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Strengthening Teachers' Digital Literacy through Training in Wordwall-Based Learning Media

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ABSTRACT
Background: Advances in information technology require teachers to possess adequate digital literacy skills to design innovative learning experiences that meet the needs of twenty-first-century students. However, limited access to training and technical mentoring has prevented the optimal use of digital learning technologies in elementary schools.
Contribution: This community service program aimed to strengthen teachers' digital literacy by introducing Wordwall as an interactive learning and assessment platform. The program also supported teachers in independently developing digital learning media that could be adapted to different instructional needs.
Method: The program was conducted at MI Muhammadiyah Wonorejo through three main stages: socialization on the importance of digital literacy, practical training in the use of the Wordwall platform, and technical mentoring in the development of interactive learning media. Program effectiveness was evaluated using pre-tests, post-tests, observations, documentation, and assessments of the learning media created by participants.
Results: The average level of teachers' digital literacy competence increased from 35% to 80.5%, representing an improvement of 45.5 percentage points. Furthermore, 80% of the teachers were able to independently create Wordwall-based learning media, 70% were able to modify templates according to instructional needs, and 65% had begun using Wordwall as a learning evaluation tool.
Conclusion: Training combined with continuous technical mentoring effectively strengthened teachers' digital literacy, practical skills, and confidence in using educational technology. The program also encouraged the development of more interactive, innovative, and technology-enhanced learning practices in elementary education.

INTRODUCTION

Advances in information technology have brought substantial changes to education. The emergence of various digital technologies has transformed the ways in which students obtain and process information, while also requiring teachers to adapt their roles in the learning process. Whereas teachers previously served primarily as transmitters of subject matter, they are now expected to act as creative facilitators who are responsive to technological developments [1]. In this context, digital literacy is an essential competence that educators need in order to provide learning experiences that meet the needs of twenty-first-century students [2]. Digital literacy is not limited to the ability to operate technological devices; it also encompasses the skills required to access, select, evaluate, and effectively use digital information to support learning activities [3]. The appropriate use of technology is expected to improve the quality of learning, encourage innovation, and enhance student engagement in the learning process [4]. Furthermore, teachers' ability to independently develop and evaluate digital media is an important factor in creating a more adaptive and modern educational environment [5]. Technology-based learning media have also been shown to increase students' interest in learning because instructional content can be presented in a more engaging, interactive, and comprehensible manner [6]. Learning media also play an important role in helping teachers explain abstract concepts so that they are more easily understood by students [7].

Nevertheless, the application of technology in learning continues to face various challenges. Previous studies indicate that teachers' digital literacy levels remain in the low-to-moderate category, meaning that the use of technology in the learning process has not yet been optimized [8]. A similar condition was identified through observations conducted during the Community Service Program (KKN) at MI Muhammadiyah Wonorejo. Learning activities at the school were still dominated by printed learning resources and conventional teaching methods, despite considerable opportunities to develop more interactive digital learning. Learning environments that remain dominated by conventional methods may reduce students' interest and engagement during the learning process [9]. This situation demonstrates the need to improve teachers' skills in using various digital education platforms [10]. Similar problems are also found in many other schools that continue to face limited access to training, insufficient technical assistance, and a lack of sustained support during the adoption of educational technology [11].

In response to these conditions, community service programs such as KKN-DIK are important as a means of mentoring and empowering teachers in digital literacy. Such programs not only provide a platform for students to implement community service activities, but can also help bridge the digital competence gap that persists in school environments [12]. In line with curriculum requirements that are increasingly adaptive to technological developments, teachers' capacity in digital literacy needs to be strengthened through continuous training and mentoring [13]. Several studies have shown that intensive mentoring can accelerate the process of technological adaptation in elementary schools through practical and collaborative approaches [14]. Therefore, activities are needed to help teachers develop more varied and engaging learning experiences for students [15].

One alternative approach that can be applied to support this objective is game-based learning. This approach can be implemented through the use of the Wordwall platform, which enables teachers to transform learning materials into more interactive and enjoyable learning activities [16]. Wordwall is relatively easy to use because it does not require complex technical skills. Through this platform, teachers can create various types of quizzes, educational games,

and evaluation activities that can increase student participation during the learning process [15]. In addition to functioning as a learning medium, Wordwall can also be used as a more effective and measurable evaluation tool [17]. Wordwall provides a variety of flexible learning templates that can be easily adapted to teachers' needs, thereby supporting more creative and innovative learning [18]. The incorporation of game elements into the learning process encourages students to become more active while providing teachers with more engaging and innovative assessment alternatives [15].

