

Empowering Primary School Teachers Through Mobile Learning to Break Educational Stereotypes

Abiodun Ezekiel Adesina¹, Husmayani Muny Putri², Eka Aghnia Syarif³

¹Integrated Science Education, Emmanuel Alayande University of Education, Oyo, Nigeria

^{2,3}Department of Biology Education, Universitas Jambi, Jambi, Indonesia

Email: draeadesina2015@gmail.com

Article Info

Received: 04/04/2025

Revised: 20/06/2025

Accepted: 28/06/2025

Abstract

This community engagement study aimed to empower primary school teachers in Oyo Town to integrate mobile learning as a tool for breaking educational stereotypes and enhancing inclusive pedagogy. The initiative responded to persistent structural and attitudinal barriers in Nigerian primary education by offering stereotype-reduction training through mobile technology. Employing a sequential exploratory mixed-methods approach, the program involved 250 teachers from public and private schools across four local government areas. Qualitative data were gathered via semi-structured interviews, followed by quantitative validation through structured questionnaires. The findings revealed that teachers—particularly younger and less experienced ones—held strong positive perceptions of mobile learning's potential to challenge stereotypes, with no significant differences by gender, qualification, or school type. However, implementation was hindered by policy ambiguity, infrastructural deficits, and limited technological readiness. The study underscores the value of localized, community-responsive interventions in promoting digital inclusion and educational equity. Future research should investigate the long-term impact of mobile learning on classroom practice and explore peer-mentoring strategies to bridge generational gaps among teachers. The study recommends targeted investments in digital infrastructure, supportive policies, and differentiated capacity-building to ensure scalable integration of mobile learning in diverse primary school contexts.

Keywords: Educational Stereotypes, Inclusive Pedagogy, Mobile Learning, Primary School Teachers, Technology Integration

How to Cite: Adesina, A. E., Putri, H. M. & Syarif, E. A. (2025). Empowering primary school teachers through mobile learning to break educational stereotypes. *Jurnal Karya Abdi Masyarakat*, 9(1), 97-108. <https://doi.org/10.22437/jkam.v9i1.42815>



© 2025 by the author(s)

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

INTRODUCTION

Primary education in Nigeria plays a critical role in equipping young learners with foundational knowledge, skills, and attitudes essential for personal and national development. The government's efforts, including the introduction of the Universal Basic Education (UBE) program in 1999 and the adoption of the 6-3-3-4 system, reflect this importance. However, learning outcomes in primary education remain uneven, particularly due to issues

such as socio-economic inequality, inadequate infrastructure, outdated curriculum, poor teaching quality, and insufficient access to resources (Aibieyi & Oghoator, 2015; Ghosh, 2024; Masoom & Siddik, 2024). These structural and systemic barriers are more pronounced in rural and under-resourced regions.

In addition to these logistical challenges, Nigerian primary schools also face deep-rooted socio-cultural problems, including the persistence of stereotypes that shape classroom interactions, teacher expectations, and student self-perception. These educational stereotypes—linked to gender, socioeconomic background, or perceived cognitive ability—can hinder students' full participation and negatively affect their learning trajectories. Consequently, addressing both infrastructural limitations and attitudinal barriers is essential for improving the overall quality of primary education in the country (World Vision Canada, 2023).

Recognizing the need for inclusive and transformative educational practices, the integration of mobile learning (m-learning) is increasingly seen as a promising approach to enhance primary education. Mobile learning supports flexible, accessible, and interactive pedagogy, tailored to individual student needs and learning paces. It has been shown to increase engagement, motivation, critical thinking, and digital literacy, particularly among primary learners (Holoatenko, 2023; Josué et al., 2024; Maria, 2023). In practice, mobile devices have already been used successfully in various global contexts—from South Africa to India and the UK—to strengthen literacy, foster collaboration, and improve science learning through apps and digital resources.

The theoretical foundation for mobile learning lies in a range of educational frameworks such as constructivism, cognitive load theory, social learning theory, and self-regulated learning (Mishra, 2023; Raturi, 2023; Sweller, 2023). These theories support the active construction of knowledge, peer collaboration, multimodal instruction, and personalized learning—all of which align with the pedagogical needs of young learners. Furthermore, models like SAMR and mobile seamless learning frameworks provide structured pathways for the integration of technology into educational environments (Boateng & Kalonde, 2024; Intan et al., 2024).

