

Enhancing Digital Literacy to Mitigate the Negative Impacts of the Internet among Orphanage Children

¹Tri Luhur Indayanti Sugata, ²Tri Puspa Rinjeni, ³Siti Mukaromah, ⁴Virdha Rahma Aulia, ⁵Prasasti Karunia Farista Ananto, ⁶Rafika Rahmawati, ⁷Lano Putra Rajendra, ⁸Naufal Hilmy Ramadhani, ⁹Rendi Adi Saputra, ^{10*}Arya Daffa Junaidi

^{1,2,3,4,5,6,7,8,9,10}Information Systems, Faculty of Computer Science, Universitas Pembangunan Nasional Veteran Jawa Timur, Surabaya, East Java, Indonesia

Email: ¹tri.luhur.fasilkom@upnjatim.ac.id, ²puspa.rinjeni.fasilkom@upnjatim.ac.id, ³sitimukaromah.si@upnjatim.ac.id, ⁴virdha.rahma.fasilkom@upnjatim.ac.id, ⁵prasasti.karunia.fasilkom@upnjatim.ac.id, ⁶rafika.rahmawati.fasilkom@upnjatim.ac.id, ⁷23082010201@student.upnjatim.ac.id, ⁸23082010209@student.upnjatim.ac.id, ⁹23082010237@student.upnjatim.ac.id, ¹⁰23082010227@student.upnjatim.ac.id

Abstract: The rapid development of internet technology presents both opportunities and risks for children, particularly those in orphanage settings who face compounded vulnerabilities due to limited supervision and inadequate digital guidance. This community service activity aimed to improve digital literacy and internet safety awareness among children at Al Jabbar Orphanage, Surabaya. This activity involved 13 participants. The program was implemented through three sequential stages: planning, implementation, and evaluation. Data were collected using pre-test and post-test instruments around eight digital literacy indicators covering topics such as understanding internet functions, recognising negative impacts, personal data protection, cyberbullying awareness, account security and information verification. Among the eight indicators assessed, descriptive analysis revealed improvement in two indicators: risk mitigation skills when interacting with strangers online (84.62% to 92.31%) and information verification proficiency (92.31% to 100%). The remaining six indicators showed no measurable change, largely due to high baseline scores. The activity showed potential to improve participants' awareness and understanding of safe internet use, particularly regarding online stranger interactions and information verification. However, given the small sample size and the absence of inferential statistical analysis, stronger evaluation methods are needed to assess the long-term effectiveness of similar programs.

Keywords: community service; cyberbullying; digital literacy; internet safety; orphanage.

1. INTRODUCTION

The massive development of information and communication technology has brought structural changes across various dimensions of modern life through the deep penetration of global internet networks (Aliya Nabila et al., 2022). In terms of functionality, the internet no longer serves only as a supporting infrastructure or traditional communication channel, but has also transformed into a critical interactive platform that structures modern digital society (Annisa et al., 2022). This cyberspace offers high efficiency, eliminates

geographical distances, and broadens accessibility to information databases worldwide (Fajrini et al., 2026). Within the education sector, the adoption of internet-based technology has proven to contribute significantly and positively to learning quality by providing a diverse range of interactive and flexible educational media (Rinjeni et al., 2024).

Nevertheless, such boundless open access inherently acts as a double-edged sword, where the internet presents severe risks of destructive outcomes if users lack sufficient digital competence (Kumpulainen et al., 2020). Recent studies indicate that digital literacy helps young people benefit from online opportunities while reducing exposure to risks such as cyberbullying, misinformation, and harmful content (Tao et al., 2026). This virtual freedom often precipitates diverse cyber threats, including the proliferation of hoaxes, diminished real-world social interactions, device addiction, and cyberbullying (Fajrini et al., 2026). Children constitute the demographic group most vulnerable to such cyber risk exposure due to their underdeveloped cognitive control in filtering inappropriate digital content, such as radicalism, violence, or pornography (Khairifa et al., 2025).

To mitigate these risks, educational interventions through the strengthening of digital literacy are absolutely imperative. Fundamentally, the concept of digital literacy should not be narrowed down to instrumental technical skills in operating computer hardware (Jang & Ko, 2023). Beyond that, digital literacy represents a multi-dimensional cognitive capability to critically evaluate information validity, comprehend digital privacy architecture, and apply social communication ethics in cyberspace (Syahputra et al., 2025). Evidence from recent research shows that digital literacy is closely linked to online resilience and the ability to respond to misinformation and negative online experiences more effectively (Pan et al., 2024). Introducing the pillars of digital literacy from an early age will train children to possess analytical and critical thinking skills, enabling them to independently identify fake news and shield themselves from the adverse effects of the digital environment (Daulay et al., 2023).

