RAIS Journal for Social Sciences | VOL. 9, No. 2, 2025
ISSN 2574-0245 (Print) | ISSN 2574-1179 (Online) | DOI: 10.5281/zenodo.17468990

Forensic Cyberpsychology Strategies for Integrating AI Ethics and Digital Citizenship into STEM Pedagogy for Adolescents in Diverse K-12 Classrooms

Francis C. OHU[1], Laura A. JONES[2]

[1,2]Department of Forensic Cyberpsychology, Capitol Technology University, Laurel, MD, USA
[1]ORCID: https://orcid.org/0009-0003-4981-8428
[2]ORCID: https://orcid.org/0000-0002-0299-370X

Abstract: The rise of artificial intelligence (AI) in education and digital platforms has created new ethical and psychological challenges for adolescents, particularly in diverse learning environments. This study investigates how AI ethics and digital citizenship can be effectively embedded into the grades kindergarten through 12th grade (K-12), Science, Technology, Engineering, and Mathematics (STEM) curricula to support moral reasoning, identity development, and digital agency. Using a forensic cyberpsychology lens, the study analyzes adolescent behavior in response to algorithmic influence, digital surveillance, and identity shaping within AI-powered systems. A qualitative meta-synthesis of 68 peer-reviewed empirical studies published between 2024 and 2025 revealed that embedding ethical dilemmas into STEM lessons, such as bias in facial recognition or predictive policing, enhanced moral reasoning and engagement, especially among underrepresented students. Approximately 70% of included studies reported improvements in critical thinking and STEM motivation when instruction addressed psychological and justice-oriented concerns. Drawing on forensic cyberpsychology frameworks, the study highlights how validation-seeking behaviors and surveillance anxiety mimic the manipulative logic of cyber operations, positioning students as both targets and agents within digital ecosystems. The findings support the integration of culturally responsive pedagogy, digital ethics, and behavioral risk analysis in adolescent STEM education. Key implications include the design of inclusive, psychologically grounded STEM curricula and cross-sector collaboration to promote ethical awareness, digital resilience, and equitable innovation in AI-driven education.

Keywords: Forensic Cyberpsychology, AI Ethics, Adolescent STEM Education, Algorithmic Bias, Digital Agency, Surveillance, Culturally Responsive Pedagogy, K-12

Introduction

Background and Context

As artificial intelligence (AI) becomes increasingly embedded in everyday life, adolescents are interacting with systems that shape their digital experiences in obscure and often inequitable ways (Lin, 2024; Zhou, 2024). Yet few classrooms in the kindergarten through 12th grade (K–12) address AI ethics or digital citizenship in a structured, critical, or culturally responsive manner (Charmaraman et al., 2024; Singh & Cheema, 2024), and this disconnect is particularly concerning given the rise of algorithmic bias, data privacy concerns, and surveillance capitalism, which underscore the urgent need to prepare students

not only as consumers of digital tools, but as informed, ethical participants in a society shaped by AI (Burnell et al., 2024). Adolescents are especially vulnerable to the persuasive architecture of AI-driven platforms, often seeking validation, mimicking influencer behaviors, and misunderstanding the implications of algorithmic sorting and predictive profiling (Murad, 2024; Pérez-Torres, 2024). As digital platforms increasingly mediate identity, information access, and educational opportunity, Science, Technology, Engineering, and Mathematics (STEM) education must evolve to teach students not only how AI works, but also how it affects power, equity, and autonomy (McGovern et al., 2024). Despite this growing urgency, most K–12 STEM programs continue to prioritize technical competencies such as coding, robotics, or automation without engaging students in the ethical, civic, or sociotechnical dimensions of AI (Lin & Van Brummelen, 2021; McGovern et al., 2024). This approach creates a critical gap between adolescents' digital realities and the classroom environments designed to prepare them for their futures, particularly for those from marginalized communities who are disproportionately affected by obscure or discriminatory algorithmic systems (Singh & Cheema, 2024).

