

Community-Based Training and Mentoring on Interactive E-LKPD Development for Mathematics Teachers in MTs Sleman Regency

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Abstract: *The development of interactive Electronic Student Worksheets (E-LKPD) plays an important role in supporting technology-integrated mathematics learning. However, many teachers still face challenges in developing interactive E-LKPD, particularly related to technical and pedagogical skills. This article aims to describe the implementation and outcomes of a community service program in the form of community-based training and mentoring on interactive E-LKPD development for mathematics teachers at Madrasah Tsanawiyah (MTs) in Sleman Regency. The program was conducted fully online in 2025 and involved 30 mathematics teachers who are members of the MTs Mathematics Teacher Working Group (MGMP). A Community-Based Research (CBR) approach was employed, consisting of preparation, training implementation, and mentoring stages. Program evaluation was carried out qualitatively by collecting participants' feedback, comments, and suggestions. The results indicate an improvement in teachers' ability to develop interactive E-LKPD, positive perceptions of the training and mentoring activities, and teachers' intentions to implement interactive E-LKPD in mathematics instruction. Nevertheless, several challenges were identified, including limited digital experience and technical constraints. Overall, the findings suggest that community-based training and mentoring have the potential to provide sustainable impact in enhancing mathematics teachers' digital pedagogical competence.*

Keywords: *interactive E-LKPD, community service, teacher training, mathematics learning, MGMP MTs*

Abstrak: Pengembangan Lembar Kerja Peserta Didik elektronik (E-LKPD) interaktif merupakan salah satu upaya penting dalam mendukung pembelajaran matematika berbasis teknologi. Namun, penerapan E-LKPD interaktif oleh guru masih menghadapi berbagai kendala, terutama terkait keterampilan teknis dan pedagogis dalam pengembangannya. Artikel ini bertujuan untuk mendeskripsikan pelaksanaan serta hasil kegiatan pengabdian kepada masyarakat berupa pelatihan dan pendampingan berbasis komunitas dalam pengembangan E-LKPD interaktif bagi guru matematika Madrasah Tsanawiyah (MTs) di Kabupaten Sleman. Kegiatan ini dilaksanakan secara daring pada tahun 2025 dengan melibatkan 30 guru matematika yang tergabung dalam Musyawarah Guru Mata Pelajaran (MGMP) Matematika MTs Sleman. Metode yang digunakan adalah Community-Based Research (CBR), dengan tahapan persiapan, pelaksanaan pelatihan, dan pendampingan. Evaluasi kegiatan dilakukan secara kualitatif melalui pengumpulan umpan balik, komentar, dan masukan dari peserta. Hasil kegiatan menunjukkan adanya peningkatan kemampuan guru dalam mengembangkan E-LKPD interaktif, respon positif terhadap pelatihan dan pendampingan, serta munculnya niat guru untuk mengimplementasikan E-LKPD dalam pembelajaran matematika. Meskipun demikian, beberapa tantangan seperti keterbatasan pengalaman digital dan kendala teknis masih ditemukan. Secara keseluruhan, kegiatan ini menunjukkan bahwa pelatihan dan pendampingan berbasis komunitas berpotensi memberikan dampak berkelanjutan dalam meningkatkan kompetensi pedagogik digital guru matematika.

Kata kunci: E-LKPD interaktif, pengabdian kepada masyarakat, pelatihan guru, pembelajaran matematika, MGMP MTs

1. INTRODUCTION

The advancement of information and communication technology (ICT) has significantly transformed educational practices, particularly in the development and utilization of digital learning resources. In the context of Indonesian education, the implementation of technology-based instructional materials has become increasingly important in supporting the learning process aligned with 21st-century skills. One of the instructional components that plays a central role in classroom learning is the Student Worksheet (Lembar Kerja Peserta Didik/LKPD), which functions as a structured guide to facilitate students' active engagement during learning activities.

Traditionally, LKPD has been used in printed form; however, the rapid growth of digital technology has encouraged the transformation of conventional worksheets into Electronic Student Worksheets (E-LKPD). E-LKPD represents a digital version of LKPD that allows learning activities to be

delivered more flexibly and interactively. The shift from printed worksheets to E-LKPD is consistent with the demand for student-centered learning, where students are expected to actively construct knowledge through exploration, interaction, and reflection (Ratu et al., 2022).

