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# UTILIZATION OF TECHNOLOGY AS A MATHEMATICS LEARNING MEDIA TO SUPPORT LEARNING IN SCHOOLS

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***Abstract***

This literature research discusses the use of technology as a mathematics learning medium to support the learning process in schools. Modern technologies such as Augmented Reality (AR), Virtual Reality (VR), and Artificial Intelligence (AI) have shown their potential in changing the way teachers and students interact with mathematical material. The use of this technology allows the application of more interactive, personalized and collaborative learning methods, which leads to increased student understanding and motivation. This study examines several important aspects in the application of technology to mathematics learning, including how the technology facilitates the visualization of complex mathematical concepts, offers personalized assistance according to student needs, and encourages collaboration between students. The results obtained show that the integration of technology in mathematics learning can increase the effectiveness and efficiency of the teaching and learning process, thereby creating an adaptive and innovative educational environment. Thus, the use of technology as a medium for mathematics learning is a strategic step in the modernization of education that contributes positively to improving the quality of students' learning experiences. This research recommendation focuses on further development and training for educators in utilizing technology optimally to support learning in schools.

**Keywords:** Technology, Learning Media, Mathematics, School Learning

## INTRODUCTION

In the current digital era, the development of information and communication technology (ICT) has a significant impact on various aspects of life, including the world of education. The use of technology in the learning process has opened up new opportunities to increase the effectiveness and

efficiency of teaching, especially in subjects that are considered challenging by many students, such as mathematics (Mustaqim, 2023).

Mathematics is one of the fundamental subjects that forms the basis for various scientific disciplines and practical applications in everyday life. However, it cannot be denied that many students experience difficulties in understanding abstract and complex mathematical concepts (Ramaswami et al., 2023). Therefore, the integration of technology into mathematics learning is very necessary to overcome this gap and increase student interest and understanding.

In addition, digital technology allows personalization in learning. By applying AI in education, learning can be adapted according to individual student needs and abilities (Hernadi et al., 2023). AI-based learning applications and platforms can analyze student learning progress and provide recommendations for learning materials appropriate to their respective ability levels. This is very effective in helping each student learn with the rhythm and learning style that best suits them, thereby increasing the level of success in understanding mathematics material (Buchory et al., 2022).

The application of technology also allows for increased collaboration and interaction between students and teachers. Collaborative tools such as Google Classroom, Microsoft Teams, and various other e-learning platforms provide a space for teachers and students to communicate and work together more effectively, even though they are not in the same physical space. By utilizing various features such as discussion forums, video conferences, and online assignments, the learning process becomes more dynamic and interactive. This closer collaboration not only helps in solving math problems, but also develops important social and teamwork skills for students (Chida & Minamino, 2023).

Various educational technologies, such as learning software, mobile applications, e-learning platforms, and digital teaching aids, have been developed to support the mathematics learning process. The use of this technology not only facilitates the delivery of more interactive and interesting material, but also allows teachers to provide a more personalized and adaptive learning experience according to the needs of each student (Aziz & Astutik, 2024).

For example, the use of interactive learning software allows students to visualize abstract mathematical concepts through simulations and animations. This helps students to more easily understand and apply these concepts in various situations. In addition, e-learning platforms provide access

to various web-based learning resources, such as video tutorials, interactive practice questions, and discussion forums, which can be accessed anytime and anywhere (Maulida et al., 2022).

On the other hand, the use of technology also has its own challenges. For example, infrastructure constraints, limited access to technology, and the need for training for teachers to master the use of technology in teaching (Wahyudi et al., 2024). Therefore, collaboration between the government, educational institutions and the private sector is very necessary to ensure the availability of adequate facilities and infrastructure as well as ongoing training for teaching staff.

Thus, the use of technology as a mathematics learning medium is not only a tool, but also an innovative strategy to improve the quality of education. With effective technology integration, it is hoped that mathematics learning can become more interesting, relevant and enjoyable for students, so that it can improve learning outcomes and form a generation that is better prepared to face future challenges (Awwalina & Wachidah, 2023).