Despite the potential, many primary school teachers in Nigeria—particularly in towns like Oyo—lack exposure to mobile learning strategies and tools. Studies have shown that teacher attitudes, training, and familiarity with technology play a critical role in determining the successful adoption of mobile learning in classrooms (Garzón & Lampropoulos, 2023; Blackmore & Rønningsbakk, 2023; Yáñez-Pérez et al., 2024). Inadequate training, low access to devices, and persistent stereotypes further limit meaningful adoption. Several studies across different countries and regions, such as by Yang and Chen (2012), Chou and Wang (2020), and Camilleri and Camilleri (2020), confirm the importance of teacher readiness in leveraging mobile learning to transform instructional practice and reduce inequity.

In response to these challenges, this community engagement initiative was developed to empower primary school teachers in Oyo Town with the knowledge and skills needed to integrate mobile learning into their teaching practice. By focusing on stereotype reduction and inclusive pedagogy, the program aimed to support teachers in leveraging mobile technology to create more equitable and student-centered learning environments. Drawing on a rich body of literature and international best practices (Tachinamutu et al., 2022; Eskandari & Valente, 2022; Pea & Sharples, 2022), this activity is grounded in both empirical research and practical community needs.

By aligning educational theory with real-world teacher capacity-building, this initiative seeks not only to improve the instructional competence of teachers but also to contribute to broader societal goals such as stereotype elimination, gender equity, and digital inclusion in education (Uzunboylu & Azhar, 2023; Adesina, 2023; Haman, 2023). As this activity demonstrates, mobile learning—when embedded within a localized, community-responsive framework—holds the potential to transform primary education in underserved settings. Unlike traditional research, this initiative focused on real-time community involvement and pedagogical empowerment.

METHODS

Type of Activity

This community service initiative employed a sequential exploratory mixed-methods approach aimed at strengthening the pedagogical capacity of primary school teachers in Oyo Town. The activity integrated both qualitative and quantitative phases to explore and validate teachers' perceptions regarding the use of mobile learning as a tool to challenge educational stereotypes and enhance the effectiveness of primary education. The intervention included assessment and reflection components as part of its knowledge exchange strategy.

Study Subjects / Community Partners

The target community for this activity comprised primary school teachers in Oyo Town, drawn from the four local government areas: Afijio, Atiba, Oyo East, and Oyo West. A total sample of 250 teachers was selected using cluster random sampling to ensure balanced representation. Each cluster was based on local government area and school type. Within each cluster, four public and two private schools were selected, and ten participants were randomly chosen from each, forming a representative and diverse participant pool.

Procedure

The activity was implemented in two phases. In the first phase, qualitative data were collected through semi-structured interviews to explore teachers' perceptions and experiences with mobile learning. Insights from this phase informed the design of the second phase, which involved the distribution of structured questionnaires to a larger group of participants. Both phases were coordinated by the researcher with the support of trained research assistants. Ethical approval was obtained from the appropriate authorities, and informed consent was secured from all participants. Anonymity and confidentiality were strictly maintained throughout the engagement.

Research Instruments

Teachers' Perception of Breaking Stereotype, Enhancing Trajectory of Primary Education through Mobile Learning Questionnaire (TPBSETPMLQ)

This instrument included Likert-scale closed-ended items measuring key constructs such as mobile learning adoption, stereotype resistance, and enhancement of educational trajectory. The scale was scored 4–1 for positively worded items and reversed for negatively worded items. The questionnaire underwent face and construct

validation by psychometric experts. A pilot test with 30 teachers outside Oyo Town yielded a Cronbach's Alpha of 0.83, indicating good internal consistency.

Teachers' Perception Interview (TPBSETPMLI)

This semi-structured interview guide was used to collect in-depth qualitative data from a smaller subset of participants. It allowed the researchers to explore contextual nuances behind the teachers' attitudes and experiences. Inter-rater reliability was assessed using Fleiss' Kappa, with a score of 0.71, indicating substantial agreement among four raters.

