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Digital Ecopedagogy-Based Counseling to Reduce Cyberbullying in Indonesian Wetland Adolescents

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Abstract
Cyberbullying remains a problem among adolescents, especially in geographically and technologically remote communities. This study evaluated an innovative digital counseling model grounded in eco-pedagogy and Bronfenbrenner's ecological systems theory to address cyberbullying among vocational high school students in remote areas of Indonesia. Using a mixed-methods design, the study involved 180 students from three schools. The intervention was implemented through a digital learning platform (LMS), which integrated ecological and social-emotional learning strategies. Expert validation of the content, media, and information technology confirmed the feasibility and appropriateness of this model. Quantitative results showed statistically significant improvements ($p < 0.05$) in student awareness and behavior, with N-Gain scores ranging from 0.42 to 0.65. Qualitative findings, obtained from interviews and group discussions, indicated increased empathy, peer support, and counselor involvement. This study contributes to the theoretical aspect that the environment can enrich digital ethics education and behavioral interventions. Practically, this model offers an accessible and culturally relevant approach to integrating digital guidance programs in educational settings with limited resources.
Keywords: *Cyberbullying; Ecopedagogy; Digital Counseling; Vocational Education; Adolescent Behavior*

1. INTRODUCTION

The widespread use of digital technology has significantly changed how adolescents interact, learn, and communicate (Alakrash & Razak, 2021). These advancements bring numerous benefits, such as easier access to information and broader social networks (Ángeles Rebollo & Vico, 2014). However, they also introduce new challenges, especially the growing problem of cyberbullying. Cyberbullying refers to intentional, repeated harm carried out using digital tools like computers, smartphones, or social media platforms (Polillo et al., 2024). Unlike face-to-face bullying, cyberbullying can occur anytime and anywhere, often anonymously, which can intensify the psychological effects (Giumetti & Kowalski, 2022; Tozzo et al., 2022). Victims frequently report experiencing anxiety, depression, isolation, and declining academic performance (Hinduja & Patchin, 2021).

In Indonesia, the underdevelopment of digital safety education and counseling services in remote or rural areas makes the issue particularly concerning (Widyanty et al., 2024). Wetland communities, regions with fragile ecosystems, and limited access to technological resources are examples of such areas (Novitawati & Anggreani, 2023). Adolescents living in these environments often have internet access but lack the digital skills and support systems to navigate online risks safely (Botturi, 2021). These environments, while rich in culture and biodiversity, often experience disparities in infrastructure, educational outreach, and health resources. This combination of isolation and connectivity creates an environment where adolescents are simultaneously exposed to global digital culture and locally limited in how they can manage or respond to cyber risks (Lareki et al., 2023; Litina & Rubene, 2024).

Schools design guidance and counseling (G&C) programs to assist students in addressing personal and social issues, including those associated with online behavior (Gibson & Mitchell, 2005; Myrick, 1987). However, most school-based counseling services still use traditional, face-to-face methods (Gading, 2020). These approaches may not effectively address the unique challenges posed by cyberbullying, especially in areas where students' life contexts, social, ecological, and technological, differ significantly from those in urban centers (Cabrera et al., 2024; Uzuegbunam, 2022). Interventions often lack adaptability, technological integration, or contextual relevance, leading to limited impact in the most vulnerable regions (Hendry et al., 2023; Milosevic et al., 2023). To be effective, G&C approaches must not only address the symptoms of online violence but also explore its underlying sociocultural and environmental causes (Oe et al., 2022; Saari et al., 2021; Uralovich et al., 2023).

To better support students, especially in underserved communities, we need new models of counseling that reflect both local realities and the digital nature of today's world (Patel & Quan-Haase, 2024). One promising approach is digital ecopedagogy, a framework that blends critical pedagogy, environmental education, and digital literacy (Monem, 2024). Based on the ideas of Paulo Freire and others, digital ecopedagogy encourages learners to understand and act on the interconnections between digital tools, their communities, and the environment (Hung, 2021). In school counseling, this approach can lead to more meaningful and sustainable solutions to problems like cyberbullying (Alzamil, 2021). Furthermore, it promotes digital engagement that is ethical, responsible, and rooted in local knowledge and values. Ecopedagogy frames education not just as the transmission of skills but as a transformative process that empowers students to shape their world (Hossain, 2024).

