

A Digital Comic-Based Approach to Cyberbullying Prevention for Improving Internet Safety Among Elementary School Students

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ARTICLE INFO

Article history

Received April 11, 2026

Revised May 25, 2026

Accepted June 11, 2026

Keywords

Cyberbullying;

Digital comic;

Digital literacy;

Elementary education;

Internet safety.

ABSTRACT

Background: The rapid growth of digital technology use among elementary school students has increased their exposure to cyberbullying and unsafe online behavior. Preliminary observations conducted at Sekolah Anak Tangguh an Nuha identified several challenges, including limited digital literacy awareness, insufficient interactive learning media, and a lack of understanding regarding cyberbullying prevention among students.

Contribution: This community service program introduces a digital comic-based educational intervention that integrates visual storytelling, digital ethics, and participatory learning activities to enhance students' awareness of cyberbullying and responsible internet use. The program offers an innovative approach by combining contextual digital narratives with interactive classroom engagement specifically designed for elementary school students.

Method: The program employed a participatory community service method with an educational intervention approach involving 35 elementary school students. The implementation stages included needs assessment, digital comic development, guided learning activities, mentoring sessions, and evaluation through pre-test and post-test assessments, observations, and questionnaires.

Results: The findings revealed a significant improvement in students' understanding of cyberbullying following the intervention. The proportion of students categorized at the high understanding level increased from 20.0% to 60.0%, while the percentage of students in the low understanding category decreased from 42.9% to 11.4%. In addition, students demonstrated greater engagement and more active participation throughout the learning activities.

Conclusion: Digital comic-based learning represents an effective and engaging approach for strengthening digital literacy and cyberbullying awareness among elementary school students.

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1. Introduction

The rapid advancement of digital technology has significantly transformed children's learning environments and social interactions. Elementary school students are increasingly exposed to internet-based communication platforms, social media, and digital learning applications at an early age. While these technologies provide various educational benefits, they also increase children's vulnerability to online risks, particularly cyberbullying and inappropriate digital behavior [1]–[3].

Cyberbullying refers to aggressive and repetitive behavior conducted through digital platforms with the intention of harming, intimidating, or humiliating others [4]. Previous studies have demonstrated that cyberbullying can negatively affect children's psychological well-being, social development, and academic performance. Victims of cyberbullying frequently experience anxiety, stress, low self-esteem, emotional distress, and reduced learning motivation [5], [6]. In Indonesia, the increasing number of cyberbullying cases among school-aged children highlights the urgent need for preventive educational interventions that promote digital ethics and responsible internet use [7], [8].

Preliminary observations conducted at Sekolah Anak Tangguh an Nuha revealed several challenges related to students' digital behavior and literacy awareness. Many students actively used smartphones and internet-based applications; however, their understanding of cyberbullying, online ethics, and safe internet practices remained limited. In addition, teachers had limited access to interactive educational media specifically designed to introduce cyberbullying prevention in a manner appropriate for elementary school students. These conditions indicate the need for innovative and context-based educational interventions that are capable of improving students' awareness and digital responsibility.

To address these challenges, the integration of digital comics into educational activities offers a promising approach for improving students' engagement and comprehension. Digital comics combine visual storytelling, narrative structure, and contextual scenarios that enable children to understand abstract social concepts more effectively [9], [10]. According to multimedia learning theory, the integration of verbal and visual information supports dual-channel cognitive processing, allowing learners to better comprehend and retain educational content [11]. Furthermore, narrative-based learning and character representation can stimulate emotional engagement and empathy, which are essential in developing positive social behavior among children [12].

Although previous studies have explored digital literacy education and anti-bullying campaigns, most interventions primarily focused on general awareness programs without integrating structured digital comic-based learning specifically designed for elementary school students in community service settings [13], [14]. In addition, limited studies have combined visual narrative learning, cyberbullying prevention, and participatory educational approaches into a single intervention model for young learners. This gap highlights the importance of developing innovative educational media that are both engaging and contextually relevant to children's daily digital experiences.

Therefore, this community service program proposes a digital comic-based educational intervention aimed at improving cyberbullying awareness and internet safety among elementary school students. The contribution of this program lies in the integration of visual storytelling, participatory learning activities, and digital ethics education into an interactive learning model that is suitable for elementary education contexts. This program is expected to provide both practical and educational contributions by supporting schools in strengthening students' digital literacy, empathy, and responsible online behavior.