Data Collection

Data were collected sequentially. The interview phase preceded the questionnaire distribution to ensure that insights from qualitative data could guide the refinement of the quantitative instrument. Interviews were conducted one-on-one and audio-recorded, while questionnaires were self-administered under researcher supervision. The trained assistants facilitated both stages, ensuring adherence to ethical protocols and consistency in administration.

Data Analysis

Qualitative Data Analysis

Data from the interviews were analyzed using thematic analysis. Responses were transcribed, coded, and categorized into themes that reflected patterns in teachers' experiences with mobile learning and their role in breaking educational stereotypes.

Quantitative Data Analysis

Data from TPBSETPMLQ were analyzed using descriptive statistics (frequency, percentage, mean, standard deviation) and inferential statistics (t-tests and ANOVA) to examine variations in teacher perceptions across demographic variables such as gender, age, teaching experience, educational background, and school type.

This structured methodology enabled a rigorous and context-sensitive investigation, bridging qualitative insights with quantitative validation to support the broader aim of empowering primary school teachers through mobile learning within a community service framework.

RESULTS AND DISCUSSION

This section presents the key findings of the community engagement program, highlighting teachers' perceptions of mobile learning, the challenges encountered during implementation, and how these perceptions vary across demographic factors. The results reflect how the intervention influenced teachers' views, revealing both strong support for mobile learning as an inclusive teaching tool and the practical barriers that may affect its adoption in primary school settings.

Teachers' Perceptions of Mobile Learning as a Tool for Breaking Educational Stereotypes**Table 1.** Teachers' Perception of Mobile Learning for Reducing Gender and Educational Stereotypes

	N	Min	Max	Mean	Std. Deviation	Variance	Skewness	Kurtosis	Std. Error
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic
mob_perception	250	42.00	95.00	74.5147	9.37478	87.886	-.787	2.259	.339
Valid N (listwise)	250								

After participating in the community engagement program, teachers who participated in the program demonstrated strong support for the use of mobile learning to address gender and educational stereotypes in primary education. As shown in Table 1, the average perception score was 74.51 (SD = 9.37), with scores ranging from 42 to 95. The negative skewness (-0.79) and positive kurtosis (2.30) indicate that most teachers gave high ratings, reflecting overall agreement with the benefits of mobile learning. These responses suggest that the intervention effectively raised awareness of mobile learning as an inclusive and flexible teaching method, particularly suited to diverse student needs.

Challenges Faced in Implementing Mobile Learning

During the qualitative phase, teachers who participated in the engagement activities reported several barriers hindering the practical implementation of mobile learning in schools. A common concern was school policies that restrict mobile device use by students. Additionally, inadequate infrastructure, such as lack of devices, unstable electricity, absence of ICT laboratories, and limited digital literacy, were frequently mentioned. Despite these issues, the teachers' willingness to adopt mobile learning tools points to the need for continuous support—both technically and structurally—to ensure effective integration. These insights emphasize the importance of follow-up initiatives such as infrastructure development, policy advocacy, and sustained capacity-building.

Overall Perception Significance Test**Table 2.** General Perception Score of Teachers Toward Mobile Learning as a Stereotype-Reducing Tool

	N	Mean	Std. Deviation	Df	t	Sig.	Remarks
mob_perception	250	74.5147	9.37478	249	113.53	.000	*S

The statistical analysis (Table 2) confirmed that the teachers' overall perception of mobile learning was significantly high ($t = 113.53$; $p < 0.05$). This level of agreement may be attributed to the relevance and practicality of the training content, which introduced mobile learning tools that were accessible and applicable to local classroom settings. The strong endorsement from participants also indicates that such interventions are meaningful and well-received at the community level.

Perception by Gender

Tabel 3. Comparison of Teachers' Perception of Mobile Learning Based on Gender

Gender	Frequency	Mean	SD	Df	t	Sig	Remarks
Male	54	73.91	9.06	248	-.890	.605	NS
Female	196	74.77	9.91				

As shown in [Table 3](#), there was no statistically significant difference in perception between male and female teachers ($p = 0.605$). This finding reinforces the inclusive nature of the program, suggesting that mobile learning resonates equally across genders. It also reflects a common understanding among all participants of the benefits of technology-enhanced instruction, regardless of background.

