Tekno-Pedagogi 16 (2) (2026)
ISSN: 2088-205X | E-ISSN: 2715-7415
Tekno-Pedagogi : Jurnal Teknologi Pendidikan
https://online-journal.unja.ac.id/pedagogi
https://doi.org/10.22437/teknopedagogi.v16i2.53934

Effectiveness and Pedagogical Approaches in Technology-Enhanced Internet Ethics Education for Elementary Students: A Systematic Review

Fatimatus Zahroh[1], Budi Purwoko[2], Fiena Saadatul Ummah[3]
[1,2,3]Universitas Negeri Surabaya, Surabaya, Indonesia
Corresponding author email: budipurwoko@unesa.ac.id

Info Article
Received: 13 March 2026
Revised: 20 March 2026
Accepted: 22 Oct 2025
Online Version: 29 Mar 2026

Abstract
This systematic review examines technology-enhanced pedagogical approaches in internet ethics education and their effectiveness in promoting safe online behavior among elementary school students within the context of increasing digitalization in education. Following the PRISMA guidelines, 15 peer-reviewed studies published between 2020 and 2025 were systematically identified, selected, and analyzed. The review focuses on various instructional strategies supported by digital technologies, including digital game-based learning, interactive learning programs, privacy literacy training, and collaborative school–parent interventions. The findings indicate that technology-mediated pedagogical approaches positively contribute to students' digital literacy, ethical awareness, and self-efficacy in navigating online environments. In particular, game-based and interactive digital learning environments demonstrate strong potential in enhancing student engagement and facilitating the understanding of abstract ethical concepts. However, the review also reveals a persistent gap between knowledge acquisition and actual behavioral change. In addition, several methodological limitations were identified, including small sample sizes, short intervention durations, and limited cross-cultural generalizability. The results suggest that the effectiveness of internet ethics education depends largely on how digital technologies are meaningfully integrated into pedagogical design rather than used merely as instructional tools. A hybrid instructional approach that combines technology-enhanced learning with offline reinforcement and multi-stakeholder collaboration appears to offer more sustainable outcomes. This study contributes to the field of technology-enhanced pedagogy by synthesizing current evidence on the role of digital tools in shaping ethical learning and safe online behavior among young learners, while also identifying directions for future research.

Keywords: Digital Citizenship; Digital Pedagogy; Elementary Education; Internet Ethics Education; Online Safety; Technology-enhanced Learning

INTRODUCTION

The rapid development of digital technology has fundamentally changed the childhood experience, with primary school students now being exposed to online environments at an increasingly young age. Research shows that children as young as six are actively engaging with digital platforms,

social media, and online learning environments, often without an adequate understanding of digital risks and ethical considerations (Purnama et al., 2021). This widespread and early digital exposure has raised pressing concerns about online safety, privacy protection, and ethical behavior in the digital space. The COVID-19 pandemic has further accelerated this trend, as distance learning necessitates widespread internet use among elementary school students, heightening the need for comprehensive digital ethics education. Contemporary studies reveal that elementary school students face a variety of online risks, including cyberbullying, privacy violations, exposure to inappropriate content, and concerns about digital footprints, which can have long-term impacts on their development and well-being (Martin et al., 2023). The critical developmental stage of primary education presents challenges and opportunities to build fundamental digital ethics competencies that will guide students throughout their lives.

Digital ethics education encompasses more than just technical skills; it involves developing moral reasoning, empathy, responsibility, and critical thinking in online contexts. Recent pedagogical research emphasizes that effective digital citizenship education must address not only the "how" of technology use but also the "why" and "what" of ethical behavior online (O'Reilly et al., 2024). Elementary school students are highly receptive to ethical guidance during this formative period, making it an optimal time for intervention and education. Studies show that children who receive structured digital ethics instruction demonstrate improved decision-making skills in online situations, increased awareness of privacy risks, and a greater likelihood of engaging in prosocial online behavior. Integrating internet ethics into the elementary school curriculum is a preventative approach that can reduce future online risks while promoting positive digital citizenship. Despite the growing body of research on digital ethics education, evidence regarding which pedagogical approaches are most effective for elementary students remains fragmented and methodologically diverse.

The theoretical foundations for digital ethics education in elementary schools draw from a variety of disciplinary perspectives, including developmental psychology, moral education, media literacy, and digital citizenship frameworks. Researchers argue that elementary school students need age-appropriate and gradual learning experiences that build understanding of increasingly complex digital ethics concepts (Livingstone et al., 2023; Tarofil et al., 2024). Contemporary approaches emphasize experiential learning, interactive methods, and collaborative engagement over traditional didactic instruction. Digital game-based learning (DGBL) has emerged as a particularly promising pedagogical strategy, capitalizing on children's natural attraction to play while embedding ethical lessons within engaging digital experiences. Furthermore, the digital ethics of care framework proposes that empathy, responsibility, and respect should be core values guiding elementary school students' online interactions. This theoretical perspective recognizes that digital ethics education must address cognitive, emotional, and behavioral dimensions simultaneously to achieve a meaningful and lasting impact on children's online safety practices.

The implementation of digital ethics education in elementary schools faces many practical challenges, including limited teacher training, inadequate curricular resources, varying levels of parental involvement, and inconsistent policy frameworks. Teachers reported concerns about their own preparedness to address complex digital safety issues, particularly regarding new technologies and evolving online threats (Martin et al., 2023). The rapid pace of technological change means that educational interventions can quickly become outdated, necessitating continuous updating and adaptation of curricula and teaching materials. Furthermore, cultural and socioeconomic factors influence children's digital access patterns and the implementation of standardized ethics education programs. Schools must navigate the tension between protecting children from online risks and promoting the digital competencies and autonomy necessary for 21st-century learning. Research shows that successful implementation requires a systemic approach involving coordinated efforts among educators, families, technology developers, policymakers, and community stakeholders to create a comprehensive support system for elementary school students' digital development.