This digital vulnerability is particularly pronounced for children in residential care settings. (Nursafitri et al., 2024) found that orphanage children using digital technology showed limited understanding of digital literacy concepts, attributing this gap to the absence of structured technology education in institutional care environments. Similarly, (Syahputra et al., 2025). documented that adolescents at Alfath Tauhid Orphanage

demonstrated low digital readiness prior to intervention, underscoring the need for targeted programs in this setting. Utilizing communication devices without a fundamental grasp of security aspects not only threatens children's mental health but also blurs their personal privacy boundaries in cyberspace (Ramadhani et al., 2025). Freedom of expression on the internet that is unaccompanied by an awareness of protecting personal space and private data can expose children to broader threats of cyber exploitation (Khairifa et al., 2025).

A preliminary field survey conducted at Al Jabbar Orphanage, Rungkut District, Surabaya, identified several indicators of digital vulnerability among the resident children. The children, aged under 10 to 20 years, had regular access to mobile devices and internet, yet caregiving staff reported limited capacity to monitor or guide digital activities. Observations and informal discussions with staff revealed that children frequently engaged with unverified online content, had limited awareness of data privacy risks, and lacked strategies for handling suspicious interactions with strangers online. These field findings indicated a clear need for structured digital literacy education tailored to the specific social context of orphanage children.

Previous community service programs on digital literacy have predominantly targeted general student populations in formal school settings (Fajrini et al., 2026)., often delivering broad awareness materials without empirically measuring outcomes across multiple digital safety dimensions. While such programs have shown promise in raising general awareness, they rarely employ structured pre-test and post-test frameworks to evaluate specific skill improvements, and they frequently overlook children in residential care settings whose institutional context compounds their digital vulnerability. Children in orphanages face a distinct risk profile, including limited caregiver-to-child ratios reduce the possibility of individualized digital guidance, and the absence of structured technology education leaves their online activities largely unsupervised (Nursafitri et al., 2024). Despite this, few community service interventions have been specifically designed and empirically evaluated for this population.

Therefore, this community service activity aimed to improve digital literacy and internet safety awareness among children living at Al Jabbar Orphanage, Surabaya, through an interactive educational intervention. Specifically, the program sought to measure changes in participants' understanding across eight digital safety dimensions: internet functions and benefits, awareness of negative digital impacts, cyberbullying recognition,

personal data protection, account security, risk mitigation when interacting with strangers online, information verification, and appropriate responses to negative content exposure.

2. METHOD

To establish a credible and replicable community service framework, this initiative adopted a systematic, field-based action methodology explicitly designed for social welfare environments. The outreach program was conducted at a designated orphanage situated within the Rungkut District of Surabaya City, serving a specific cohort of institutionalized children who integrate mobile devices and internet access into their daily educational and recreational routines. In order to deliver a targeted and highly impactful intervention, the operational workflow discarded ad-hoc approaches, utilizing instead a structured, sequential three-stage methodological design. This comprehensive framework encompasses three vital interconnected phases: Planning, Implementation, and Evaluation. Each phase was systematically calibrated to address the underlying digital vulnerabilities of the participants while ensuring empirical data collection for post-activity analysis, with the overall structural progression outlined in Figure 1.

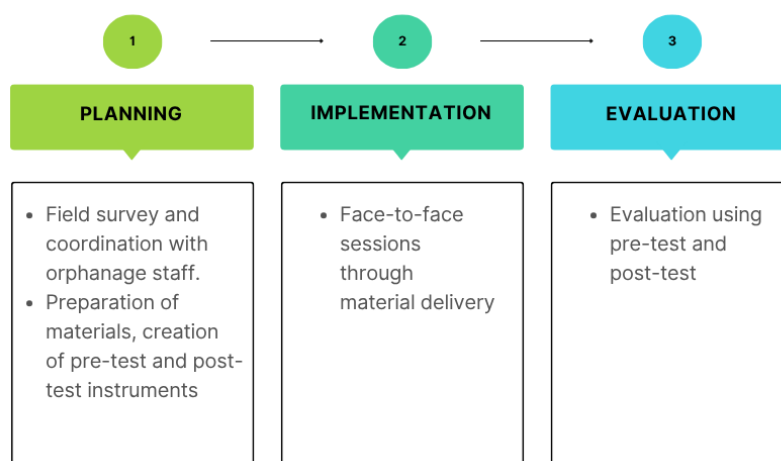


Figure 1. Workflow of the Community Service Program

The structured outreach program was executed in **April 2026** at the Al Jabbar Orphanage, located in the Rungkut District of Surabaya City. The intervention targeted a specific cohort of 13 institutionalized children aged under 10 to 20 years old, spanning educational backgrounds from elementary to senior high school levels.

