Empowering elementary teachers: Digital mathematics learning resource training center for enhanced classroom instruction

Dwi Novitasari[1]*, Harry Soeprianto[1], Nani Kurniati[1], Junaidi[1], Ratna Yulis Tyaningsih[1], Arianti Agustina[2]

[1] Mathematics Education, FKIP, University of Mataram, Mataram
[2] Students of Mathematics Education, FKIP, University of Mataram, Mataram

dwinovitasari@unram.ac.id

Abstrak

Ketersediaan dan pemanfaatan Pusat Sumber Belajar (PSB) yang mendukung pembelajaran matematika menjadi faktor penting dalam meningkatkan kualitas pengajaran guru di sekolah dasar. PSB yang terintegrasi dengan teknologi informasi dapat membantu guru dalam menyusun pembelajaran yang menarik, interaktif, dan relevan, sekaligus mendorong minat belajar peserta didik. Namun, kenyataannya di lapangan menunjukkan bahwa akses guru terhadap sumber belajar digital masih terbatas, dan pemanfaatan teknologi dalam pembelajaran matematika belum optimal. Menyikapi hal tersebut, kegiatan pengabdian ini dirancang untuk memberikan pelatihan kepada guru-guru sekolah dasar dalam menggunakan PSB Matematika berbasis digital secara efektif. Tujuan utamanya adalah meningkatkan keterampilan guru dalam memanfaatkan PSB sebagai media pendukung pembelajaran matematika di kelas. Pelatihan dilaksanakan melalui metode diskusi, demonstrasi, dan simulasi langsung, dengan peserta sebanyak 18 guru dari SD Gugus 10 Puyung. Hasil evaluasi melalui post-test dan angket menunjukkan bahwa peserta (1) menunjukkan antusiasme tinggi selama kegiatan, (2) mampu mengoperasikan PSB matematika secara mandiri, dan (3) memberikan tanggapan positif terhadap manfaat PSB dalam mendukung proses belajar mengajar. Diharapkan pelatihan ini mampu memperluas wawasan dan keterampilan guru dalam memanfaatkan teknologi, serta berkontribusi pada peningkatan kualitas pembelajaran matematika di sekolah dasar.

Kata Kunci: pusat sumber belajar; media pembelajaran matematika; pembelajaran digital

Abstract

The availability and utilization of Mathematics Learning Resource Centers (LRC) play a crucial role in enhancing the quality of teaching in elementary schools. LRC integrated with IT can assist teachers in designing engaging, interactive, and relevant lessons, while also fostering students' interest in learning. However, field observations reveal that teachers' access to digital learning resources remains limited, and the integration of technology in mathematics instruction is still suboptimal. To address this issue, the program provided training for elementary school teachers on effectively utilizing digital-based learning resource centers. The main objective in this community service is to improve teachers' skills in using LRC as a supportive medium for mathematics instruction in the classroom. The training was conducted through discussions, demonstrations, and hands-on simulations, involving 18 elementary school teachers from Puyung. Evaluation results, obtained through questionnaires, indicate that participants (1) showed high enthusiasm throughout the training, (2) were able to operate the digital LRC independently, and (3) responded positively to the usefulness of LRC in supporting the teaching and learning process. It is expected that this training will broaden teachers' knowledge and skills in utilizing technology,and contribute to the improvement of mathematics teaching quality at the elementary school level

Keywords: mathematics learning resource center; mathematics learning media; digital learning

1. INTRODUCTION

The availability and utilization of Learning Resource Centers (LRC), particularly for mathematics learning, play a strategic role in enhancing the quality of teaching in elementary schools. LRCs offer a wide range of structured instructional materials aligned with the curriculum, including printed textbooks as well as interactive digital media such as videos, audio recordings, animations, and computer-based simulations (Cahyadi, 2018). For teachers, LRCs serve as a valuable solution to address the challenges of teaching mathematics, which is often perceived by students as difficult and abstract. By providing diverse and engaging learning resources, LRCs help facilitate more concrete and innovative instruction, while also boosting students' learning motivation (Siregar & Kustandi, 2022; Khogali et al., 2011).

Learning resources can generally be classified into two categories: self-developed resources and those that are already available for use. Creating learning materials independently requires teachers to have the skills to design both the conceptual content and the technical implementation. In contrast, using existing learning resources does not require comprehensive development from the teacher but rather the ability to select and adapt the materials to suit students' learning needs (Sutisna et al., 2021). Teacher-created resources are ideal when there is sufficient time and access to necessary support materials, while pre-made resources are more suitable in situations where time and development resources are limited.