Perception by Age Group

Tabel 4. Variation in Teachers' Perception of Mobile Learning by Age Group

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3211.896	4	802.974	10.483	.000
Within Groups	18765.53	245	76.594		
Total	21977.426	249			

Tabel 5. Post-Hoc Comparison of Perceptions by Age Group (Bonferroni Test)

(I) Age	(J) Age	Mean Difference			95% Confidence Interval	
		(I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
25-34	Below 25 years	2.27679	2.38725	1.000	-4.5035	9.0570
	35-44	1.70147	1.69582	1.000	-3.1150	6.5179
	45-54	6.49429*	1.56324	.000	2.0544	10.9342
	55 Years& above	20.21429*	3.69832	.000	9.7104	30.7182

*The mean difference is significant at the 0.05

[Table 4](#) and its posthoc analysis indicate a significant variation in perception across age groups ($F = 10.48$; $p < 0.05$). Teachers aged 25–34 reported the highest mean scores, followed by those aged 35–44. The oldest group (55 and above) showed the lowest levels of agreement. This result implies that younger teachers—possibly more digitally fluent—are more open to integrating mobile learning. For future programs, differentiated training strategies that support older educators could help bridge this perception gap and increase inclusivity.

Perception by Teaching Experience

Tabel 6. Variation in Teachers' Perception Based on Years of Teaching Experience

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4132.485	4	1033.121	16.330	.000
Within Groups	15499.68	245	63.264		
Total	19632.165	249			

Tabel 7. Post-Hoc Comparison of Perceptions by Teaching Experience (Bonferroni Test)

(I) Years of teaching experience	(J) Years of teaching experience	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1-5 years	6-10 years	5.26373*	1.58165	.011	.7686	9.7589
	11-15 years	5.75000	2.09603	.067	-.2070	11.7070
	16-20 years	7.65476*	2.18401	.006	1.4477	13.8618
	21 years&above	17.99561*	2.25544	.000	11.5855	24.4057

*The mean difference is significant at the 0.05 level.

Table 6 reveals a significant difference in perception based on years of teaching experience ($F = 16.33$; $p < 0.05$). Teachers with 1–5 years of experience reported the most positive views, while those with over 21 years of experience showed lower enthusiasm. These findings highlight the potential for peer-mentoring approaches, where younger, tech-savvy teachers support senior colleagues in adopting mobile tools and practices.

Perception by Educational Qualification

Tabel 8. Comparison of Perceptions Based on Teachers' Educational Qualifications

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2334.508	3	778.169	1.471	.749
Within Groups	130135.722	246	529.007		
Total	132470.230	249			

Table 8 shows no significant differences in perception based on academic qualification. Whether the teachers held NCE, bachelor's, or postgraduate degrees, their responses reflected a common understanding of the role of mobile learning in improving classroom inclusivity. This indicates that the training content was appropriately designed to be accessible and relevant to participants with varied academic backgrounds.

Perception by Field of Study

Tabel 9. Teachers' Perception of Mobile Learning by Field of Study

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	9977.686	3	3325.895	2.074	.092
Within Groups	394489.044	246	1603,614		
Total	404466.73	249			

Similarly, Table 9 suggests no significant differences based on academic discipline ($p = 0.092$). This consistency across different subject areas—science, social studies, arts—points to the universal applicability of mobile learning tools and their potential for cross-curricular integration.

Perception by School Type

Tabel 10. Comparison of Perceptions Based on Type of School (Public vs. Private)

Type of School	Frequency	Mean	SD	Df	t	Sig	Remarks
Public	156	72.99	10.28	248	-2.34	.137	NS
Private	94	75.04	9.98				

As presented in [Table 10](#), teachers who participated from both public and private schools showed similar levels of agreement ($p = 0.137$). This result implies that mobile learning has scalable potential, with relevance in both well-resourced and under-resourced school environments. Future outreach programs can be designed with this inclusiveness in mind, ensuring equitable implementation across different school types.

