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Microlearning Videos to Foster Cyberbullying Understanding and Digital Empathy in Vocational Education: A Mixed-Methods Study

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ABSTRACT

The rapid advancement of digital technology has transformed students' learning behavior and online interaction, increasing the risk of cyberbullying among adolescents. This study analyzed vocational high school students' understanding of the forms of cyberbullying through microlearning-based educational videos. A mixed-method sequential explanatory design was employed, integrating quantitative (one-group pretest–posttest) and qualitative (semi-structured interviews) approaches. Participants included 35 tenth-grade students from a vocational high school in Surakarta. Quantitative data were analyzed using inferential statistics and Normalized Gain (N-Gain), and qualitative data were analyzed thematically. The results showed a significant difference between pretest and posttest scores ($p = 0.010$; $t = -2.722$; $df = 34$), with an N-Gain of 0.0804, categorized as low. A per-aspect analysis further indicated improvements across most cyberbullying aspects, particularly harassment, cyberstalking, flaming, and elimination, while impersonation remained relatively stable. Qualitative findings revealed that students were able to translate, interpret, and apply concepts related to cyberbullying after watching the videos, indicating improved comprehension and ethical awareness. The study concludes that microlearning-based educational videos contributed to measurable yet modest improvements in conceptual understanding and digital empathy among vocational students. The novelty of this research lies in combining microlearning principles with video-based media to strengthen cyberbullying awareness and digital ethics education in vocational learning contexts.

Keywords
Cyberbullying
Educational Video
Microlearning
Student Understanding
Vocational Education

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Introduction

The advancement of digital technology has transformed the way students learn, communicate, and interact. In Indonesia, adolescents constitute one of the largest groups of internet users, accounting for 80.66% of the population (229 million) connected online in 2025. The increasing accessibility of digital media provides opportunities for flexible learning but also presents new challenges related to online ethics and behavior. One of the most concerning phenomena emerging from this digital interaction is cyberbullying, which refers to intentional and repeated acts of harassment, humiliation, or intimidation conducted through digital platforms [1].

Reports from the Indonesian Child Protection Commission show that cases of cyberbullying and online harassment among students continue to rise, with more than 2.000 incidents reported in 2024. These incidents have severe emotional, psychological, and academic consequences for victims, such as stress, anxiety, and decreased motivation to learn [2]. In vocational education, students are among the most active users of digital devices and social media. However, the learning process in vocational schools tends to emphasize technical competencies, while aspects of digital ethics and responsible online behavior often receive limited attention [3]. This condition creates a critical gap; students are digitally skilled but ethically unprepared to navigate online interactions responsibly. Although digital literacy initiatives exist, few integrate structured instructional models that explicitly address ethical digital conduct. Therefore, there is a growing need for educational strategies that combine technology-oriented learning with ethical awareness.

Cyberbullying can manifest in various forms, including impersonation, cyberstalking and harassment, flaming, and elimination [4]. These behaviors are not only harmful but often misunderstood by students, who may not fully realize that their online actions constitute bullying. Prior studies have addressed cyberbullying prevention through campaigns, counseling, and awareness programs [5], yet most remain non-instructional and lack integration within classroom learning.

In contrast, microlearning offers an alternative that aligns with the learning styles of Generation Z. It delivers content in short, focused segments that support better engagement and cognitive retention [6]. When implemented through educational videos, microlearning provides a visually rich and time-efficient medium for students to grasp ethical and behavioral

concepts [7]. Research has shown that such approaches can increase learners' attention, comprehension, and motivation [8]. Despite these findings, research specifically focusing on microlearning for improving students' understanding of cyberbullying in vocational education is still limited. Vocational students' exposure to technology is high, but their conceptual grasp of digital ethics remains weak. Thus, the present study addresses this pedagogical gap by applying microlearning-based educational videos to help students recognize and understand various forms of cyberbullying in a structured, engaging way.