Some of the key benefits of the Learning Resource Center (LRC) include: (1) Providing high-quality teaching materials. The mathematics LRC offers access to a variety of systematically and well-organized instructional resources. Teachers can use these materials as references aligned with the curriculum and tailored to the needs of students at various levels, particularly in elementary schools. (2) Supporting teachers in overcoming instructional challenges. Teaching mathematics often comes with obstacles, as many students struggle to grasp certain concepts. The LRC offers support through additional learning materials, effective teaching strategies, and practical solutions to help students overcome these difficulties. (3) Enhancing teachers' professional competencies. Through the LRC, teachers can participate in training programs and develop their teaching skills, including the use of appropriate learning media, technology integration, and innovative approaches to deliver mathematical concepts in engaging and accessible ways. (4) Fostering students' interest and motivation. By utilizing diverse and appealing resources, teachers can create a more enjoyable mathematics learning experience. The LRC provides a variety of media, such as educational games, interactive applications, and visual materials that increase students' enthusiasm and motivation to learn. (5) Serving as a platform for collaboration and knowledge sharing. The LRC also functions as a medium for teachers to share teaching materials, learning tools, and recent research findings in mathematics education. Through this collaboration, educators—teachers, lecturers, and education practitioners—can exchange ideas and best practices, ultimately contributing to the improvement of mathematics teaching quality, especially at the elementary level.

In addition to serving as a source of instructional materials, the Learning Resource Center (LRC) also functions as a platform for teachers' professional development. It offers a variety of training programs, teaching tools, and educational media that encourage teachers to continuously update their instructional approaches in line with advancements in educational technology (Puspita & Hanif, 2019). However, observations and interviews conducted at SD Gugus 10 Puyung Selatan revealed that most teachers still rely on conventional resources such as textbooks and the school library. Access to and use of LRCs—including digital platforms like the Merdeka Mengajar Platform (PMM)—remain suboptimal due to limited technical knowledge and a lack of adequate training (Darmawan et al., 2023; Prayitno et al., 2023).

This condition directly affects mathematics teaching in the classroom, which still tends to be conventional and lacks active student engagement. In fact, maximizing the use of IT-based LRCs can support teachers in delivering more contextual, adaptive, and student-centered learning (Okongo et al., 2015). Therefore, this community service initiative aims to train elementary school teachers in utilizing digital-based mathematics LRCs. Through this training, teachers are expected to integrate the LRC effectively and creatively into classroom instruction.

The Learning Resource Center (LRC) developed by the community service team from the Mathematics Education Study Program at the University of Mataram was designed to address the challenges in mathematics teaching. This LRC offers various interactive, web-based learning media that are developed based on research and real classroom needs (Firmansyah et al., 2023; Junaidi et al., 2024; Novitasari et al., 2018, 2021; Safinaturrahmah et al., 2024; Subarinah et al., 2023). Its advantages include enhancing instructional productivity, enabling more personalized learning approaches, and expanding access to educational content without geographical limitations. As such, this LRC strengthens technology-based learning processes (Cahyadi, 2018; Siregar & Kustandi, 2022).

The research findings also indicate that web-based LRCs not only function as a hub for learning resources but also support the development of technology-based instructional materials, learning systems, and multimedia. This LRC is equipped with facilities such as multimedia laboratories, digital libraries, and access to interactive teaching materials, which significantly enhance the quality of learning. Therefore, web-based LRCs are highly effective in overcoming the limitations of access to teaching materials while improving the quality and efficiency of education, particularly in areas with limited infrastructure (Junaidi et al., 2024).

Web-based learning tools have proven to possess significant potential in improving mathematics education. These resources allow students to enhance their analytical skills and overall academic performance (Umam & Azhar, 2021). The flexibility offered by web-based resources provides students with the opportunity to review and learn materials at their own pace, according to their individual needs (Kartika, 2018). Additionally, the use

of web-based resources has received positive feedback from students, demonstrating increased interest and satisfaction in learning mathematics (Kartika, 2018). These internet-based resources are also highly effective in bridging the gap between educators and students, particularly in the context of distance learning (Umam & Azhar, 2021).

Overall, the use of web-based LRCs has proven to be an effective and interactive approach to teaching mathematics. Through this training, it is expected to support the transformation of mathematics learning in elementary schools, making it more effective, engaging, and aligned with the needs of students in the digital era.

