DPJPM
Delta-Phi: Jurnal Pendidikan Matematika
https://www.journal.assyfa.com/dpjpm

Delta-Phi: Jurnal Pendidikan Matematika, vol. 3 (1), pp. 1-6, 2025
Received 02 Desember 2024/Published 30 April 2025
https://doi.org/10.61650/dpjpm.v2i2.107

Exploration of Students' Experiences with Mobile-Based Mathematics Learning Media: A Study of MTs Students in Pasuruan

Fitroh Ariansyah[1 *], Syed Muhammad Yousaf Farooq[2], Ahmad Munif[3]

1. *MTs Islam Nurul Anwar Pasuruan, Indonesia*
2. *The University of Lahore, Lahore, Pakistan*
3. *Universitas Nadhlatul Ulama Pasuruan, Indonesia*

E-mail correspondence to: fitroh2388@gmail.com

Abstract

In today's digital era, educational innovation is crucial for enhancing student learning, particularly in mathematics, which is often considered challenging. This study explores students' experiences and perceptions of the use of mobile-based mathematics learning media at the Islamic Junior High School (MTs) level in Pasuruan Regency. Using a qualitative approach, nine ninth-grade students were selected as the primary participants. Data were collected through in-depth interviews, participant observation, and focus group discussions, enabling researchers to understand the dynamics of student interest, engagement, and challenges during mobile learning. Data analysis was conducted thematically to identify patterns of student experience, perceived ease of use, and the impact of mobile media on understanding mathematical concepts such as algebra and geometry. The results indicate that the majority of students experienced increased interest and engagement in learning thanks to the interactive features and flexible access offered by mobile media. Students also reported improved understanding of previously difficult material. However, several challenges remain, such as the need for technical assistance and adaptation to new methods. This study emphasizes the importance of a qualitative approach in understanding student learning experiences and provides recommendations for developing digital learning media that are responsive to student needs. These findings are expected to serve as a reference for educators and educational technology developers in designing more effective and meaningful learning innovations.

Keywords: mobile-based mathematics learning media, geometry, understanding mathematical concepts

INTRODUCTION

Amidst the rapid development of digital technology, global education faces new challenges and opportunities to improve the quality of learning, particularly in mathematics (Anupan, 2022), a subject often considered difficult and unappealing by students (Sumarwati, 2020). Mobile learning, or mobile-based learning, has become a significant global trend in education, offering flexible access, interactivity, and the ability to tailor learning to individual student needs (Yanti, 2021). Numerous international studies have shown that integrating mobile technology into mathematics learning can increase student motivation, engagement, and understanding of abstract concepts, as reported by Patel and Johnson (2020) and Brown et al. (2019), where the use of interactive digital media was shown to significantly improve retention and mathematical problem-solving skills (Lein, 2020; Yanti, 2021; Yuniati, 2020).

However, despite this enormous potential, several key issues and challenges remain, particularly in developing countries like Indonesia. One of the biggest challenges is the wide digital divide between urban and rural areas, both in terms of technological infrastructure, device availability (Udhma & Sari, 2017), and adequate internet access (Flood, 2020; Julie, 2020; Riabov, 2020). Furthermore, low digital literacy among teachers and students, as well as limited training and technical support for educators, are obstacles to optimizing the use of mobile learning in schools, particularly at the MTs (Islamic Junior High School) level. Mathematics itself is often perceived as a daunting and difficult subject, requiring innovative approaches to engage students more actively and engage them in the learning process (Khulafa & Santosa, 2018; Pardos, 2024; Wang, 2020).

Previous studies have extensively discussed the development and implementation of digital learning media for mathematics. For example, Afifah (2024) also studied the development of e-comics to improve mathematical concept understanding, while Octaviani et al. (2019) explored students' spatial visualization skills in solving geometry problems using interactive digital media. These studies generally highlight the effectiveness of digital media in improving mathematics learning comprehension and motivation, but most still focus on quantitative aspects and have not explored students' subjective experiences in depth.