The present study aims to analyze the effect of microlearning-based educational videos on vocational students' understanding of various forms of cyberbullying, to describe how students comprehend these forms after engaging with the videos, and to evaluate the overall effectiveness of the microlearning approach in enhancing their conceptual understanding of cyberbullying. Through this design, the research seeks to provide both quantitative and qualitative insights into how microlearning can support digital ethics education in vocational contexts. The findings of this study provide both theoretical and practical contributions. Theoretically, this study enriches research on digital ethics education and microlearning implementation in vocational contexts by offering empirical evidence of its effectiveness in improving conceptual understanding. In practice, it provides teachers with a practical learning model that integrates microlearning videos into classroom instruction to promote ethical awareness and prevent cyberbullying.

The novelty of this research lies in the integration of microlearning and educational video design to enhance vocational students' understanding of cyberbullying. This approach has been rarely addressed in previous Indonesian studies. This study thus contributes to the advancement of digital ethics pedagogy by proposing a structured, technology-supported model for cultivating responsible digital behavior among students in vocational education.

Material and Methods

A. Research Design and Approach

This research applied a mixed-method sequential explanatory design, integrating quantitative and qualitative approaches to obtain both measurable and contextual insights. The quantitative phase used a one-group pretest–posttest design, where students' understanding of cyberbullying was measured before and after the learning intervention using microlearning-based educational videos. The qualitative phase was followed to explore students' perceptions and experiences during and after the learning process through semi-structured interviews. This design was chosen to measure not only the improvement in students' conceptual understanding but also the underlying factors influencing their learning experience within the context of digital ethics education.

B. Participants

The population in this study consisted of 72 tenth-grade students at a vocational high school in Surakarta, Central Java. The quantitative sample included 35 students (23 male and 12 female, aged 15–17 years), selected using simple random sampling to ensure equal representation. This number met the minimum requirement for parametric statistical testing (n > 30). The pretest scores were used to classify students into three categories of understanding (low, medium, and high) based on the mean and standard deviation of the pretest results. The selected informants consisted of five male and five female students to ensure gender balance. The selection aimed to capture variation in students' initial levels of understanding and to obtain more in-depth qualitative insights into their conceptual development following the intervention. A detailed description of the interview participants is presented in Table 1.

Table 1. Description of Interview Participants

No.	Participant Code	Gender	Age	Category of Understanding
1.	INF01	Female	17	Medium
2.	INF02	Male	16	High
3.	INF03	Female	16	Medium
4.	INF04	Male	16	High
5.	INF05	Female	16	Medium
6.	INF06	Female	15	Low
7.	INF07	Male	16	Medium
8.	INF08	Female	16	High
9.	INF09	Male	15	High
10.	INF10	Male	16	Low

Source: Primary Data, 2025

C. Research Instruments

Two main instruments were used in this study:

1. Questionnaire (Cyberbullying Understanding Test)

   The questionnaire consisted of 20 Likert-scale items (4-point scale: strongly disagree–strongly agree) measuring students' understanding of cyberbullying across four aspects: impersonation, cyberstalking and harassment, flaming, and elimination. Each aspect was developed from the indicators of cyberbullying understanding, adapted from [9]. The instrument was validated using the Pearson Product-Moment method, with all items showing r-count > r-table—the reliability test using Cronbach's Alpha.

2. Semi-Structured Interview Guide

   The semi-structured interview guide consisted of open-ended questions aligned with the study's objective of analyzing students' understanding of cyberbullying. The questions were structured based on Bloom's taxonomy levels. Translation questions focused on defining and restating forms of cyberbullying. Interpretation questions explored students'

ability to relate concepts to real-life online situations. Extrapolation questions examined students' reflective attitudes and behavioral considerations after the intervention. This structure ensured alignment between qualitative data collection and the conceptual framework of understanding.

D. Research Procedures

The overall research procedure is summarized in Fig. 1. The study consisted of five main stages: pretest administration, microlearning video intervention, discussions, posttest administration, and semi-structured interviews with selected participants.