2. METHODS

The implementation of this community service program consists of seven stages: 1) Selection of partner schools, 2) Obtaining permission for the training and mentoring program, 3) Documentation and interviews, 4) Development of training materials, 5) Socialization of the program, 6) Scheduling and executing the training program, which includes: a) Introduction to the concept of Learning Resource Centers (LRC), b) Training on using the Mathematics Learning Resource Center (Math LRC), c) Trial run of LRC usage by the training participants, d) Implementation of LRC use in classroom teaching, and e) Focus Group Discussion (FGD) on the results of the implementation at each school, and finally, 7) Final report. The flowmap for each stage of this community service activity is presented in Figure 1.
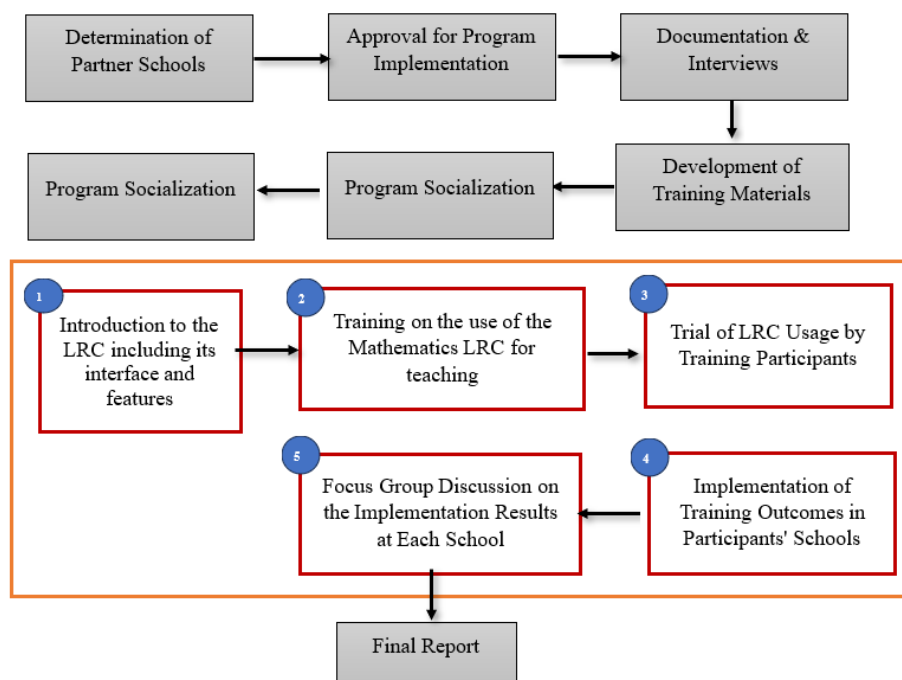

Figure 1. Flowmap of the Stages in the Community Service Implementation

The participants of this program are 18 elementary school teachers from Cluster 10 Puyung Selatan, Central Lombok, including teachers from grades 3, 4, 5, and 6, as well as mathematics subject teachers. Each school is represented by two or three teachers. The teachers are guided using a modified block discrete method (Zepeda & Mayers, 2006).

Each participant is required to bring and prepare devices such as laptops or smartphones to ensure the activities run smoothly and effectively, especially during the practical sessions and simulations of using the LRC by the participants.