The present study revealed that primary school teachers in Oyo Town generally have a high perception of mobile learning as a tool for breaking educational stereotypes in primary education. This strong perception is reflected in the high mean scores across the sample ($M = 74.51$; $SD = 9.37$), with responses skewed toward agreement. This finding supports assertions in the introduction that mobile learning offers inclusive, flexible, and engaging pedagogy capable of addressing attitudinal and structural barriers in primary education (Uzunboylu & Azhar, 2023; Adesina, 2023; Haman, 2023). The widespread prevalence of mobile devices in society likely contributes to this positive outlook, as also observed in Blackmore & Rønningsbakk (2023) and Yáñez-Pérez et al. (2024), who emphasized the role of teacher familiarity and digital literacy in technology adoption.

In relation to the challenges identified, teachers reported that factors such as unclear policies on mobile device use, inadequate infrastructure, low technological knowledge, and financial constraints impede effective implementation. These findings align with the infrastructural and policy gaps highlighted in the introduction (Ghosh, 2024; Masoom & Siddik, 2024). For instance, while some states like Lagos and private schools in Nigeria have adopted mobile learning practices, the lack of national-level clarity and support continues to hinder broader adoption. The consistency between these findings and prior studies underscores the systemic nature of these barriers and highlights the urgent need for policy reforms and targeted investments to create enabling environments for mobile learning.

Regarding the tested hypotheses, the study confirmed that there is a significant perception among teachers of mobile learning as a tool for breaking educational stereotypes. This is consistent with earlier reports that mobile learning can foster critical thinking, creativity, and problem-solving skills among primary school students (Holovatenko, 2023; Maria, 2023; Josué et al., 2024). The high perception of mobile learning as stereotype-reducing can also be interpreted through the lens of constructivist and social learning theories (Mishra, 2023; Raturi, 2023), which advocate for learner-centered, collaborative, and technology-supported environments as a means of challenging entrenched stereotypes.

A deeper analysis of demographic variations provides additional insights. The study found that younger teachers and those with fewer years of teaching experience reported significantly higher perceptions of mobile

learning's effectiveness. This is consistent with findings from Adesina (2023) and Uzunboylu & Azhar (2023), who argue that digital natives and newer entrants into the profession are typically more comfortable integrating technology into their practice. The lower scores among older teachers may reflect their relative unfamiliarity with mobile tools or greater attachment to traditional teaching methods. This generational divide highlights the need for differentiated capacity-building programs that are sensitive to teacher backgrounds, as suggested in the introduction (Garzón & Lampropoulos, 2023).

Conversely, no significant differences were found based on gender, field of study, educational qualification, or school type. This finding aligns with Uzunboylu & Azhar (2023) and Yáñez-Pérez et al. (2024), who noted that mobile learning appeals broadly across different teacher demographics because of its inherent flexibility and relevance. The inclusive nature of mobile learning means it can transcend typical demographic divides and offer equitable teaching tools across varied contexts (World Vision Canada, 2023). This universal perception is particularly significant in community engagement settings, as it suggests that mobile learning interventions can be designed for broad scalability without the need for heavy customization by demographic profile.

Importantly, these findings make several contributions to knowledge and practice. Theoretically, the study reinforces existing models that position mobile learning as a transformative tool in primary education and validates its role in stereotype reduction through empirical data. Practically, the results emphasize the value of community-based professional development programs in enhancing teacher readiness for mobile learning. This supports the case for embedding mobile learning initiatives within larger educational equity and inclusion strategies. Methodologically, the study demonstrates how sequential exploratory mixed-methods designs can yield rich, context-sensitive insights that are crucial for designing effective community service interventions.

Finally, while the study confirms much of the existing literature, it also highlights areas for further inquiry. Future research could explore how sustained use of mobile learning impacts classroom practices over time, or how peer mentoring models—where younger, digitally fluent teachers support older colleagues—might help bridge the generational divide. There is also scope for policy-focused studies to identify strategies for overcoming the infrastructural and regulatory barriers that currently inhibit mobile learning adoption in Nigerian primary schools.

