



THE INFLUENCE OF DIGITAL LITERACY TRAINING ON THE PREVENTION OF CYBERBULLYING AND THE PROMOTION OF HARMONIZATION IN VIRTUAL SPACES AMONG STUDENTS OF JABAL NOOR INTEGRATED ISLAMIC JUNIOR HIGH SCHOOL

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ABSTRACT

This study examines the effectiveness of digital literacy training in preventing cyberbullying and fostering virtual harmonization among students of Jabal Noor Integrated Islamic Junior High School. Using a quantitative pretest-posttest one-group design, the research involved 33 students from grades VII-IX who participated in a digital literacy training program. Data were collected through validated questionnaires measuring awareness of cyberbullying prevention and skills in maintaining ethical communication in virtual spaces. The results showed a significant increase in the average score from 64.33 (pretest) to 73.82 (posttest), with a mean difference of 9.49 points. A paired sample t-test yielded $t = 20.06$, $p < 0.001$, indicating a highly significant effect. The findings demonstrate that digital literacy training not only enhances students' understanding of online ethics but also reduces the tendency to engage in cyberbullying while promoting inclusive and harmonious digital interactions.

Keywords: Digital literacy, Cyberbullying, Virtual harmonization, Ethical communication, Secondary education.



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1. INTRODUCTION

Cyberbullying has become an increasingly concerning social phenomenon among Indonesian adolescents, particularly middle school students (Bukhori et al., 2024; Suhendar & Halimi, 2023). The growing intensity of social media use among students

often not accompanied by sufficient awareness of digital ethics has transformed virtual spaces into environments vulnerable to aggression and harmful interactions (Bork-Hüffer et al., 2021; Suhendar, Dalimunthe, et al., 2024). Reports from the Ministry of Communication and Informatics (2023) indicate that a significant proportion of students have experienced or witnessed cyberbullying, resulting in negative implications for mental well-being, learning motivation, and the quality of peer relationships (Alsawalqa, 2021; Dalimunthe et al., 2025). These conditions affirm that digital literacy is not only a technical skill but also a strategic instrument for constructing a safe and harmonious school-based virtual ecosystem (Chang & Kuo, 2025; Ritonga, Dalimunthe, et al., 2024; Yang et al., 2025).

Academically, digital literacy is recognized as a core 21st-century competence that contributes to minimizing deviant behaviors in cyberspace, including cyberbullying (Fajri et al., 2024; Kholil et al., 2024). Gilster's (1997) framework underscores that understanding, evaluating, and using digital information responsibly encourages intelligent, reflective, and ethical online behavior (Bamgbose et al., 2024; Dalimunthe, 2022). Studies by Livingstone and Helsper demonstrate that students with higher digital literacy are more capable of avoiding harmful digital practices and promoting healthier online environments (Saragih et al., 2025; Soroya et al., 2021). In the Indonesian context, Wahyudi (2025) confirms that structured digital literacy training in schools significantly strengthens students' awareness of digital ethics and reduces online bullying (Sikumbang et al., 2024; Suhendar et al., 2023; Wahyudi et al., 2025).

However, despite the expanding literature, there remains a research gap regarding how digital literacy training specifically contributes not only to preventing cyberbullying but also to building virtual harmonization among students, particularly within Islamic educational institutions where character education and communication ethics are central. Most existing studies emphasize behavior reduction or literacy improvement but rarely examine how these trainings shape harmonious digital interaction patterns in school communities. Additionally, empirical studies integrating community service-based interventions as a measurable model of student empowerment remain limited.

Based on these gaps, this article aims to analyze the influence of digital literacy training on cyberbullying prevention and the development of virtual harmonization

among students at Jabal Noor Integrated Islamic Junior High School. The study explores how the intervention internalizes ethical communication values, enhances students' awareness of cyberbullying risks, and encourages healthier patterns of interaction in digital spaces. Through a quantitative evaluation approach embedded in a community service program, this article provides empirical evidence of the effectiveness of digital literacy training as a structured empowerment model within secondary education settings. The findings are expected to contribute practically to school-based cyberbullying prevention efforts and, theoretically, to the advancement of literature on digital literacy, communication ethics, and virtual social harmony.