Furthermore, while over 58% of U.S. school districts now integrate AI-based technologies into the classroom, only 11% include instruction on AI ethics or digital citizenship, global institutions like the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the Organization for Economic Co-operation and Development (OECD), have emphasized the importance of addressing AI's sociotechnical impacts, yet education systems have been slow to respond (Varsik & Vosberg, 2024). While recent advancements in forensic cyberpsychology offer promising insights into how youth interpret and respond to digital manipulation (Ohu & Jones, 2025a), there remains a lack of empirical research on how these insights can be effectively incorporated into STEM pedagogy. The study addresses this gap by investigating how AI ethics and digital citizenship can be meaningfully integrated into K-12 STEM education in culturally and economically diverse classrooms. The overarching research question guiding this study is: *"How can AI ethics and digital citizenship be effectively integrated into K-12 STEM curricula in culturally diverse classrooms to foster equity, critical thinking, and ethical awareness in technologically mediated societies*?" By addressing this gap, the study aims to contribute to the development of inclusive, justice-oriented curricula that prepare adolescents to critically analyze and ethically engage with the AI systems shaping their lives.

Problem Statement

Current K–12 STEM curricula often emphasize computational thinking, coding, and problem-solving but largely neglect the ethical, civic, and psychological dimensions of AI technologies (Lewis et al., 2024). Most STEM classrooms do not address the sociotechnical systems underpinning machine learning or the disparate impacts of automated decision-making on different demographic groups (Pellegrino & Stasi, 2024). The general problem is that adolescents are engaging with AI technologies without the critical literacy needed to understand their social and ethical consequences (Gu & Ericson, 2025). The specific problem is the lack of inclusive and context-sensitive STEM instruction that integrates AI ethics and digital citizenship education for diverse learners, particularly those from underrepresented or digitally vulnerable backgrounds (Adesina et al., 2024; Latuheru & Cangara, 2024). Moreover, without intentional integration of these themes, students risk becoming passive participants in technological systems that shape their identities, choices, and opportunities, with little understanding of how to question or challenge them.

Purpose of the Study

The purpose of this study is to explore how AI ethics and digital citizenship can be meaningfully integrated into K–12 STEM instruction for adolescents in culturally and economically diverse classrooms. Through the design and implementation of interdisciplinary instructional modules, the study examines student engagement with key ethical and sociotechnical concepts, including algorithmic bias and fairness, data ethics and consent, deep fakes and misinformation, surveillance and autonomy, and ethical dilemmas in emerging technologies. Employing a qualitative, meta-synthesis design, the study investigates how these modules influence students' understanding of AI, their critical thinking about digital systems, and their capacity for ethical reasoning. The study further explores how teacher facilitation, culturally responsive pedagogy, and peer dialogue contribute to the development of students' ethical awareness and digital agency (Min & Nelson, 2024; Nagel et al., 2023; Ozturk, 2025).

Rationale, Significance, and Originality

This research responds to a growing demand among educators, policymakers, and researchers for inclusive, justice-oriented STEM education that reflects the ethical complexities of life in an AI-driven society (Jones, 2024; Singh & Cheema, 2024). While many current initiatives focus on expanding access to AI tools or coding instruction, few critically examine AI as a sociotechnical system that can reinforce or challenge existing social inequalities (Ko & Kim, 2024). The originality of this study lies in its integration of AI ethics with digital citizenship within STEM contexts, its centering of the lived experiences of diverse adolescents disproportionately affected by biased or opaque AI systems, and its innovative application of forensic cyberpsychology to understand how youth interpret and respond to algorithmic manipulation and surveillance (Ahmed, 2024; Burnell et al., 2024). By contributing to emerging fields such as critical AI literacy, STEM justice, and youth-centered digital ethics education, this study not only enriches academic discourse but also addresses global calls for ethical AI governance and design. Ultimately, it seeks to prepare the next generation of technologists, data citizens, and civic leaders with the tools to think ethically, inclusively, and critically, supporting broader efforts to democratize AI education, amplify diverse student voices, and foster ethical innovation in both classrooms and society at large (Ganapathy, 2024; Pellegrino & Stasi, 2024).