Previous studies have demonstrated that digital literacy training has a positive effect on improving teachers' competence. Nurhidayat et al. [1] reported that digital literacy training improved teachers' ability to integrate technology into learning. Similar findings were reported by Ma'rif et al. [16] and Mubaroq et al. [17], who showed that Wordwall can help teachers develop more interactive and engaging learning media. Other studies have also found that the use of Wordwall can increase students' interest and motivation in thematic learning at the elementary school level [19], [20]. Conceptually, this program is also consistent with international digital competence frameworks for educators, which emphasize teachers' abilities to select digital resources, design learning activities, facilitate interaction, and conduct technology-based evaluation [21], [22]. However, most existing programs have focused primarily on introducing applications or providing one-way training. Mentoring that combines guided practice, product assessment, and reflection on teachers' use of learning media remains relatively limited, particularly in rural Islamic elementary schools. Therefore, this community service program was designed to address this gap through a model comprising socialization, guided practice, mentoring, and product reflection, enabling teachers not only to understand digital literacy concepts but also to produce Wordwall media that are relevant to their instructional needs.

This community service program was implemented through participatory socialization and technical mentoring for teachers at MI Muhammadiyah Wonorejo. This approach was expected to help participants independently develop the ability to design and use digital learning media that correspond to students' characteristics [1]. The strengthening of digital literacy was intended not only to address short-term needs but also to serve as an initial step toward creating a learning environment that is more adaptive to technological development [5]. Accordingly, this program aimed to strengthen teachers' digital literacy through training and mentoring in the use of Wordwall-based interactive learning media, describe the forms of media produced by participants, and analyze the supporting factors, challenges, and implementation limitations within the context of MI Muhammadiyah Wonorejo.

METHOD

This community service program aimed to strengthen teachers' digital literacy through socialization and training in Wordwall-based interactive learning media at MI Muhammadiyah Wonorejo. The program was conducted in February 2026 and involved all eight teachers at the school. The main activity was held from 09:30 to 11:00 Western Indonesian Time (WIB), followed by technical mentoring and follow-up communication with participants to ensure that the media they created could be used in classroom learning. The materials and equipment included laptops, smartphones, an LCD projector, an internet connection, Wordwall accounts, pre-test and post-test sheets, observation sheets, product-assessment rubrics, and activity documentation. Before implementation, the KKN-DIK team coordinated with the school,

prepared the socialization and training materials, developed the evaluation instruments, and tested the Wordwall platform to ensure that the activity could be conducted smoothly.

Table 1. General characteristics of the participants

Aspect	Description
Number of participants	Eight active teachers at MI Muhammadiyah Wonorejo
Participants' roles	Classroom teachers and/or subject teachers directly involved in the learning process
Initial technology experience	Participants were accustomed to using smartphones; their use of laptops and digital learning media varied
Initial Wordwall experience	Most participants had never independently created Wordwall-based learning media
Primary needs	Practical training, technical mentoring, and examples of easily applicable digital evaluation media

The variables in this community service program consisted of an independent variable, namely training in Wordwall-based learning media, and a dependent variable, namely teachers' digital literacy. Teachers' digital literacy was measured using four indicators: (1) understanding of digital literacy, (2) ability to operate Wordwall, (3) ability to create interactive learning media, and (4) confidence in using technology for learning. These four indicators were developed with reference to the practical needs of elementary school teachers and the principles of educators' digital competence, which emphasize the use of technology to access information, design instruction, manage learning activities, and conduct digital evaluation [21], [22]. The program was implemented through three main stages: socialization, training, and mentoring.

1. Socialization

The socialization stage involved presenting material on the importance of digital literacy in twenty-first-century learning and the use of technology-based interactive learning media. At this stage, participants were introduced to the concept of digital literacy, the urgency of using technology in learning, and the benefits of Wordwall as both a learning and evaluation medium. The material was delivered through presentations, question-and-answer sessions, and interactive discussions to improve participants' understanding of technology use in the learning process.

2. Training

The training stage was conducted through a direct demonstration of the Wordwall platform. Teachers were introduced to Wordwall's features, including how to create an account, select educational game templates, develop questions, and manage game-based learning media.