## RESEARCH METHOD

The study in this research is qualitative with literature. The literature study research method is a research approach that involves the analysis and synthesis of information from various literature sources that are relevant to a particular research topic. Documents taken from literature research are journals, books and references related to the discussion you want to research (Earley, M.A. 2014; Snyder, H. 2019).

## RESULT AND DISCUSSION

### The Effect of Using Technology on Understanding Mathematical Concepts Among Students

The use of technology in the mathematics learning process has had a significant impact on understanding mathematical concepts among students. One of the most pronounced positive impacts is increased accessibility and interactivity in learning. With supporting applications and software, students can access a variety of materials and exercises easily and quickly, both in class and outside of class. Digital learning resources such as video tutorials, interactive simulations, and educational games help a lot in strengthening basic concepts and their application so that students are more interested and motivated in learning mathematics (Rahman & Abdullah, 2022).

Apart from that, technology also allows individualized learning or learning that is tailored to the needs of each student. Through e-learning platforms and adaptive programs, teachers can identify the weaknesses and strengths of each student and provide material appropriate to their ability level (Dewi et al., 2024). In this way, the guidance provided becomes more effective and efficient, as well as accelerating students' understanding of concepts that are considered difficult. This is very useful, especially for students who have various backgrounds, abilities and different learning speeds.

However, there are also several challenges that need to be faced along with the use of technology in mathematics learning. One of the main challenges is students' potential dependence on technology, which can reduce their ability to think critically and analytically independently. In addition, not all schools have adequate access to technological devices and internet connections, which can create a digital divide which has the potential to make the learning process uneven (Tohir et al., 2022). Therefore, it is important for educators and policy makers to design effective strategies so that the use of technology in education can be carried out optimally and evenly in order to increase understanding of mathematical concepts among students.

To handle these challenges, the involvement of various parties, from the government, schools, teachers, to parents, is very necessary. The government needs to ensure that all schools have adequate access to technology and the internet through subsidy programs and sustainable infrastructure investment. Then, schools and teachers need to be given sufficient training regarding the effective use of technology in the learning process. Teachers must be able to utilize technology not only as a teaching tool, but also as a means to improve students' critical thinking and problem solving skills (Kaensige, 2022).

Apart from that, it is also important to involve parents in the technology-based learning process. Parents can be educated about how they can support their children at home, either by monitoring technology use or by providing adequate learning facilities. Support from parents is an important key to ensuring that the use of technology is not only beneficial academically but also helps the development of children's character and independence. Collaboration between teachers and parents needs to be improved to monitor student progress and find solutions together if there are obstacles (Simon, 2022).

Finally, ongoing evaluation and research is needed to measure the impact of technology use on understanding mathematical concepts. Data and findings from various studies can be used as a basis for improving and developing better learning strategies (Ndani & Erita, 2023). In addition, technological innovation continues to develop, so it is very important for the world of education to always follow the latest trends and adapt to changes. With a holistic and collaborative approach, the positive influence of technology on understanding mathematical concepts can be maximized, while emerging challenges can be overcome effectively (Sitepu & Siregar, 2023).

**The Effectiveness of Technology as a Mathematics Learning Media in Increasing Student Learning Motivation**

The use of technology in mathematics learning has been proven effective in increasing students' learning motivation. Technology allows the delivery of more interesting and interactive material, for example through the use of learning applications, video tutorials and simulations. This media not only makes learning more fun, but also helps students understand complex concepts more easily. The interactivity offered by technology makes students more actively involved in the learning process, thereby increasing their motivation and interest in studying mathematics (Suripah & Susanti, 2022).

In addition, technology allows for personalization of learning according to each student's needs. Technology-based learning applications and programs often have features that can adjust the difficulty level of the material to the student's abilities, offering adaptive learning that automatically changes the level of difficulty based on student performance (Rajput et al., 2022). This way, students can progress at their own pace without feeling overwhelmed by material that is too difficult or bored by material that is too easy. This is very important to maintain students' enthusiasm for learning, because they feel they are receiving attention and support according to their abilities.