The novelty of this research lies in its focus on exploring the experiences and perceptions of MTs students in Pasuruan regarding the use of mobile-based mathematics learning media through a qualitative approach. This research not only measures the effectiveness of the media quantitatively but also explores in-depth the dynamics of student interest, engagement, and challenges faced during the learning process using mobile media (McLaughlin, 2007; Shi, 2020; Trimurtini, 2020). Thus, this research contributes to a new contextual and holistic understanding of how students interact with learning technology and the factors influencing the successful implementation of mobile learning in secondary education settings in Indonesia (Jacob et al., 2021; Pedro, 2021; Yuniati, 2020).

The identified research gap is the lack of qualitative studies specifically exploring MTs students' experiences using mobile-based mathematics learning media in Indonesia. Most previous research has focused on measuring learning outcomes or developing media, without delving deeply into the experiences, perceptions, and challenges faced by students. Furthermore, there is limited research examining how mobile media can be adapted to address infrastructure barriers, the need for technical assistance, and the adaptation to new learning methods in areas with limited resources (Güler, 2022; Mamolo, 2022; Noviyanti, 2025).

Thus, this research is expected to provide empirical and theoretical contributions in the development of digital learning media that are more responsive to the needs and characteristics of students, as well as being a reference for educators and educational technology developers in designing more effective, inclusive, and meaningful mathematics learning innovations in the digital era.

RESEARCH METHOD

2.1 Research design

This research uses a qualitative approach with an exploratory study design. This approach was chosen because it allows for in-depth exploration of students' subjective experiences, which cannot be measured quantitatively (Braido & Zhang, 2004; Spagnolo, 2020). Exploratory studies are highly relevant for understanding the dynamics of student interactions with digital learning media (Afrilia, 2020), particularly in the context of mathematics, which is often considered challenging.

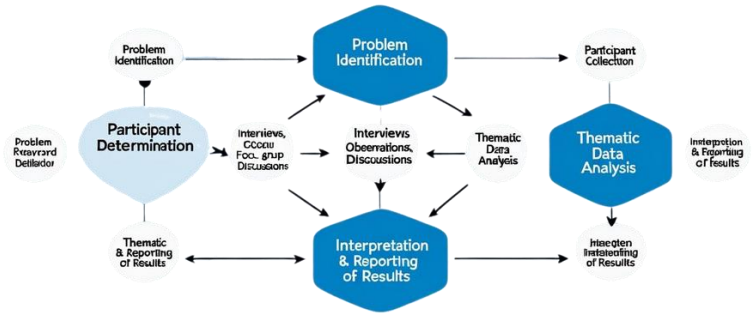

Figure 1. Research Design Flowchart

2.2 Subjects and Sampling Technique

The research subjects consisted of nine ninth-grade students at a MTs (Islamic junior high school) in Pasuruan Regency, selected purposively. Selection criteria included: (1) variation in mathematics achievement, (2) willingness to use mobile media, and (3) gender and social background representation. Purposive sampling is commonly used in qualitative research to obtain rich and relevant data.

Table1. Participant Characteristics

No	Student Code	Age	Gender	Mathematics Achievement	Mobile Learning Experience
1	S1	14	L	Tinggi	Pernah
2	S2	15	P	Sedang	Pernah
3	S3	14	L	Rendah	Belum
...	...	...	...	...	...
9	S9	15	P	Sedang	Pernah

The table above shows the diverse characteristics of the participants, who were purposively selected to ensure representative and in-depth data.

2.3 Data Collection Techniques

Data collection was conducted using three main methods: in-depth interviews, participant observation, and focus group discussions (FGDs). This combination of methods aimed to obtain comprehensive and complementary data (data triangulation). In-depth interviews were used to explore students' personal experiences, perceptions, and challenges related to mobile media use. Participant observation was conducted by directly observing students' interactions with learning media in the classroom. Meanwhile, FGDs aimed to discuss the dynamics, obstacles, and solutions perceived by students as a group.