Participants were then given an opportunity to practice creating learning media on their own devices under the guidance of the implementation team. This activity was intended to improve teachers' skills in developing interactive and engaging learning media.

3. Mentoring

The mentoring stage was conducted throughout the training and practice sessions and was reinforced through follow-up communication with the school to encourage the continued use of Wordwall after the main activity. The KKN-DIK team provided participants with technical guidance in creating Wordwall-based learning media, helped them address technical difficulties, and provided feedback on the products they developed. Mentoring focused on the ability to select appropriate templates, write questions, configure the display, share media links with students, and use Wordwall as an evaluation instrument. The purpose of the mentoring was to ensure that participants could use Wordwall independently and implement it in learning activities.

Program data were obtained from pre-test and post-test results, observations, documentation, and the learning-media products created by participants. The pre-test was administered before the activity to identify participants' initial abilities, whereas the post-test was administered after the training to measure improvements in teachers' digital literacy competence. The pre-test and post-test instruments consisted of 20 assessment items covering four digital literacy indicators. Each indicator was represented by five assessment items using a scale of 1-5, ranging from very low to very good. Observations were conducted throughout the activity to assess participants' level of participation and their skills in using Wordwall. Documentation was used to record the entire series of activities, while the learning-media products were used to assess participants' ability to develop interactive learning media. The content validity of the instruments was reviewed by the implementation team and discussed with the school to ensure that the indicators corresponded to teachers' needs.

Table 2. Program evaluation indicators and techniques

Indicator	Number of items/components	Measurement technique	Assessment criteria
Understanding of digital literacy	5 items	Pre-test and post-test	Understanding of the concepts, benefits, and ethics of technology use
Ability to operate Wordwall	5 items	Practice and observation	Logging in, selecting a template, creating an activity, and sharing a link
Ability to create interactive media	5 items	Product rubric	Alignment with objectives, accuracy of content, interactivity,

			readability, and ease of use
Confidence in using technology	5 items	Pre-test, post-test, and observation	Readiness to use digital media for learning and evaluation

The data were analyzed using descriptive quantitative and qualitative methods. Quantitative data from the pre-test and post-test were analyzed using the mean and the percentage of participants' achievement for each indicator. The score for each indicator was converted into a percentage using the formula: Score (%) = (score obtained / maximum score) x 100%. The difference in achievement was calculated using the formula: Difference (%) = post-test score (%) - pre-test score (%). This formula was used because the purpose of the evaluation was to compare changes in achievement before and after the activity among the same group of participants.

$$\text{Percentage increase} = \frac{\text{Post-test score - pre-test score}}{\text{Pre-test score}} \times 100\%$$

Meanwhile, qualitative data obtained from observations, documentation, discussions, and product outputs were analyzed descriptively to illustrate changes in teachers' abilities, skills, confidence, implementation challenges, and readiness to use Wordwall-based learning technology. Because the participants were limited to eight teachers at one school, the results are presented as a contextual evaluation of the community service program rather than as findings that can be generalized to all elementary school teachers.

RESULTS AND DISCUSSION

Implementation Results

The community service program to strengthen teachers' digital literacy through socialization, training, guided practice, and mentoring in the use of Wordwall-based learning media at MI Muhammadiyah Wonorejo was successfully implemented and had a positive effect on teachers' digital competence within the partner-school context. The evaluation results showed that the average level of teachers' digital literacy competence increased from 35% to 80.5%, representing an increase of 45.5 percentage points. Improvements were observed in the understanding of digital literacy, the ability to operate Wordwall, the ability to create interactive learning media, and confidence in using technology during the learning process. In addition, most teachers were able to independently develop Wordwall-based learning media and had begun to implement them in learning and evaluation activities.

The training stage was subsequently conducted through demonstrations and direct practice in using Wordwall. Teachers were introduced to the available features, including account creation, template selection, question development, and publication of the learning media they had created. The final mentoring stage was conducted intensively during the practice sessions to help participants overcome technical difficulties and ensure that each participant could produce learning media that were ready for use. To assess the effectiveness of the program, pre-test and post-test measurements were conducted using four main indicators:

understanding of digital literacy, ability to operate Wordwall, ability to create interactive learning media, and confidence in using technology. The evaluation results are presented in Table 3.