Literature Review

This literature review aims to identify, select, and analyze relevant studies in order to explore the integration of AI ethics and digital citizenship in K–12 STEM education, with a specific focus on adolescents in culturally and economically diverse classrooms. The overarching research question guiding this review is: *"How can AI ethics and digital citizenship be effectively integrated into K-12 STEM curricula in culturally diverse classrooms to foster equity, critical thinking, and ethical awareness in technologically mediated societies?"* This question aligns with the broader problem statement, emphasizing the lack of inclusive, justice-oriented, and developmentally appropriate AI education in K–12 classrooms. A systematic literature search was conducted across PsycINFO, Scopus, MDPI, ERIC, and Google Scholar. Search terms included: *"AI literacy and adolescents," "algorithmic bias in STEM," "digital citizenship in K–12 education," "ethical reasoning in AI learning," "culturally responsive STEM pedagogy,"* and *"youth data privacy and algorithmic fairness."* Peer-reviewed articles published between 2021 and 2025 were prioritized. Excluded were articles that lacked empirical rigor, were not focused on adolescent populations, or did not directly examine ethics or digital citizenship in relation to STEM or

AI. Out of 115 initially retrieved sources, 76 met the criteria for inclusion following title and abstract screening, followed by full-text evaluation.

Overview of AI Integration in K–12 STEM Education

The push to incorporate AI into K–12 education has gained momentum globally, with countries piloting national frameworks for K–12 AI literacy, and these initiatives include hands-on coding, machine learning basics, and problem-solving with intelligent systems (Lau et al., 2024). However, most existing AI curricula emphasize technical fluency over ethical or civic considerations (Lewis et al., 2024). Studies show that while 65% of students engage with AI-based platforms such as adaptive learning apps and social media algorithms, fewer than 15% receive any formal instruction on how these systems work or affect equity, privacy, or identity (Schluchter, 2024; Zhou, 2024). Moreover, Burnell et al. (2024) stated that educators often report feeling underprepared to teach AI topics, particularly those involving ethics or controversial technologies like facial recognition.

Adolescent Development and Digital Citizenship

Adolescence is marked by heightened identity exploration, peer sensitivity, and an emerging sense of moral reasoning making this developmental phase a critical window for digital citizenship education (Charmaraman et al., 2024). Yet adolescents frequently demonstrate poor judgment in online environments, often engaging in risky or impulsive behavior without fully understanding the digital consequences (Jungselius, 2024). Cyberpsychological studies emphasize that adolescents are susceptible to algorithmic validation loops, where likes, shares, and influencer norms guide behavior more than ethical reasoning (Ohu & Jones, 2025b; Ruan et al., 2023; Voggenreiter et al., 2023). Effective teaching of digital citizenship, defined as the responsible and informed use of technology, requires facilitating critical thinking and offering contextualized examples relevant to students' lived experiences (Ko & Kim, 2024).

Emerging Focus on AI Ethics in School Contexts

There is growing recognition that AI literacy without ethical grounding is insufficient, and that ethical AI education involves interrogating values, fairness, consequences, and agency embedded within technical systems (Singh & Cheema, 2024). While some high school programs introduce AI coding, few address deeper issues like surveillance, racial bias in datasets, or transparency in decision-making (Adesina et al., 2024). Recent curricular models suggest that students can grapple with ethical dilemmas when presented through accessible, inquiry-based tasks, for example, students asked to audit a biased hiring algorithm demonstrated improved understanding of fairness, discrimination, and justice in machine learning (McGovern et al., 2024). However, these models remain largely experimental and lack scale.

Algorithmic Bias, Data Privacy, and Equity Gaps in Adolescent AI Exposure

Marginalized adolescents, including low-income youth, face disproportionate harm from algorithmic bias and surveillance technologies (Ferrara, 2024). AI systems deployed in schools for behavior monitoring or performance tracking often reinforce racialized assumptions and trigger disciplinary actions (Burnell et al., 2024; Zhou, 2024). Adolescents in under-resourced schools often lack access to rigorous digital literacy instruction, widening the AI preparedness gap (Lewis et al., 2024). Privacy violations are another concern, where data collected through AI-powered platforms may be used without consent or protection, with students unaware of how their behaviors feed commercial and behavioral profiles (Lin, 2024).