To deliver a targeted intervention, the operational workflow utilized a structured, sequential three-stage methodological design: Planning, Implementation, and Evaluation (Figure 1).

The planning stage involved field surveys and coordination with orphanage staff to map existing digital habits. During this stage, the evaluation instrument was developed, consisting of a questionnaire with 16 closed-ended multiple-choice questions (2 questions per indicator) mapped across eight distinct digital literacy dimensions derived from literature. The questionnaire was developed based on a review of previous studies on children's digital literacy, online safety, and digital resilience (Hammond et al., 2024; Jang & Ko, 2023; Kumpulainen et al., 2020; Pan et al., 2024) , and was further tailored to the objectives of the community service program and the needs identified during the preliminary field survey.

The implementation stage began with a printed pre-test to capture baseline knowledge, followed by a 120-minute face-to-face session delivering material via interactive slides, case simulations, and Q&A. The evaluation stage compared pre-test and post-test individual scores, which were distributed and collected immediately before and after the session. Given the small sample size, no inferential statistical tests were conducted; the evaluation relied strictly on a descriptive analysis of percentage changes in correct answers. The full questionnaire instrument is provided as supplementary data for replicability and instrument evaluation.

3. RESULT AND DISCUSSION

3.1 Participant Characteristics

The characteristics of the participants in the socialization activity can be seen in Figure 2. A total of 13 children participated in the program. Based on the age level, there were 5 participants under 10 years old (38.46%), 3 participants aged 10–15 years (23.08%), and 5 participants aged 16–20 years (38.46%).

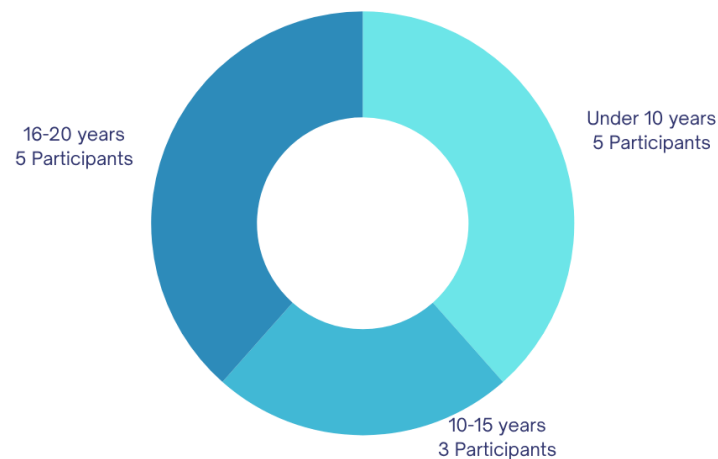


Figure 2. Participant Characteristics Based on Age Level

Based on educational level, 6 participants were from elementary school/equivalent level (46.15%), 2 participants were from junior high school/equivalent level (15.38%), and 5 participants were from senior high school/vocational high school/equivalent level (38.46%), as shown in Figure 3.

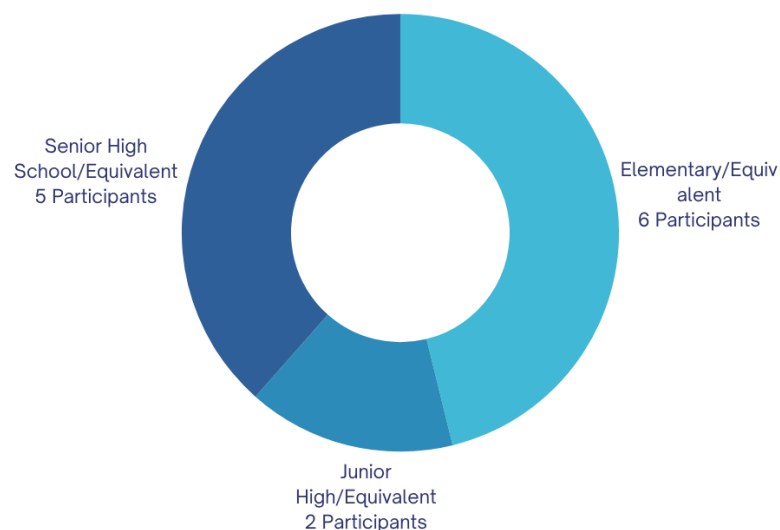


Figure 3. Participant Characteristics Based on Educational Level

3.2 Mapping of Digital Literacy Indicators

Prior to evaluating the effectiveness of the community service activity, the team established cognitive evaluation parameters tailored to the vulnerabilities and developmental needs of children at Al Jabbar Orphanage. The indicators were formulated based on the educational objectives of the program, the preliminary needs assessment conducted at Al Jabbar Orphanage, and concepts synthesized from previous studies on children's digital literacy, online safety, and digital resilience (Hammond et al., 2024; Jang & Ko,

2023; Kumpulainen et al., 2020; Pan et al., 2024). The indicators assessed in the pre-test and post-test are presented in Table 1 below.