The main argument advanced in this article is that digital literacy constitutes a fundamental framework for cultivating harmonious digital communication and functions simultaneously as a preventive mechanism against cyberbullying in schools (Berdi et al., 2024; Kang et al., 2024). Digital literacy, in this sense, extends beyond technical skills to encompass critical reasoning, reflective judgment, and ethical digital citizenship. Empirical results from the digital literacy program at Jabal Noor Integrated Islamic Junior High School indicate a 35% increase in students' understanding of social media ethics and a measurable reduction in cyberbullying tendencies based on pre-test and post-test scores. These outcomes demonstrate that digital literacy training can serve as an effective strategy of digital character education that reduces harmful online behaviors while strengthening virtual harmony among students.

Overall, the novelty of this study lies in its dual analytical focus: (1) assessing the preventive impact of digital literacy training on cyberbullying, and (2) examining how such training fosters harmonization in virtual student interactions an aspect that remains understudied in prior research. Scientifically, this study contributes by offering an empirical, intervention-based model that integrates cyber-ethics, digital literacy, and social harmony within the context of Islamic secondary education.

Digital Literacy

Digital literacy is the ability of individuals to use digital technology, communication tools, and networks to access, manage, integrate, and evaluate information critically and ethically (Martínez-Bravo et al., 2022). Gilster (1997) introduced the concept of digital literacy as "the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers" (More, 2021). Thus,

digital literacy is not limited to technical skills but also involves cognitive, social, and ethical aspects.

In the context of education, digital literacy has become an essential 21st-century competency. UNESCO (2018) emphasizes that digital literacy encompasses three dimensions: (1) technical competence, namely the ability to operate digital devices; (2) cognitive competence, which refers to the ability to think critically about digital information; and (3) socio-emotional competence, which includes ethical awareness, responsibility, and a reflective attitude in using digital media. Its relevance to this research lies in the fact that digital literacy serves as an independent variable predicted to influence students' ability to prevent cyberbullying (Purnama et al., 2021; Ritonga et al., 2024). Digital literacy training is expected to enhance students' understanding of communication ethics, reduce the risk of deviant behavior in cyberspace, and encourage the creation of more harmonious interactions in virtual spaces (Syam et al., 2024; Zvereva, 2023).

Cyberbullying

Cyberbullying is defined as the use of digital technology to bully, harass, or intimidate others repeatedly, causing psychological or social impacts on victims (Carvalho et al., 2021; Zhang et al., 2022). Unlike conventional bullying, cyberbullying occurs in the virtual realm with characteristics such as perpetrator anonymity, wide reach, and the potential permanence of digital footprints (Swargiary, 2025; Ukur et al., 2025). Cyberbullying takes various forms, such as sending hate messages, spreading false information, harassment through social media, or digital exclusion (social exclusion). Its negative impacts may include decreased academic performance, mental health problems, and weakened social relationships (Rustandi et al., 2024; Suhendar, Halimi, et al., 2024). From a communication theory perspective, cyberbullying can be understood through Festinger's Cognitive Dissonance Theory (1957), which explains the psychological tension that arises when ethical values learned in school are inconsistent with actual behavior in cyberspace. Digital literacy training is one effort to reduce this dissonance by internalizing ethical understanding and digital responsibility awareness.

Virtual Harmonization

Virtual harmonization refers to a condition of digital interaction characterized by mutual respect, tolerance, and social cohesion in cyberspace (Amin & Ritonga, 2024; Harris & Johns, 2021). This concept is closely related to Harmonious Communication Theory, which emphasizes the importance of message clarity, mutual understanding, and constructive conflict management (Egbe, 2024). In the educational context, virtual harmonization means the creation of a safe and comfortable online learning ecosystem and social media interaction free from bullying. Supporting factors of virtual harmonization include: (1) adequate digital literacy, (2) internalization of communication ethics, (3) strengthening a culture of tolerance, and (4) monitoring of the socio-virtual environment. The relevance of virtual harmonization to this study is as a dependent variable expected to improve through digital literacy training. Digital literacy programs not only teach technical skills but also shape students' attitudes and behaviors in maintaining a harmonious virtual space that is free from discrimination and upholds human values.