This study also draws on Bronfenbrenner's ecological systems theory, which explains human development through several interconnected systems: the microsystem (e.g., family and school), mesosystem (interactions between microsystems), exosystem (external settings affecting the individual), macrosystem (cultural norms and values), and chronosystem (changes over time) (Bronfenbrenner, 1979). Using this model allows us to design a counseling framework that addresses not just individual students but the broader social and environmental factors that shape their behavior. When applied to digital education and adolescent mental health, this theory encourages the creation of interventions that are embedded across multiple levels of students' lives, including peer networks, school culture, family dynamics, and policy structures (Korsant, 2024).

Despite its potential, educational counseling, particularly in the Global South, has rarely applied digital ecopedagogy (Hossain, 2024). Most cyberbullying interventions focus on technical solutions, like blocking software or reporting systems, or on general emotional skills training (Dhamodharan & Sunaina, 2023). While useful, these methods often ignore the specific cultural and ecological challenges students face (Agha et al., 2024; Miao & Li, 2024a). They tend to treat digital harm as an isolated behavior rather than a socially and environmentally embedded phenomenon. Furthermore, much of the existing research is concentrated in high-income, urbanized countries, with little attention to how adolescents in ecologically distinct or socioeconomically challenged regions experience cyberbullying (D'Hooghe et al., 2023; Lee et al., 2024; Shi et al., 2024). This study addresses that gap by developing a digital ecopedagogy-based counseling model for adolescents in Indonesia's wetland areas, tailored to their daily realities and accessible technologies.

National reports support the need for this kind of intervention. Data from Indonesia's Ministry of Communication and Information Technology (Nugraheni, 2021) show that cases of cyberviolence among school-aged children have risen by 27% in the last two years. Many victims, however, do not report incidents due to fear, embarrassment, or a lack of trust in available support systems. This highlights a serious gap in protection, especially in non-urban communities like South Kalimantan, where cultural complexity and limited access to mental health services present further challenges. School counselors often lack training in digital ethics or trauma-informed online counseling practices (Patel & Quan-Haase, 2024; Solmaz, 2021). Ecological vulnerability and digital risk intersect, necessitating integrated, inclusive, and resilient solutions (Liu et al., 2024).

To respond to these issues, our proposed model includes digital counseling modules, peer support systems, and digital literacy training. The content is delivered through a responsive e-learning platform and incorporates cultural stories and ecological references that are familiar to students in wetland regions (Alakrash et al., 2022; Ali & Lefticaru, 2023). This helps ensure that the intervention resonates with students' experiences and keeps them engaged. The platform emphasizes interactive learning, self-reflection, and collective problem-solving (Tomczyk et al., 2020). By encouraging adolescents to take active roles in their learning and well-being, the model fosters self-confidence, empathy, and shared responsibility (Alturif & Alsand, 2024; Maurya, 2023). It positions students not as passive recipients but as collaborators in co-creating safer digital environments (Chen et al., 2024; Legvart et al., 2022).

A key feature of this approach is its participatory design. Teachers, counselors, students, parents, and local leaders were all involved in creating the model (Day-Vines et al., 2022). This inclusive method contributes to the counseling program's reflection of community values and enhances its sustainability over time (Alzamil, 2021; Sari & Setiawan, 2023). It also increases the likelihood that the program can be adapted and applied in other settings with similar challenges. Through workshops, focus group discussions, and iterative testing, the model was refined to align with local linguistic, cultural, and technological contexts (Setiawan et al., 2024). Such a process increases effectiveness and strengthens

ownership of the solution (Antinluoma et al., 2021; Meesuk et al., 2021; Yada et al., 2023; Yulius et al., 2024).

This article outlines the research context, theoretical background, and practical implementation of the model. Using a mixed-methods approach, the study examines: (1) the extent and effects of cyberbullying among adolescents in five high schools in South Kalimantan; (2) the design process of the digital ecopedagogy-based model; (3) its effectiveness in reducing cyberbullying and improving students' coping skills; and (4) its potential implications for education policy and practice. The results offer a foundation for scaling context-sensitive, ecologically grounded digital interventions that address both current and future challenges in adolescent well-being.

This research aims to expand the conversation on ecopedagogy and demonstrate how it can be applied in real-world school counseling programs. It provides a practical and adaptable framework that responds to one of the most urgent issues facing adolescents today. In doing so, it invites educators, policymakers, and community members to rethink school counseling not as a static or isolated service, but as a dynamic, context-aware, and digitally supported system for student well-being. With its theoretical grounding, participatory methodology, and practical insights, the study contributes to the growing field of sustainable and inclusive educational innovation.