2. Method

This community service program employed a participatory educational intervention approach aimed at enhancing elementary school students' awareness of cyberbullying and responsible internet use through digital comic-based learning activities. The intervention integrated participatory engagement, visual storytelling, and technology-supported learning to create an interactive and contextually relevant educational environment for students [15]–[17].

Unlike conventional one-way instructional approaches, this program emphasized active participation from students and teachers throughout the implementation process. Students were encouraged to engage in observation, discussion, reflection, and collaborative learning activities related to cyberbullying prevention and digital ethics [18].

The integration of digital comics as an educational medium was designed to support students' comprehension and engagement through contextual visual narratives. Previous studies have shown that visual storytelling and interactive digital media can improve students' understanding, participation, and retention of learning materials, particularly in elementary education settings [19], [20].

To ensure systematic implementation, the program was organized into several interconnected stages, including needs assessment, digital comic development, implementation, mentoring, and evaluation. These stages were designed to support continuous learning improvement and strengthen the effectiveness of community-based educational interventions [21].

2.1. Research Approach

This program adopts a participatory and experiential learning approach, emphasizing active involvement of students, teachers, and school stakeholders. This approach ensures that the intervention remains contextually relevant and responsive to real challenges faced by the target community.

The integration of digital literacy education with technology-supported learning enables students to actively engage with learning materials while developing critical thinking and responsible digital behavior [21], [22]. Furthermore, the application of experiential learning principles allows students to gain knowledge through observation, interaction, and reflection, enhancing both comprehension and retention [23], [24]. A user-centered design perspective is also applied in the development of the digital comic to ensure that the content aligns with

students' cognitive levels, emotional characteristics, and learning needs. This integration results in a more meaningful and effective learning experience. [Figure 1](#) Location and environment of Sekolah Anak Tangguh An Nuha. The program was implemented at Sekolah Anak Tangguh an Nuha, as shown in [Figure 1](#), an educational institution committed to fostering resilient and character-based students. The school is located at Jalan Balai Desa Marendal II, Perumahan Pondok Nusantara Kavling II, Kecamatan Patumbak, Kabupaten Deli Serdang, Sumatera Utara, Indonesia.

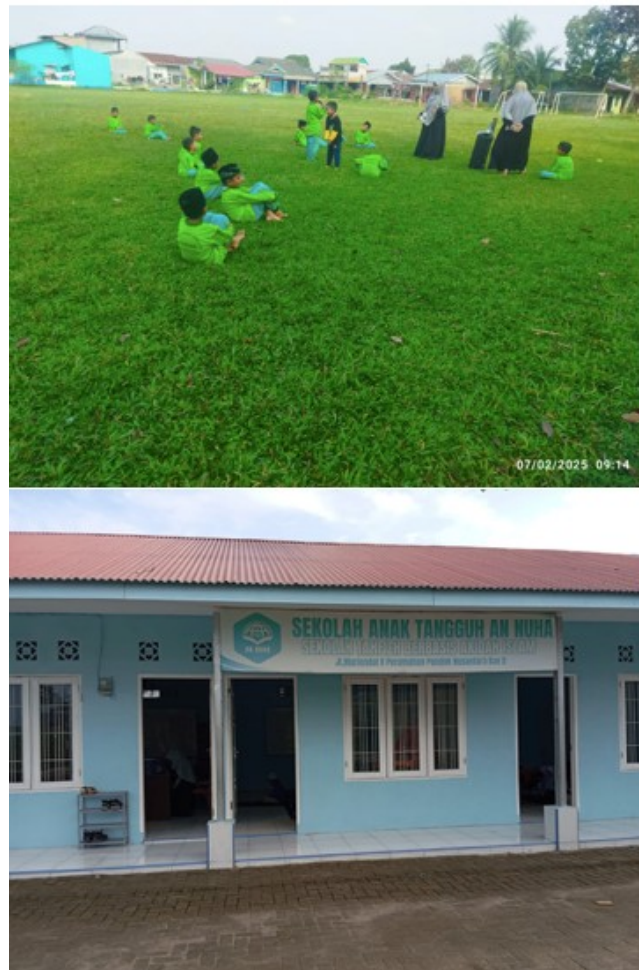


Figure 1. Learning environment and program implementation site at Sekolah Anak Tangguh an Nuha

The school environment shown in [Figure 1](#) demonstrates the institution's support for student-centered and character-based learning activities. The active participation of students and teachers during the preliminary activities also reflects the school's readiness to implement interactive educational programs related to cyberbullying prevention and digital literacy development.