Recent research on digital ethics education reveals a variety of intervention approaches, assessment methodologies, and outcome measures. Experimental studies have evaluated specific programs such as "Be Internet Awesome," educational games like "Bedipoli," thematic storytelling, comic-based instruction, and integrated social studies curricula focused on digital citizenship (Jones

et al., 2024; Novianti et al., 2025). These interventions vary widely in theoretical orientation, target competencies, delivery format, and intensity. Quantitative research using randomized controlled trials, quasi-experimental designs, and survey methodologies has provided evidence of increased knowledge, behavioral changes, and attitudinal shifts resulting from digital ethics interventions. Qualitative studies offer deeper insights into student experiences, teacher perspectives, and contextual factors influencing program effectiveness. However, methodological limitations, including small sample sizes, short follow-up periods, and the lack of standardized assessment instruments, limit the ability to draw definitive conclusions about best practices in digital ethics education for elementary school students.

Synthesizing existing research through a systematic review methodology provides a valuable opportunity to identify patterns, gaps, and future directions in the field of digital ethics education for elementary schools. By comprehensively analyzing available evidence on the effectiveness of interventions, pedagogical approaches, and implementation factors, this review aims to inform evidence-based practice and policy decisions. The findings have significant implications for curriculum development, teacher professional development, parent education programs, and policy frameworks governing digital citizenship education (Kanishevska & Lesyk, 2023). As digital technologies continue to evolve and impact all aspects of children's lives, the need to build robust, effective, and scalable digital ethics education systems becomes increasingly important. This systematic review contributes to this important goal by synthesizing current knowledge, evaluating the effectiveness of interventions, and proposing recommendations to advance the field of internet ethics education in elementary schools.

Despite the growing body of research on digital ethics and online safety education, existing studies remain fragmented in explaining how technology-enhanced pedagogical approaches are systematically designed and implemented in elementary education contexts. Most prior research focuses on outcomes such as digital literacy or risk reduction, while providing limited synthesis of how digital technologies function as integral components of instructional design to support ethical learning. Furthermore, there is a lack of comprehensive reviews that examine the interplay between pedagogical strategies and technology integration in shaping students' safe online behaviour. Therefore, this study aims to systematically examine and synthesize existing research on the effectiveness and pedagogical approaches in technology-enhanced internet ethics education for elementary school students. Specifically, the review seeks to identify the types of technology-enhanced instructional strategies employed, evaluate their contributions to students' digital literacy, ethical awareness, and safe online behavior, and analyze how digital technologies are integrated within pedagogical design to support meaningful learning outcomes. In addition, this study aims to highlight current research gaps and provide evidence-based insights to inform the development of effective technology-enhanced pedagogical practices in digital ethics education at the elementary level. This study also seeks to contribute to the growing field of technology education by positioning digital ethics learning within a technology-enhanced pedagogical framework.

RESEARCH METHODS

Research Design

This study employed a systematic review design to examine and synthesize existing research on technology-enhanced internet ethics education for elementary school students. The review followed the guidelines of the *Preferred Reporting Items for Systematic Reviews* and *Meta-Analyses* to ensure transparency, rigor, and replicability in the identification, selection, and analysis of relevant studies. This design was considered appropriate as it allows for a comprehensive synthesis of empirical evidence regarding the effectiveness and pedagogical approaches used in digital ethics education within technology-mediated learning environments.

Research Subject

The subjects of this study were peer-reviewed research articles focusing on internet ethics education, digital citizenship, and online safety interventions for elementary school students. A total of 15 studies published between 2020 and 2025 were included in the final analysis. These studies represented diverse geographical contexts and employed various research designs, including experimental, quasi-experimental, qualitative, and review-based approaches.

Research Procedure

The research procedure consisted of several systematic stages. First, a comprehensive literature search was conducted across multiple academic databases, including ERIC, PsycINFO, Web of Science, Scopus, and Google Scholar, using combinations of keywords such as “digital ethics,” “internet safety,” “elementary school,” “online behavior,” “digital citizenship,” and “cyberbullying prevention.”