2. LITERATURE REVIEW

Cyberbullying is increasingly recognized as a significant issue affecting adolescent mental health, psychosocial development, and educational attainment. Defined as the deliberate and repetitive use of digital technologies to harm others, cyberbullying often takes place via social networks, messaging platforms, email, or gaming environments (Dhamodharan & Sunaina, 2023). The anonymity and ubiquity of digital communication make it more difficult to regulate or escape from such harmful behaviors. Adolescents who are victims of cyberbullying frequently experience heightened stress, anxiety, depression, poor self-esteem, and academic disengagement (Cohen-Almagor, 2022; Hinduja & Patchin, 2021). This is a growing concern globally and especially pressing in Southeast Asian countries like Indonesia, where the digital divide compounds the risks for adolescents in rural and ecologically vulnerable communities (Kollo & Mahfud, 2024). In such areas, access to the internet has outpaced the development of critical digital competencies and institutional support systems, exacerbating the vulnerability of youth to online harm (Alnasib, 2023).

2.1 Cyberbullying in Adolescent Populations

Adolescents are particularly at risk for experiencing and perpetrating cyberbullying due to their developmental sensitivity, social reliance on peer feedback, and intense involvement in digital life. Numerous international studies have documented how the are magnified by personal, familial, and social-environmental factors such as parenting style, peer support, school climate, and socioeconomic inequality (Ho et al., 2019; Lukács J et al., 2023). Cultural dimensions also shape how adolescents interpret and respond to cyberbullying. For example, in collectivist societies, shame and the desire to preserve group harmony may prevent victims from reporting abuse. In the Indonesian context, youth in rural areas often have limited access to school counselors, digital rights education, or mental health services, leaving them underprepared to manage digital threats (Alif, 2023; Kollo & Mahfud, 2024; Wahanisa et al., 2021). Although digital literacy initiatives have gained momentum in metropolitan areas, their reach and impact in more remote regions remain minimal (Seçkin Kapucu et al., 2021). Moreover, language and cultural barriers further limit access to resources tailored to local contexts.

2.2 School-Based Counseling and Digital Interventions

School-based counseling plays a central role in supporting student mental health and well-being. Traditionally focused on academic planning and behavioral regulation, school counseling has increasingly taken on the responsibility of addressing digital risks such as cyberbullying (Putro et al., 2023; Sari & Setiawan, 2023). However, most school counselors still lack formal training in digital literacy, trauma-informed practices, and online safety. Effective interventions must integrate culturally sensitive pedagogy with technological tools, enabling counselors to engage meaningfully with students' digital lives (Khakimova & Gumerova, 2024). The integration of digital competencies into school counseling is not merely a technical issue but also an ethical and pedagogical one (Gading, 2020). In many Indonesian schools, however, inadequate infrastructure, outdated policies, and the absence of continuous professional development hinder counselors' capacity to address cyberbullying effectively (Alif, 2023; Bukhori et al., 2024; Putra, 2024). Hierarchical educational systems compound this situation by limiting innovation and slowing the adoption of new practices.

Innovative counseling approaches that utilize digital media, peer education, and participatory methods have demonstrated potential (Ping, 2024; Zainudin et al., 2022). For instance, online peer support forums, mobile counseling apps, and gamified e-learning content have been used in various contexts to increase student engagement and emotional resilience (Ping, 2024). However, Western settings often design and test these tools, which limits their applicability to Indonesian adolescents. Adapting these approaches to local cultural and ecological contexts is essential for their effectiveness and sustainability (Miao & Li, 2024a).

2.3 Digital Ecopedagogy: Conceptual Foundations

Digital ecopedagogy is an emerging framework that combines ecopedagogy's emphasis on environmental consciousness and critical reflection with digital literacy and socio-political engagement. Rooted in Paulo Freire's pedagogy of the oppressed, ecopedagogy advocates for an education that encourages learners to critically understand and transform their world (Hung, 2021; Ponirin & Diansyah, 2022). When applied to the digital realm, this means fostering awareness of how technologies influence relationships, identities, and ecosystems (Monem, 2024). It also involves interrogating power dynamics in online spaces and promoting ethical, responsible digital citizenship (Korsant, 2024).