Furthermore, technology provides access to various and current learning resources. Students can explore mathematical concepts from various perspectives, find real applications in everyday life, and even collaborate virtually with friends or mentors from different parts of the world. This ease of access allows students to deepen their understanding and foster great curiosity (Sanulita et al., 2024). In this way, technology is not only a learning tool, but also a strong motivator in increasing students' desire to continue learning and excel in mathematics.

However, the effectiveness of technology as a mathematics learning medium also requires support from various parties involved in education. Teachers must have adequate abilities and skills in integrating technology into the learning process. Training and guidance for teachers is very important so that they can understand and make maximum use of technology (Nevarini et al., 2023). Apart from that, adequate infrastructure such as internet access and adequate hardware needs to be prepared by educational institutions and the government. Without adequate support, the potential of technology to increase student motivation and learning outcomes may not be achieved optimally.

Parents also have an important role in supporting the use of technology in mathematics learning. They need to provide assistance and supervision so that students' use of technology remains on a positive and educative path. Through good communication with teachers and understanding what children are learning, parents can help ensure that technology is used effectively to support the learning process. Encouragement and moral support from parents can also increase students' self-confidence and motivation to learn (Bahri, 2022).

With the involvement of all parties, the use of technology in mathematics learning can be an effective solution in increasing students' learning motivation. Technology not only helps students understand material more easily, but also makes the learning process more interesting and interactive (Handayani & Bahri, 2024). In this digital era, adopting technology in education is an inevitable step to better prepare students to face future challenges. Along with technological developments, it is hoped that learning methods will also continue to develop and provide greater benefits for improving the quality of education, especially in the field of mathematics (Parinduri et al., 2022).

**Challenges and Obstacles in the Application of Technology in Mathematics Learning in Schools**

The application of technology in mathematics learning in schools is not without challenges and obstacles. One of the biggest challenges is the digital divide. Not all students have the same access to technological devices and the internet in their homes (Asfiana, 2024). This creates inequality in access to education which can hinder the learning process of students who are in remote areas or from low-income families. This inequality in access can create

a wider educational gap between students who have technological facilities and those who do not.

Additionally, a lack of technology skills among teachers is a significant obstacle. Many teachers are not familiar or trained in using technological devices and applications to teach mathematics. In fact, integrating technology in the learning process requires a change in mindset and teaching methods which may be different from conventional methods (Sara, 2022). Therefore, intensive and continuous training for teachers is very necessary so that they can use technology effectively and creatively to improve the quality of mathematics learning in their classes.

In the context of educational infrastructure, the availability of hardware and technical support is also often an issue. Many schools do not have adequate technological facilities, such as computers, tablets, projectors, or stable internet access (Puhka et al., 2023). In addition, maintenance and repair of technological equipment requires quite a lot of money. Limited school budgets for technology investment can hinder the implementation of technology-based learning. Therefore, synergy between educational institutions, government and the private sector is important to ensure that technological facilities and infrastructure can be met to support more efficient and effective learning (Achadi, 2024).

Apart from the digital divide and technology skills, the existing curriculum also poses challenges in implementing technology in mathematics learning. Rigid and dense curricula often do not provide enough space for teachers to experiment with technology-based teaching methods. Many curricula have not been integrated with the systematic and planned use of technology. As a result, teachers often have difficulty finding ways to implement technology effectively in accordance with existing learning standards. Curriculum reforms that are more flexible and inclusive of technology are needed so that students can experience the maximum benefits from technology-based learning (Almaiteh, 2024).

Apart from that, the traditional approach which is still dominant in learning evaluation and assessment is also an obstacle. Conventional assessment methods such as written exams and standardized tests are often unable to measure students' skills in using technology to solve mathematical problems (Ghimire, 2022). In addition, concerns about integrity and fairness in technology-based assessments also often arise, such as the risk of cheating or dishonesty in conducting online exams. Therefore, innovation is needed in the

evaluation system that can accommodate and reflect students' abilities to use technology authentically and validly (Aldebsi & Eldesoky, 2023).