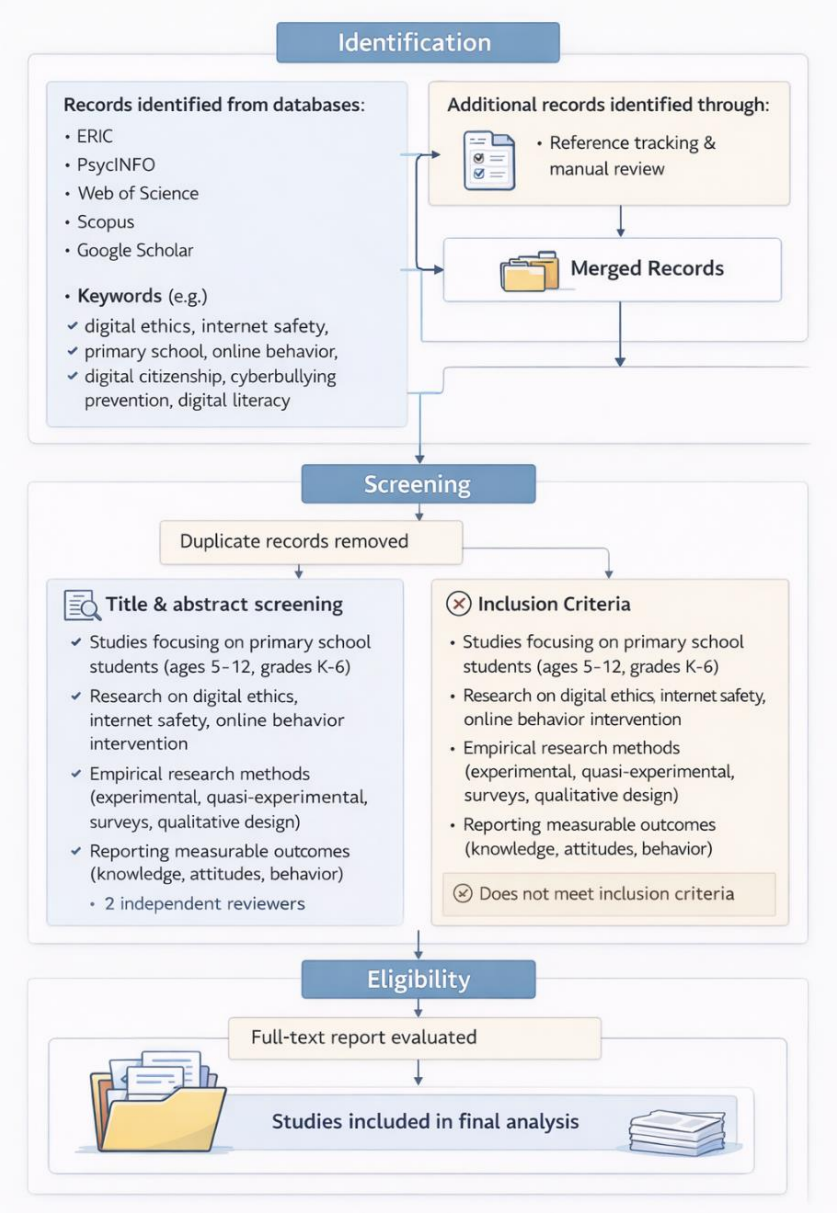

Figure 1. Stages of Research Procedure

Second, the search results were screened based on predefined inclusion and exclusion criteria. Studies were included if they: (1) focused on elementary school students; (2) examined internet ethics, digital safety, or related behavioral interventions; (3) employed empirical or review-based methodologies; (4) reported measurable outcomes related to knowledge, attitudes, or behavior; and (5) were published in English. Studies were excluded if they focused on non-elementary populations, lacked empirical evidence, or did not address ethical dimensions of online behavior.

Third, the screening process was conducted by two independent reviewers through title and abstract evaluation, followed by full-text assessment. Any discrepancies were resolved through discussion to reach consensus. The overall selection process is illustrated in Figure 1. Finally, the selected studies were analyzed using a thematic synthesis approach to identify patterns related to pedagogical strategies, technology integration, and learning outcomes.

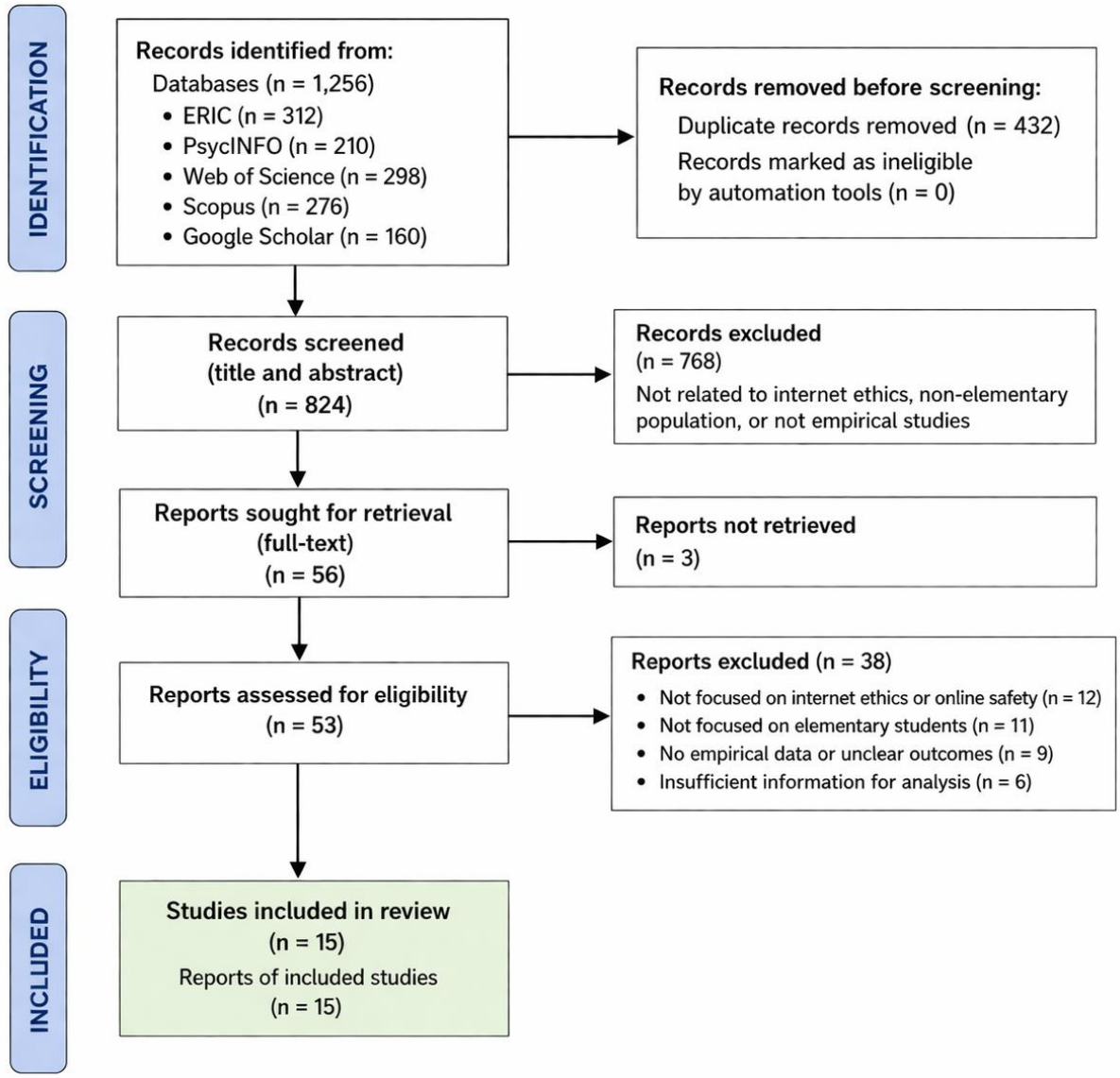

Figure 2. PRISMA Model

Instruments and Data Collection Techniques

Data collection was conducted using a structured data extraction framework designed to systematically capture key information from each selected study. The extracted data included publication details (authors, year, and country), research design, sample characteristics, type and duration of intervention, pedagogical approach, use of digital technology, targeted outcomes, measurement instruments, key findings, strengths, and limitations.