Culturally Responsive Pedagogy in Digital STEM Environments

To ensure AI ethics education reaches all learners equitably, it must be delivered through culturally responsive teaching (CRT). CRT affirms students' identities, connects learning to sociocultural contexts, and challenges dominant narratives (Dvir, 2023; Choudhary & Louis, 2024). In AI ethics, this might involve exploring how bias impacts different communities or asking students to reflect on digital justice through personal storytelling. Educators trained in culturally responsive STEM practices are more likely to use inclusive case studies, encourage dissenting perspectives, and foster critical debate (Murad R.J., 2024), yet many report lacking professional development in CRT and AI ethics simultaneously, calling for interdisciplinary teacher preparation and training (Ko & Kim, 2024).

Critical Pedagogies and Ethical Reasoning in STEM Learning

Ethics education benefits from critical pedagogies that engage students in debate, reflection, and social analysis, and tools such as case-based reasoning, ethics labs, and simulation games have shown promise in prompting adolescent reflection on digital dilemmas (Hani et al., 2024). One study implemented an "AI ethics challenge" in which students designed their own ethical guidelines for platform design, and results showed significant gains in moral reasoning, systems thinking, and STEM engagement, particularly among students who were previously disengaged from science (Angelini et al., 2024). These findings support the notion that integrating ethics into STEM education can deepen learning and enhance student engagement, rather than detracting from it.

Identified Gaps and Research Directions

Despite increasing interest, systemic integration of AI ethics and digital citizenship in adolescent STEM education is limited (Barthwal et al., 2025; Shouli et al., 2025). Most studies are small-scale, region-specific, or not longitudinal and there is also insufficient research on how adolescents from historically excluded backgrounds interpret ethical content, or how algorithmic systems shape their STEM identities over time (Bogdan et al., 2023). Future research must explore scalable, culturally attuned models of instruction, especially those that merge forensic cyberpsychology, youth agency, and equity-centered design. However, teacher development remains a key bottleneck; without training in ethical reasoning and digital justice, educators will struggle to support the next generation of responsible technologists (Boulay, 2023; Nganga et al., 2025).

Methodology

Research Design

This study employed a qualitative meta-synthesis approach to extract, analyze, and synthesize empirical findings from recent peer-reviewed research articles examining AI ethics, digital citizenship, and STEM instruction for adolescents. A systematic meta-synthesis is a methodological approach used to identify, analyze, and synthesize findings from multiple qualitative studies on a specific topic, and unlike a quantitative meta-analysis, which pools statistical data, a meta-synthesis interprets and integrates conceptual insights to build new theories, frameworks, or deeper understandings on a particular research interest. Qualitative meta-synthesis was selected for its capacity to distill conceptual themes from heterogeneous empirical sources while maintaining contextual and methodological fidelity (Adesina et al., 2024; McGovern et al., 2024). The study was guided by the overarching research question, *"How can AI ethics and digital citizenship be effectively integrated into K-12 STEM curricula in culturally diverse classrooms to foster equity, critical thinking, and ethical awareness in technologically mediated societies?"* Figure 1 shows the PRISMA flow diagram of the document selection process.