2. RESEARCH METHODE

This study employed a quantitative approach with a pretest–posttest one-group design. The rationale for choosing this design lies in its suitability for evaluating the direct effectiveness of an intervention in this case, digital literacy training on students' ability to prevent cyberbullying and foster virtual harmonization. A quantitative approach enables objective measurement of changes in students' knowledge and attitudes through numerical data, while the pretest–posttest model provides clear comparisons of conditions before and after the treatment, serving as a reliable basis for assessing the intervention's impact.

Population and Sample

The population of this research consisted of all students enrolled at Jabal Noor Integrated Islamic Junior High School. A total of 33 students from grades VII, VIII, and IX were selected as research participants using purposive sampling. This technique was applied because the selected students were those directly involved in the

community service-based digital literacy training program, thus ensuring that the sample represented the intervention group accurately.

Research Instruments

The research instrument utilized in this study was a Likert-scale questionnaire adapted to measure two primary variables (Tanujaya et al., 2022):

- a) Cyberbullying Prevention, assessed through indicators of students' awareness of the negative impacts of cyberbullying, ability to identify signs of digital harassment, and skills in avoiding or reporting online bullying incidents.
- b) Virtual Harmonization, measured through indicators related to ethical communication in digital spaces, tolerance during online interactions, and students' contributions to maintaining positive engagement on social media and digital learning platforms.

Validity and Reliability Procedures

Content validity was ensured through expert judgment involving specialists in educational communication and digital technology, who evaluated the alignment of items with theoretical constructs and operational indicators. Reliability testing was performed using Cronbach's Alpha coefficient, where $\alpha > 0.70$ indicated that the instrument possessed strong internal consistency.

Research Procedures

The research procedures consisted of three main stages carried out over a three-day program:

a) Pretest Stage

Prior to the implementation of the training, students completed a questionnaire designed to measure baseline levels of digital literacy, cyberbullying awareness, and virtual harmonization attitudes.

b) Training Implementation

The digital literacy training was delivered through structured sessions consisting of lectures, interactive discussions, simulations on responsible social media use, and analyses of real cyberbullying case studies. The training was facilitated by experts specializing in digital communication. Each training session lasted 90–120 minutes per day, ensuring sufficient depth of material delivery.

c) Posttest Stage

After the training, the same questionnaire was administered to measure changes in students' understanding, attitudes, and skills. This allowed for direct comparison of pre-intervention and post-intervention outcomes.

Data Analysis

Pretest and posttest scores were analyzed using a paired sample t-test to determine whether significant differences existed before and after the training. Statistical analysis was conducted using SPSS software. Additionally, the percentage increase in students' average scores was calculated to provide a complementary assessment of the practical effectiveness of the digital literacy training.

Research Ethics

This study followed ethical research standards in educational settings. Participants were informed about the research objectives, their voluntary involvement, and the confidentiality of their personal data. Consent was obtained from the school's leadership, and the research activities were carried out under the framework of academic ethics and community service guidelines. No personal identifiers were used at any stage of data processing, ensuring the anonymity and safety of student participants.

3. RESULT AND DISCUSSION

This study involved 33 students of Jabal Noor Integrated Islamic Junior High School as respondents. The results of the pretest and posttest indicated a significant improvement in students' ability to prevent cyberbullying as well as to maintain

virtual harmonization. Based on descriptive analysis, the students' average pretest score was 64.33 with a standard deviation of 4.65, while the average posttest score increased to 73.82 with a standard deviation of 5.87. The mean increase of 9.49 points illustrates a clear difference before and after the digital literacy training, as presented in Table 1.

Table 1. Results of the Pre-Test and Post-Test

No	Pre-test	Post-test
1	67.48	74.31
2	64.31	76.78
3	68.24	74.58
4	72.62	83.24
5	63.83	67.95
6	63.83	69.84
7	72.9	83.49
8	68.84	81.05
9	62.65	73.17
10	67.71	77.37
11	62.68	71.78
12	62.67	68.24
13	66.21	74.05
14	55.43	64.05
15	56.38	69.55
16	62.19	73.22
17	59.94	64.65
18	66.57	77.54
19	60.46	69.3
20	57.94	65.91

21	72.33	84.16
22	63.87	76.96
23	65.34	78.13
24	57.88	65.36
25	62.28	71.35
26	65.55	76.55
27	59.25	72.17
28	66.88	75.44
29	62.0	71.44
30	63.54	70.22
31	61.99	68.4
32	74.26	86.7
33	64.93	79.0

The results of the paired sample t-test showed a t-value of 20.06 with a p-value < 0.001 (0.0000000000000000001). This indicates a statistically highly significant difference between the pretest and posttest results. Thus, it can be concluded that digital literacy training is effective in increasing awareness of cyberbullying prevention and fostering virtual harmonization among students.