Table 1. Digital Literacy Indicators Used in the Pre-Test and Post-Test

No	Indicator
1	Understanding the Primary Function of the Internet
2	Utilizing the Positive Benefits of the Internet
3	Awareness of the Negative Impacts of Gadgets/Games
4	Risk Mitigation Skills Against Strangers
5	Understanding the Concept of Cyberbullying
6	Account Security Protection
7	Information Verification Proficiency
8	Response to Negative Content Exposure

3.3 Implementation of the Activity

The implementation began with the distribution of pre-test instruments to map participants' initial knowledge levels. A total of 13 participants involved in the activity from various age groups, under 10 years old to 20 years old. Subsequently, the socialization activity was conducted face-to-face using interactive visual presentation media. The materials delivered included an understanding of the concept of the internet and its benefits in daily life, cyberbullying, the concept of digital literacy, the importance of filtering information, and strategies to prevent the negative impacts of internet use in everyday life.



Figure 4. Socialization Activity

The materials were delivered using simple language adjusted to the participants' age range. This approach considered the differences in cognitive capacity among elementary, junior high, and senior high school participants. An ice-breaking activity **was** also implemented to maintain participants' attention and reduce

boredom. After the material presentation, a question-and-answer session was conducted, several participants asked questions related to their experiences interacting with the internet.

3.4 Comparison of Pre-Test and Post-Test Results

To assess the effectiveness of the activity, a comparative analysis was conducted based on participants' answer across the eight indicators before (pre-test) and after (post-test) the activity. The results are summarised in Table 2 which presents the percentage of participants who answered each indicator correctly.

Table 2. Comparison of Improvements in Digital Literacy Understanding

No	Indicator	Pre-Test (%)	Post-Test (%)
1	Understanding the Primary Function of the Internet	100%	100%
2	Utilizing the Positive Benefits of the Internet	100%	100%
3	Awareness of the Negative Impacts of Gadgets/Games	100%	92.31%
4	Risk Mitigation Skills Against Strangers	84.62%	92.31%
5	Understanding the Concept of Cyberbullying	100%	100%
6	Account Security Protection	92.31%	92.31%
7	Information Verification Proficiency	92.31%	100%
8	Response to Negative Content Exposure	100%	100%

As presented in Table 2, the descriptive analysis reveals nuanced outcomes across the eight indicators. While positive adjustments were observed in practical protection skills, two anomalies warrant critical interpretation. A slight decrease was observed in Indicator 3 (Awareness of the Negative Impacts of Gadgets/Games), from 100% in the pre-test to 92.31% in the post-test. Since only 13 participants were involved, this decrease represents a change in the response of a single participant. Therefore, the result is unlikely to indicate a substantial decline in participants' understanding. It may instead reflect individual response variation after participants were exposed to broader examples and discussions during the educational session.

On the other hand, Indicator 6 (Account Security Protection) remained unchanged at 92.31%. This stagnation implies that concepts related to technical protection, such as password complexity and two-factor authentication, require a higher cognitive load and more prolonged, hands-on technical practice to show measurable improvement, particularly for younger participants in the cohort. Furthermore, the high baseline scores (100%) observed in Indicators 1, 2, 5, and 8 during the pre-test created a ceiling effect, which inherently

limited the instrument's capacity to register further quantifiable upward changes. This finding suggests that participants already had relatively high baseline knowledge before the activity, leaving only limited room for improvement in the post-test results.

The indicator related to risk mitigation skills against strangers on the internet showed some improvement. Indicator 4, which measured how well participants knew how to handle suspicious interactions with strangers online, showed 84.62% from the pre-test result. This indicated that some participants were still unsure about how to respond to suspicious interactions from unknown individuals online. After the activity, the score increased to 92.31%, indicating a modest improvement in participants' understanding of how to respond to suspicious interactions with strangers online. This finding is consistent with previous digital literacy outreach programs that reported improvements in children's awareness of online safety after interactive educational activities (Fajrini et al., 2026; Syahputra et al., 2025).