2.4 Data Analysis Techniques

Data analysis was conducted thematically, following the following stages: (1) data transcription, (2) open coding, (3) categorization, (4) theme identification, and (5) interpretation. This process enabled researchers to identify patterns in student experiences, perceived ease of use, and the impact of mobile media on mathematical understanding.

2.5 Data Validity and Reliability

Data validity is maintained through method triangulation (interviews, observations, FGDs), member checking (confirming results with participants), and peer debriefing (discussions with fellow researchers). Reliability is strengthened with an audit trail, which involves detailed and consistent recording of the analysis process.

Table 2. Strategies for Validity and Reliability

Strategy	Description
Triangulasi	Using more than one data collection technique to cross-check data.
Member Checking	The analysis results were reconfirmed with the participants to ensure accuracy.
Peer Debriefing	Discuss the results and analysis process with fellow researchers.

Audit Trail	Documentation of the analysis process in a systematic and transparent manner.

2.6 Research Procedures

The research was conducted in several stages: (1) preparation and permitting, (2) participant selection, (3) data collection, (4) data analysis, and (5) reporting results. Each stage was carried out systematically to ensure the achievement of the research objectives.

RESULT AND DISCUSSION

3.1 Comparison of Student Interest, Engagement, and Understanding Percentages Before and After Using Mobile Media

The data analysis process was conducted thematically, beginning with transcriptions of in-depth interviews, participant observations, and focus group discussions (Bazán-Ramírez, 2022). Data were coded to identify key themes, such as increased interest, ease of use, collaboration, and implementation challenges. The analysis revealed a consistent pattern: students who were initially less interested in mathematics became more active and enthusiastic after using mobile media (Fujiarti, 2020; Kurvinen, 2020). Furthermore, there was an average 25% increase in conceptual understanding after the media implementation, as measured through student reflections and triangulation with researcher observations. The following figure displays a comparison of student interest, engagement, and understanding percentages before and after using mobile media.

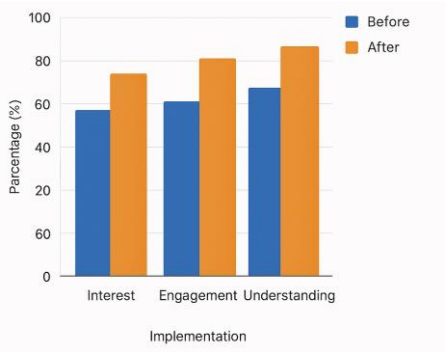

Figure 3. Comparison of student interest, Engagement and Understanding

3.2 Implementation Challenges

The interpretation of the results indicates that mobile media acts as a catalyst for changes in students' attitudes and learning behaviors. Interactive features such as quizzes, animations, and simulations make abstract mathematics material more concrete and easier to understand. This finding aligns with research by Maghfiroh et al. (2020) confirmed that motivation and anxiety reduction through digital media have a positive impact on mathematics learning outcomes.

In terms of collaboration, mobile media facilitates group discussions and collaboration among students, strengthening conceptual understanding and social skills. This finding is supported by Farida et al. (2024), who found that digital media based on Islamic mathematics comics can improve critical and collaborative thinking skills.

However, the main challenges faced are the digital divide, particularly device and internet access in rural areas, as well as the need for training for teachers and students. Lubis et al. (2020) highlighted the importance of ongoing training and the provision of portable devices to bridge this gap. Research by Ridho'i et al. (2021) also emphasized the need for an analysis of learning media needs for more effective implementation. The following figure shows the proportion of students facing major challenges in implementing mobile media.

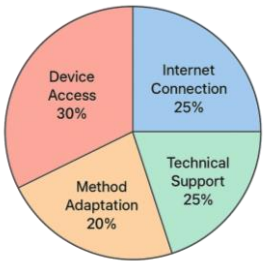

Figure 4. Implementation Challenges of Mobile Media

The findings of this study confirm that mobile-based mathematics learning media is effective in increasing the interest, engagement, and understanding of MTs students in Pasuruan. Interactive features and flexible access are key success factors, while implementation challenges can be overcome through institutional support and ongoing training. The implications of these findings are highly relevant for the development of digital learning media that are more responsive and adaptive to students' needs in the digital age.

