Implementation of Micro Learning to Improve Digital Literacy among High School Students

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Abstract: Digital literacy has become an essential competency for secondary school students as they navigate the rapid flow of online information. Preliminary identification at SMA Negeri 67 Jakarta indicated that most students still demonstrated low levels of digital literacy, particularly in evaluating information and using learning applications effectively. This community service program implemented a micro-learning model as a structured, concise, and accessible instructional approach delivered through students' digital devices. The method consisted of needs analysis, micro-learning content development, training sessions, individual mentoring, and evaluation through pre- and post-tests and classroom observations. The results showed a substantial improvement in students' digital literacy, with average scores increasing from 55 to 78. The distribution of student scores also shifted positively, marked by a significant reduction in low-score categories and an increase in high-achievement groups. Beyond cognitive gains, the program enhanced student engagement, independence, and collaborative skills during learning activities. These findings indicate that micro-learning is an effective and contextually appropriate approach for strengthening digital literacy in secondary education, and it holds strong potential for further development as a sustainable digital learning strategy.

Keywords: Digital Literacy, Educational Intervention, Micro-Learning, Secondary Students, Technology-Enhanced Learning.

Introduction

The development of digital technology over the past decade has changed the learning patterns, communication methods, and information access processes of secondary school students. Digital literacy, which includes the ability to access, understand, evaluate, and produce digital information ethically, has become an increasingly important basic competency for students to navigate the fast-paced, often uncurated flow of information. Unfortunately, various national reports indicate that Indonesian teenagers' digital literacy remains at a moderate level (Amri et al., 2021; Darmawati, 2022; Rosyidah et al., 2025). A survey by Kominfo (2022) found that the digital literacy of Indonesia's younger generation reached only 3.54 on a scale of 5, with information and data literacy the weakest component. This condition illustrates the gap between the availability of technology and the ability to use it intelligently and responsibly (M et al., 2024; Tobing et al., 2023).

This picture is clearly seen in the initial findings at SMA Negeri 67 Jakarta, the location where this community service was carried out. This school, located in the Cipayung area of East Jakarta, has a pretty good learning environment: stable school internet access, computer laboratory facilities, and most students come from families with adequate access to digital devices. Of the 120 tenth-grade students, 93% have personal smartphones, 78% have internet access at home, and 67% admit to using their devices for more than four hours every day. However, the use of these devices is dominated by entertainment activities, such as social media and online games, rather than learning activities (Adnas, 2022; Purmadi et al., 2022). Initial interviews with teachers showed that around 60% of students still had difficulty understanding platform-based digital material, especially when it was long and not well

segmented. Teachers also reported that students often lost focus quickly when using long digital teaching materials.

This is where the micro learning approach becomes relevant. Micro learning is a learning strategy that presents content in small, focused, concise, easily accessible units that can be studied at any time via digital devices. Salleh et al. (2022) study shows that microlearning can increase attention to learning and facilitate the internalization of concepts through short-duration materials. The digital generation is more responsive to concise visual content such as 2-5 minute videos, infographics, and modular activities. In the Indonesian context, microlearning has been shown to improve students' digital literacy (Kurniawan et al., 2024), exceptionally when the material is packaged in an interactive format accessible on personal devices.

Based on these findings, the following community service issues were formulated:
1) students' low ability to utilize digital technology for practical learning activities;
2) students' lack of ability to identify the credibility of digital information; and
3) the suboptimal integration of micro learning strategies in learning at SMA Negeri 67 Jakarta. This community service activity seeks to address these issues through a micro-learning implementation model tailored to the characteristics and learning patterns of 10th-grade students at the school.

The objectives of this community service activity are:
1) To improve the digital literacy of students at SMA 67 Jakarta, particularly their ability to access, evaluate, and utilize digital information ethically and effectively;
2) To develop and implement micro learning content based on short videos, infographics, and digital activity sheets that are tailored to students' needs;
3) To strengthen teachers' capacity to integrate micro learning into regular learning activities; and
4) To develop an applicable, measurable, and replicable digital literacy mentoring model for other secondary schools.

With adequate infrastructure, progressive teacher support, and high student device ownership, SMA Negeri 67 Jakarta is a strategic environment for implementing the microlearning approach. This community service activity is expected not only to improve students' digital literacy scores but also to provide examples of good practices for using technology appropriately to optimize the learning process in secondary schools.

Method

This community service activity uses a community-based educational intervention approach that focuses on implementing microlearning to improve students' digital literacy at SMA Negeri 67 Jakarta. This approach was chosen because it allows students and teachers to be actively involved at all stages of the activity, from needs analysis and content development to evaluation of results.