2.2. Program Implementation Stages

The implementation of the community service program was carried out through several interconnected stages to ensure systematic execution and effective learning outcomes. Each

stage was designed to support students' understanding of cyberbullying prevention, digital ethics, and responsible internet use through interactive and participatory learning activities [25], [26].

The first stage involved a needs assessment process conducted through classroom observations, informal interviews with teachers, and preliminary discussions with students. This stage aimed to identify students' initial understanding of cyberbullying, online interaction, and digital behavior. The findings from the assessment process served as the basis for designing the educational intervention and determining appropriate learning objectives for elementary school students [27].

The second stage focused on the development of the digital comic as the primary educational medium. The development process included storyline preparation, storyboard design, script writing, character illustration, and visual layout development. The comic content was designed using contextual scenarios closely related to students' daily digital experiences to improve relatability, emotional engagement, and learning participation [28], [29].

The third stage involved the implementation of guided learning activities using the developed digital comic. During this stage, students participated in reading sessions, group discussions, question-and-answer activities, and reflective learning exercises facilitated by teachers and facilitators. Interactive discussions were conducted to encourage students to identify cyberbullying behavior, express their opinions, and develop appropriate responses toward digital social situations [30].

The fourth stage consisted of mentoring and assistance activities for teachers to support the integration of digital comic-based learning into classroom activities. This stage aimed to strengthen program sustainability and improve teachers' capacity in delivering digital literacy education and cyberbullying prevention materials [31].

The final stage involved evaluation and monitoring activities conducted using pre-test and post-test assessments, observations, questionnaires, and participant feedback collection. The evaluation process was intended to measure changes in students' understanding, awareness, and behavioral responses related to cyberbullying prevention and responsible internet use [32], [33].

During the evaluation stage, a structured questionnaire was administered to assess students' understanding, awareness, and behavioral responses related to cyberbullying prevention. The questionnaire instrument employed a simplified five-point Likert scale adapted to the cognitive characteristics of elementary school students to ensure clarity and ease of understanding during the response process [34], [35].

The questionnaire items were adapted to the cognitive characteristics and comprehension levels of elementary school students to ensure clarity and ease of response during the evaluation process. The questionnaire indicators and measurement instruments used during the evaluation process are presented in [Table 1](#).

Table 1. Questionnaire Instrument for Measuring Students' Understanding of Cyberbullying

No	Indicator	Statement	Scale
1	Understanding	I understand the meaning of cyberbullying	1 2 3 4 5
2	Understanding	I can identify cyberbullying behavior on social media	1 2 3 4 5
3	Understanding	I understand that cyberbullying can hurt other people	1 2 3 4 5
4	Understanding	I understand the negative impacts of cyberbullying	1 2 3 4 5
5	Awareness and Attitude	I believe that cyberbullying is a serious problem	1 2 3 4 5
6	Awareness and Attitude	I will not engage in cyberbullying toward others	1 2 3 4 5
7	Awareness and Attitude	I care about friends who become victims of cyberbullying	1 2 3 4 5
8	Behavioral Response	I know what to do if I experience cyberbullying	1 2 3 4 5
9	Behavioral Response	I will report cyberbullying to teachers or trusted adults	1 2 3 4 5
10	Behavioral Response	I will help friends who experience cyberbullying	1 2 3 4 5

The questionnaire instrument shown in Table 1 focused on three primary indicators, namely understanding, awareness and attitude, and behavioral response. The instrument was designed to support a more comprehensive evaluation of students' learning outcomes following the implementation of the digital comic-based educational intervention.

2.3. Program Implementation Model

The implementation of the community service program was conducted through several interconnected stages to ensure systematic execution and effective learning outcomes. The program implementation stages are illustrated in Figure 2.