Though still largely conceptual, digital ecopedagogy has begun to inform curriculum design, environmental education, and media literacy programs (Hung, 2021). Creative media practices can be used to explore ecological issues and social justice through participatory storytelling and digital art. In school counseling, a digital ecopedagogical approach could enable students to explore how their online behaviors are connected to broader cultural narratives, community dynamics, and ecological relationships (Monem, 2024; Ponirin & Diansyah, 2022). This would allow for a more holistic understanding of cyberbullying not just as harmful behavior, but as a symptom of deeper social and environmental disconnections. Integrating these ideas into counseling could empower students to take collective, context-sensitive action against online abuse (Ponirin & Diansyah, 2022).

2.4 Ecological Systems Theory and Adolescent Well-Being

Bronfenbrenner's ecological systems theory provides a valuable lens for understanding adolescent development as influenced by multiple, nested systems. These include the microsystem (family, peers, school), mesosystem (connections between microsystems), exosystem (external institutions like the media), macrosystem (cultural and policy context), and chronosystem (changes over time) (Bronfenbrenner, 1979). This framework has been widely adopted in education, psychology, and public health to design interventions that account for the complexity of human development.

When applied to cyberbullying, ecological systems theory encourages educators and counselors to consider not only the individual student but also the surrounding systems that influence their online behavior (Agha et al., 2024). For instance, school culture, peer norms, and parental digital competence all affect how cyberbullying emerges and is addressed (Miao & Li, 2024a). An argument for multi-sectoral strategies that bring together families, schools, technology companies, and policy makers to create safer digital environments for youth (Shah et al., 2023). By integrating ecological systems thinking with digital ecopedagogy, school counselors can design interventions that are both systemic and transformative (Hung, 2021).

2.5Research Gap and Justification

Despite the urgent need for culturally relevant, ecologically grounded approaches to cyberbullying, few studies have explicitly combined digital ecopedagogy with ecological systems theory in counseling contexts. Most existing interventions focus on short-term skill-building or punitive measures rather than systemic change. Additionally, there is a lack of research in low-resource, ecologically fragile regions like Indonesia's wetland communities, where youth face intersecting risks related to digital inequality, environmental instability, and cultural marginalization.

Furthermore, participatory design approaches that involve students, parents, counselors, and local leaders in developing counseling models remain rare. Without stakeholder engagement, interventions often fail to align with the lived realities of the communities they aim to serve. This study seeks to address these gaps by developing a digital ecopedagogy-based counseling model that is locally grounded, theoretically robust, and practically applicable. By combining ecological systems thinking with participatory pedagogy and digital literacy, the model offers a novel and context-sensitive response to adolescent cyberbullying in Indonesia's wetland regions.

3. METHOD

This study employed a mixed-method approach, combining both qualitative and quantitative techniques to develop and evaluate a guidance and counseling (BK) model based on digital ecopedagogy for addressing cyberbullying among adolescents in wetland areas. The research was carried out in several coherent phases, beginning from theoretical exploration to empirical validation.

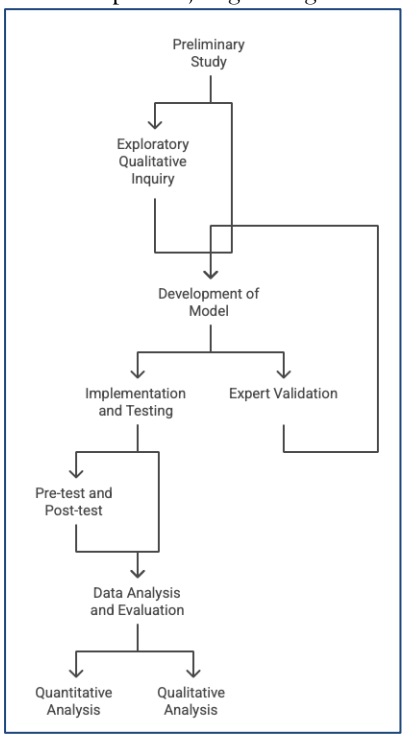

Figure 1. Research design plan

Stage 1: Preliminary Study

To initiate the research process, a literature review was collaboratively conducted with academic partners from the University of the Immaculate Conception (UIC) in the Philippines. This step aimed to strengthen the theoretical foundation related to digital ecopedagogy, cyberbullying, and ecological systems theory. The review synthesized findings from Scopus-indexed journals published within the last five years, emphasizing interdisciplinary perspectives from education, counseling, and environmental psychology.

