaktif dalam Pembelajaran Matematika. *Journal of Education Research*, *5*(4), 4382–4390.

Ozer, M. G., Boyaci, D. B., & Ozer, F. (2022). A Novel Turkish Learning Environment for Foreign Primary School Students: The Educational Digital Game "Journey to Turkish". *International Technology and Education Journal*, *6*(2), 18–36.

Park, M. (2022). *Internalization of STEM Education*. ISTES Organization Monumen, CO, USA. https://doi.org/10.3102/1571467

Prestridge, J. (2023). No Excuses: How One District Made Sure Students Thrived Mathematically Through The Pandemic. *Alabama Journal of Educational Leadership*, 87–98.

Putra, D. D., Pamungkas, A. S., Nindiasari, H., Fathurrohman, M., & Porter, A. (2024). Impact the Labirin: the board game on the student's numeracy ability. *JRAMathEdu (Journal of Research and Advances in Mathematics Education)*, *9*(1), 34–44. https://doi.org/10.23917/jramathedu.v9i1.3299

Rahmadhea, S. (2024). Pemanfaatan Game Edukasi Untuk Meningkatkan Minat Dan Pemahaman Siswa Dalam Pembelajaran Sains. *JSE: Journal Sains and Education*, *2*(2), 33–39.

Risalah, D., Cahyanita, S., & Muchtadi. (2023). Penggunaan Video Pembelajaran Bermuatan Karakter Dalam Proses Pembelajaran Matematika. *Mathema: Jurnal …*, *5*(2), 138–149. https://ejurnal.teknokrat.ac.id/index.php/jurnalmathema/article/view/2821%0Ahttps://ejurnal.teknokrat.ac.id/index.php/jurnalmathema/article/download/2821/1218

Rosnelli, & Ristiana, P. A. (2023). Independent Curriculum Learning Management to Improve Students' Literacy and Numerical Competence in Schools. *International Journal of Education in Mathematics, Science and Technology*, *11*(4), 946–963. https://doi.org/10.46328/ijemst.3513

Rulyansah, A., Hidayat, M. T., Rihlah, J., Shari, D., & Mariati, P. (2023). Digital Play for Enhancing Language Learning in Early Grades. *Pegem Egitim ve Ogretim Dergisi*, *13*(2), 182–190. https://doi.org/10.47750/pegegog.13.02.22

Saad, A. F. (2021). An Exploratory Study Regarding the Use of Blogs in a Project Management Approach in Teaching and Learning for the Case of "Students at Risk." In *University Of Petrosani*. University Of Petrosani. http://login.ezproxy.lib.vt.edu/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=ED621778&scope=site

Sittichai, W., & Wichaidit, P. R. (2024). Beyond play: The interplay of analogy and enjoyment in game-based learning. *Journal of Pedagogical Research*, *8*(2), 276–295. https://doi.org/10.33902/JPR.202425578

Suwarto, D. H., Setiawan, B., & Machmiyah, S. (2022). Developing Digital Literacy Practices in Yogyakarta Elementary Schools. *Electronic Journal of E-Learning*, *20*(2), 101–111. https://doi.org/10.34190/ejel.20.2.2602

Tamashita, T., Kim, G., Liou, C.-L., Ando, T., Bardo, A. R., & Liu, D. (2024). The Roles of Education and Literacy in the Digital Divide Among Middle-Aged Adults: Cross-National Evidence from the United States, Japan, and South Korea. *Adult Literacy Education: The International Journal of Literacy, Language, and Numeracy*, *6*(1), 4–16. https://doi.org/10.35847/tyamashita.gkim.cliou.tando.abardo.dliu.6.1.4

Tuttle, M., & Carter, E. W. (2023). Systematic Review of Studies Addressing Computer-Assisted Instruction for Students with Visual Impairment. *Journal of Special Education Technology*, *38*(3), 274–287. https://doi.org/10.1177/01626434221088026

Vereş, S., Buda, P. M., & Ilie, A.-S. (2024). Use Of Films, Platforms, And Educational Applications In Primary Education. *Romanian Review of Geographical Education*. https://doi.org/10.23741/RRGE20244

Wahyuningsih, T., Sediyono, E., Hartomo, K. D., & Sembiring, I. (2024). The role of gamification implementation in improving quality and intention in software engineering learning. *Journal of Education and Learning*, *18*(1), 173–184. https://doi.org/10.11591/edulearn.v18i1.20823

Xilang, H. (2023). A Conceptual Exploration: Incorporating Physical Education with Metaverse. *International Journal of Education and Literacy Studies*, *11*(4), 325–331. https://doi.org/10.7575/aiac.ijels.v.11n.4p.325