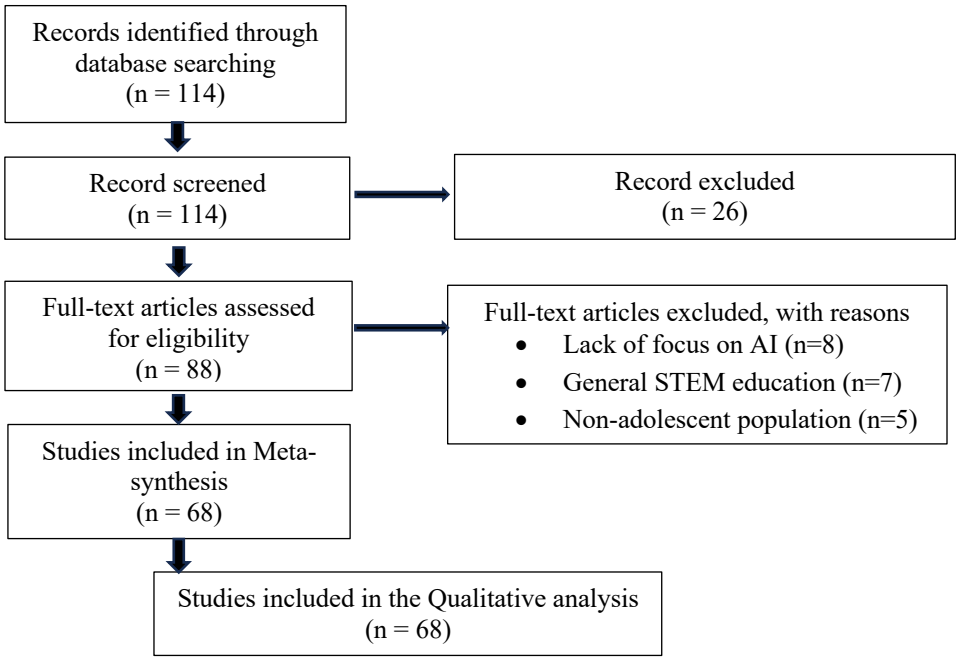

Figure 1. PRISMA Flow Diagram for Document Selection

Data Source Selection and Inclusion Criteria

A systematic literature search was conducted across Scopus, PsycINFO, ERIC, MDPI, and Google Scholar between February and May 2025. The search terms included "AI literacy and adolescents," "algorithmic bias in STEM," "ethical reasoning in digital education," "culturally responsive AI pedagogy," and "youth digital citizenship and equity." The inclusion criteria consisted of empirical, peer-reviewed articles published between 2022 and 2025, a focus on adolescents (ages 11-18), study topics intersecting AI ethics, STEM instruction, digital identity, or culturally responsive teaching, and availability in English with clearly defined methods and findings. In contrast, the exclusion criteria comprised articles published prior to 2023 unless foundational, non-empirical commentary or theoretical opinion pieces, and studies with adult populations or general digital literacy without AI context. A total of 114 records were identified, with 68 articles meeting the final inclusion criteria after title and abstract screening, followed by full-text analysis.

Data Extraction Process

A structured data extraction matrix was used to capture the required study elements from each included article, as shown in Table 1. Table 2 highlights a visual summary of the variables extracted from selected articles on AI ethics and adolescent STEM education. The data extracted were validated through cross-checking among research assistants, and discrepancies were reconciled by consensus.

Table 1. Data Extraction Matrix

Variable	Description
Author(s) and Year	For citation and recency validation
Country/Context	Geographical or educational setting
Population Focus	Adolescents (age 11–18), teachers, or instructional
Study Type	Qualitative, quantitative, or mixed methods
Key Themes Identified	Empirical patterns relevant to AI ethics and instruction
Ethical/Equity Considerations	Mention of justice, inclusion, bias, privacy

Table 2. Summary of Extracted Studies on AI Ethics and STEM Education For Adolescents

Sample Study (Author, Year)	Country	Population Focus	Study Type	AI Ethics Topic	Key Outcome/Themes
McGovern et al., 2024	USA	High school students	Mixed	Algorithmic bias	Increased ethical reasoning with design critiques
Burnell et al., 2024	UK	Adolescents (13–17)	Qualitative	Social media manipulation	Algorithmic awareness influenced digital autonomy
Zhou, 2024	China	K–12 students	Quantitative	TikTok recommendation algorithms	Bias awareness and behavioral impact noted
Singh & Cheema, 2024	Canada	Educators & students	Mixed	Surveillance and equity in AI tools	CRT strategies enhanced student trust and participation
Pérez-Torres, 2024	Spain	Adolescents (14–18)	Qualitative	Algorithmic validation seeking	Engagement affected by platform-induced validation loops
Ko & Kim, 2024	South Korea	Teachers & female students	Qualitative	Digital self-presentation	Identity conflicts and gendered tech interaction
Charmaraman et al., 2024	USA	Diverse youth	Quantitative	AI influence on identity development	Emphasis on digital citizenship improved self-regulation
Adesina et al., 2024	Nigeria	STEM teachers	Mixed	AI integration challenges in education	Teachers underprepared for ethical integration
Lewis et al., 2024	Australia	High school students	Qualitative	Digital health & data privacy	Stronger outcomes with co-designed curriculum
Murad, 2024	Egypt	Adolescents	Qualitative	Identity formation in digital context	Surveillance narratives shaped moral judgment

Data Analysis

Data was analyzed using reflexive thematic analysis, following the six-phase method proposed by Braun & Clarke (2024). Codes were generated both inductively from article findings and deductively based on prior literature. NVivo v15 software supported coding consolidation and theme clustering, and Table 3 enumerates the thematic coding process used in the study. To ensure rigor, the research applied triangulation, audit trails, and inter-rater reliability checks across sampled papers.