The use of E-LKPD provides several pedagogical advantages. Digital worksheets enable teachers to integrate multimedia elements such as images, videos, animations, and interactive questions that can enhance students' motivation and conceptual understanding. Moreover, E-LKPD allows learning activities to be accessed anytime and anywhere, supporting independent and self-paced learning. From a teacher's perspective, E-LKPD facilitates efficient data management, as students' responses and learning progress can be recorded automatically, enabling timely feedback and continuous evaluation (Amizera et al., 2023)

Although various studies have reported the effectiveness of E-LKPD in improving learning outcomes and student engagement, most of these studies remain limited to the context of product development and experimental research. The dissemination and implementation of research-based E-LKPD products in real classroom settings are still relatively low. Many innovative E-LKPD products developed by researchers are not widely adopted by teachers and often remain as academic outputs without sustainable classroom application. This condition indicates a gap between research findings and actual teaching practices in schools.

To address this gap, community service programs focusing on training and mentoring teachers in E-LKPD development have been conducted in several regions. Siregar et al., (2023) reported a training program using Liveworksheets to enhance teachers' skills in creating interactive E-LKPD at the junior high school level. Similarly, Amizera et al., (2023) implemented E-LKPD training based on the Problem-Based Learning (PBL) model for science teachers, which resulted in improved teachers' understanding of instructional design and digital worksheet development.

Other community service initiatives have utilized various platforms, such as Jotform and Canva, to support teachers in developing digital worksheets. Ghufon et al., (2022) conducted training using Jotform for elementary school teachers, while Sumanik & Siregar (2023) implemented E-LKPD training through Liveworksheets and Canva at the junior high school level. These programs generally reported positive responses from participants; however, most of them were designed for general subjects and did not specifically address the instructional characteristics of mathematics learning.

Mathematics has distinctive characteristics that differentiate it from other subjects, including its abstract nature, symbolic representations, and emphasis on logical reasoning and problem-solving. Effective mathematics instruction requires learning materials that support visualization, step-by-step reasoning, and interactive exploration of concepts. Therefore, the development of interactive E-LKPD for mathematics teachers demands a subject-specific approach that integrates appropriate pedagogical strategies and digital tools tailored to mathematical content.

In the context of Islamic Junior High Schools (Madrasah Tsanawiyah/MTs), mathematics teachers face additional challenges related to curriculum demands and limited access to continuous professional development in educational technology. Preliminary discussions with the Mathematics Teacher Working Group (MGMP Matematika) of MTs Sleman Regency revealed that most teachers still rely on printed worksheets and have limited experience in designing interactive E-LKPD independently. Teachers also reported difficulties in selecting suitable digital platforms and integrating technology effectively into mathematics instruction.

Another challenge identified is the lack of sustained mentoring following training activities. Many previous training programs focused primarily on short-term workshops without providing continuous assistance during the implementation stage. As a result, teachers often experience difficulties when applying newly acquired skills in their classrooms, leading to low sustainability of digital innovation practices. This condition highlights the importance of combining training with ongoing mentoring to ensure meaningful and long-term impact.

Based on these identified needs, this community service program was designed using a community-based training and mentoring approach. Community-Based Research (CBR) was

employed to actively involve mathematics teachers as partners in the planning, implementation, and evaluation of the program. This approach emphasizes collaboration, shared problem identification, and mutual learning between the community service team and the teacher community, ensuring that the program is contextually relevant and responsive to teachers' real needs.

The focus of this program is not only on improving teachers' technical skills in developing interactive E-LKPD using Liveworksheet but also on strengthening their digital pedagogical competence in mathematics learning. Through structured training sessions and continuous mentoring, teachers are guided to design interactive E-LKPD that align with curriculum objectives, promote student engagement, and support meaningful learning experiences.

Ultimately, this community service initiative aims to contribute to the sustainable integration of digital instructional materials in mathematics education at MTs in Sleman Regency. By empowering teachers with practical skills and pedagogical understanding, this program is expected to enhance the quality of mathematics learning and serve as a model for similar community-based professional development initiatives in other regions.

2. METHOD

This community service program was conducted using a Community-Based Research (CBR) approach. The program involved mathematics teachers who are members of the Mathematics Teacher Working Group (Musyawarah Guru Mata Pelajaran/MGMP Matematika) of Madrasah Tsanawiyah (MTs) in Sleman Regency, Yogyakarta. The participants of this program consisted of 30 mathematics teachers from various MTs in Sleman Regency. All participants were active members of the MGMP Matematika and voluntarily participated in the training and mentoring activities. The community service activities were conducted online in 2025. All training and mentoring sessions were delivered synchronously through video conferencing platforms and supported by asynchronous communication using online discussion groups. The fully online mode was implemented to accommodate participants' schedules and ensure broader participation.