An improvement was also found in indicator 7, which assessed information verification proficiency. The pre-test score of 92.31%, increased to 100% in the post-test. This result shows that participants became more aware about the importance of verifying information before sharing it on digital platforms. A similar improvement in information verification has also been highlighted in previous studies, which identified information evaluation as a key component of children's digital resilience (Hammond et al., 2024; Pan et al., 2024).

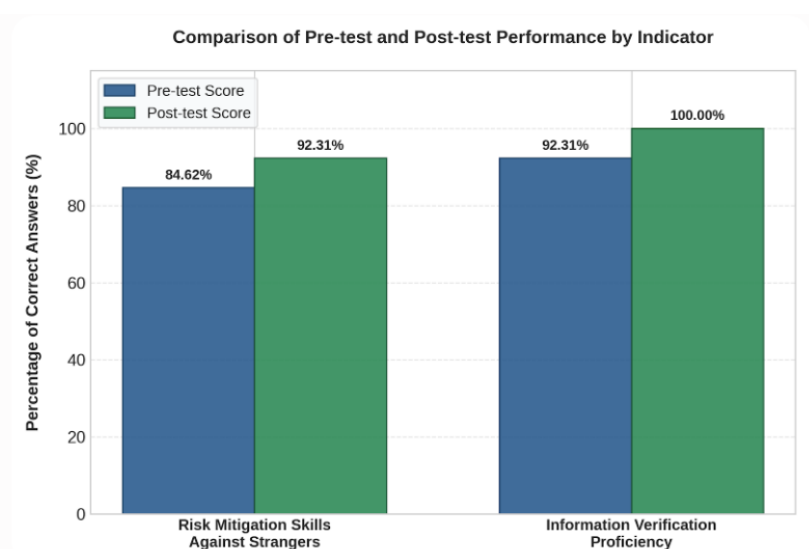


Figure 5. Comparison of Pre-Test and Post-Test Performance Across Improved Digital Literacy Indicators

Based on the descriptive findings in Figure 5, the comparison between the pre-test and post-test metrics indicates an upward improvement in selected digital literacy indicators. Prior to the educational intervention, the children already exhibited a high foundational awareness, with baseline scores standing at 84.62% for Risk Mitigation Skills Against Strangers and 92.31% for Information Verification Proficiency. Following the implementation of the structured socialization sessions, the competency to mitigate risks against online strangers rose to 92.31% (a net gain of +7.69%), while the capacity to verify digital information reached 100.00% (a net gain of +7.69%). This descriptive improvement indicates that the educational activity may contribute to strengthening participant's awareness of safe internet practices, particularly when interacting with strangers online and verifying digital information.

Overall, the descriptive comparison indicates modest improvements in participants' awareness of internet safety, particularly in online stranger interactions and information verification. The interactive learning activities may have supported participants' understanding of these topics during the educational session.

3.5 Limitations and Future Suggestions

This community service activity has several limitations. First, the number of participants was relatively small, involving only 13 children from one orphanage, which limits the generalizability of the findings. Second, the evaluation relied on a simple pre-test and post-test comparison without a control group or inferential statistical analysis. Third, several indicators had already reached 100% in the pre-test, which limited the ability of the instrument to detect further improvement after the intervention. Fourth, the activity was conducted within a limited intervention period, so the long-term retention of digital literacy knowledge and behavioral changes could not be assessed. In addition, the use of self-report or direct response instruments may have introduced response bias among participants.

To address these limitations, future community service programs should involve a larger number of participants from different orphanages or educational settings to improve the generalizability of the findings. The evaluation instrument should also be refined by including questions with varying levels of difficulty to better capture changes in participants' understanding. In addition, future programs may include a follow-up

assessment several weeks or months after the intervention to evaluate knowledge retention and possible behavioral changes. The use of a control or comparison group and more rigorous statistical analysis is also recommended to provide stronger evidence regarding the effectiveness of digital literacy interventions.

4. CONCLUSION

This community service activity indicated that interactive digital literacy education can support children's awareness of safe and responsible internet use, particularly in risk mitigation when interacting with strangers online and information verification before sharing digital content. The pre-test and post-test comparison showed improvement in selected indicators, although several indicators remained unchanged due to high baseline scores. These findings suggest that digital literacy outreach may be useful as an introductory educational strategy for orphanage children. However, stronger evaluation methods are needed to assess the long-term effectiveness of similar programs.

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CONFLICT OF INTERESTS

The authors declare no conflict of interest or otherwise

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