Finally, there are also challenges in the psychological and social aspects of implementing technology. Continuous use of technology can cause mental fatigue in students and teachers. Apart from that, social interaction between students can also be reduced, because they are more focused on their respective technological devices rather than communicating directly. A balance between technology and human interaction must be maintained so that the learning process remains holistic and inclusive. Therefore, learning strategies that combine technology and positive social activities need to be well designed so that technology can support, not replace, rich and varied learning experiences for students (Mphahlele et al., 2022).

**Strategies that can be used by Teachers to Utilize Technology**

To maximize the use of technology in mathematics learning, teachers can apply several innovative strategies. First, teachers can use technology-based learning devices and applications such as GeoGebra, Khan Academy, or Desmos, which offer high interactivity and visualization of mathematical concepts. These tools allow students to manipulate mathematical objects and see the results directly, so that abstract concepts can become more real and easier to understand. By creating more interactive lessons, students will be more interested and motivated in the learning process (Yulianti, 2024).

The second strategy is to apply a project-based learning model that utilizes technology. In this approach, students will work in groups to complete projects related to mathematical concepts using various technological tools (Manzoor et al., 2024). For example, they can create digital presentations, learning videos, or simple applications that show the application of the concepts they have learned. Projects like these not only improve understanding of mathematical concepts, but also develop students' collaborative and technical skills, which are critical in today's digital age.

Finally, teachers can utilize e-learning platforms and Learning Management Systems (LMS) such as Google Classroom, Moodle, or Edmodo to support learning outside class hours. Through this platform, teachers can upload additional materials, provide assignments, and conduct online discussions. Students can also access learning materials anytime and anywhere, so they can learn more flexibly and independently (AHISKALI et al., 2022). In addition, by using the analysis and monitoring features on the

platform, teachers can track the progress of each student and provide more specific and personalized guidance according to each student's needs.

Continuing the use of technology in mathematics learning, teachers can also use Augmented Reality (AR) and Virtual Reality (VR) technology to create immersive learning experiences. This technology allows students to explore mathematical concepts in a more immersive and realistic environment. For example, teachers can invite students to "walk" through three-dimensional geometric structures, or understand integral concepts through complex visual simulations. By using AR and VR, the material taught can become more interesting and make it easier for students to remember and understand complex concepts (Atherton & Pratt, 2022).

Furthermore, integrating Artificial Intelligence (AI) in mathematics learning can also be an effective strategy. AI tools such as virtual tutors or learning chatbots can provide real-time assistance and guidance to students. By using AI, students can get additional explanations or step-by-step instructions when working on math problems. This technology also allows for personalization of learning, where the program can adjust the difficulty of questions based on each student's abilities, so that each student can learn at their own pace and level (Abdul-Majeed, 2023).

Finally, teachers can also encourage collaboration and communication through social technology and collaborative platforms. Using tools like Google Docs, Padlet, or Microsoft Teams, students can work together to complete math assignments or projects. The platform allows students to share ideas, discuss and solve problems together online, so they learn math concepts while developing communication and collaboration skills. Teachers can also use discussion forums or class-specific social media groups to build supportive and mutually helpful learning communities, making mathematics a more cooperative and enjoyable subject (Smith, 2023).

## CONCLUSION

The use of technology in mathematics learning in schools provides various significant benefits that can support teaching and learning activities. Technologies such as Augmented Reality (AR) and Virtual Reality (VR) allow students to explore mathematical concepts in a more realistic and immersive environment, making it easier to understand complex concepts. Integrating Artificial Intelligence (AI) in learning also offers assistance and personalization of learning, helping students learn at their own pace and ability level. Additionally, collaborative technologies such as Google Docs, Padlet, and

Microsoft Teams encourage cooperation between students in solving math problems, as well as developing communication and collaboration skills. The benefits of this technology make mathematics a more cooperative and engaging subject, and create a supportive learning community. Overall, the use of technology as a mathematics learning medium not only increases student motivation and interest, but also increases learning effectiveness by providing a more interactive, personal and collaborative learning experience. This technology is a strategic tool in creating a learning environment that is dynamic and responsive to student needs, thereby strengthening the quality of mathematics education in schools.