The activity was carried out in four main stages, namely:
1) needs analysis;
2) micro learning content development;
3) training and mentoring; and
4) program evaluation.

Each stage was designed to align to improve students' digital literacy, particularly in terms of information access, information evaluation, the use of learning applications, and communication ethics in the digital space (Elga et al., 2022; Muchrom et al., 2025; Qur'ani & Anggraini, 2021).

The first stage is a needs analysis, conducted through questionnaires and brief interviews with 40 tenth-grade students and three accompanying teachers. The questionnaire instrument includes indicators of device ownership, length of daily device use, the types of applications most frequently used, experience with digital learning platforms, and difficulties encountered when accessing digital materials. The results of the needs analysis form the basis for developing micro-learning content that is relevant and appropriate to participants' characteristics.

The second stage was the preparation and development of micro-learning content. The content was packaged as 2-4-minute videos, infographics, and digital activity sheets accessible via QR codes. Each micro-learning unit contained only one learning objective, such as evaluating the credibility of information, understanding digital ethics, or utilizing simple learning applications. The content is then validated by two lecturers who are experts in digital literacy to ensure the suitability of the material, presentation flow, and level of difficulty.

The third stage is the implementation of training and mentoring. The activity is divided into two main sessions: a theory session and an independent practice session. In the theory session, students are introduced to the concept of digital literacy and how to use micro-learning content. In the practice session, students are asked to access each micro-learning unit through their personal devices and complete digital activity-based tasks. The accompanying teachers play a role in providing guidance, helping students who experience

technical difficulties, and recording the dynamics of learning. This approach allows students to learn gradually, independently, and in a focused manner, following the micro-learning flow.

The fourth stage is evaluating the program's success. The evaluation used a combination of quantitative and qualitative methods. Quantitatively, the improvement in students' digital literacy was measured through a pre-test and post-test consisting of 20 multiple-choice questions covering indicators of information access, credibility evaluation, use of digital platforms, and digital ethics. The data was analyzed by comparing the average scores before and after the intervention. Qualitatively, observations are made to see the level of student engagement, timeliness of task completion, ability to use links and QR codes, and ability to work independently or help friends. In addition, teacher and student perception questionnaires are used to assess the ease of use of the content, the attractiveness of the material, and the relevance of microlearning to their learning needs (Anjarwati et al., 2022; Intaniasari & Utami, 2022; Rizqiya & Setiani, 2024).

The success rate of the activity was determined through three leading indicators:

1) an increase in the average digital literacy score of at least 20 points from the pre-test to the post-test;
2) at least 80% of students were able to complete all micro-learning units without significant technical obstacles; and
3) teachers gave positive assessments of the suitability of micro-learning content as an additional learning strategy.

With these indicators, the program's achievements can be objectively measured and provide a comprehensive picture of microlearning's effectiveness in improving students' digital literacy. This evaluation program ensures that the results of the community service are not only descriptive but also systematically measurable.

Result and Discussion

This community service activity was designed to achieve three main objectives, namely:

1) to improve the digital literacy of students at SMA Negeri 67 Jakarta;
2) to introduce and implement micro learning as a learning strategy; and
3) to improve teachers' capacity to integrate micro learning into regular learning.

All activities were designed in stages through needs analysis, content development, training, mentoring, and evaluation based on tests and classroom observations.

Activity Implementation

The activities were carried out through a combination of theoretical and practical methods. Visual documentation shows the dynamics of the implementation process, which ran effectively.

Figure 1. Initial Explanation to Students

Figure 1 shows the initial stage of the activity, when the facilitator explains the material to students on the basic concepts of digital literacy and the flow of microlearning. At this stage, students are introduced to the activity's objectives, the microlearning unit's structure, and how to access the content on their devices. The classroom atmosphere was orderly; all students focused their attention on the projector screen displaying the introductory material (Lestari et al., 2024; Naimah et al., 2024; Rihlah et al., 2022). This initial explanation provided students with an important foundation for understanding the activity's context before entering the practical session. In addition, this session ensured that all participants had the same understanding of the competencies to be developed and the technical instructions to be followed during the activity.