Each of the six microlearning videos focused on a general introduction to cyberbullying and specific forms of cyberbullying, impersonation (including outing, trickery, and denigration), flaming, harassment, cyberstalking, and elimination. Each video lasted approximately 1–3 minutes and was designed using a microlearning approach emphasizing concise explanations and contextual examples. After viewing each video, students participated in a guided discussion lasting 10–15 minutes to reinforce conceptual understanding. The discussions encouraged students to identify real-life examples and ethical awareness reinforcement. As the discussions were not formally recorded, reflective insights are presented in the qualitative findings section based on semi-structured interview data.

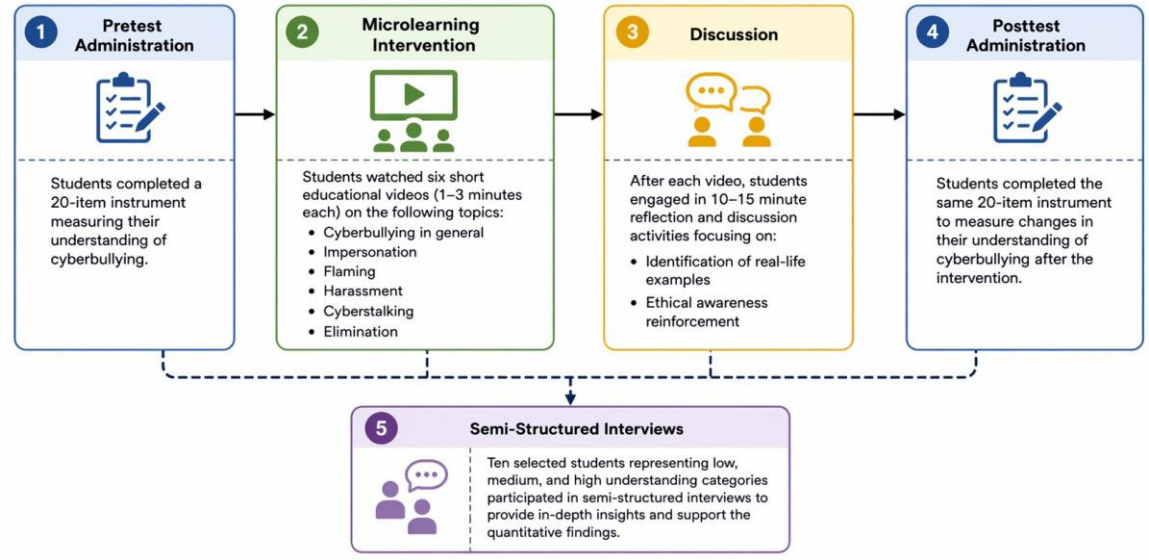


Fig. 1. Microlearning Intervention Procedure

E. Data Preprocessing

Before data analysis, both quantitative and qualitative data underwent preprocessing to ensure validity and accuracy:

1. Quantitative Data

Pretest and posttest scores were screened for completeness and consistency. Data was coded in Microsoft Excel and exported to SPSS version 26. Missing values and outliers were

removed. Data normality was verified using the Shapiro–Wilk test, and data were then prepared for inferential analysis (paired sample *t*-test and N-Gain).

2. Qualitative Data

Audio recordings from interviews were transcribed verbatim and anonymized. Transcripts were organized using thematic codes and processed through the Miles et al. [10] interactive model, which includes data condensation, data display, and conclusion drawing or verification.

F. Data Processing and Analysis

Quantitative and qualitative data were analyzed separately and then integrated during the interpretation phase.

1. Quantitative Analysis

Descriptive statistics (mean, minimum, maximum, standard deviation) were computed to describe data distribution. Before inferential testing, prerequisite assumption tests were conducted. The Shapiro–Wilk test was used to examine the normality of pretest and posttest scores, as it is appropriate for small sample sizes ($n < 50$). The results indicated significance values greater than 0.05, confirming that the data were normally distributed.