The program was implemented in three main stages: preparation, training and mentoring, and evaluation. The preparation stage involved coordination with representatives of the MGMP Matematika to determine the scope, schedule, and technical aspects of the activities, followed by the development of training materials and modules related to interactive E-LKPD for mathematics learning. These materials covered an introduction to interactive E-LKPD, instructional design principles for mathematics worksheets, and the use of digital platforms for E-LKPD development. The training implementation stage focused on enhancing participants' skills in creating interactive E-LKPD through online sessions that included material presentations, live demonstrations, and guided practice using the Liveworksheet platform. During these sessions, participants were given opportunities to ask questions, engage in discussions, and directly practice developing their own E-LKPD. Following the training sessions, mentoring and evaluation activities were conducted to support participants in refining the E-LKPD they developed, with mentoring provided through online discussions and consultations. Participants were also encouraged to submit their E-LKPD products and share their experiences and challenges encountered during the development process as part of the evaluation of the program.

Data for evaluating the implementation of the community service program were collected qualitatively. Participants were asked to provide written feedback, comments, and suggestions regarding the training and mentoring activities. The feedback focused on participants' experiences, perceived benefits, challenges encountered during E-LKPD development, and suggestions for future improvement. The qualitative data obtained from participants' feedback were analyzed using descriptive qualitative analysis. Participants' comments and suggestions were grouped into thematic categories to identify common patterns related to the effectiveness of the training, participants' skill development, and the challenges faced during the implementation of interactive E-LKPD. The outcomes of the community service program were identified based on participants' ability to develop interactive E-LKPD products for mathematics learning, the quality and relevance of the feedback and

suggestions provided during the activities, and participants' expressed intention to apply interactive E-LKPD in their teaching practices.

3. RESULT AND DISCUSSION

Results

A. Implementation of Community Service Activities

The implementation of the community service program was conducted fully online in 2025 and involved 30 mathematics teachers who are members of the Mathematics Teacher Working Group (MGMP Matematika) of Madrasah Tsanawiyah (MTs) in Sleman Regency. The online format was selected to ensure broader participation and continuity of engagement, considering teachers' professional responsibilities and geographical distribution. Despite being implemented virtually, the program was designed to maintain active interaction, collaborative learning, and continuous mentoring throughout all stages of the activities.

The implementation of the program was organized into three interrelated stages, namely preparation, training implementation, and mentoring. These stages were structured to form a coherent process that gradually guided participants from initial orientation and capacity building to practical application and refinement of interactive E-LKPD products. Each stage played a distinct role in supporting participants' learning experiences and ensuring the sustainability of the program outcomes.

The preparation stage focused on establishing coordination with MGMP Matematika representatives and identifying the general conditions of mathematics teachers related to the use of digital instructional materials. Initial communication was conducted to align the objectives of the community service program with the needs and expectations of the teacher community. During this stage, the community service team also discussed the technical implementation of online activities, including scheduling, digital platforms to be used, and communication channels for mentoring and follow-up discussions.

Based on the coordination results, training materials and modules were systematically developed by the community service team. The materials were designed to address essential competencies required for developing interactive E-LKPD for mathematics learning. These competencies included an understanding of the concept and function of interactive E-LKPD, principles of instructional design for mathematics worksheets, and the utilization of digital platforms for creating interactive content. Special attention was given to ensuring that the materials were relevant to the curriculum context of MTs and could be easily understood by teachers with diverse levels of digital literacy. The preparation stage played a crucial role in laying a strong foundation for the subsequent training and mentoring activities.

The training implementation stage was conducted through synchronous online sessions that emphasized active participation and hands-on practice. The training sessions began with an introduction to interactive E-LKPD and its role in supporting student-centered mathematics learning (Figure 1). Participants were guided to understand how interactive worksheets can facilitate student engagement, promote independent learning, and support the development of mathematical reasoning and problem-solving skills. These introductory sessions aimed to build participants' awareness of the pedagogical potential of E-LKPD in mathematics instruction.