The collected data were then organized and synthesized narratively to identify recurring themes and patterns across studies, particularly focusing on technology-enhanced pedagogical approaches and their effectiveness in supporting safe online behavior. The summary of study characteristics is presented in Table 1.

Table 1. Characteristics of included studies on internet ethics education for elementary school students

Study	Country	Research Design	Sample Size	Type of Intervention	Key Findings
Zheng et al. (2024)	China	Quasi-experimental	120 students	Digital game-based learning intervention	Improved digital ethics literacy, learning motivation, and student engagement
Martin et al. (2023)	United States	Qualitative interview	24 teachers	Teacher perspectives on digital safety practices	Identified concerns, instructional practices, and monitoring strategies
Jones et al. (2024)	United States	Randomized controlled trial	1,067 students	“Be Internet Awesome” curriculum	Increased knowledge, self-efficacy, and privacy-related behaviors
Novianti et al. (2025)	Indonesia	Pre-test–post-test design	48 students	Educational game “Bedipoli”	Improved understanding of digital ethics
Shyshak et al. (2024)	Ukraine	Experimental	Not specified	Story-based, comic-based, and game-based learning	Development of safe online behavior
Kamalia et al. (2025)	Indonesia	Training evaluation	60 students	Social media education program	Increased ethical awareness and data security understanding
O'Reilly et al. (2024)	England	Qualitative participatory study	88 children	Digital ethics of care framework	Enhanced empathy, responsibility, and respect in online interactions
Purnama et al. (2021)	Indonesia	Cross-sectional survey	300 students	Digital literacy assessment	Reduced exposure to online risks
Marsini (2025)	Indonesia	Literature review	Not available	Integration into social studies curriculum	Conceptual development of digital ethics pedagogy

Study	Country	Research Design	Sample Size	Type of Intervention	Key Findings
Evangelio et al. (2022)	Spain	Systematic review	43 articles	Cyberbullying prevention programs	Demonstrated overall program effectiveness
Desimpelaere et al. (2020)	Belgium	Experimental (two online studies)	270 children	Privacy literacy training	Improved privacy understanding and information disclosure behavior
Finkelhor et al. (2021)	United States	Program review	Various programs	Internet safety education programs	Identified effective integrated approaches
Polanin et al. (2022)	United States	Meta-analysis	50 studies (45,371 participants)	Cyberbullying intervention programs	Reduced perpetration and victimization rates
Soler-Costa et al. (2021)	Spain	Systematic review	Various studies	Online etiquette education	Developed theoretical frameworks and measurement approaches
Livingstone et al. (2023)	England	Evidence review	34 studies	Digital skills education	Identified relationships between digital opportunities and risks

RESULTS AND DISCUSSION

A systematic review of 15 studies revealed substantial evidence supporting the effectiveness of internet ethics education in shaping safe online behavior among elementary school students, although with significant variation across intervention types, implementation contexts, and outcome measures. Digital game-based learning (DGBL) emerged as a highly effective pedagogical approach, with Zheng et al. (2024) which showed significant improvements in digital etiquette literacy, learning motivation, and student engagement compared to conventional teaching methods. The study found that elementary school students who participated in the DGBL intervention showed measurable improvements in understanding appropriate online communication, recognizing digital risks, and applying ethical reasoning to online scenarios. Novianti et al. (2025) strengthen this through their evaluation of the educational monopoly game "Bedipoli" in Indonesia, which reported significant improvements in digital ethics understanding among participating students, both pre- and post-test. This game-based approach capitalizes on elementary school students' developmental preferences for interactive and engaging learning experiences, while embedding ethical concepts in contextually relevant digital scenarios. Evidence suggests that gamification strategies can effectively transform abstract ethical principles into concrete and memorable learning experiences that resonate with young learners. However, both studies acknowledge limitations, including relatively small sample sizes and implementation in only one school, raising questions about generalizability across educational contexts.

Privacy literacy training is another intervention domain that has shown promising results in protecting elementary school students from online risks. Desimpelaere et al. (2020) conducted two online experiments with children aged 9–13 and found that targeted privacy education significantly improved participants' understanding of privacy concepts and reduced their willingness to share personal information online. The training included age-appropriate explanations of data collection practices, the potential consequences of oversharing, and strategies for protecting personal information in digital environments. Participants demonstrated an improved ability to identify privacy

risks in common online scenarios and demonstrated improved critical evaluation of information requests from websites and apps. Kamalia et al. (2025) reported complementary findings from their social media education program in Indonesia, with 85% of participating students demonstrating increased knowledge of digital ethics and 80% demonstrating greater caution in sharing personal data after the intervention. This privacy-focused intervention addresses a critical vulnerability in elementary school students' online experiences, as research consistently shows that young children are often unaware of how their digital information can be collected, used, and potentially misused by third parties. Comprehensive digital citizenship programs that combine multiple components show mixed but generally positive results across multiple outcome domains. Jones et al. (2024) conducted a cluster-randomized controlled trial evaluating the "Be Internet Awesome" curriculum with over 1,000 elementary school students in grades 4-6, finding significant improvements in digital safety knowledge and self-efficacy, but no significant impact on privacy behaviors or reductions in cyberbullying. The curriculum covered topics including online sharing, phishing awareness, safe communication, and combating cyberbullying through interactive lessons, videos, and accompanying online games. Although students demonstrated increased confidence in their ability to safely navigate online situations and demonstrated increased declarative knowledge of digital safety principles, these cognitive improvements did not consistently translate into observable behavioral changes. These findings highlight a critical challenge in digital ethics education: bridging the gap between knowledge acquisition and behavioral implementation. The researchers suggest that a single-semester intervention may not be sufficient to build lasting behavioral change and recommend a sustained, multi-year approach integrated across the elementary school curriculum.