**REFERENCES**


Abdul-Majeed, M. R. (2023). Investigating Motivational Teaching Strategies used by Iraqi EFL Primary School Teachers. *JOURNAL OF LANGUAGE STUDIES*, *6*(2), 49–60. https://doi.org/10.25130/jls.6.2.4

Achadi, B. S. (2024). Application of Problem-Solving Learning to Improve Mathematics Learning Outcomes in Elementary Schools. *PEDAGOGIKA*, *14*(2), 209–220. https://doi.org/10.37411/pedagogika.v14i2.2725

AHISKALI, E. E., İNNALI, H. Ö., & AYDIN, İ. S. (2022). COPING STRATEGIES USED BY PRE-SERVICE TEACHERS TO OVERCOME WRITING CHALLENGES. *International Online Journal of Primary Education*, *11*(2), 426–446. https://doi.org/10.55020/iojpe.1060603

Aldebsi, A. H. M. H. A., & Eldesoky, E. M. A. (2023). Challenges and Obstacles of Teaching and Learning the Arabic Language in Secondary Religious Schools in Malaysia, Suggestions and Solutions. *International Journal of Academic Research in Business and Social Sciences*, *13*(5). https://doi.org/10.6007/ijarbss/v13-i5/17327

Almaiteh, R. (2024). Attitudes of computer teachers towards employing educational technology means and obstacles to their application in public schools in Karak Governorate. *The Arab Journal for Quality Assurance in Higher Education*, *16*(56), 1–23. https://doi.org/10.20428/ajqahe.v16i56.2207

Asfiana, A. (2024). ANALYSIS OF THE ADVANTAGES AND CHALLENGES OF INFORMATION COMMUNICATION TECHNOLOGY-BASED LEARNING IN ELEMENTARY SCHOOLS. *PIONIR: JURNAL PENDIDIKAN*, *13*(1). https://doi.org/10.22373/pjp.v13i1.21335

Atherton, P., & Pratt, A. (2022). FROM REFLECTIVE MODELS TOWARDS COLLABORATIVE AUTOETHNOGRAPHY: HOW CAN SOCIAL MEDIA BE USED AS A PEDAGOGIC TOOL FOR SECONDARY STUDENT TEACHERS? *INTED Proceedings*, *Query date: 2024-08-07 14:26:08*. https://doi.org/10.21125/inted.2022.2268

Awwalina, J. R., & Wachidah, K. (2023). Enhancing Student Motivation: Articulate Storyline Learning Media Experiment. *Academia Open*, *8*(1). https://doi.org/10.21070/acopen.8.2023.5220

Aziz, A., & astutik, A. P. (2024). *Effectiveness of Scramble Media in Increasing Student Learning Focus on PAI and Character Subjects*. *Query date: 2024-08-07 14:15:19*. https://doi.org/10.21070/ups.3939

Bahri, M. S. (2022). APPLICATION OF MULTIMEDIA LEARNING MEDIA TO INCREASE STUDENT MOTIVATION AND LEARNING OUTCOMES IN PKN SUBJECTS AT SMP 01 ISLAM JEMBER. *Journal of Education Technology and Inovation*, *5*(1), 79–89. https://doi.org/10.31537/jeti.v5i1.700

Buchory, H. A., Homan, H. S., & Willy, S. (2022). Effectiveness Of Monopoly Accounting Game Media In Increasing Motivation And Learning Outcomes. *Jurnal ASET (Akuntansi Riset)*, *14*(1), 11–20. https://doi.org/10.17509/jaset.v14i1.45978

Chida, S., & Minamino, K. (2023). Effectiveness of Relative Evaluation Feedback Using Motivation Tests and Learning Data in University Mathematics. *2023 11th International Conference on Information and Education Technology (ICIET)*, *Query date: 2024-08-07 14:15:19*. https://doi.org/10.1109/iciet56899.2023.10111463

Dewi, M. R., Jumadi, & Wahyudi. (2024). Analysis of Student Learning Barriers for Elementary School Students in Understanding Mathematical Concepts of Fractions. *Jurnal Pendidikan Matematika (JPM)*, *10*(1), 74–86. https://doi.org/10.33474/jpm.v10i1.21576

Earley, M. A. (2014). A synthesis of the literature on research methods education. Teaching in Higher Education, 19(3), 242-253.