Figure 2. Individual Assistance in Completing Digital Activities

Figure 2 shows the process of individual assistance provided by facilitators while students work on micro-learning-based digital activities. At this stage, some students still need technical guidance on accessing

links, scanning QR codes, or following activity instructions on their devices. Assistance is provided on a personal basis so that students clearly understand each step and do not encounter obstacles during the learning process. This kind of direct interaction helps boost students' confidence in using technology and ensures that all participants can follow the material at the same pace (Anggrasari, 2020; Awaliyah, 2019; Putri & Supriansyah, 2021; Rahmasiwi et al., 2023). The picture shows an active classroom dynamic, with the facilitator acting as a guiding mediator rather than just a provider of material, making the learning process more humanistic and responsive to students' needs.

Figure 3. Student Presentations after Completing the Micro Learning Unit

The third image illustrates the increase in student engagement. The courage to present their work in front of the class indicates a growth in conceptual understanding and confidence after participating in micro learning.

Improvement in Student Digital Literacy

To determine the effectiveness of microlearning implementation in improving students' digital literacy at SMA Negeri 67 Jakarta, pre- and post-test measures of ability were conducted before and after the intervention. The test instrument consisted of 20 questions covering four main aspects of digital literacy, namely access to information, evaluation of source credibility, use of learning applications, and digital ethics (Hendaryan et al., 2022; Kustini et al., 2021; Lubis, 2022; Wahyuni et al., 2022). Analysis of the test results provided a quantitative picture of students' ability development after participating in a series of activities. In addition, the distribution of student scores at both measurement stages was analyzed to see a more comprehensive shift in learning achievement.

Table 1. Pre-test and Post-test Scores per Digital Literacy Aspect

Digital Literacy Aspects	Pre-test Score (Average)	Post-test Score (Average)	Improvement (Δ)
Access and search for digital information	58	80	22
Evaluation of the credibility of information sources	52	77	25
Use of digital learning applications and platforms	56	79	23
Ethics in digital communication and interaction	54	75	21
Overall average	55	78	23

The results in Table 1 show consistent improvement across all tested aspects. The most significant improvement occurred in evaluating source credibility (+25), indicating a significant change in students' ability to distinguish valid information amid the prevalence of hoaxes and unreliable digital content. This shows that micro-learning materials focused on information verification have helped students develop a stronger understanding.

The aspect of learning application usage also increased significantly (+23), indicating that students are becoming more capable of operating digital platforms to access materials and complete assignments. This improvement is supported by the micro-learning format, which guides students step by step through easy-to-follow practical instructions.

On the other hand, the increase in digital ethics (+21) indicates that students increasingly understand appropriate behavior in digital communication, including the use of polite language, maintaining privacy, and avoiding the dissemination of risky content. Although the increase is smaller than in other aspects, these results still show the positive impact of the micro-learning model (Desi, 2020; N.K. Widiastini, 2021; Pentianasari et al., 2022; Soenandi et al., 2021).

In addition to the increase in average scores, changes in the distribution of scores were also analyzed to see shifts in student abilities across the population. This distribution analysis is important because it provides an overview of whether the improvement occurred evenly across all students or only among a small portion. The following table shows the number of students in each score range before and after the micro learning intervention.

Table 2. Distribution of Pre-test and Post-test Scores for Digital Literacy

Value Range	Number of Pre-test Students	Number of Post-test Students
< 50	12 students	1 students
50 – 59	18 students	5 students
60 – 69	7 students	12 students
70 – 79	3 students	14 students
≥ 80	0 students	8 students

Analysis of the score distribution in Table 2 shows a very significant change. In the pre-test, the majority of students were in the low category, with 30 students (75%) scoring below 60. This condition indicates that their initial digital literacy skills were inadequate.

However, after the micro learning intervention was implemented, the number of students in the low category dropped dramatically. Only one student remained in the <50 score category. Conversely, the number of students in the high-scoring category (≥80) increased from 0 to 8. This shift indicates that the improvement in skills did not only occur in a small number of students, but also extended to almost all participants.

The increase in the number of students in the 70–79 score range (from 3 to 14) indicates that many students achieved a good level of understanding after participating in microlearning. Meanwhile, the increase in the 60–69 category shows that students who were previously behind were able to catch up.

This shift in the score distribution shows that the micro-learning method has a strong equalizing effect, helping students with varying initial skill levels achieve significant improvement (Agrini & Agustin, 2022; Ahsani et al., 2021; Mardiana et al., 2022). Thus, this approach is not only practical for high-achieving students but also provides significant support for students who initially had low digital literacy.