3. RESULTS AND DISCUSSION

The community service activity focused on training the utilization of a Technology-Based Mathematics Learning Resource Center (LRC) was held in July 2024 in the area of Cluster 10 Puyung Selatan, Central Lombok. This training was attended by 18 elementary school teachers teaching grades 3 through 6. The event began with a speech and opening remarks by the Head of Cluster 10 Puyung Selatan, who emphasized the importance of innovative mathematics teaching, followed by a presentation by the service team from the Mathematics Education Program at the University of Mataram. In this session, participants were introduced to the web-based LRCs platform developed by the team, which can be accessed online anytime and anywhere. The participants appeared enthusiastic as they were introduced to the key features of LRC, such as access to digital learning media including videos, activity sheets, educational games, and interactive modules based on the "Kurikulum Merdeka" (Independent Curriculum). Figure 2 shows an example of the initial interface of the Mathematics LRCs.
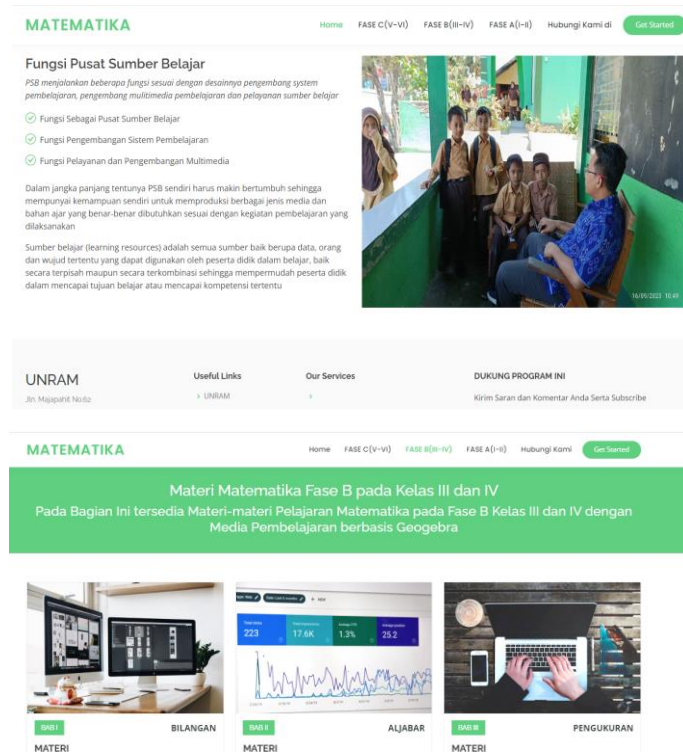
Figure 2. Interface of the Mathematics LRC

The main objective of this training was to introduce a digital learning resource alternative that aligns with the needs of elementary school students in understanding mathematical concepts. The use of LRCs supports learning that is appropriate for the cognitive development stages of the students. Referring to Piaget's theory (Santrock, 1995),

elementary school students are still in the concrete operational stage, requiring learning media that are manipulative and visual. This is further supported by Bruner's perspective (in Reys, 1998), which emphasizes the importance of using concrete, semi-concrete, and abstract representations in stages to understand mathematical concepts.

After the presentation session, the activity continued with an interactive hands-on practice session. Each participant used their own device—either a laptop or smartphone—to access and explore the LRC website that had been prepared by the team. The community service team provided a series of practice materials in the form of problem-based exercises, which the participants were expected to explore and solve. This activity was designed to encourage active engagement, as well as to develop critical and creative thinking skills in adapting LRC materials into their respective classroom contexts. The aim was to provide teachers with practical experience in navigating and utilizing digital resources for mathematics instruction.

Figure 3. Presentation of Materials and Introduction to LRC

The following session involved a simulation of LRC implementation in mathematics teaching. In this session, teachers had the opportunity to directly apply the use of LRC in delivering mathematics content, with a focus on the concept of number sequencing as part of numeracy skills. Participants enthusiastically explored various features available on the LRC website, including interactive media, digital worksheets, and visual representations of number concepts. The simulation was intended to demonstrate how teachers could adapt LRC content into more engaging and contextually relevant classroom learning experiences for their students.
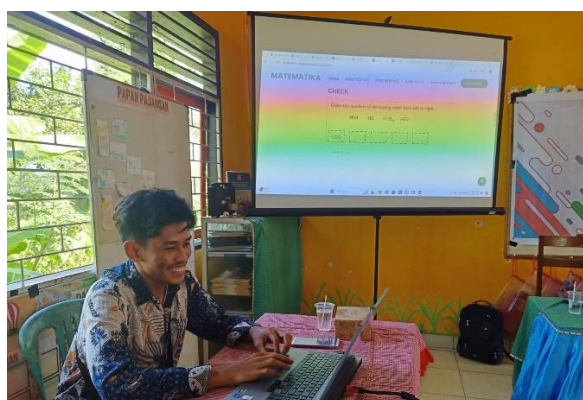
Figure 4. Hands-on Practice of Using LRC by Participants

The evaluation outcomes revealed a notable level of enthusiasm and engagement among the training participants throughout the implementation of the program. A majority of the teachers expressed that the training enriched their understanding of digital learning resources and inspired them with innovative strategies to deliver mathematics instruction in a more enjoyable and meaningful manner. Additionally, the program was carried out smoothly, with minimal technical difficulties reported—participants were able to access the LRC platform with ease and comprehend the instructional content effectively. These findings highlight the program's success in enhancing teachers' digital pedagogical competencies in mathematics education.