Therefore, a Paired Sample t-test was employed to examine the significance of differences between pretest and posttest scores, with $p < 0.05$ indicating statistical significance. In addition, the Normalized Gain (N-Gain) was calculated to measure the level of improvement. The gain scores were categorized as high ($g > 0.70$), medium ($0.30 \leq g < 0.70$), or low ($g < 0.30$) based on Hake [11].

2. Qualitative Analysis

Conducted using an iterative coding process to identify emerging patterns in students' conceptual understanding and engagement with microlearning videos. Thematic categories were developed to explain the reasons behind score improvements and perceptions of learning effectiveness. The analysis focused on recurring themes related to translation, interpretation, and extrapolation as dimensions of conceptual understanding. Data credibility was strengthened through repeated review of interview transcripts and comparison across participant responses.

G. Ethical Considerations

The study received formal approval from the Department of Informatics Education, Universitas Sebelas Maret, and the participating vocational school. Informed consent was obtained from all participants, and participation was voluntary. All data were anonymized, kept confidential, and used solely for academic purposes. Participation or withdrawal did not affect students' grades or school assessments.

Results and Discussions

A. Quantitative Results

To provide a more detailed interpretation of students' understanding, the Cyberbullying Understanding Test was further analyzed per aspect. The comparison between pre-test and post-test conditions is presented in Table 2.

Table 2. Comparison of Cyberbullying Understanding Scores Aspect

Aspect	Pretest (Min-Max)	Pre Mean	Post (Min-Max)	Posttest Mean
Impersonation	1-4	2.69	1-4	2.66
Harassment	1-4	3.59	3-4	3.70
Cyberstalking	2-4	3.49	1-4	3.65
Flaming	1-4	3.29	1-4	3.46
Elimination	2-4	3.39	2-4	3.56

Source: Primary Data, 2025

As shown in Table 2, most aspects demonstrated an increase in mean scores after the intervention. Harassment increased from 3.59 to 3.70, cyberstalking from 3.49 to 3.65, flaming from 3.29 to 3.46, and elimination from 3.39 to 3.56. The Impersonation aspect remained relatively stable. The minimum–maximum ranges indicate that score distributions remained within the same scale boundaries, suggesting consistent understanding levels across participants. This per-aspect analysis provides a more nuanced interpretation of the intervention's impact beyond overall mean differences.

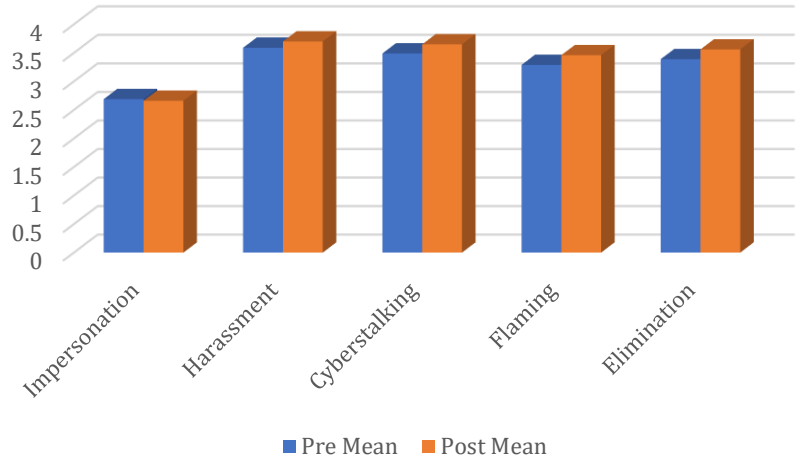


Fig. 2. Comparison of Pre-test and Post-test Mean Scores per Aspect

As illustrated in Fig. 2, most aspects demonstrated an increase in mean scores following the intervention. Improvements were observed in harassment, cyberstalking, flaming, and elimination. The impersonation aspect showed a relatively stable pattern. These findings indicate that microlearning-based educational videos contributed to enhanced understanding across most aspects of cyberbullying.