Simultaneously, an exploratory qualitative inquiry was carried out in tree target schools across South Kalimantan. The data collection included structured interviews with school guidance counselors and parents, as well as focused group discussions (FGDs) with students. These instruments were designed to capture the prevalence, forms, and perceived causes of cyberbullying, as well as the specific digital behaviors and environmental contexts associated with youth in wetland regions. The findings from this stage served as a diagnostic baseline for the model's contextual relevance and grounded its initial design.

Stage 2: Development of the Digital Ecopedagogy-Based Guidance and Counseling Model

The model was designed through the construction of interactive guidance modules, digital learning content, and integrated counseling strategies facilitated through a web-based platform. This platform can be accessed at https://lms.inspiraeducare.id and includes materials on digital citizenship, ecological awareness, and socio-emotional development tailored to adolescents in wetland communities.

To ensure academic and practical quality, the modules underwent rigorous expert validation involving three domains: content (substantive experts in guidance and counseling), media (instructional design and visual communication specialists), and information technology (IT system developers and e-learning practitioners). The feedback provided by these experts was used to revise and refine the platform's structure, interactivity, and pedagogical accuracy.

The design process was grounded in Bronfenbrenner's ecological systems theory and informed by the core tenets of digital ecopedagogy, ensuring that each component addressed multi-layered contextual, environmental, and technological factors influencing adolescent behavior. These included micro-level dynamics such as peer interaction, meso-level structures like school environments, and macro-level influences including digital culture and ecological literacy.

Stage 3: Implementation and Testing of the Model

The model was implemented in three vocational high schools (SMK) located in the wetland regions of South Kalimantan: Each school was selected based on its ecological location and reported cases of cyberbullying among students. The implementation focused on applying the counseling model to address cyberbullying behavior through structured interventions, including digital ecopedagogy modules and peer support mechanisms. A pre-test and post-test design was utilized to assess the effectiveness of the model in reducing instances of cyberbullying.

Stage 4: Data Analysis and Evaluation

The data analysis stage employed both quantitative and qualitative techniques to capture the effectiveness and contextual relevance of the implemented model. Quantitatively, data were collected through pre-test and post-test instruments administered to students at three vocational high schools (SMKN 1 Pelaihari, SMKN 2 Banjarmasin, and SMKN 1 Sungai Tabuk, Indonesia). The main indicator evaluated was the frequency and form of cyberbullying incidents before and after the intervention. Statistical analyses included descriptive statistics to summarize the data, paired-sample t-tests to identify significant differences between pre- and post-intervention scores, and N-Gain analysis to determine the magnitude of change.

Qualitatively, thematic analysis was performed using interview transcripts and observational notes. The data were categorized into recurring themes such as emotional responses, peer interaction, counselor involvement, and perceptions of ecological values. Coding was conducted manually and then verified using NVivo software. Triangulation was achieved by comparing responses across data sources (students, counselors, and parents), ensuring that conclusions were consistent and credible.

4. RESULTS

The implementation of the digital ecopedagogy-based guidance and counseling model in three vocational high schools in South Kalimantan yielded comprehensive results that reflect both the procedural rigor and the practical impact of each phase of the research. The findings are structured to correspond with the stages of the research process described in the methods section.

4.1 Preliminary Study Outcomes

The exploratory interviews and FGDs conducted during the preliminary stage revealed that cyberbullying in wetland-based communities was not only prevalent but also normalized by many students due to limited awareness and digital supervision. Respondents highlighted verbal harassment, social exclusion, and identity impersonation as the most common forms of cyberbullying. These insights shaped the content development of the model, emphasizing ecological analogies, moral reasoning, and empathy-building narratives.

4.2 Model Development Insights

During the model design phase, expert validators from the domains of counseling, media, and IT provided structured feedback. Content expert Emma Yuniarrahmah, a lecturer in psychology at Universitas Lambung Mangkurat, emphasized the importance of embedding ecological ethics and social-emotional learning within the module content. Media expert Rene M. Babiera II, a lecturer in education at the University of the Immaculate Conception, Philippines, helped refine the user interface of the LMS to ensure accessibility on low-bandwidth mobile networks, which was critical for students in wetland areas. IT expert Budi Santosa, the leader of the Google Educator Group Surabaya, validated the platform's technical reliability, focusing on cross-device compatibility and secure user interactions. These revisions collectively increased user satisfaction and improved the digital experience for both students and counselors.