Figure 1. Introduction session

Following the introductory sessions, the training activities focused on the practical aspects of developing interactive E-LKPD. Participants were introduced to the Liveworksheet platform as a tool for creating interactive digital worksheets. Through live demonstrations, the facilitators explained the main features of the platform, including the creation of interactive question types, integration of multimedia elements, and customization of worksheet layouts. The demonstrations were accompanied by step-by-step guidance to ensure that participants could follow the process and apply it directly to their own worksheet designs (Figure 2).



Figure 2. Demonstrations using Liveworksheet

An important component of the training implementation stage was guided practice. Participants were encouraged to develop their own interactive E-LKPD during the training sessions by adapting existing printed worksheets or designing new worksheets aligned with their teaching materials. During this process, participants actively engaged in asking questions, sharing difficulties, and exchanging ideas with other teachers. The interactive nature of the training sessions fostered a collaborative learning environment, allowing participants to learn not only from the facilitators but also from their peers.

The online training format enabled flexible interaction while maintaining structured learning activities. Discussion sessions were incorporated to allow participants to reflect on their learning experiences and to discuss challenges encountered during the development of interactive E-LKPD. These discussions provided valuable insights into teachers' initial responses to the use of digital platforms and highlighted common issues faced during the transition from printed worksheets to interactive digital formats. The training implementation stage thus functioned as a critical phase for building participants' confidence and practical skills in E-LKPD development.

Following the completion of the training sessions, the program proceeded to the mentoring stage, which aimed to provide continuous support for participants as they refined and finalized their interactive E-LKPD products. Mentoring activities were conducted online through scheduled consultations and asynchronous discussions using digital communication platforms. Participants were encouraged to submit drafts of their E-LKPD products and to share their experiences during the development process.

During the mentoring stage, facilitators provided feedback on both technical and pedagogical aspects of the E-LKPD products. Feedback focused on improving the interactivity, clarity of instructions, alignment with mathematics learning objectives, and overall usability of the worksheets. Participants were given opportunities to revise their products based on the feedback received, enabling them to gradually enhance the quality of their interactive E-LKPD. This iterative process supported deeper learning and helped participants overcome difficulties that were not fully addressed during the training sessions.

The mentoring stage also served as a platform for reflective learning and knowledge sharing among participants. Teachers shared insights regarding the challenges they faced, such as adapting mathematical content into interactive formats and managing technical constraints during online development. These shared experiences contributed to a collective learning process within the MGMP community and strengthened collaboration among mathematics teachers.

Overall, the implementation of the community service activities demonstrated a systematic and continuous approach to professional development. The integration of preparation, training, and mentoring stages enabled participants to progress from initial exposure to practical application and refinement of interactive E-LKPD. The fully online implementation facilitated sustained engagement and interaction, while the emphasis on guided practice and mentoring ensured that participants were supported throughout the development process. This comprehensive implementation process provided a solid foundation for achieving the program outcomes, which are further elaborated in the subsequent section based on specific indicators of impact.

B. Outcomes of the Community Service Program

The outcomes of the community service program were identified based on qualitative analysis of participants' feedback, comments, and suggestions collected during and after the training and mentoring activities. The findings are presented according to the predefined outcome indicators, focusing on changes in participants' skills, perceptions, challenges encountered, and intentions to apply interactive E-LKPD in mathematics learning.

Improvement in Teachers' Ability to Develop Interactive E-LKPD

The first indicator of the program outcomes relates to the improvement in teachers' ability to develop interactive E-LKPD for mathematics learning. Qualitative analysis of participants' feedback and the submitted E-LKPD products indicates that the training and mentoring activities contributed to meaningful skill development among participants. Teachers reported gaining new insights into the structure and design of interactive worksheets, particularly in organizing mathematical content, formulating interactive questions, and aligning worksheet activities with learning objectives.

Participants indicated that prior to the program, most of them relied on printed worksheets or static digital documents and had limited experience in developing interactive learning materials independently. Through the training sessions, participants became familiar with the technical aspects of using digital platforms for E-LKPD development, including creating interactive answer fields, designing various question formats, and integrating supporting elements such as images and structured instructions. The step-by-step demonstrations and guided practice sessions enabled participants to gradually build confidence in using the Liveworksheet platform for instructional purposes.

The mentoring activities further strengthened participants' ability to develop interactive E-LKPD. Through feedback and consultations, participants were able to identify weaknesses in their initial worksheet designs and make improvements related to clarity of instructions, level of interactivity, and suitability for students' learning characteristics. Several participants noted that the mentoring process helped them better understand how to adapt mathematical concepts—especially those considered abstract into interactive worksheet formats that are more accessible to students.