Teachers' perspectives and concerns provide important contextual insights into the implementation of digital ethics education. Martin et al. (2023) In-depth interviews with elementary school teachers revealed widespread concerns about cyberbullying, privacy violations, and students' digital footprints. Teachers reported that effective digital safety education requires a combination of proactive teaching with active monitoring and responsive intervention when problems arise. Many teachers reported feeling underprepared to address complex digital ethics issues despite recognizing their importance, indicating the need for increased professional development opportunities. (Mishna et al., 2009). Teachers identified several barriers to effective implementation, including limited instructional time, conflicting curriculum demands, varying levels of parental support and technology access among students, and rapidly changing digital platforms that outstrip educational resources. However, teachers who received specialized training and had access to quality curriculum materials reported greater confidence and effectiveness in addressing digital ethics topics. This qualitative evidence underscores that the success of digital ethics education depends not only on well-designed interventions but also on adequate support systems for educators implementing these programs.

Collaborative approaches involving multiple stakeholders have shown increased effectiveness compared to isolated school-based interventions. Purnama et al. (2021) A survey of 300 elementary school students in Indonesia found that digital literacy combined with parental mediation significantly reduced children's exposure to online risks. The study used structural equation modelling to examine the relationships between digital literacy, parental involvement, self-control, and online risk behavior, revealing that both direct and indirect pathways contributed to risk reduction. Students whose parents actively engaged in discussions about internet use, set appropriate limits, and modelled responsible digital behavior showed significantly lower rates of encountering problematic online content, disclosing personal information, and experiencing cyberbullying. Kanishevska & Lesyk (2023) emphasize that effectively developing safe digital behaviors requires a coordinated effort between teachers, parents, and government agencies to create a comprehensive support system. Their analysis identifies the need for a systemic approach that addresses individual competencies, family practices, school policies, and broader societal norms related to digital citizenship. This multilevel perspective recognizes that elementary school students' online safety cannot be ensured through education alone, but requires an ecological approach that addresses the various spheres of influence in children's lives.

Research on cyberbullying prevention interventions provides additional insights into effective strategies for promoting ethical behavior in cyberspace. Evangelio et al. (2022) conducted a systematic review of 43 studies on cyberbullying prevention programs for elementary and middle school students

and concluded that effective programs incorporate collaboration between teachers, parents, and school psychologists. Successful interventions combine awareness-raising, skill-building, peer support mechanisms, and clear reporting protocols to create a comprehensive prevention system. Polanin et al. (2022) A meta-analysis of 50 cyberbullying intervention studies involving over 45,000 participants found significant reductions in both perpetration and victimization across programs. However, the meta-analysis revealed considerable heterogeneity in effect sizes, with program effectiveness varying based on intervention intensity, theoretical foundation, implementation fidelity, and cultural context. Programs that explicitly addressed the ethical dimensions of online interactions, fostered empathy and perspective-taking, and provided opportunities for students to practice intervention skills as bystanders demonstrated stronger effects than programs that primarily focused on awareness or rules-based approaches.

Innovative pedagogical approaches that incorporate creative media and arts-based methods demonstrate potential for engaging elementary school students in digital ethics learning. Shyshak et al. (2024) demonstrated that thematic stories, comics, and interactive games effectively shaped safe online behavior patterns among elementary school students in Ukraine. This creative approach leveraged narrative engagement and visual storytelling to make abstract ethical concepts more accessible and memorable to young learners. The study found that students exposed to the story-based intervention demonstrated improved abilities to recognize potentially dangerous online situations and identify appropriate responses. O'Reilly et al. (2024) developed and evaluated a "digital ethics of care" framework in primary schools in England, using participatory methods that positioned children as co-researchers and co-interviewers. This approach empowered students to explore digital ethics issues through peer dialogue and collaborative inquiry, resulting in an increased understanding of empathy, responsibility, and respect in online contexts. This participatory methodology recognized primary school students as active agents capable of meaningfully engaging with complex ethical questions, rather than passive recipients of rules dictated by adults.

The integration of digital ethics into existing curriculum areas presents opportunities for sustained and contextualized learning. Marsini (2025) analyzes the potential for transforming social studies education to foster digital ethics in elementary schools, arguing that social studies provide a natural opportunity to discuss citizenship, responsibility, and ethical decision-making in digital contexts. The proposed integration would embed discussions of digital ethics within units on community, governance, rights and responsibilities, and contemporary social issues, making these topics more relevant and meaningful to students. This curricular integration approach addresses concerns about already crowded elementary school schedules by incorporating digital ethics into existing content areas rather than adding a separate subject. However, this integration strategy requires teachers to have content expertise in their subject areas and a sufficient understanding of digital ethics issues, highlighting the importance of comprehensive teacher professional development.

The findings of this systematic review indicate that internet ethics education plays a significant and diverse role in shaping safe online behavior among elementary school students, while also revealing significant complexities in implementation and achievement of outcomes. The evidence supporting digital game-based learning as an effective pedagogical approach aligns with contemporary theories of engaged learning and developmental psychology, which emphasize that elementary school-aged children learn most effectively through interactive activities and experiences that connect abstract concepts to concrete situations (Zheng et al.., 2024). The success of the DGBL intervention reflects the fundamental principles of motivation and engagement, as games provide immediate feedback, progressive levels of challenge, and intrinsic rewards that sustain children's attention and effort. However, the effectiveness of a game-based approach relies heavily on thoughtful instructional design that balances entertainment value with educational objectives, ensuring that ethical lessons are central to, and not merely peripheral to, the gaming experience. Preliminary evidence from studies conducted in diverse cultural contexts, including China, Indonesia, and Ukraine, suggests potential for broader applicability, although systematic cross-cultural validation is needed to establish generalizability and identify necessary adaptations.