CONCLUSION

This study demonstrated that primary school teachers in Oyo Town hold a strong and positive perception of mobile learning as a tool for breaking educational stereotypes, particularly among younger and less experienced teachers. Despite this enthusiasm, implementation remains limited due to infrastructural barriers, policy ambiguity, and uneven digital readiness. The findings reinforce the relevance of mobile learning within inclusive pedagogy and underscore its potential for transforming primary education in underserved contexts. However, the study was limited to perceptual data within a single geographic area and did not assess the long-term classroom application of mobile learning. Future research should explore sustained usage patterns, evaluate student outcomes, and examine how peer mentoring or differentiated training might bridge generational gaps among teachers. It is recommended that educational stakeholders invest in context-specific digital infrastructure, policy support, and

teacher capacity-building programs to ensure the scalable and equitable integration of mobile learning across diverse school settings.

ACKNOWLEDGMENTS

The authors sincerely thank all participating teachers, community partners, and research assistants who contributed to the success of this community engagement activity. Their collaboration, time, and commitment were invaluable to the smooth implementation of the program.

DECLARATIONS

- Author Contribution : AEA: Conceptualization, Writing - Original Draft, Formal Analysis, Visualization, and Validation;
HMP: Writing – Review, Editing, Proof Reading;
EAS: Editing and Proof Reading.
- Funding Statement : This community engagement activity did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.
- Conflict of Interest : The authors declare no conflict of interest.
- Additional Information : Additional information is available for this paper.

REFERENCES

- Adesina, A. E. (2023). Primary school teachers' perceptions of rebranding basic science education in Oyo Town, Nigeria. *International Journal of Contemporary Issues in Education*, 5, 279–291. <http://ijcie.oauife.edu.ng/index.php/ijcie/article/view/102/87>
- Aibieyi, S., & Oghoator, I. H. (2015). Factors militating against effective implementation of the 6-3-3-4 education policy in Nigeria: A case study in policy failure. *African Research Review*, 9(4), 321–332. <https://doi.org/10.4314/afrrrev.v9i4.24>
- Akanbi, G. O. (2014). Professionalising teaching in Nigeria through quality teacher education. *Journal of Education and Practice*, 5(24), 107–112. <https://iiste.org/Journals/index.php/JEP/article/download/15264/15630>
- Blackmore, K., & Rønningsbakk, L. (2023). Let us explain everything: Pupils' perspectives of the affordances of mobile technology during primary science inquiry. *Frontiers in Education*, 8, 1168459. <https://doi.org/10.3389/feduc.2023.1168459>
- Boateng, S., & Kalonde, G. (2024). Exploring the synergy of the SAMR (Substitution, Augmentation, Modification, and Redefinition) model and technology integration in education: The key to unlocking student engagement and motivation. *Proceedings of the International Conference on Advanced Research in Education, Teaching, and Learning*, 1(1), 37–46. <https://doi.org/10.33422/aretl.v1i1.185>
- Camilleri, M. A., & Camilleri, A. C. (2020). The use of mobile learning technologies in primary education. In R. Zheng (Ed.), *Cognitive and affective perspectives on immersive technology in education* (pp. 250–266). IGI Global. <https://doi.org/10.4018/978-1-7998-3250-8.ch013>