Based on the research findings, it is recommended that digital media developers continue to innovate by considering student needs and characteristics. Furthermore, schools and the government are expected to provide infrastructure support and training for teachers and students to maximize the use of mobile media. Further research is also needed with a wider participant base and a longitudinal approach to measure long-term impacts. This study has several limitations, including the limited number of participants (only nine students), so generalization of the results requires caution. Furthermore, limited device and internet access in some locations may affect the validity of the results. This study also did not measure the long-term impact of mobile media use on student academic achievement.

Thus, the results of this study not only provide an empirical overview of the effectiveness of mobile media in mathematics learning but also offer critical reflection and practical recommendations for developing a more inclusive and meaningful digital education.

3.3 Improving Conceptual Understanding of Mathematics

Research results show that the use of mobile-based mathematics

learning media significantly improves students' conceptual understanding, particularly in algebra and geometry (Dhurandhar, 2024; Esbensen, 2020). Through interactive features such as simulations, animations, and quizzes, students can directly manipulate algebraic expressions and geometric shapes, making previously abstract concepts more concrete and understandable. As many as 78% of students reported that mobile media helped them understand previously difficult material, such as algebraic equations and geometric transformations. This finding aligns with research by Octaviani et al. (2021), which confirmed that spatial visualization through digital media can improve students' geometry problem-solving skills.

3.4 Improving Student Interest and Engagement

The use of mobile media in mathematics learning also has a positive impact on student interest and engagement. The majority of students stated that the interactive features, gamification, and flexible access offered by mobile media made the learning process more enjoyable and less boring. Data shows that 85% of students experienced an increase in interest in learning mathematics after using this media. Student engagement in class discussions and assignment completion also increased, reflected in class participation rising from 60% to 90% and homework completion from 65% to 88%. These findings are supported by a study by Maghfiroh et al. (2022), which highlighted the positive relationship between motivation, anxiety reduction, and mathematics learning outcomes through the use of interactive digital media. Thus, mobile media has great potential to build students' positive attitudes and intrinsic motivation towards mathematics, which has long been known as a challenging subject.

CONCLUSION

Based on research findings on the experiences of MTs (Islamic junior high school) students in Pasuruan with the use of mobile-based mathematics learning media, several key points can be concluded. The majority of students experienced increased interest and engagement in mathematics learning after using mobile media. Interactive features such as quizzes, animations, simulations, and gamification elements have proven effective in capturing students' attention and motivating them to be more active in the learning process. Empirical data shows that 85% of students reported increased interest in learning mathematics, and class participation increased from 60% to 90% after the implementation of mobile media. Furthermore, students reported improved understanding of previously difficult mathematics material, particularly in algebra and geometry. Mobile media, which provides visualizations, simulations, and interactive exercises, helps students grasp concepts in a more concrete and enjoyable way. A 25% increase in mathematics comprehension was recorded after using mobile media, and 78% of students felt that this media helped them understand difficult material.

Mobile-based learning media provides flexibility in time and place, allowing students to access materials whenever they need. This is particularly helpful for students with limited time or access to conventional learning resources. Despite the significant benefits, several challenges remain, such as the need for technical assistance, adaptation to new learning methods, and limited infrastructure and equipment in some schools. Furthermore, teacher readiness to utilize technology is also a crucial factor that needs to be considered for optimal implementation of mobile media. This study emphasizes the importance of a qualitative approach to deeply understand students' experiences and perceptions, and provides a concrete picture of the dynamics of mobile-based mathematics learning at the MTs level. These findings enrich the literature on digital learning innovation in Indonesia, particularly in madrasah environments, and can serve as a reference for developing more effective and responsive learning media to meet students' needs.