Table 3. Comparison of teachers' digital literacy abilities before and after the training

No.	Competence indicator	Before (%)	After (%)	Difference (%)
1	Understanding of digital literacy	45	85	40
2	Ability to operate Wordwall	30	80	50
3	Ability to create interactive media	25	75	50
4	Confidence in using technology	40	82	42
	Average	**35**	**80.5**	**45.5**

As shown in Table 3, all indicators improved after the program was implemented. The average teacher-competence score increased from 35% to 80.5%, representing an average increase of 45.5 percentage points. These results indicate that the socialization, training, and mentoring activities had a positive effect on strengthening teachers' digital literacy. The greatest improvements occurred in the ability to operate Wordwall and the ability to create interactive learning media, each of which increased by 50 percentage points. This finding suggests that a hands-on training approach provided teachers with opportunities to learn through direct experience, making the acquired skills easier to understand and apply. Meanwhile, the 40-percentage-point increase in the understanding of digital literacy indicates that participants gained not only technical skills but also a stronger understanding of the importance of using technology in learning.

An improvement was also observed in confidence in using technology, which increased by 42 percentage points. Before the activity, most teachers reported that they were still hesitant to use technology because of limited experience and a lack of previous training. After participating in the training and mentoring, the teachers demonstrated a more open attitude toward technology use and greater confidence in integrating digital media into learning.

The socialization and material-delivery activities are shown in Figure 1.

Figure 1. illustrates the socialization activity, in which participants were actively involved

The session included discussions of the challenges associated with using technology in learning and strategies for applying digital media in accordance with the characteristics of elementary school students. The participants' high level of involvement indicates that teachers have a substantial need to improve their digital competence.

Figure 2. Training and mentoring in the development of Wordwall-based learning media

At this stage, participants directly practiced creating Wordwall-based learning media. Mentoring was provided individually and in groups so that each teacher had an opportunity to address the difficulties encountered during the media-development process. The observation results indicated that most participants were able to follow each stage successfully and produce learning media that corresponded to their respective subjects.

In addition to quantitative data, qualitative data revealed changes in teachers' behavior and instructional practices. Before the activity, learning was still dominated by lectures and printed learning resources. After the activity, teachers began to demonstrate initiative in using digital media as a more engaging and interactive learning alternative. A total of 80% of teachers were able to create Wordwall media independently, 70% were able to modify templates according to instructional needs, and 65% had begun using Wordwall as a learning-evaluation instrument. Participants' product achievements and changes in conditions before and after the activity are presented in Tables 4 and 5.

Table 4. Participants' Wordwall product achievements

Achievement	Percentage	Interpretation
Creating Wordwall media independently	80%	Most teachers were able to create digital learning activities without intensive assistance
Modifying templates according to instructional needs	70%	Teachers began adapting game formats, questions, and displays to their subjects

Using Wordwall as an evaluation medium	65%	Some teachers began using Wordwall for quizzes, exercises, or formative assessment

Table 5. Conditions before and after the program

Aspect	Before the program	After the program
Use of digital media	Still limited and dominated by printed learning resources	Teachers began using Wordwall as an interactive medium
Ability to create media	Not accustomed to creating digital educational quizzes or games	Most teachers were able to create and modify Wordwall media
Learning evaluation	Mostly relied on conventional oral or written questions	Some teachers began using Wordwall quizzes for formative evaluation
Confidence	Some teachers were still hesitant to use learning technology	Teachers became more confident in experimenting with digital media in learning

Discussion

The improvement in teachers' abilities across all indicators demonstrates that practice-based training and mentoring were highly effective in strengthening digital literacy within the partner-school context. This finding supports the study by Nurhidayat et al. [1], which stated that digital literacy training can improve teachers' ability to integrate technology into the learning process. Through direct practical experience, teachers were given opportunities to understand the use of technology contextually in relation to the instructional needs they encounter in their daily work. From a technology-adoption perspective, the success of the training was also influenced by perceived ease of use, direct benefits for learning, and technical support during practice [23], [24].

The substantial improvements in the ability to operate Wordwall and create interactive learning media indicate that the main difficulty previously faced by teachers was not a lack of motivation, but rather limited access to practical training. Before the activity, most teachers already owned digital devices such as smartphones and laptops, but had not used them optimally for learning. After receiving training and mentoring, the teachers were able to transform their existing devices into more effective learning-support tools. From the perspective of digital literacy theory, these results indicate that improving digital literacy concerns not only the ability to operate technological devices but also the ability to use technology productively to support the learning process. This finding is consistent with Kurnianingsih et al. [5], who stated that digital literacy includes the ability to access, understand, evaluate, and use digital information effectively and responsibly.