Table 2. Summary of intervention results by type

Type of Intervention	Number of Studies	Key Findings	Effect Size / Impact	Limitations
Digital Game-Based Learning	3	Improved digital ethics literacy, learning motivation, and student engagement	Moderate to large effect (significant improvement)	Small sample sizes; limited to single-site implementation
Privacy Literacy Training	2	Improved understanding of privacy and reduced willingness to share personal data	Moderate effect (increase in knowledge; some behavioral change)	Limited to privacy domain; short-term effects
Comprehensive Digital Citizenship Programs	2	Increased knowledge and self-efficacy; mixed results in behavioral outcomes	Small to moderate effect (knowledge gains exceed behavioral change)	Knowledge–behavior gap; limited intervention duration
Cyberbullying Prevention Programs	2	Reduced cyberbullying perpetration and victimization	Small to moderate effect (heterogeneous results)	Variation in program quality; implementation fidelity issues
Creative / Arts-Based Approaches	2	Increased awareness of online risks and enhanced ethical reasoning	Moderate effect (emerging evidence)	Limited rigorous evaluation; small sample sizes
Curriculum Integration Approaches	1	Potential for sustainable and contextually embedded learning	Not empirically tested	Conceptual stage; lack of empirical validation
Multi-Stakeholder Collaboration	2	Improved effectiveness through collaboration between schools and families	Moderate to large effect (synergistic impact)	Complex implementation; variability in stakeholder involvement

The persistent gap between knowledge and behavior, as identified in several studies, represents a fundamental challenge for digital ethics education that requires both theoretical and practical attention. Jones et al. (2024) demonstrated substantial increases in declarative knowledge about digital safety while demonstrating minimal changes in actual online behavior, a finding consistent with broader research on health education, moral reasoning, and behavior change. This gap suggests that knowing what to do in online situations is quite different from actually doing it when faced with pressure, temptation, or real-world social dynamics. Bridging this gap likely requires interventions that go beyond information transmission to include behavioral rehearsals, social-emotional skill development, environmental support, and sustained reinforcement over time. The finding that single-semester interventions often fail to produce lasting behavioral change underscores the importance of viewing digital ethics education not as a discrete topic to be "covered" but as a continuous, developmental process requiring ongoing attention throughout the elementary school years. Schools may need to adopt a spiral curriculum approach that revisits and deepens digital ethics concepts at increasing levels of sophistication as students' progress through the elementary grades.

The important role of teacher readiness and self-confidence emerges as both supporting and inhibiting factors in the implementation of effective digital ethics education. Martin et al. (2023) Research reveals that many elementary school teachers feel ill-prepared to address complex issues of digital safety and ethics despite recognizing their importance, a finding that has significant

implications for teacher education and professional development. Pre-service teacher education programs may need to expand their coverage of digital citizenship, online safety, and technology ethics to better prepare future elementary school educators for these responsibilities. In-service professional development should provide not only information about digital risks and ethical principles, but also practical pedagogical strategies, curriculum resources, and opportunities for teachers to develop confidence through guided practice and peer collaboration. The rapid evolution of digital technologies means that one-off training is not enough; teachers need ongoing professional learning opportunities to stay abreast of emerging platforms, evolving risks, and innovative educational approaches. Supporting teachers' expertise in digital ethics education is a crucial lever for achieving broad and sustainable impact on elementary school students' online safety.

Parental engagement and family-school partnerships are essential components of a comprehensive approach to promoting safe online behavior among elementary school students. Purnama et al. (2021) Studies have shown that parental mediation significantly enhances the protective effects of school-based digital literacy education, confirming that children's online experiences and behaviors are shaped by a variety of social contexts that extend beyond the school setting. Effective parental engagement encompasses a range of strategies, including shared technology use, active discussions about online experiences, setting appropriate rules and expectations, monitoring online activity, and modelling responsible digital behavior by parents themselves. However, parents vary widely in their own digital literacy, awareness of contemporary online risks, confidence in discussing technology issues with their children, and time available for active mediation. Schools can support effective parental engagement through parent education programs, communication strategies that help families understand what children are learning about digital ethics, and resources that enable parents to engage meaningfully in their children's digital development. Evidence suggests that the most effective approaches treat parents as partners in digital citizenship education rather than as passive audiences for school-prescribed messages.

The integration of empathy, ethics of care, and socio-emotional dimensions into digital ethics education is an important theoretical and practical development in this field. O'Reilly et al. (2024) emphasizes that technical knowledge and adherence to rules alone are insufficient as a basis for ethical behavior online. This perspective aligns with contemporary understandings of moral development, which emphasize that ethical behavior stems not only from cognitive understandings of right and wrong, but also from emotional capacities including empathy, perspective-taking, compassion, and concern for the well-being of others. Elementary school students benefit from educational approaches that help them recognize the human impact of online actions, understand that digital interactions occur between real people with feelings and experiences, and develop motivation to act ethically based on concern for others rather than simply fear of consequences. This care-oriented approach may be particularly important for preventing cyberbullying and promoting prosocial behavior online, as it addresses the psychological distance and deindividuation that sometimes occur in digital environments. Integrating social-emotional learning with digital ethics education creates synergistic benefits, supporting both domains simultaneously.

Curriculum integration strategies offer a promising path to embedding digital ethics education within existing educational structures, rather than treating it as an additional burden on an already busy elementary school schedule. Marsini (2025) Articulate a vision for transforming social studies education to include digital citizenship concepts, recognizing the natural connection between traditional civics education topics and contemporary digital citizenship challenges. Similar integration opportunities exist across other content areas: literacy education can address digital reading, information evaluation, and online communication; mathematics can incorporate data literacy and privacy concepts; science can explore the impact of technology on society; and arts education can engage with creative approaches to digital expression and ethics. This integrated approach ensures that digital ethics is woven throughout students' educational experiences, rather than confined to isolated technology lessons. However, successful curriculum integration requires teachers across content areas to have a sufficient understanding of digital ethics concepts and their beliefs to connect them to the subject matter. Curriculum materials, lesson examples, and professional development that support cross-curricular integration can facilitate this approach.