Table 1. Results of digital eco-pedagogy validation by experts

Validator Type	Name and Affiliation	Assessed Aspect	Average Score (Max 5)	Interpretation

Content Expert	Dr. Emma Yuniarrahmah, Universitas Lambung Mangkurat	Relevance and clarity of ecological materials	4.75	Very Valid
Media Expert	Rene M. Babiera II, University of the Immaculate Conception, Philippines	Accessibility and interactivity of LMS	4.70	Very Valid
IT Expert	Budi Santosa, Google Educator Group Surabaya	Technical functionality and security	4.65	Very Valid

The validation results confirmed that the model met high standards of content relevance, media design, and technological robustness, indicating its feasibility for large-scale implementation.

4.3 Implementation Results

The model was piloted at SMKN 1 Pelihari, SMKN 2 Banjarmasin, and SMKN 1 Sungai Tabuk, Indonesia. Pre-test assessments across these schools revealed moderate to high frequencies of cyberbullying behaviors, accompanied by low levels of reporting and bystander intervention. After the implementation of the digital ecopedagogy-based counseling model, post-test data indicated statistically significant improvements. The paired-sample t-tests showed meaningful reductions in cyberbullying indicators ($p < 0.05$), and the N-Gain scores, 0.42 for SMKN 1 Pelaihari, 0.57 for SMKN 2 Banjarmasin, and 0.65 for SMKN 1 Sungai Tabuk, demonstrated moderate to high effectiveness in behavior modification.

To present the outcomes more clearly, the following table summarizes the key statistical indicators across the intervention sites:

Table 2. Pre-Test and Post-Test Results

School	Pre-test Mean Score	Post-test Mean Score	N-Gain Score	Significance (p-value)
SMKN 1 Pelaihari	73.2	85.1	0.42	< 0.05
SMKN 2 Banjarmasin	71.5	86.7	0.57	< 0.05
SMKN 1 Sungai Tabuk	69.8	88.3	0.65	< 0.05

This statistical trend confirms the model's capacity to enhance students' self-awareness, reduce aggression in online contexts, and increase confidence in managing or reporting cyberbullying incidents. These quantitative results were corroborated by narrative feedback indicating strengthened digital ethics and social accountability among participants.

Table 3. Qualitative data analysis results

Theme	Description	Implication
Environmental Metaphors	Students associated digital toxicity with ecological damage, improving their comprehension of online ethics.	Strengthened moral reasoning and analogical thinking about digital behavior.
Peer Empathy	Peer mentoring encouraged openness and empathy, making it easier for students to discuss their problems.	Enhanced peer-to-peer support and reduced stigma in addressing cyberbullying.

Counselor Engagement	Counselors observed better student disclosure due to interactive and relatable LMS content.	Improved digital counseling dynamics and rapport.
Cultural Relevance	Use of localized language and environmental imagery made the content more relatable to students' contexts.	Increased student engagement and cultural resonance with intervention materials.

The qualitative findings underscore how the model's integration of ecopedagogical themes did more than just reduce harmful behavior; it actively reshaped how students perceive their digital environments. The use of ecological metaphors served as an accessible bridge for understanding abstract digital ethics, while peer mentoring mechanisms enhanced mutual support. Furthermore, counselor-student engagement improved due to the platform's interactive features, and cultural adaptation of the content significantly contributed to its acceptance. Altogether, these thematic patterns provide strong qualitative evidence supporting the model's contextual effectiveness and pedagogical soundness.

5. DISCUSSION

These findings confirm that digital counseling models grounded in ecopedagogical and ecological systems theory can foster not only behavioral change but also cognitive and emotional growth. The intervention succeeded in reducing cyberbullying while simultaneously strengthening students' sense of agency, environmental empathy, and social belonging. This aligns with Bronfenbrenner's ecological model, wherein coordinated interventions at multiple systemic levels (individual, peer, institutional) generate more sustainable outcomes.