The study analyzed students' understanding of cyberbullying forms before and after learning through educational videos using the microlearning method. Quantitative results indicated an improvement in students' understanding levels after the intervention. The average pretest score was 58, with a minimum score of 49 and a maximum of 72, while the posttest average increased to 60 with the same score range. Although the increase was modest, it demonstrated a positive trend in comprehension.

Table 3. Descriptive Statistics of Students' Understanding Scores

Data	N	Mean	Minimum	Maximum	Std. Deviation
Pretest	35	58	49	72	6
Posttest	35	60	51	72	6

Source: Primary Data, 2025

The normality test was conducted using the Shapiro–Wilk test to determine whether the data were normally distributed before performing the Paired Sample t-Test. Based on Table X, the significance values for the pretest (0.158) and posttest (0.229) were both greater than 0.05. Therefore, it can be concluded that the data were normally distributed and met the assumption required for parametric testing. Since the normality assumption was satisfied, the use of parametric analysis, specifically the Paired Sample t-test, was statistically appropriate to examine the mean differences between pretest and posttest scores. No violation of statistical assumptions was identified; therefore, no non-parametric alternative analysis was required.

Table 4. Normality Test

Data	Significance α = 5%		Description
	Value	Condition	
Pretest	0.158	Sig > 0.05	Normal
Posttest	0.229	Sig > 0.05	Normal

Source: Primary Data, 2025

The Paired Sample T-Test was applied to examine the difference between students' pretest and posttest scores after learning with microlearning-based educational videos. The analysis yielded a t-value of -2.722 with df = 34 and a significance value of 0.010 ($p < 0.05$), indicating that there was a significant difference between the two mean scores. This result confirms that the implementation of microlearning videos had a statistically significant effect on improving students' understanding of cyberbullying forms.

Table 5. Paired Sample T-Test

Data	df	Significance	Level of Significance	Description
Pretest & Posttest	34	0.010	-2.722	Significant Difference

Source: Primary Data, 2025

The N-Gain test was used to measure the level of improvement in students' understanding after the intervention. The calculation produced an N-Gain score of 0.0804, which falls into the

low category. This means that the microlearning intervention led to a meaningful, though not high, increase in students' comprehension levels. Pedagogically, this result suggests that short, visual, and focused learning materials can contribute to measurable yet modest improvements in conceptual understanding within a limited learning duration.

Table 6. N-Gain Score

Statistic	N	Minimum	Maximum	Mean	Std. Deviation
N-Gain Score	35	-0.43	0.45	0.0804	0.21376
N-Gain Persen	35	-42.86	44.83	8.0402	21.37602

Source: Primary Data, 2025

The statistical results indicate that the use of microlearning videos had a significant positive effect on students' understanding of cyberbullying. The low N-Gain suggests that while the increase was not significant, the learning intervention successfully improved comprehension within a short exposure. Pedagogically, this shows that microlearning's short, visual, and focused segments help learners absorb key concepts efficiently but still require reinforcement for deeper comprehension.

B. Qualitative Results

To further support the quantitative findings, qualitative data were obtained through interviews with ten students from different levels of initial understanding (low, medium, and high). Data analysis using the Miles, Huberman, and Saldana model generated three major themes based on Bloom's understanding taxonomy: translation, interpretation, and extrapolation.

1. Translation (Restating Knowledge)

   Students were able to restate and explain the meaning of cyberbullying in their own words after watching the video. They identified several forms such as impersonation, flaming, harassment, cyberstalking, and elimination. For example, students mentioned that "impersonation is like pretending to be someone else to humiliate them," and "flaming is a rude argument in the comments section." This indicates that the translation aspect was achieved: students were able to recall and rephrase the conceptual definition correctly. They also reported that the short length and visual nature of the video made it easier to focus and remember, for example, "it was easier to remember because the images were clear and not too long." These findings support the idea that microlearning facilitates initial cognitive understanding by simplifying complex ideas through visual learning [6], [12], [13].