This systematic review identified several important methodological limitations and research gaps that require attention in future investigations. Many studies used small, convenient samples from a single school or limited geographic area, which limits generalizability and the ability to examine how effectiveness varies across different student populations, school contexts, and cultural settings (Novianti et al., 2025). Few studies included long-term follow-up assessments that would reveal whether intervention effects persist over time or fade without reinforcement. The field lacks validated and standardized assessment instruments to measure digital ethics competency and safe online behavior in a developmentally appropriate manner for elementary school students. Measurement challenges are particularly acute for behavioral outcomes, as self-reported online behavior may be susceptible to social desirability bias, while direct observation of behavior raises privacy and practical concerns. Future research should prioritize large-scale studies with diverse samples, longer follow-up periods, more rigorous experimental designs, and the development of robust measurement tools that can allow for more definitive conclusions about the effectiveness of interventions and their impact mechanisms.

The evidence synthesis from this systematic review suggests several priority recommendations for advancing the field and improving the practice of digital ethics education for elementary school students. First, schools should adopt a comprehensive and sustainable approach to digital citizenship education that spans the entire elementary school grades, rather than a one-off intervention, incorporating evidence-based pedagogical strategies including digital game-based learning, interactive methods, and creative approaches. Second, significant investment in teacher preparation and ongoing professional development is essential to ensure educators have the knowledge, confidence, and resources needed to implement effective digital ethics instruction. Third, schools should actively engage parents as partners in supporting children's digital development through parent education, communication strategies, and the provision of resources. Fourth, curriculum developers should create an integrated approach that embeds digital ethics across content areas while ensuring developmentally appropriate coverage and sequencing. Fifth, researchers should conduct rigorous studies to address current methodological limitations and examine the immediate and long-term impacts of various intervention approaches. Sixth, policymakers should support digital citizenship education through funding, policy frameworks, and infrastructure that enable a comprehensive approach. Coordinated efforts at these multiple levels can advance the goal of ensuring that all elementary school students develop the knowledge, skills, values, and behaviors necessary for safe, responsible, and ethical participation in the digital space.

CONCLUSION

This systematic review provides compelling evidence that internet ethics education significantly contributes to shaping safe online behaviors among elementary school students, although its effectiveness varies widely across intervention approaches, implementation contexts, and outcome domains. Digital game-based learning, privacy literacy training, comprehensive digital citizenship programs, and collaborative multi-stakeholder approaches all demonstrate potential positive impacts, with the strongest evidence supporting interactive and engaging pedagogical methods that connect abstract ethical principles to concrete digital situations relevant to children's lives. However, persistent challenges, including the knowledge-behaviour gap, limited teacher preparedness, variable parental involvement, and methodological limitations in existing research, limit current understanding and practice. This field requires continued innovation in intervention design, rigorous evaluation of emerging approaches, development of validated assessment tools, and systematic investigation of implementation factors that facilitate or hinder effectiveness across educational contexts.

As digital technologies continue to evolve and their influence expands into all aspects of children's lives, the need for effective internet ethics education is growing. Elementary school is a critical developmental period for building foundational digital citizenship competencies that will guide students throughout their increasingly digital lives. Success in this endeavor requires moving beyond isolated, short-term interventions to a comprehensive, sustained, and integrated approach supported by adequate teacher preparation, parent partnerships, evidence-based curricula, and

supportive policy frameworks. The evidence synthesized in this review provides essential guidance for educators, researchers, policymakers, and other stakeholders committed to protecting children in digital spaces while promoting the knowledge, skills, and values necessary for responsible digital citizenship. Future research and practice should build on this foundation while addressing identified gaps to advance toward the shared goal of ensuring all elementary school students can navigate digital environments safely, ethically, and confidently.

REFERENCES

Akhmad, F. A. P., & Azzam, F. (2022). The effectiveness of academic supervision implementation by supervisors in improving the professional competence of Islamic education teachers in elementary schools in South Tambun District. *Parameter*, *7*(1), 26–40.

Alam, H. W. N. (2017). Improving the ability to produce complex procedure texts using the demonstration method. *Diksatrasia: Journal of Indonesian Language and Literature Education*, *1*(1), 32. https://doi.org/10.25157/diksatrasia.v1i1.176

Andriana, M. (2021). *The use of audio-visual media to improve listening skills in Class XI MIPA 2 Students at SMA Negeri 1 Plupuh in the 2021/2022 Academic Year*. Academia.

Bapala, D. (Ekawati, D.). (2018). Development of the SAVI (Somatic, Auditory, Visual, Intellectual) learning model using video media in drama learning for Class VIII A at SMPN 1 Menganti, Gresik, Academic Year 2018/2019. *Bapala*, *5*(2).

Brown, D. A. (2018). *Affective factors in second language acquisition and technology use*. Oxford University Press.

Brown, M. (2018). *Investigating the relationship between video-based instruction and procedural memory in vocational students* [Master's thesis]. University of Toronto.

Brown, R. P. (2019). *The challenge of external validity in educational research*. Guilford Press.

Chen, D. (2023). Challenges in measuring critical thinking in technology-enhanced learning environments. In K. L. Adams (Ed.), *Research innovations in learning analytics* (pp. 45–60). Academic Press.

Chen, R., & Li, T. (2022). The role of digital tools in facilitating socio-cultural learning environments. *Journal of Educational Technology Development*, *15*(3), 112–129.

Chen, S. T., Huang, Y., & Liu, X. (2020). Dual-coding theory revisited: The impact of combined visual-verbal instruction on L2 vocabulary retention. *Language Learning & Technology*, *24*(1), 120–135.