The use of Wordwall as a game-based learning medium also contributed to greater

teacher creativity in designing instruction. Teachers served not only as users of technology but also as developers of learning media who were able to adapt instructional content to students' characteristics. This finding supports the studies by Ma'rif et al. [16] and Mubaroq et al. [17], which showed that Wordwall can enhance teachers' creativity in producing more engaging and innovative learning media. From a pedagogical perspective, the implementation of Wordwall supports a game-based learning approach that positions students as active participants in the learning process. Through the available educational game features, learning becomes more enjoyable and can increase student participation. This condition has the potential to improve learning motivation and the quality of interaction between teachers and students during the learning process.

The novelty of this community service program lies in the implementation of the SPPR model, comprising Socialization, Guided Practice, Mentoring, and Product Reflection. Unlike Wordwall training activities that generally focus on introducing the application, this model positions teachers as active participants who not only receive material but also practice, obtain feedback, improve their products, and reflect on their potential classroom application. This approach is relevant to the teacher digital competence framework, which positions teachers as designers of digital learning experiences rather than merely as application users [21], [25]. In addition, implementation at a rural Islamic elementary school provides a contextual contribution to the development of a digital literacy strengthening model that can be readily replicated in schools with limited resources.

The implications of the program were experienced not only by the participating teachers but also by the school as a whole. Improving teachers' ability to use technology has the potential to enhance the quality of learning, enrich the variety of teaching methods, and create a learning environment that is more adaptive to technological developments. In the long term, teachers' ability to independently develop learning media can support the establishment of a culture of innovation within the school and strengthen the readiness of educational institutions to address the challenges of twenty-first-century education.

Overall, the results show that the Wordwall-based digital literacy strengthening program had a positive effect on teachers' knowledge, skills, and confidence. The program also successfully encouraged a shift in instructional practices toward learning that is more interactive, innovative, and oriented toward the sustainable use of digital technology.

Implementation Challenges

Several challenges affected the training process. First, internet connection stability was inconsistent, meaning that some participants required more time to access templates and save Wordwall activities. Second, participants' initial abilities in using laptops and digital platforms varied considerably, requiring individualized mentoring. Third, the main activity was relatively brief, so not all teachers were able to immediately develop more complex media variations. These challenges were addressed through direct assistance, the use of simple template examples, and guidance that enabled participants to continue exploring the media independently after the activity.

Program Limitations and Follow-Up

This program was limited by the small number of participants, comprising only eight teachers, and its implementation at a single school; therefore, the results cannot be broadly generalized. The evaluation also focused primarily on improvements in teachers' competence after the

training and did not measure the long-term effects of Wordwall use on student learning outcomes. Accordingly, the recommended follow-up activities include monitoring the use of Wordwall over several classroom sessions, collecting examples of teachers' products, and evaluating students' responses to the media used. Further mentoring may focus on developing a digital question bank, creating variations of game-based learning templates, and integrating Wordwall with classroom formative assessment.

CONCLUSION

The community service program to strengthen teachers' digital literacy through socialization, training, and mentoring in the use of Wordwall-based learning media at MI Muhammadiyah Wonorejo was successfully implemented and had a positive effect on teachers' digital competence. The evaluation results showed that the average level of teachers' digital literacy competence increased from 35% to 80.5%, representing an increase of 45.5 percentage points. Improvements were observed in the understanding of digital literacy, the ability to operate Wordwall, the ability to create interactive learning media, and confidence in using technology during the learning process. In addition, most teachers were able to independently develop Wordwall-based learning media and had begun implementing them in learning and evaluation activities.

The novelty of the program lies in the implementation of the SPPR model, comprising Socialization, Guided Practice, Mentoring, and Product Reflection, which enabled participants to acquire not only conceptual understanding but also practical skills that could be applied directly. Nevertheless, the program was limited by the small number of participants, the limited duration of the training, and the absence of measurements of its effect on student learning outcomes. Future activities should therefore focus on monitoring the implementation of Wordwall in the classroom, developing a wider variety of media products, and evaluating students' responses so that the program's sustainability can be assessed more comprehensively.

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