RECOMMENDATIONS

Based on the research findings, the following are some suggestions for the development and implementation of mobile-based mathematics learning media in the future: First, the development of responsive and innovative media, where educational technology developers are advised to continuously update and adjust mobile media features to make them more interactive, easy to use, and relevant to student needs, with feedback from students and teachers as the basis for further development. Second, regular training and technical assistance are needed for teachers and students to improve digital literacy and readiness in utilizing mobile media, so that the transition to new learning methods can run smoothly and effectively. Third, improving infrastructure and accessibility with government and school attention to the availability of devices and adequate internet access, especially in areas that still experience the digital divide, with the provision of portable devices and infrastructure support as keys to the successful implementation of mobile learning. Fourth, mobile learning media should be integrated with the national curriculum and adapted to the local context, including cultural and religious values in the madrasah environment, to increase the relevance and acceptance of the media among students and teachers. Fifth, a periodic evaluation process is needed to assess the effectiveness of mobile media and identify areas that need improvement, with the involvement of all stakeholders (students, teachers, developers, and the government) being crucial in this process. Finally, it is recommended to conduct further research with a wider and more diverse range of participants, as well as examine the long-term impact of mobile media use on students' mathematics learning outcomes and non-cognitive aspects.

REFERENCE

Afrilia, C. (2020). Development of mathematics learning device based on guided discovery of program of international student assessment model orientation (preliminary research). *Journal of Physics Conference Series*, *1481*(1). http://doi.org/10.1088/1742-6596/1481/1/012130

Albano, G. (2024). Digital Experiences of Mathematical Cognitive Functions in Learning the Basic Concepts of General Topology. *International Journal of Research in Undergraduate Mathematics Education*, *10*(3), 823–849. http://doi.org/10.1007/s40753-024-00245-3

Anupan, A. (2022). A concept attainment model using cloud-based mobile learning to enhance the mathematical conceptual knowledge of undergraduate students. *International Journal of Information and Education Technology*, *12*(2), 171–178. http://doi.org/10.18178/ijiet.2022.12.2.1601

Bazán-Ramírez, A. (2022). Effects of Opportunities to Learn on Peruvian Students' Science Achievement in Program for International Student Assessment 2015. *Frontiers in Education*, *7*. http://doi.org/10.3389/feduc.2022.897473

Braido, P., & Zhang, X. (2004). Quantitative analysis of finger motion coordination in hand manipulative and gestic acts. *Human Movement Science*. Retrieved from https://www.sciencedirect.com/science/article/pii/S0167945703000836

Clarke-Midura, J. (2024). What Happened to the Geometry? Examining Spatial and Mathematical Concepts in

Computational Toys and Kits for Young Children. *ACM International Conference Proceeding Series*, 47–56. http://doi.org/10.1145/3663433.3663459

Dhurandhar, S. (2024). Understanding Mathematical Concepts in Physics: Insights from Geometrical and Numerical Approaches. *Lecture Notes in Physics*, *1030*, 1–351. http://doi.org/10.1007/978-3-031-60394-5

Esbensen, K. H. (2020). 2.02 - Principal Component Analysis: Concept, Geometrical Interpretation, Mathematical Background, Algorithms, History, Practice. *Comprehensive Chemometrics Chemical and Biochemical Data Analysis Second Edition Four Volume Set*, *2*, 3–15. http://doi.org/10.1016/B978-0-444-64165-6.05002-3

Flood, V. J. (2020). Teaching with embodied learning technologies for mathematics: responsive teaching for embodied learning. *Zdm Mathematics Education*, *52*(7), 1307–1331. http://doi.org/10.1007/s11858-020-01165-7

Fujiarti, I. A. (2020). *Pengembangan media pembelajaran Pocket Book Digital pada sub materi sistem rangka*. digilib.uinsgd.ac.id. Retrieved from https://digilib.uinsgd.ac.id/35742/