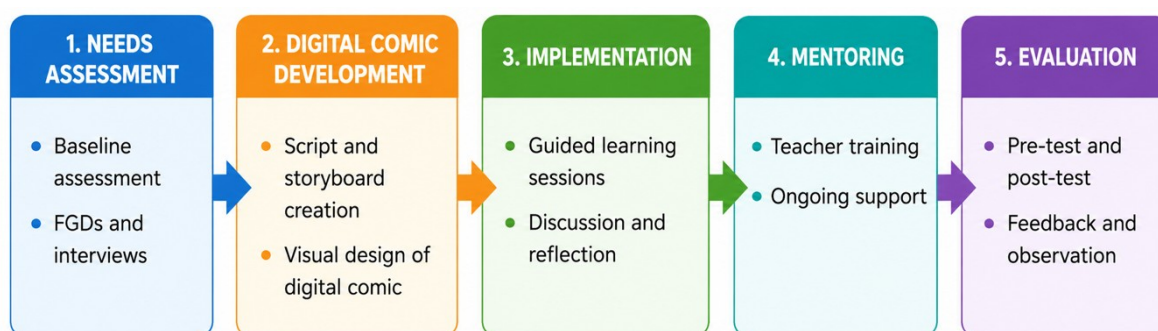
**Figure 2.** Program implementation stages of the digital comic-based educational intervention

Figure 2 illustrates the overall implementation flow of the digital comic-based educational intervention program. The implementation model consisted of five main stages, namely needs assessment, digital comic development, implementation, mentoring, and evaluation.

The first stage involved a needs assessment process conducted through classroom observations, focus group discussions, and informal interviews with teachers and students. This stage aimed to identify students' initial understanding of cyberbullying, digital ethics, and responsible internet behavior. The findings obtained during this stage served as the basis for designing the educational materials and determining appropriate learning objectives for elementary school students. The second stage focused on the development of digital comic-based learning media. The development process included script preparation, storyboard creation, visual illustration design, and digital layout development. The comic content was

designed using contextual scenarios closely related to students' daily digital experiences to improve engagement, comprehension, and emotional connection with cyberbullying prevention materials.

The third stage involved the implementation of guided learning activities using the developed digital comic media. During this stage, students participated in reading activities, classroom discussions, reflective learning sessions, and interactive question-and-answer activities facilitated by teachers and facilitators. Interactive discussions were conducted to encourage students to identify cyberbullying behavior and develop responsible digital communication practices. The fourth stage consisted of mentoring and assistance activities for teachers to support the sustainability of digital comic-based learning implementation within classroom activities. This stage also aimed to strengthen teachers' capacity in delivering digital literacy and cyberbullying prevention education.

The final stage involved evaluation and monitoring activities conducted through pre-test and post-test assessments, observations, questionnaires, and participant feedback collection. These evaluation activities were intended to measure changes in students' understanding, participation, awareness, and behavioral responses related to cyberbullying prevention and responsible internet use. The structured implementation stages presented in Figure 2 demonstrate the integration of participatory learning, visual storytelling, mentoring activities, and evaluation processes within the community service program. This implementation model supports continuous learning improvement and strengthens the effectiveness of digital literacy education for elementary school students.

3. Results and Discussion

The results of this community service program demonstrate the effectiveness of digital comic-based learning interventions in improving elementary school students' awareness and understanding of cyberbullying issues. This section discusses the development process of the digital comic, its implementation within classroom learning activities, and the educational outcomes observed during the intervention.

The discussion is organized based on the sequential stages of the program implementation, beginning with the development of the digital comic, followed by classroom implementation activities, and concluding with the evaluation of students' understanding and participation during the learning process. In addition to describing the implementation outcomes, this section also analyzes how visual storytelling and interactive learning activities contributed to students' cognitive and emotional engagement.

The integration of contextual narratives, visual communication, and collaborative discussion activities created a more interactive learning environment that encouraged students to actively participate in identifying cyberbullying behavior and reflecting on responsible digital communication practices. These findings indicate that digital comic-based learning media can support both conceptual understanding and social awareness among elementary school students.

3.1. Digital Comic Development Results

The development of the digital comic entitled “Message for Rara” was conducted through a structured design process integrating visual storytelling, contextual learning, and character-based educational approaches. The primary objective of this development was to create an engaging educational medium capable of introducing cyberbullying awareness to elementary school students through relatable situations and emotional narratives.

The initial stage involved the preparation of a storyboard used to organize the storyline structure, visual composition, character interaction, and sequence of events within the comic. The storyboard was designed to represent situations closely related to students’ daily social interactions and digital communication experiences.



Figure 3. Storyboard design of the digital comic “Message for Rara”

The storyboard shown in [Figure 3](#) played an important role in ensuring consistency between the educational objectives and the visual narrative presented in the comic. Through this stage, emotional expressions, character responses, and social conflict situations related to cyberbullying were systematically arranged to support students’ understanding and emotional engagement during the learning process.