Table 1. Evaluation Results of the Community Service Program

No.	Assessment Indicators	Percentage
1	Appropriateness of the presented content	72%
2	Understanding of the material	81%
3	Application of the material in school-based learning	91%
4	Delivery of material by the team	94%

Overall, this training program has made a tangible contribution to enhancing the competencies of elementary school teachers in integrating technology as an essential component of the learning process. The introduction of the Mathematics Learning Resource Center (LRC) has opened new opportunities for teachers to access and utilize a variety of interactive and diverse instructional media. This approach aligns with the principles of the *Kurikulum Merdeka*, which emphasizes student-centered learning and adaptability to diverse educational needs.

Evaluation results indicate that all participating teachers successfully adopted and implemented the use of the LRC in their mathematics instruction. Throughout the training and simulation sessions, teachers demonstrated active participation and a collaborative spirit in exploring the available features. This suggests that they not only understood how the LRC functions but were also able to apply it effectively to enhance students' comprehension of mathematical concepts in an engaging and meaningful way.

The integration of the LRC into classroom instruction is expected to yield benefits beyond cognitive development, contributing also to the affective and psychomotor domains of student learning. Considering the developmental characteristics of elementary school students, who benefit greatly from visual and contextualized learning strategies, the use of the LRC is regarded as highly relevant (Sabil et al., 2021). Consequently, similar training initiatives should be sustained and expanded through ongoing mentoring, advanced training programs, and the contextual development of LRC content that is tailored to local needs and classroom conditions.

4. CONCLUSION

The digital learning resource training for elementary school teachers—specifically the utilization of the Mathematics Learning Resource Center (LRC) based on information technology—has had a positive impact on teachers' ability to use digital learning materials. Through this training, teachers gained new insights into the importance of integrating technology into the learning process, particularly to support the student-centered approach emphasized in the *Kurikulum Merdeka*. The training also demonstrated that teachers are capable of adopting and implementing the LRC in mathematics instruction. Active participation during the practical and simulation sessions served as a key indicator of the program's success, reflecting the teachers' readiness to deliver more contextual and interactive learning experiences for their students.

Considering the benefits achieved, the use of LRC in mathematics education contributes not only to students' cognitive development but also positively influences their affective and psychomotor domains. Therefore, follow-up actions such as advanced training, the development of locally relevant content, and continuous mentoring are essential to optimize the use of LRC in daily teaching practices.

5. ACKNOWLEDGEMENT

6. RECOMMENDATION

Based on the results of the community service activity, it is recommended that the training on the use of digital-based Mathematics Learning Resource Centers (LRC) be continued on a sustainable basis through follow-up training and technical assistance for teachers to ensure optimal implementation in classroom learning. In the future, it is necessary to develop LRC content that is more contextual and tailored to the local characteristics of the students. Additionally, challenges such as limited devices, uneven internet access, and varying teacher competencies in using technology need to be anticipated. Therefore, the training should be designed with consideration of the real conditions in the field and accompanied by alternative solutions such as the provision of offline modules or small group mentoring.

7. REFERENCES

Cahyadi, A. (2018). Pengembangan Media dan Sumber Belajar Teori dan Prosedur. In *Journal of Chemical Information and Modeling*. Serang: Laksita Indonesia.

Darmawan, I. ., Setyowati, E., Ulinniam, Tyaningsih, R. ., Mary, E., Ali, M. ., Susilawati, E., Kusumastati, W., & Wibisono, H. . (2023). *Desain Sistem Pembelajaran* (Vol. 01). Bandung: Widina.

Firmansyah, F., Ahyani, H., Tiyanti, D., Ma'arif, M., Wibisono, H. ., Tyaningsih, R. ., R, A.., Ahmad, A., Syahrul, Y., Meliani, F., Hidayat, R., & Sembiring, D. (2023). *Teknologi Pendidikan Jarak Jauh*. Bandung: Widina.