The E-LKPD products submitted by participants demonstrate that teachers were able to independently develop interactive worksheets that are relevant to mathematics learning at the MTs

level. There are 30 products of e-LKPD that made by the teacher as a follow up this program. These products reflect participants' increased competence in combining pedagogical considerations with digital tools to support mathematics instruction. Overall, the findings for this indicator suggest that the community-based training and mentoring program successfully enhanced teachers' practical skills and confidence in developing interactive E-LKPD for use in their teaching practices.

Practically, in Table 1 below, the summary of teacher's competency before and after joining the training program based on interview on 30 teachers.

Table 1. Teacher's competency before and after joining the training program

No	Competency Aspect	Digital Pedagogical Competency Indicators	Teacher Before Joining this Program	Teacher After Joining this Program
1	Instructional Analysis	Analyzing learning outcomes and students' characteristics as the basis for e-worksheet development	Worksheets are designed without systematic analysis of learning objectives and learners' needs	e-LKPD are developed based on learning outcomes and students' characteristics
	Pedagogical Design	Designing structured learning activities (introduction, exploration, reflection) in e-worksheets	Learning activities are task-oriented and lack clear structure	Learning activities are systematically organized and process-oriented
2	Learning Model Integration	Integrating innovative learning models (PBL, PjBL, inquiry) into e-worksheets	Worksheets are not aligned with any specific learning model	e-LKPD are aligned with the syntax of selected learning models
3	Technology Integration	Selecting and utilizing appropriate digital platforms and tools for e-worksheet development	Printed worksheets or static digital files are mainly used	Interactive e-LKPD are developed using suitable digital platforms
4	Multimedia Utilization	Integrating text, images, videos, and simulations pedagogically	Limited use of media that does not fully support conceptual understanding	Relevant multimedia is integrated to enhance understanding and engagement
5	Interactive Learning Activities	Developing exploratory and interactive learning activities in e-worksheets	Activities are one-directional and procedural	Activities promote exploration, reasoning, and active student engagement
6	Digital Assessment	Designing assessment tasks embedded in e-worksheets	Assessment is separated from worksheets and minimally supported by technology	Assessment is embedded within e-worksheets using digital features
7	Feedback Provision	Providing timely and constructive feedback through digital tools	Feedback is limited and delayed	Feedback is provided promptly through automated or descriptive digital feedback
8	Digital Literacy and Ethics	Applying copyright, ethics, and digital safety principles	Digital ethics and copyright issues are rarely considered	Copyright, citation, and data security are properly addressed
9	Evaluation and Reflection	Evaluating and revising e-worksheets based on usage data and learning outcomes	e-LKPD are rarely evaluated or revised	e-LKPD are continuously evaluated and improved based on data

Participants' Perceptions of the Training and Mentoring Activities

The second indicator focuses on participants' perceptions of the training and mentoring activities implemented in the community service program. Analysis of participants' feedback and comments indicates that the overall response toward the program was positive. Participants perceived the training materials as relevant to their instructional needs and appropriate for the context of mathematics learning at the MTs level. The content presented during the training sessions was considered clear and directly applicable, enabling participants to understand the concepts of

interactive E-LKPD development without requiring extensive prior experience with digital learning tools.

Participants also highlighted the effectiveness of the online training format in supporting their learning process. The combination of material presentations, live demonstrations, and guided practice was perceived as helpful in facilitating understanding and skill development. Teachers appreciated the opportunity to engage in discussions, ask questions, and receive immediate clarification during the sessions. This interactive approach contributed to participants' active involvement and sustained engagement throughout the program.

The mentoring component was perceived as a particularly valuable aspect of the program. Participants reported that the availability of mentoring sessions allowed them to receive constructive feedback on their E-LKPD products and address challenges encountered during the development process. The mentoring activities were viewed as supportive and responsive, enabling participants to refine their work and deepen their understanding of interactive worksheet design. Participants also noted that continuous communication through online discussion platforms facilitated timely assistance and encouraged collaborative learning among teachers.

Overall, participants' perceptions indicate that the integration of training and mentoring created a supportive learning environment that enhanced their learning experiences. The positive responses suggest that the program design and implementation were aligned with participants' expectations and needs, contributing to the effectiveness of the community service activities.