Desimpelaere, L., Hudders, L., & Van de Sompel, D. (2020). Pengetahuan sebagai strategi untuk perlindungan privasi: Bagaimana pelatihan literasi privasi memengaruhi perilaku pengungkapan informasi online anak-anak. Computers in Human Behavior, 110, 106382. https://doi.org/10.1016/j.chb.2020.106382

Evangelio, C., Rodríguez-González, P., Fernández-Río, J., & Gonzalez-Villora, S. (2022). Perundungan siber pada siswa sekolah dasar dan menengah: Tinjauan sistematis. Komputer & Pendidikan, 176, 104356. https://doi.org/10.1016/j.compedu.2021.104356

Finkelhor, D., Walsh, K., Jones, L., Mitchell, K., & Collier, A. (2021). Pendidikan Keamanan Internet untuk Remaja: Menyelaraskan Program dengan Basis Bukti. Trauma, Kekerasan, & Pelecehan, 22(5), 1233–1247. https://doi.org/10.1177/1524838020916257

Jones, LM, Mitchell, KJ, & Beseler, CL (2024). Dampak Pendidikan Kewarganegaraan Digital Remaja: Wawasan dari Evaluasi Hasil Uji Coba Terkontrol Acak Klaster Kurikulum Be Internet Awesome (BIA). Psikologi Sekolah Kontemporer, 28(4), 509–523. https://doi.org/10.1007/s40688-023-00465-5

Kamalia, AZ, Herlianto, HR, Wiyarno, Rijal Akmaludin, & Noval Adi Iryanto. (2025). Membangun Kesadaran Etika dan Keamanan Digital Melalui Edukasi Media Sosial bagi Siswa. ABDIMAS: Jurnal Pengabdian Masyarakat, 8(2), 857–865. https://doi.org/10.35568/abdimas.v8i2.6372

KANISHEVSKA, L., & LESYK, A. (2023). PEMBENTUKAN PERILAKU AMAN SISWA SEKOLAH DASAR DI RUANG DIGITAL. Makalah ilmiah Universitas Pedagogi Negeri Berdiansk Seri Ilmu Pedagogi, 1(1), 115–121. https://doi.org/10.31494/2412-9208-2023-1-1-

115-121

Livingstone, S., Mascheroni, G., & Stoilova, M. (2023). Dampak memperoleh keterampilan digital bagi kehidupan dan kesejahteraan kaum muda: Tinjauan bukti sistematis. New Media & Society, 25(5), 1176–1202. https://doi.org/10.1177/14614448211043189

Marsini, M. (2025). Memberdayakan pikiran muda: Mengubah pendidikan IPS untuk menumbuhkan etika digital di sekolah dasar. Jurnal Kewarganegaraan: Media Kajian Kewarganegaraan, 22(1). https://doi.org/10.21831/jc.v22i1.1352

Martin, F., Bacak, J., Polly, D., Wang, W., & Ahlgrim-Delzell, L. (2023). Kekhawatiran dan Tindakan Guru dan Sekolah tentang Keamanan Digital Anak Sekolah Dasar. TechTrends, 67(3), 561–571. https://doi.org/10.1007/s11528-022-00803-z

Mishna, F., Cook, C., Saini, M., Wu, M., & MacFadden, R. (2009). Intervensi untuk Anak-Anak, Remaja, dan Orang Tua untuk Mencegah dan Mengurangi Pelecehan Siber. Campbell Systematic Reviews, 5(1). https://doi.org/10.4073/csr.2009.2

Novianti, PA, Hikmawan, R., & Fajrussalam, H. (2025). BEDIPOLI : Penerapan Monopoli Game Edukasi untuk Meningkatkan Etika Digital pada Siswa Sekolah Dasar di Purwakarta, Indonesia. Jurnal Paedagogi, 12(1), 119. https://doi.org/10.33394/jp.v12i1.13654

O'Reilly, M., Levine, D., Batchelor, R., & Adams, S. (2024). Etika digital tentang kepedulian dan kewarganegaraan digital di sekolah dasar Inggris: Anak-anak sebagai pewawancara. Jurnal Anak dan Media, 18(4), 585–604. https://doi.org/10.1080/17482798.2024.2394932

Polanin, JR, Espelage, DL, Grotpeter, JK, Ingram, K., Michaelson, L., Spinney, E., Valido, A., Sheikh, A. El, Torgal, C., & Robinson, L. (2022). Tinjauan Sistematis dan Meta-analisis Intervensi untuk Mengurangi Perbuatan dan Korban Cyberbullying. Prevention Science, 23(3), 439–454. https://doi.org/10.1007/s11121-021-01259-y

Purnama, S., Ulfah, M., Machali, I., Wibowo, A., & Narmaditya, BS (2021). Apakah literasi digital memengaruhi risiko online siswa? Bukti dari Covid-19. Heliyon, 7(6). https://doi.org/10.1016/j.heliyon.2021.e07406

Shyshak, A., Chaika, V., Shcherbiak, I., Gažiová, M., & Tvrdon, M. (2024). Membentuk Kemampuan Siswa Muda untuk Berperilaku Aman di Internet. Jurnal Pendidikan Budaya dan Masyarakat, 15(1), 333–347. https://doi.org/10.15503/jecs2024.1.333.347

Soler-Costa, R., Lafarga-Ostáriz, P., Mauri-Medrano, M., & Moreno-Guerrero, A.-J. (2021). Etiket Internet: Etika, Pendidikan, dan Perilaku di Internet—Tinjauan Literatur Sistematis. Jurnal Internasional Penelitian Lingkungan dan Kesehatan Masyarakat, 18(3), 1212. https://doi.org/10.3390/ijerph18031212

Tarofil, N., Prastyo, L., Solihin, A., Subrata, H., & Daoyi, Z. (2024). Meningkatkan Literasi Digital pada Siswa Kelas Delapan melalui ProProfs.com yang Terintegrasi dengan AI dan Pembelajaran Diferensiasi. 2(3), 160–168. https://doi.org/10.70437/educative.v2i3.812

Zheng, Y., Zhang, J., Li, Y., Wu, X., Ding, R., Luo, X., Liu, P., & Huang, J. (2024). Pengaruh pembelajaran berbasis permainan digital terhadap literasi etiket digital siswa, motivasi belajar, dan keterlibatan. Heliyon, 10(1), e23490. https://doi.org/10.1016/j.heliyon.2023.e23490