Following the storyboard stage, a narrative script and panel structure were developed to define dialogues, narration, and scene progression within the comic. The narrative emphasized contextual and reflective learning by presenting situations commonly experienced by elementary school students in both classroom and digital environments. [Table 2](#) presents several examples of narrative scenes and dialogue structures used in the digital comic.

Table 2. Examples of Narrative Script and Panel Structure in the Digital Comic

Page	Scene Description	Dialogue/Narration
1	Rara introduces her colorful drawing	"Drawing is my way of expressing imagination."
2	Teacher gives classroom drawing activity	"Today we will draw our future dreams."
3	Friends begin criticizing Rara's drawing	"Why is the grass blue?"
4	A photo of the drawing is shared in a group chat	"Look at this strange drawing!"
5	Rara feels sad after reading negative comments	"Is my drawing really that bad?"
6	Teacher notices Rara's fear and hesitation	"Why don't you want to draw today?"
7	Teacher explains the impact of hurtful words	"Words can hurt other people."
8	Students reflect on empathy and respect	"Every child has unique creativity."
9	Dino apologizes for his behavior	"I am sorry for making fun of you."
10	Students begin supporting one another	"Your drawing is creative and brave."

The use of conversational language and character-driven storytelling helped students better understand the emotional impact of cyberbullying situations. The contextual narrative approach also encouraged students to reflect on empathy, respect, and responsible digital communication practices. The final stage resulted in a fully developed digital comic product characterized by colorful visual elements, expressive character illustrations, and structured panel sequencing designed to maintain students' attention and learning engagement.



Figure 4. Final digital comic product used in the learning process

The final digital comic shown in Figure 4 demonstrates the integration of educational content and visual storytelling within an interactive learning medium. The visual presentation, narrative flow, and character expressions were intentionally designed to simplify complex social issues into learning materials that are more accessible and understandable for elementary school students.

3.2. Evaluation and Discussion

The evaluation stage was conducted to assess the effectiveness of the digital comic-based learning intervention in improving students' understanding and awareness related to cyberbullying prevention. The evaluation process focused on students' ability to recognize cyberbullying behavior, understand its negative impacts, and demonstrate appropriate responses toward digital social interactions. The implementation of the learning program was carried out through interactive classroom activities involving direct student participation. Learning sessions were facilitated using digital visual media projection to support students' comprehension and engagement during the learning process.



Figure 5. Teacher explaining digital comic content using a projector

As illustrated in [Figure 5](#), the teacher played an important role in guiding students through the storyline and explaining the educational messages contained in the digital comic. The guided learning approach helped students better understand the context of cyberbullying situations and encouraged them to actively participate in classroom discussions. The implementation process also demonstrated positive student engagement during the learning activities. Students showed enthusiasm during discussion sessions, responded actively to questions, and participated in reflective learning activities related to responsible digital behavior.



Figure 6. Student engagement during interactive learning activities

Figure 6 demonstrates students' active participation during the implementation process. The visual and narrative elements presented in the digital comic contributed to maintaining students' attention and stimulating curiosity during classroom discussions. The use of contextual visual storytelling also helped students connect the learning materials with their daily social experiences. In addition to teacher-guided instruction, students participated in collaborative discussions and mentoring activities designed to encourage reflection and empathy development related to cyberbullying situations.



Figure 7. Group discussion and mentoring session during the program

The discussion activities shown in Figure 7 created opportunities for students to express their opinions, share experiences, and reflect on the consequences of inappropriate digital behavior. This collaborative learning atmosphere supported students' communication skills, critical thinking, and social awareness throughout the intervention process. The delivery of cyberbullying awareness material was conducted through interactive discussion activities and contextual learning sessions, as shown in Figure 8.



Figure 8. Delivery of cyberbullying awareness material to students

The integration of visual media, storytelling approaches, and interactive discussions contributed to the creation of a more student-centered learning environment. These activities not only improved students' conceptual understanding but also encouraged positive behavioral responses toward cyberbullying prevention and responsible internet use.

To evaluate students' understanding levels, pre-test and post-test assessments were conducted before and after the implementation of the program. The evaluation results are presented in [Table 3](#).