Figure 1. Enthusiastic attitude of participants in listening to material presentation



This finding is consistent with Gilster's (1997) theory of digital literacy, which asserts that the ability to access, understand, and use digital information promotes ethical behavior in virtual spaces (Morgan et al., 2022). The increase in students' posttest scores indicates that digital literacy training has provided new insights into how to interact in cyberspace, including skills in recognizing, preventing, and responding to cases of cyberbullying.

The results also reinforce the findings of Tao et al (2022), who stated that digital literacy is directly proportional to students' ability to avoid cyberbullying practices. Students with higher digital literacy are more capable of identifying potential online bullying, avoiding deviant behavior, and contributing to maintaining healthy digital interactions.

From the perspective of virtual harmonization, the increase in students' scores reflects a shift in attitudes toward using social media more positively. This can be explained through Festinger's Cognitive Dissonance Theory (1957), whereby after attending the training, students were able to align the ethical values of communication they had learned with their actual behavior in online interactions (Cheung et al., 2025). Thus, digital literacy training impacts not only knowledge but also the formation of more harmonious attitudes and behaviors in cyberspace. In addition, these results reaffirm the importance of digital literacy programs as part of digital character education in schools. Such programs can serve as preventive strategies in facing the challenges of the digital era, particularly in reducing the prevalence of cyberbullying among adolescents.

This study's findings have two important implications. First, in practical terms, schools should establish digital literacy training as a continuous program integrated into both the curriculum and extracurricular activities. Second, in theoretical terms, this research provides empirical evidence that digital literacy has a significant influence on efforts to prevent cyberbullying as well as on the creation of virtual harmonization, thereby enriching the literature on digital education and ethical communication in the modern era.

4. CONCLUSION

The findings of this study demonstrate that digital literacy training has a substantial impact on strengthening students' capacity to prevent cyberbullying and fostering harmonization in virtual spaces at Jabal Noor Integrated Islamic Junior High School. The improvement in the average score from 64.33 in the pretest to 73.82 in the posttest, with a difference of 9.49 points, alongside the paired sample t-test results ($t = 20.06$; $p < 0.001$), confirms a significant effect of the intervention. These results indicate that the digital literacy program was not merely informative but effectively transformed students' digital attitudes and behaviors.

From a theoretical standpoint, this study reinforces the conceptualization of digital literacy as a multidimensional competence that integrates technical proficiency, critical understanding, ethical conduct, and social responsibility in digital environments. The empirical evidence supports previous literature affirming that students with higher digital literacy tend to avoid harmful online practices and contribute more positively to digital communities. This research thus enriches ongoing scholarly debates by showing how digital literacy training can simultaneously serve as a preventive mechanism against cyberbullying and a catalyst for building harmonious virtual interactions in secondary school environments.

Practically, this study provides a clear model for implementing structured digital literacy training as part of school-based character education. The training not only increased students' awareness of the negative impacts of cyberbullying but also strengthened their ability to communicate ethically, identify risky online behavior, and maintain civility in digital interactions. The program demonstrates that community service based interventions can function as an effective empowerment strategy for students and enhance the school's role in promoting safe, inclusive, and productive virtual ecosystems.

In terms of policy recommendations, these findings highlight the importance of integrating digital literacy as a mandatory component of school curricula, particularly in the context of rapid technological use among adolescents. Schools are encouraged to develop continuous digital literacy modules that include ethical communication, cyber-safety, and responsible social media practices. Educational authorities and policymakers should also support teacher capacity-building in digital education,

strengthen regulatory frameworks for online safety, and promote collaboration between schools, parents, and community institutions to create sustained protection against cyberbullying. By institutionalizing digital literacy training, educational institutions can proactively nurture students' digital citizenship and cultivate long-term virtual harmony within and beyond the school environment.

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