Challenges Encountered During the Development of Interactive E-LKPD

The third indicator highlights the challenges encountered by participants during the development of interactive E-LKPD throughout the training and mentoring activities. Analysis of participants' feedback and comments indicates that, despite the overall positive outcomes, several obstacles were experienced that affected the development process. One of the most frequently reported challenges was limited prior experience with digital worksheet platforms. Some participants indicated that they initially encountered difficulties in understanding platform features and navigating the tools required to create interactive elements.

Another challenge identified relates to the nature of mathematics content itself. Participants reported that adapting abstract mathematical concepts into interactive digital formats required careful planning and additional effort. Designing interactive questions that remain conceptually accurate while being engaging for students was perceived as a demanding task, particularly for topics involving symbolic representations, procedural steps, or complex problem-solving processes. This challenge underscores the need for subject-specific guidance in developing digital instructional materials for mathematics.

Technical constraints were also reported as challenges during the online implementation of the program. Several participants mentioned issues related to internet connectivity and limited access to adequate devices, which occasionally disrupted their participation in synchronous training sessions or slowed down the development process. In addition, participants noted that allocating sufficient time to develop high-quality interactive E-LKPD was challenging due to their regular teaching responsibilities and administrative workload.

These challenges suggest that while the training and mentoring activities successfully supported participants in developing interactive E-LKPD, continuous support and practice are necessary to strengthen teachers' digital competencies. The identification of these challenges provides important insights for improving future community service programs, particularly in terms of providing extended mentoring, technical support, and flexible learning opportunities tailored to teachers' professional contexts.

Participants' Intentions to Implement Interactive E-LKPD and Program Sustainability

The fourth indicator concerns participants' intentions to implement interactive E-LKPD in their teaching practices and the potential sustainability of the community service program outcomes.

Analysis of participants' feedback indicates that many teachers expressed a strong intention to apply the interactive E-LKPD developed during the program in their mathematics classes. Participants reported that the worksheets they created were considered suitable for use as supplementary learning materials or as part of regular classroom instruction at the MTs level.

Several participants also indicated their intention to further develop interactive E-LKPD for other mathematics topics beyond those addressed during the training. This suggests that participants not only acquired technical skills but also developed a positive attitude toward continuous improvement and innovation in digital instructional material development. The willingness to explore and expand the use of interactive E-LKPD reflects participants' growing confidence in integrating technology into mathematics learning.

In addition, participants expressed interest in sharing their E-LKPD products and development experiences with fellow teachers through MGMP forums and informal professional discussions. This intention highlights the potential for broader dissemination of the program outcomes within the mathematics teacher community. Peer sharing and collaboration are expected to contribute to the sustainability of the initiative by encouraging collective learning and the adoption of interactive E-LKPD among teachers who did not directly participate in the program.

Overall, participants' intentions to implement and further develop interactive E-LKPD indicate that the community service program has the potential to generate sustainable impact. The expressed commitment to applying digital worksheets in teaching practices and sharing resources within the MGMP community suggests that the outcomes of the program may extend beyond the duration of the training and mentoring activities.

Discussion

The results of this community service program demonstrate that community-based online training and mentoring can effectively enhance mathematics teachers' competence in developing interactive E-LKPD. The improvement in teachers' ability to design and develop interactive worksheets supports findings from previous community service and development studies, which indicate that hands-on training combined with guided assistance enables teachers to move beyond passive use of digital materials toward active instructional design (Ratu et al., 2022; Siregar et al., 2023; Zukhrufurrohmah et al., 2025). In this program, teachers were not only introduced to the Liveworksheets platform but were also guided to transform printed worksheets into interactive digital formats aligned with mathematics learning objectives.

The findings further confirm that effective professional development in digital learning media should integrate pedagogical considerations with technical skills. Research on E-LKPD development emphasizes that the effectiveness of digital worksheets depends on instructional design quality, such as clarity of instructions, suitability of question types, and alignment with students' cognitive (Amizera et al., 2023; Febryanti & Rusmini, 2022; Rahmayani & Atmazaki, 2025). The ability of participants to produce interactive E-LKPD products indicates that the training successfully addressed both pedagogical and technological aspects of worksheet development, which is particularly important in mathematics learning that involves abstract concepts and symbolic representations.

Participants' positive perceptions of the training and mentoring activities reinforce the importance of continuous support in teacher professional development. Similar studies have reported that mentoring plays a crucial role in supporting teachers during the transition from learning digital tools to implementing them in instructional practice (Ghufron et al., 2022; Sumanik & Siregar, 2023; Zukhrufurrohmah et al., 2025). In this program, mentoring provided opportunities for feedback, reflection, and revision of E-LKPD products, which participants perceived as essential for improving the quality of their worksheets and increasing their confidence in using digital learning media.