Table 3. Students' Understanding Level Before and After Implementation

Understanding Level	Before Implementation	After Implementation
Low	15 students (42.9%)	4 students (11.4%)
Moderate	13 students (37.1%)	10 students (28.6%)
High	7 students (20.0%)	21 students (60.0%)
Total	35 students	35 students

The data presented in [Table 3](#) indicate a substantial improvement in students' understanding following the implementation of the digital comic-based learning program. Prior to the intervention, most students were categorized within the low and moderate understanding levels, indicating limited awareness regarding cyberbullying concepts and responsible digital behavior. After the implementation, the number of students categorized at the high understanding level increased significantly from 20.0% to 60.0%. At the same time, the percentage of students categorized within the low understanding level decreased considerably from 42.9% to 11.4%. These findings indicate that the digital comic-based educational intervention was effective in improving students' understanding and awareness related to cyberbullying prevention.

The improvement observed during the intervention can be associated with the integration of visual storytelling, contextual learning situations, and collaborative discussion activities that allowed students to relate the educational content to their daily experiences. The use of narrative-based learning also supported students' emotional engagement and empathy development during the learning process. Furthermore, the implementation results demonstrate that digital comic media can function as an engaging and accessible educational tool for introducing social and ethical issues to elementary school students. The combination of visual communication and guided discussion activities contributed positively to students' participation, comprehension, and learning motivation throughout the program. As part of the program documentation, a closing session was conducted involving students, teachers, and facilitators to reflect on the learning activities and overall implementation outcomes.

The final documentation session shown in [Figure 9](#) reflects the active participation and collaboration established throughout the implementation process. The positive learning atmosphere observed during the program indicates that interactive educational interventions based on digital storytelling can support meaningful learning experiences for elementary school students. This community service program has several limitations that should be considered. First, the implementation was conducted within a limited number of participants and only involved one partner school, which may limit the generalization of the findings to broader educational settings. Second, the intervention was conducted over a relatively short period, making it difficult to evaluate the long-term impact of the program on students' behavioral changes related to cyberbullying prevention.



Figure 9. Documentation of participants and facilitators at the end of the program

In addition, the evaluation process primarily focused on descriptive analysis using pre-test and post-test comparisons without involving more advanced statistical analysis. Future programs are expected to involve larger participant groups, longer implementation periods, and more comprehensive evaluation methods to obtain deeper insights into the effectiveness of digital comic-based educational interventions in elementary education contexts.

The implementation of the digital comic-based educational intervention successfully improved elementary school students' understanding and awareness related to cyberbullying prevention and responsible digital behavior. The integration of visual storytelling, contextual narratives, and interactive learning activities created a more engaging and student-centered learning environment that encouraged active participation during the learning process. The implementation results demonstrated that digital comic media can function as an effective educational tool for introducing social and ethical issues to elementary school students. Students showed positive responses throughout the program, particularly during discussion sessions, reflective activities, and collaborative learning processes related to cyberbullying situations presented in the digital comic.

4. Conclusion

The evaluation findings also indicated a significant improvement in students' understanding levels following the implementation of the program. The increase in the number of students categorized within the high understanding level reflects the effectiveness of visual and narrative-based learning approaches in supporting students' comprehension and social awareness development. In addition to improving students' conceptual understanding, the program also contributed to the development of empathy, communication skills, and responsible digital attitudes among participants. The integration of mentoring activities and teacher involvement further supported the sustainability of digital literacy education within

the school environment. Overall, this community service program demonstrates that digital comic-based learning interventions have strong potential to support cyberbullying prevention education in elementary schools. Future programs are expected to involve broader participant groups, longer implementation periods, and more comprehensive evaluation methods to strengthen the effectiveness and sustainability of digital literacy education programs in primary education contexts.

Acknowledgement

This community service activity reflects the institutional commitment of STMIK Triguna Dharma in realizing impactful education through real-world engagement and knowledge dissemination. The authors would like to express their sincere appreciation to STMIK Triguna Dharma for supporting and facilitating this program as part of its “Kampus Berdampak” initiative. The authors also extend their gratitude to Sekolah Anak Tangguh an Nuha for their collaboration and openness in implementing this program. Special thanks are addressed to the teachers and students who actively participated and contributed to the success of the activity.

Finally, the authors would like to acknowledge all individuals and parties who have provided support, both directly and indirectly, in the implementation of this community service program. This study also highlights the importance of integrating visual-based learning media into primary education to address emerging digital social issues effectively. Conflicts of Interest: The authors declare no conflict of interest. Author Contribution: All authors contributed equally to the main contributor to this paper. All authors read and approved the final paper.

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