- Chou, P., & Wang, P. (2020). Looking deeper: Using the mobile microscope to support young children's scientific inquiries. *Sustainability*, 13(7), 3663. <https://doi.org/10.3390/su13073663>
- Eskandari, S., & Valente, J. P. (2022). An extended technology acceptance model in the context of mobile learning for primary school students. In M. E. Auer & T. Tsiatsos (Eds.), *New realities, mobile systems and applications. IMCL 2021. Lecture notes in networks and systems* (Vol. 411, pp. xxx–xxx). Springer. https://doi.org/10.1007/978-3-030-96296-8_25
- Garzón, J., & Lampropoulos, G. (2023). Mobile learning for science education: Meta-analysis of K–12 research. *Interactive Learning Environments*, 1–16. <https://doi.org/10.1080/10494820.2023.2280973>
- Ghosh, S. S. (2024). Assessing the impact of socioeconomic factors on educational equity in Indian primary schools: A structural modelling perspective. *Measurement: Interdisciplinary Research and Perspectives*, 1–11. <https://doi.org/10.1080/15366367.2024.2334592>
- Holovatenko, T. (2023). Enhancing elementary classroom learning experiences with mobile learning: Implications for practice. In M. Parks (Ed.), *Impactful classroom experiences in elementary schools: Practices and policies* (pp. 25–49). IGI Global. <https://doi.org/10.4018/978-1-6684-8551-4.ch002>
- Haman, I. (2023). Overview of applications for the development of logical thinking of children of primary school age. *OD*, 2(41), 37–56. <https://doi.org/10.28925/2312-5829.2023.23>
- Intan, N., AM, S. A., & Hijrah. (2024). Substitution, augmentation, modification and redefinition (SAMR) model to technology integration for English teachers at SMP Negeri 2 Sungguminasa. *Journal of Computer Interaction in Education*, 7(1), 19–32. <https://doi.org/10.56983/jcie.v7i1.619>
- Josué J. G. D. S., J. J., Leandro de Oliveira, M., & da Silva–Paraíba, W. (2024). Educational technologies and personalized learning: Challenges and opportunities. *Multidisciplinary Scientific Journal*, 1(1), 1–7.
- Mai, M. Y., & Muruges, G. R. (2022). Primary school science teachers' attitude towards using virtual learning environment (VLE) in teaching science. *European Journal of Education*, 5(1), 129–140. <https://doi.org/10.26417/ejed.v1i3.p155-162>
- Maria, Z. (2023). Introducing mobile learning into the primary school curriculum: A case study of the continuous pedagogical use of mobile devices. *The European Conference on Education 2023: Official Conference Proceedings*, 1293–1303. <https://doi.org/10.22492/issn.2188-1162.2023.104>
- Masoom, M. R., & Siddik, I. A. (2024). Beyond the classroom: Structural and qualitative challenges in Bangladesh's primary education. *Research on Preschool and Primary Education*, 2(1), 38–49. <https://doi.org/10.55976/rppe.22024124238-49>
- Mishra, N. R. (2023). Constructivist approach to learning: An analysis of pedagogical models of social constructivist learning theory. *Journal of Research and Development*, 6(1), 22–29. <https://doi.org/10.3126/jrdn.v6i01.55227>
- Pea, R., & Sharples, M. (2022). Grounding technology in the learning sciences. In R. K. Sawyer (Ed.), *Mobile learning* (pp. 362–382). Cambridge University Press. <https://doi.org/10.1017/9781108888295.022>
- Raturi, S. (2023). A social constructivist approach to e-learning: Methodology and challenges. *BSSS Journal of Education*, 12(1), 78–90. <https://doi.org/10.51767/je1206>
- Sweller, J. (2023). Cognitive load theory. In R. J. Tierney, F. Rizvi, & K. Ercikan (Eds.), *International Encyclopaedia of Education* (4th ed., pp. 127–134). Elsevier.

- Tachinamutu, M., Bin Mohamad Said, M. N. H., Binti Abdullah, Z., Bin Ali, M. F., & Bin Mohd Tahir, L. (2022). The effect of using 'Microb' mobile application in science learning in primary school. *International Journal of Interactive Mobile Technologies (IJIM)*, 16(2), 82–100. <https://doi.org/10.3991/ijim.v16i02.27307>
- Uzunboylu, H., & Azhar, N. (2023). Mobile learning as a new technology in education. *Global Journal of Information Technology: Emerging Technologies*, 13(1), 7–16. <https://doi.org/10.18844/gjit.v13i1.8459>
- Wang, J. C., Hsieh, C., & Kung, S. (2023). The impact of smartphone use on learning effectiveness: A case study of primary school students. *Education and Information Technologies*, 28, 6287–6320. <https://doi.org/10.1007/s10639-022-11430-9>
- World Vision Canada. (2023). Why is education important and how does it affect one's future? <https://www.worldvision.ca/stories/education/why-is-education-important>
- Yáñez-Pérez, I., Toma, R. B., & Meneses-Villagrà, J. Á. (2023). Design and usability evaluation of a mobile app for elementary school inquiry-based science learning. *School Science and Mathematics*. <https://doi.org/10.1111/ssm.18303>
- Yang, J. C., & Chen, C. H. (2012). A mobile learning environment for supporting inquiry-based experimental activities in elementary school. *International Journal of Mobile Learning and Organisation*, 6(1), 8–24. <https://doi.org/10.1504/IJMLO.2012.046879>