To provide a visual illustration of the dynamics of the activity, the following is a documentation of the micro learning implementation process at SMA Negeri 67 Jakarta. These photos show how students and facilitators interacted during the activity and the changes in learning behavior that emerged after the intervention. This documentation provides a visual context for the quantitative findings presented, allowing readers to see how the micro-learning approach is applied in the classroom and the level of student participation during the mentoring process.

The results of the activity show that implementing microlearning has a significant positive impact on students' digital literacy at SMA Negeri 67 Jakarta. The increase in test scores from an average of 55 on the pre-test to 78 on the post-test is quantitative evidence that the micro-learning strategy improved students'

technical and cognitive abilities in accessing, evaluating, and using digital information. The learning model, with small, structured material units, made it easier for students to understand the concept of digital literacy without feeling burdened by the material's length or complexity.
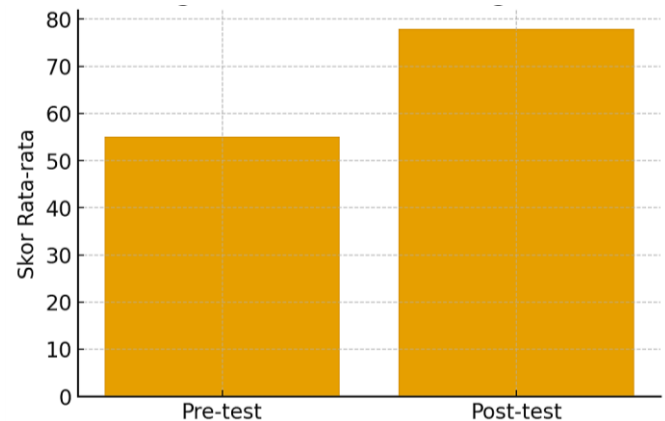
Figure 4. Graph Showing the Increase in Students' Digital Literacy

This aligns with Kurniawan et al. (2024) research, which found that microlearning is efficacious in improving information retention and student focus. Qualitatively, documentation during the activity showed increased student activity and engagement. Individual assistance in the early stages helped reduce technical barriers, especially for students unfamiliar with using QR codes or accessing digital content via links.

In the next stage, students were able to complete activities independently and even helped peers who were experiencing difficulties. This phenomenon shows that micro learning not only improves digital literacy but also fosters collaboration and independent learning (Naila et al., 2021; Winarni et al., 2021).

Discussion and presentation activities, as documented, reinforced learning outcomes by encouraging students to apply the information they gained through microlearning. Student presentations are an indicator of the development of critical thinking and communication skills. Thus, microlearning not only affects digital literacy but also non-cognitive aspects such as confidence, active participation, and the ability to express opinions.

Teacher support is a determining factor in the program's success. Teachers assess that microlearning can serve as an alternative learning strategy that aligns with students' characteristics, particularly because its concise, visual content is easy to integrate into regular learning. Teachers also stated that this model helps shift the use of gadgets from entertainment to productive learning. Teachers' positive perceptions indicate that the

program's sustainability offers significant opportunities for further development, for example, by enabling teachers to produce microlearning content for specific subjects. However, this activity still has several limitations. The internet's instability in schools at certain times disrupted access to content.

In addition, some students did not have sufficient internet quota to download materials when they were outside of school (Nampoothiri et al., 2024; Nikolic et al., 2024). These obstacles indicate the need for mitigation strategies, such as providing school hotspots or distributing content offline. However, these obstacles did not diminish the program's overall effectiveness, as test scores and student engagement continued to show substantial gains.

Conclusion

Community service activities through microlearning at SMA Negeri 67 Jakarta demonstrate that this approach is efficacious in improving students' overall digital literacy. The average score increased from 55 to 78 across all aspects of digital literacy, indicating that microlearning can strengthen students' abilities to access information, evaluate the credibility of sources, use learning applications, and understand digital ethics. In addition to cognitive impacts, this activity increased student engagement, confidence, and their ability to collaborate in the learning process. The main advantage of this program lies in the concise, engaging, and easily accessible packaging of its material, which aligns with the characteristics of the digital generation, thus bridging the gap between the availability of technological devices and their optimal use. However, this program still has several weaknesses, such as dependence on internet access and variations in students' initial technical abilities, which require more intensive assistance in the early stages. However, these weaknesses can be overcome through technical adjustments and support for school facilities. The success of this activity opens up opportunities for further development, either through the integration of micro learning into the school curriculum, the creation of digital content by teachers independently, or the replication of the program in other schools to expand the impact of strengthening digital literacy in secondary education. Thus, this activity not only provides short-term benefits but also has the potential to become a model for sustainable digital learning in the modern education era.

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