Ghimire, B. (2022). Blended Learning in Rural and Remote Schools: Challenges and Opportunities. *International Journal of Technology in Education*, *5*(1), 88–96. https://doi.org/10.46328/ijte.215

Handayani, K., & Bahri, S. (2024). Contextual Based Learning Strategy Outing Class in Increasing Student Motivation to Realize Freedom of Learning. *Jurnal Pendidikan Sosiologi Dan Humaniora*, *15*(1), 357–357. https://doi.org/10.26418/j-psh.v15i1.62461

Hernadi, H., Firdaus, R., & Rusmianto, N. E. (2023). Effectiveness of Humanistic Approach Assisted by Learning Media to Increase Motivation Student Learning in MTs Darul Huffaz Pesawaran. *Jurnal Teknologi Pendidikan : Jurnal Penelitian Dan Pengembangan Pembelajaran*, *8*(3), 530–530. https://doi.org/10.33394/jtp.v8i3.7496

Kaensige, A. L. (2022). Application of the Peer Tutoring Method to Improve Students' Understanding of Mathematical Concepts. *INTELEKTIUM*, *3*(2), 403–408. https://doi.org/10.37010/int.v3i2.1087

Manzoor, M., Durrani, R., & Manzoor, S. (2024). Conflict Management Strategies used by Early Grade Teachers: A Qualitative Approach.

*ANNALS OF SOCIAL SCIENCES AND PERSPECTIVE*, *5*(1), 31–39. https://doi.org/10.52700/assap.v5i1.359

Maulida, N. N., Sukadi, S., & Rahayu, S. (2022). Effectiveness of The Implementation Game-Based-Learning in Increasing Student Learning Outcomes. *Jurnal Penelitian Pendidikan*, *22*(3), 252–265. https://doi.org/10.17509/jpp.v22i3.50977

Mphahlele, R. S., Manyaka, M. M., & Moshaba, P. O. N. (2022). Challenges in Using African Languages as the Language of Learning and Teaching (LoLT) for Mathematics in Rural Schools: Foundation Phase Teachers' Perspectives. *Journal of Mathematics Education at Teachers College*, *13*(2), 19–27. https://doi.org/10.52214/jmetc.v13i2.9451

Mustaqim, M. F. (2023). Development of Interactive Web-Based Learning Media with the Discovery Learning Model to Increase Student Learning Motivation in Object Oriented Programming XI Vocational High Schools. *Letters in Information Technology Education (LITE)*, *6*(1), 22–22. https://doi.org/10.17977/um010v6i12023p22-26

Ndani, Y. E., & Erita, S. (2023). Describe The Understanding of Mathematical Concepts in Class VII Junior High School Students Regarding Objective Questions. *Didaktika : Jurnal Kependidikan*, *17*(2), 64–72. https://doi.org/10.30863/didaktika.v17i2.5751

Nevarini, M., Agustiani, R., & Zahra, A. (2023). Application of Augmented Reality in Geometry Learning in Increasing Student Learning Motivation. *Journal of Curriculum and Pedagogic Studies (JCPS)*, *2*(1), 40–50. https://doi.org/10.30631/jcps.v2i1.1757

Parinduri, W. M., Lubis, R. R., Rambe, T. R., & Rambe, N. (2022). DEVELOPMENT OF FLIPBOOK BASED SMART CARD LEARNING MEDIA IN SCIENCE LEARNING TO IMPROVE STUDENT LEARNING MOTIVATION CLASS III SD. *SCHOOL EDUCATION JOURNAL PGSD FIP UNIMED*, *12*(3), 232–239. https://doi.org/10.24114/sejpgsd.v12i3.40164

Puhka, P., Annemari, B., & Harry, R. (2023). Application of Learning Media and Technology in Schools to Increase Student Interest in Learning. *World Psychology*, *1*(3), 160–176. https://doi.org/10.55849/wp.v1i3.387