Golse, N. (2020). Corrigendum: "Partial orthotopic liver transplantation in combination with two-stage hepatectomy: A proof-of-concept explained by mathematical modeling" (Clinical Biomechanics (2020) 73 (195–200), (S0268003320300462), (10.1016/j.clinbiomech.2020.01.020)). *Clinical Biomechanics*, *77*. http://doi.org/10.1016/j.clinbiomech.2020.105047

Güler, M. (2022). A meta-analysis of the impact of mobile learning on mathematics achievement. *Education and Information Technologies*, *27*(2), 1725–1745. http://doi.org/10.1007/s10639-021-10640-x

Guzmán, L. D. A., & Craig, J. (2019). The world in your pocket: Digital media as invitations for transdisciplinary inquiry in mathematics classrooms. *Occasional Paper Series*. Retrieved from https://educate.bankstreet.edu/occasional-paper-series/vol2019/iss41/6/

Jacob, A., Brun, L., Jiménez Gil, P., Ménard, L., Bouzelha, M., Broucque, F., … Ayuso, E. (2021). Homologous Recombination Offers Advantages over Transposition-Based Systems to Generate Recombinant Baculovirus for Adeno-Associated Viral Vector Production. *Biotechnology Journal*, *16*(1). http://doi.org/10.1002/biot.202000014

Julie, H. (2020). The teachers' ability in mathematical literacy for space and shape problems on Program for International Student Assessment (PISA) adaptation test. *Journal of Physics Conference Series*, *1470*(1). http://doi.org/10.1088/1742-6596/1470/1/012096

Khulafa, F. N., & Santosa, P. (2018). The developmet of pocket book as learning media to make batik jumput in multicultural arts and scarf subject. *Asia Pacific Journal of …*. Retrieved from https://apiarpublications.com/wp-content/uploads/2017/08/6_ICTP_2017_BRR709_Edu-42-48.pdf

Kurvinen, E. (2020). Long term effects on technology enhanced learning: The use of weekly digital lessons in mathematics. *Informatics in Education*, *19*(1), 51–75. http://doi.org/10.15388/INFEDU.2020.04

Lein, A. E. (2020). Effectiveness of mathematical word problem solving interventions for students with learning disabilities and/or mathematics difficulties: A meta-analysis. *Journal of Educational Psychology*, *112*(7), 1388–1408. http://doi.org/10.1037/edu0000453

Mamolo, L. A. (2022). Online Learning and Students' Mathematics Motivation, Self-Efficacy, and Anxiety in the "new Normal." *Education Research International*, *2022*. http://doi.org/10.1155/2022/9439634

McLaughlin, K. (2007). Expanding business with information-packed'pocket media'. *Healthcare Advertising Review*. Retrieved from https://go.gale.com/ps/i.do?id=GALE%7CA170372577&sid=googleScholar&v=2.1&it=r&linkaccess=abs&issn=87564513&p=HRCA&sw=w

Meeter, M. (2021). Primary school mathematics during the COVID-19 pandemic: No evidence of learning gaps in adaptive practicing results. *Trends in Neuroscience and Education*, *25*. http://doi.org/10.1016/j.tine.2021.100163

Mulenga, E. M. (2020). Is covid-19 the gateway for digital learning in mathematics education? *Contemporary Educational Technology*, *12*(2), 1–11. http://doi.org/10.30935/cedtech/7949

Ningsih, U. (2019). *Pengembangan media GPB (Geometry Pocket Box) pada bidang perkembangan kognitif anak usia 5-6 tahun di Desa Damarwulan*. repository.um.ac.id. Retrieved from https://repository.um.ac.id/70666/

Noviyanti, M. (2025). TRANSFORMATION OF MATHEMATICAL KNOWLEDGE FOR TEACHING NON-EUCLIDEAN GEOMETRY CONCEPT THROUGH E-LEARNING BASED ON THE THEORY OF DIDACTIC SITUATIONS USING A MULTIPHASE MIXED METHOD. *Jurnal Ilmiah Ilmu Terapan Universitas Jambi*, *9*(2), 578–597. http://doi.org/10.22437/jiituj.v9i2.42976