Junaidi, J., Tyaningsih, R. Y., & Sripatmi, S. (2024). Pusat Sumber Belajar Matematika Berbasis Website Untuk Meningkatkan Mutu Proses Pembelajaran Matematika. *Mandalika Mathematics and Educations Journal*, *6*(2), 699-711. http://dx.doi.org/10.29303/jm.v6i2.8247

Kartika, H. (2018). Teaching and learning Mathematics through web-based resource: An interactive approach. *MaPan: Jurnal Matematika dan Pembelajaran*, 6(1), 1-10. https://doi.org/10.24252/mapan.2018v6n1a1

Khogali, S. E. O., Davies, D. A., Donnan, P. T., Gray, A., Harden, R. M., McDonald, J., Pippard, M. J., Pringle, S. D., & Yu, N. (2011). Integration of e-learning resources into a medical school curriculum. *Medical Teacher*, *33*(4), 311–318. https://doi.org/10.3109/0142159X.2011.540270

Novitasari, D., Hamdani, D., Arifin, S., & Junaidi. (2021). Pengembangan LKPD berbasis geogebra untuk meningkatkan pemahaman konsep matematika. *Jurnal Edukasi Dan Sains Matematika*, *7*(1), 1–16. https://doi.org/doi.org/10.25134/jes-mat.v7i1.3916

Novitasari, D., Indrawati, I., & Risfianty, D. K. (2018). Pengembangan Perangkat Pembelajaran Matematika Dengan Pendekatan Saintifik Berbasis GeoGebra Untuk SMA di Mataram. *Jurnal Math Educator Nusantara: Wahana Publikasi Karya Tulis Ilmiah Di Bidang Pendidikan Matematika*, *4*(2), 186. https://doi.org/10.29407/jmen.v4i2.12526

Okongo, R. B., Ngao, G., Rop, N. K., & Nyongesa, W. J. (2015). Effect of Availability of Teaching and Learning Resources on the Implementation of Inclusive Education in Pre- School Centers in Nyamira North Sub-County, Nyamira County, Kenya. *Journal of Education and Practice*, *6*(35), 132–141.

Prayitno, S., Subarinah, S., Novitasari, D., & Triutami, T. W. (2023). Pelatihan penggunaan media dan evaluasi pembelajaran matematika berbasis higher order thinking skills di sekolah dasar. *Rengganis Jurnal Pengabdian Masyarakat*, *3*(2), 205–212. https://doi.org/10.29303/rengganis.v3i2.348

Puspita, Y., & Hanif, M. (2019). Using Learning Media to Increase Learning Motivation in Elementary School. *Anatolian Journal of Education*, *4*(2), 53–60. https://doi.org/10.29333/aje.2019.426a

Reys, R. E. (1998). *Helping Children Learn Mathematics*. New York: A Viacom Company.

Sabil, H., Asrial, A., Syahrial, S., Robiansah, M. A., Zulkhi, M. D., Damayanti, L., Kiska, N., Silvia, N., & Ubaidillah, U. (2021). Online Geoboard Media Improves Understanding of Two-dimensional Flat Shape Concepts in Elementary School Students. *International Journal of Elementary Education*, 5(4), 685. https://doi.org/10.23887/ijee.v5i4.41785

Safinaturrahmah, Uyun, W., Siharani, Fardiansyah, Rahmawati, M., & Novitasari, D. (2024). Digital storytelling berbasis budaya Sasak untuk meningkatkan literasi peserta didik SDN Sulin. *Rengganis Jurnal Pengabdian Masyarakat*, *4*(2), 337-347. https://doi.org/10.29303/rengganis.v4i2.495

Santrock, J. W. (1995). *Educational psychology, 6th ed*. In Educational psychology, 6th ed. New York: McGrawHill.

Siregar, E., & Kustandi, C. (2022). Inovasi Pusat Sumber Belajar. In *Sipeg.Unj.Ac.Id* (Vol.1).

Subarinah, S., Prayitno, S., Novitasari, D., Junaidi, J., & Wahyu Triutami, T. (2023). Pelatihan dan Pendampingan Pengimplementasian Alat Peraga Kopermatik Bagi Guru Sekolah

Dasar. *Rengganis Jurnal Pengabdian Masyarakat*, *3*(1), 140–148. https://doi.org/10.29303/rengganis.v3i1.311

Sutisna, M. R., Yuniarti, Y., Windayana, H., & Hendriyana, H. (2021). Design of a web-based digital learning resource center to assist online learning with mathematics content in primary schools. In *Journal of Physics: Conference Series*, 1987(1): 012005). IOP Publishing. https://doi.org/10.1088/1742-6596/1987/1/012005

Umam, K., & Azhar, E. (2021). Bagaimana bahan ajar berbasis website membantu meningkatkan kemampuan berpikir kritis matematis siswa. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *10*(3), 1493-1506. https://doi.org/10.24127/ajpm.v10i3.3702

Zepeda, S. J., & Mayers, R. S. (2006). An analysis of Research on Block Scheduling. *Review of Educational Research*, *76*(1), 137–170. https://doi.org/10.3102/00346543076001137