Rahman, N. A. A. A., & Abdullah, M. F. N. L. (2022). A study on the use of collaborative learning to enhance mathematical understanding among elementary students. *EDUCATUM Journal of Science, Mathematics and Technology*, *9*(2), 10–15. https://doi.org/10.37134/ejsmt.vol9.2.2.2022

Rajput, P. K., Ravulakollu, K. K., & Singhal, S. (2022). An enhanced learning approach for increasing student engagement, motivation and learning using gamification in blended teaching. *International Journal of Technology Enhanced Learning*, *14*(1), 17–17. https://doi.org/10.1504/ijtel.2022.120558

Ramaswami, G., Susnjak, T., & Mathrani, A. (2023). Effectiveness of a Learning Analytics Dashboard for Increasing Student Engagement Levels.

*Journal of Learning Analytics*, *10*(3), 115–134. https://doi.org/10.18608/jla.2023.7935

Sanulita, H., Hendriyanto, D., Lestari, N. C., Ramli, A., & Arifudin, O. (2024). Analysis Of The Effectiveness Of Audio Visual Learning Media Based On Macromedia Flash Usage On School Program Of Increasing Student Learning Motivation. *Journal on Education*, *6*(2), 12641–12650. https://doi.org/10.31004/joe.v6i2.5121

Sara, J. A. (2022). Anxiety Analysis of Students Taking Distance Learning in Mathematics Learning in Junior High Schools. *Journal of Mathematics and Mathematics Education*, *12*(2). https://doi.org/10.20961/jmme.v12i2.64438

Simon, M. A. (2022). Contributions of the learning through activity theoretical framework to understanding and using manipulatives in the learning and teaching of mathematical concepts. *The Journal of Mathematical Behavior*, *66*(Query date: 2024-08-07 14:11:41), 100945–100945. https://doi.org/10.1016/j.jmathb.2022.100945

Sitepu, E. G., & Siregar, T. M. (2023). Development of Learning Animation Videos Using the Sparkol Videoscribe Application to Improve Students' Understanding of Mathematical Concepts at SMPS Sultan Iskandar Muda. *Formosa Journal of Multidisciplinary Research*, *2*(1), 287–302. https://doi.org/10.55927/fjmr.v2i1.2592

Smith, M. (2023). Investigating Why Early Career Literacy Teachers Utilize Literacy Frameworks in Their Lesson Planning Processes. *Proceedings of the 2023 AERA Annual Meeting*, *Query date: 2024-08-07 14:26:08*. https://doi.org/10.3102/2007296

Snyder, H. (2019¬). Literature review as a research methodology: An overview and guidelines. Journal of business research, 104, 333-339.

Suripah, S., & Susanti, W. D. (2022). ALTERNATIVE LEARNING DURING A PANDEMIC: USE OF THE WEBSITE AS A MATHEMATICS LEARNING MEDIA FOR STUDENT MOTIVATION. *Infinity Journal*, *11*(1), 17–17. https://doi.org/10.22460/infinity.v11i1.p17-32

Tohir, M., Munawwarah, M., Saiful, Muqit, Abd., Anwar, K., Kandiri, & Asmuki. (2022). Analysis of students' understanding of mathematical concepts in the Faraid calculation using modulo arithmetic theory. *AIP Conference Proceedings*, *Query date: 2024-08-07 14:11:41*. https://doi.org/10.1063/5.0102211

Wahyudi, S., Lubis, A., Jufri, & Chandra, D. A. (2024). Effectiveness of Using Digital Technology-Based Learning Media in Increasing Student Motivation at State Elementary School 012 Ujung Batu III Rokan Hulu. *JOURNAL OF ICT APLICATIONS AND SYSTEM*, *2*(2), 41–49. https://doi.org/10.56313/jictas.v2i2.269

Yulianti, D. (2024). A Study of Communication Strategies used by English Teachers and its Implication in Teaching English as a Foreign Language.

*International Journal of Current Science Research and Review*, *7*(6). https://doi.org/10.47191/ijcsrr/v7-i6-56