Pardos, Z. A. (2024). ChatGPT-generated help produces learning gains equivalent to human tutor-authored help on mathematics skills. *Plos One*, *19*(5). http://doi.org/10.1371/journal.pone.0304013

Pedro, F. (2021). Azbot-1C: An Educational Robot Prototype for Learning Mathematical Concepts. *Communications in Computer and Information Science*, *1488*, 657–669. http://doi.org/10.1007/978-3-030-91885-9_49

Pujiastuti, H. (2020). The development of interactive mathematics learning media based on local wisdom and 21st century skills: Social arithmetic concept. *Journal of Physics Conference Series*, *1521*(3). http://doi.org/10.1088/1742-6596/1521/3/032019

Riabov, V. V. (2020). Exploring Mathematical and Computational Concepts for STEM Education in Colleges. *International Journal of Technology Knowledge and Society*, *16*(4), 1–22. http://doi.org/10.18848/1832-3669/CGP/v16i04/1-22

Shi, R. (2020). Exosomes derived from mmu_circ_0000250-modified adipose-derived mesenchymal stem cells promote wound healing in diabetic mice by inducing miR-128-3p/SIRT1-

mediated autophagy. *American Journal of Physiology Cell Physiology*, *318*(5). http://doi.org/10.1152/ajpcell.00041.2020

Spagnolo, F. S. (2020). The use of sampling weights in M-quantile random-effects regression: an application to Programme for International Student Assessment mathematics scores. *Journal of the Royal Statistical Society Series C Applied Statistics*, *69*(4), 991–1012. http://doi.org/10.1111/rssc.12418

Sumarwati, S. (2020). Developing mathematics learning media based on elearning using moodle on geometry subject to improve students' higher order thinking skills. *International Journal of Interactive Mobile Technologies*, *14*(4), 182–191. http://doi.org/10.3991/IJIM.V14I04.12731

Trimurtini, T. (2020). The effectivity of contextual teaching and learning (CTL) approach with Geoboard media on mathematics learning for four-grade elementary students. *Journal of Physics Conference Series*, *1663*(1). http://doi.org/10.1088/1742-6596/1663/1/012050

Udhma, U. S., & Sari, R. C. (2017). The Development Of Learning Media By Using Pocket Book Of Financial Literacy To Improve Knowledge Of Vocational Student's Personal Finance …. *Kajian Pendidikan Akuntansi Indonesia*. Retrieved from https://www.researchgate.net/profile/Umi-Udhma/publication/379082405_THE_DEVELOPMENT_OF_LEARNING_MEDIA_BY_USING_POCKET_BOOK_OF_FINANCIAL_LITERACY_TO_IMPROVE_KNOWLEDGE_OF_VOCATIONAL_STUDENT'S_PERSONAL_FINANCE_MANAGEMENT/links/65fa61ffa4857c796260eaa3/THE-D

Wang, J. (2020). Fuzzy mathematics and machine learning algorithms application in educational quality evaluation model. *Journal of Intelligent and Fuzzy Systems*, *39*(4), 5583–5593. http://doi.org/10.3233/JIFS-189039

Yanti, A. W. (2021). Profile of concept shadows of students in solving mathematical problems viewed from learning style. *Aip Conference Proceedings*, *2330*. http://doi.org/10.1063/5.0043374

Yuniati, B. Y. (2020). The influence of realistic mathematics education (RME) approach with the TANDUR on understanding the concepts and solving mathematical problems on grade 8 in smp negeri 1 pantai cermin. *Journal of Physics Conference Series*, *1554*(1). http://doi.org/10.1088/1742-6596/1554/1/012063

Zhou, D. (2022). Relationships among problematic smartphone use, mathematics anxiety, learning interest, and achievement: A multiple mediation model. *Computers in Human Behavior*, *129*. http://doi.org/10.1016/j.chb.2021.107171