2. Interpretation (Explaining and Connecting Meaning)

   At this level, students were able to interpret and relate the concept of cyberbullying to real-world online situations. Some reported realizing that behaviors like teasing or sharing

personal content also constitute cyberbullying. One participant said, “Rude comments can embarrass people, but it turns out that’s bullying too.” Another said, “I used to see people being insulted in groups, but I only now realized that it was cyberbullying.” These findings indicate increased interpretive understanding, where students can connect abstract concepts with social consequences. They also demonstrated increased awareness and empathy, suggesting that short video lessons can improve emotional sensitivity in online behavior [14]-[16].

3. Extrapolation (Applying Understanding to Real Situations)

In the extrapolation phase, students demonstrated the ability to apply their understanding to real-life contexts. After the intervention, students reported being more cautious and reflective when using social media. Statements such as “Now I think twice before commenting, afraid of hurting people,” and “If I see a friend being bullied in a group, I prefer to reprimand them or keep quiet,” illustrate that microlearning helps shape ethical awareness and self-regulation in online communication. These results support the concept that microlearning not only builds knowledge but also drives behavioral change, as highlighted by the method’s role in fostering digital ethics among vocational students [17]-[19].

The Discussion integrates both quantitative and qualitative findings to provide a comprehensive interpretation of the intervention’s impact. Quantitatively, the Paired Sample t-test revealed a significant difference between pretest and posttest scores ($p = 0.010$), indicating measurable improvement in students’ understanding of cyberbullying forms. However, the N-Gain score (0.0804) was categorized as low, suggesting that the improvement occurred incrementally during the short intervention period.

The qualitative findings help explain this statistical pattern. Interview data showed that students progressed across Bloom’s levels of understanding. At the translation level, they were able to restate definitions of impersonation, flaming, and harassment. At the interpretation level, they connected these concepts to real-life digital interactions. At the extrapolation level, students expressed more cautious and reflective intentions in their online behavior. These qualitative developments indicate that although the numerical gain was modest, meaningful cognitive and ethical progression occurred [20], [21].

From a theoretical perspective, these findings align with Bloom’s taxonomy, which conceptualizes understanding as a gradual progression from basic recall to deeper interpretation and extrapolation. The relatively low N-Gain score supports the view that cognitive and ethical awareness, particularly in digital ethics contexts, develops incrementally and requires repeated reinforcement. Prior empirical studies on microlearning similarly report that short, focused instructional segments enhance

engagement and conceptual clarity, yet sustained behavioral transformation often depends on longer-term implementation. Therefore, the results suggest that microlearning functions effectively as a foundational strategy for digital ethics education among vocational students. Microlearning enhances conceptual understanding through short, digestible segments, but deeper learning requires reinforcement through reflection or discussion [22]-[24].

Conclusion

This study concludes that microlearning-based educational videos contributed to improving vocational students' understanding of cyberbullying forms. Although the N-Gain score (0.0804) indicates a low magnitude of improvement, the statistically significant difference ($p = 0.010$) demonstrates measurable cognitive progress. The findings suggest that microlearning functions as a supportive foundational strategy for digital ethics education, particularly when reinforced through continued discussion and reflection.

Limitations and Suggestions

This study had several limitations. The research was conducted in a single vocational high school with a limited number of participants 35 students), which restricts the generalization of the findings. N-Gain value (0.0804) indicates that the improvement in students' understanding was categorized as low. This may be influenced by the group-based worksheet implementation, which potentially caused social loafing and limited the accurate measurement of individual learning gains. Additionally, the microlearning videos and instructional modules were not formally validated by subject-matter or instructional design experts. The study also employed a one-group pretest–posttest design without a control group, limiting causal inference. Furthermore, the relatively short intervention period and students' internal and external factors may have influenced the learning outcomes.

Future studies are recommended to employ experimental designs with control groups, conduct formal expert validation of instructional media, optimize individual-based learning activities, extend intervention duration, and integrate follow-up reinforcement strategies to achieve deeper conceptual and ethical understanding.

Conflict of Interest

The authors declare no conflict of interest.

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