From the quantitative perspective, the statistical outcomes of the model implementation show clear behavioral improvements. The consistent N-Gain scores (ranging from 0.42 to 0.65) across three different schools demonstrate that the intervention was not only significant ($p < 0.05$) but also consistently effective across varied student populations. These outcomes suggest a reliable pattern of improvement in students' emotional regulation and behavioral response to cyberbullying threats. Studies such as Gámez-Guadix et al., (2022) support this, showing that socio-emotional interventions in schools significantly reduce cyber-aggression. Our results add value to this finding by introducing ecopedagogical content as the contextual driver of change.

From a qualitative standpoint, thematic patterns, such as increased empathy, strengthened peer support, and improved counselor-student relationships, highlight the psychosocial dimensions of the intervention's impact. The ecological metaphor was especially effective in helping students internalize the implications of online actions through analogies familiar from their environmental surroundings (Agha et al., 2024; Bronfenbrenner, 1979; Edwards, 2021; Miao & Li, 2024a, 2024b; Patel & Quan-Haase, 2024; Solmaz, 2021). Anto & D, (2022) demonstrated that when digital ethics is taught through metaphorical and environmental narratives, students develop deeper reflective thinking and long-term ethical awareness. The current study affirms this and contributes by localizing such metaphors in wetland-based cultural contexts.

The digital learning platform (LMS) that supported this intervention played a pivotal role in accessibility and engagement (Ali & Lefticaru, 2023; Gutta, 2024; Rosliani, 2024; Suvandy et al., 2024). Adler et al., (2024) emphasized that digital tools should resonate with the sociocultural and linguistic realities of their users. The success of our platform, developed in Bahasa Indonesia with regional metaphors and low-bandwidth features, echoes these best practices and exemplifies how design localization enhances educational inclusivity.

Moreover, the collaborative peer mentoring element in the model not only empowered students to take proactive roles in their digital communities but also echoed the findings of Japar, (2023), who emphasized the value of integrating civic responsibility and environmental awareness in digital education. This element was particularly effective in shifting classroom dynamics toward collective responsibility, as reflected in student narratives.

Counselor feedback also supports the model's holistic benefits (Rudolph et al., 2024). Compared to their traditional practice, counselors observed that the digital sessions, framed ecopedagogically, stimulated more openness, critical thinking, and behavioral ownership among students. Hinduja & Patchin, (2021) have long advocated for ecological counseling approaches that transcend reactive responses. The present model exemplifies this by aligning ecological ethics with cognitive-behavioral strategies.

At the policy level, this research supports the necessity of integrated interventions. Sustainable anti-cyberbullying programs require institutional leadership and curriculum innovation (Aizenkot & Kashy-Rosenbaum, 2020). The current model, combining environmental literacy, social-emotional development, and accessible technology, provides a replicable framework aligned with these policy imperatives (Ryoo & Kim, 2024; Vlaanderen et al., 2020).

In conclusion, this discussion synthesizes empirical findings with established literature to argue for the efficacy and scalability of ecopedagogical digital counseling. The model not only demonstrated positive behavioral and emotional outcomes but also advanced pedagogical and systemic strategies for addressing cyberbullying in marginalized regions. By uniting ecological metaphor, digital ethics, and community engagement, the model offers a pioneering direction for future interventions grounded in environmental-human interconnectedness.

6. CONCLUSION

This study demonstrates that a digital counseling model grounded in ecopedagogy and Bronfenbrenner's ecological systems theory can effectively reduce cyberbullying among adolescents in wetland-based vocational high schools. By embedding environmental metaphors, socio-emotional learning, and peer mentoring into a localized digital learning platform, the intervention not only reduced harmful online behaviors but also fostered empathy, self-regulation, and ecological awareness. Quantitative findings confirmed significant behavioral improvements, while qualitative insights revealed deeper shifts in student perspectives, peer interactions, and counselor engagement.

Theoretically, the study extends existing literature by integrating ecological ethics into digital behavioral interventions, providing a holistic framework that addresses multiple systemic levels—from individual cognition to institutional policy. Practically, the model offers an accessible, culturally resonant, and low-bandwidth-compatible solution for schools in low-resource or geographically isolated contexts.

For educational policymakers, the findings highlight the importance of supporting digital counseling programs that are both technologically adaptable and contextually meaningful. Scaling such models requires institutional investment in counselor training, digital infrastructure, and curriculum innovation that integrates environmental literacy with digital citizenship. Future research should explore longitudinal impacts, cross-regional applicability, and integration with broader mental health initiatives to sustain and expand the model's positive effects.

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