The challenges encountered by participants are consistent with those reported in earlier studies on the implementation of digital worksheets and technology integration in mathematics education. Limited digital literacy, technical constraints, and difficulties in adapting abstract

mathematical content into interactive formats have been identified as common obstacles faced by teachers (Fahrizy & Fathurrahman, 2024; Fauzi et al., 2021; Siregar et al., 2023). These challenges suggest that developing interactive E-LKPD requires not only technical proficiency but also sufficient time, practice, and contextual support. The findings highlight the need for sustained mentoring and follow-up activities to strengthen teachers' digital competencies and address contextual barriers such as internet access and workload.

The expressed intention of participants to implement interactive E-LKPD in their teaching practices indicates the potential sustainability of the program outcomes. Previous studies suggest that teachers' willingness to adopt digital instructional materials is influenced by perceived usefulness, ease of use, and confidence gained through practical experience (Ansoriyah & Supardi, 2025; Kholida et al., 2025; Ratu et al., 2022). The intention to apply and further develop interactive E-LKPD, as well as to share products within the MGMP community, suggests that the program may contribute to broader dissemination and collaborative learning among mathematics teachers in MTs Sleman Regency.

From a broader perspective, the findings support the relevance of a community-based approach to teacher professional development. By involving teachers as active participants and encouraging collaboration within the MGMP forum, the program aligns with recommendations that emphasize collective learning and local professional communities as key factors for sustaining instructional innovation (Weinhandl et al., 2021). The fully online implementation also demonstrates that digital professional development can be effectively conducted when supported by appropriate instructional design and mentoring, which is particularly relevant in contexts where face-to-face training is limited.

Overall, this discussion indicates that community-based online training and mentoring on interactive E-LKPD development can serve as an effective strategy for enhancing mathematics teachers' digital pedagogical competence. The alignment between the program outcomes and existing literature suggests that this initiative contributes to the growing body of community service research on digital learning media development. The insights gained from this program may inform future community service activities aimed at supporting mathematics teachers in integrating interactive digital worksheets into their instructional practices, particularly within similar educational contexts.

4. CONCLUSION

This community service program demonstrated that community-based online training and mentoring can effectively support mathematics teachers in developing interactive E-LKPD. Through structured training and continuous mentoring, teachers were able to enhance their skills in designing interactive digital worksheets that are pedagogically aligned with mathematics learning objectives and suitable for use at the MTs level. The program also facilitated teachers' understanding of how digital platforms, such as Liveworksheets, can be utilized to transform conventional worksheets into more engaging and interactive learning resources.

The findings indicate that the combination of training and mentoring plays a crucial role in strengthening teachers' confidence and readiness to integrate interactive E-LKPD into their teaching practices. Participants' positive perceptions, the quality of the developed E-LKPD products, and their expressed intention to apply and further develop interactive worksheets suggest that the program has the potential to generate sustainable impact. At the same time, the challenges identified—such as limited digital experience, technical constraints, and time availability highlight the importance of providing ongoing support and opportunities for practice in future initiatives.

Overall, this program contributes to community service practices by offering a contextualized model of professional development for mathematics teachers that emphasizes collaboration, practical skill development, and sustainability. The results of this study may serve as a reference for similar community service programs aimed at enhancing teachers' digital pedagogical competence, particularly in the development of interactive learning materials. Future programs are encouraged to

extend mentoring duration, involve broader teacher communities, and explore the integration of interactive E-LKPD with various instructional models to further strengthen the quality of mathematics learning.

Based on the findings, it is recommended that e-worksheet (e-LKPD) training for teachers be implemented in a continuous and structured manner, with a strong emphasis on digital pedagogical competence rather than merely technical skills. Future training programs should integrate instructional analysis, pedagogical design, interactive activity development, and digital assessment into hands-on practice, enabling teachers to design e-worksheets that are pedagogically meaningful, student-centered, and aligned with learning objectives. In addition, follow-up mentoring and reflective evaluation should be provided to support teachers in refining their e-LKPD based on classroom implementation and student learning data. Such sustained professional development is expected to strengthen teachers' ability to integrate technology effectively into teaching and ultimately enhance students' engagement and learning outcomes.

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