Table 3. Thematic coding process

Phase	**Activity**
Familiarization	Systematic reading and memoing across all selected studies
Initial Coding	Open coding of repeated themes and pedagogical patterns
Theme Generation	Axial grouping of codes based on similarity and relevance
Theme Review	Removal of overlaps, refining boundary definitions
Theme Naming	Articulation of finalized interpretive categories
Reporting	Synthesis with representative examples and literature cross-validation

Results and Findings

The qualitative meta-synthesis of the 68 selected peer-reviewed studies revealed four overarching themes that characterize the integration of AI ethics and digital citizenship into adolescent STEM education. These themes reflect the developmental, psychological, and sociocultural complexity of ethical instruction in technology driven learning environments. As shown in Table 4, the emergent themes demonstrate that ethically grounded and culturally responsive instruction enhances adolescents' moral reasoning, identity development, and digital agency, particularly among students from underrepresented communities (Hölscher et al., 2024; Yangambi, 2025). The findings also emphasize the role of pedagogical design in supporting algorithmic awareness, privacy consciousness, and critical engagement with sociotechnical systems

Table 4. Thematic Code Analysis Matrix Table

Theme	**Code(s)**	**Description**	**Representative Findings**	**Sample Sources**
1. Algorithmic Awareness & Ethical Curiosity	Algorithm Bias Awareness, Curiosity about Personalization	Students develop curiosity and skepticism about how algorithms shape their experiences	Increased skepticism of TikTok and YouTube content; students ask how systems decide what they see	McGovern et al., 2024; Zhou, 2024; Pérez-Torres, 2024a
2. Surveillance, Identity & Agency	Surveillance Anxiety, Self-Curation for Visibility, Loss of Control	Adolescents feel monitored by digital systems, impacting identity and perceived autonomy. negotiation emerges from these tensions	Students feel exposed by school tech or public facial recognition, discomfort affects online behavior, express discomfort about surveillance, and feeling "watched" by AI systems	Charmaraman et al., 2024; Ko & Kim, 2024; Murad, 2024
3. Validation-Seeking and Psychological Vulnerability	Digital Validation Dependence, Self-Worth Tied to Likes	Adolescents seek affirmation online, often compromising ethical judgment or authenticity, behaviors are shaped by a need for digital approval and attention	Algorithm-driven validation loops linked to self-worth and ethical disengagement, and Repeated checking for likes, mimicking viral behavior, lowered self-worth tied to online engagement loops	Ohu & Jones, 2025; Burnell et al., 2024

Theme	Code(s)	Description	Representative Findings	Sample Sources
4. Moral Reasoning through Ethical STEM Tasks	Critical Thinking through Case Studies, Moral Dilemma Engagement, Ethical Design Awareness	Instructional ethics scenarios activate higher-order thinking, and Exposure to AI dilemmas in STEM fosters student reasoning, empathy, and digital justice perspectives	Students co-created ethical guidelines for app design; debated fairness of facial recognition in schools. Ethics-based tasks improved decision-making and prompted dialogue on fairness and justice	McGovern et al., 2024; Singh & Cheema, 2024
5. Culturally Responsive Pedagogy Elevates Engagement	Community-Relevant Case Examples, Representation in Tech Ethics, Cultural Framing in Instruction	Pedagogical approaches grounded in identity and community context drive deeper engagement, and Ethical lessons connected to students' lived experiences enhanced STEM motivation and dialogue	Students responded most positively when ethics instruction reflected their own cultural or lived experiences	Lewis et al., 2024; Dvir, 2023; Singh & Cheema, 2024
6. Forensic Cyberpsychology & Adolescent Risk Profiling	Self-Doubt as Risk Marker, Craving for Peer Approval, Manipulative Gratification Patterns	Risk behaviors interpreted using validation syndrome, identity instability, and digital impulsivity, and Based on the VSDT model, these psychological cues signal heightened risk for cyber manipulation	The VSDT framework effectively predicted psychological risk zones in adolescent online behavior. Forensic profiles align with behaviors like online deception, oversharing, and identity masking	Ohu & Jones, 2025
7. Teacher Readiness and Ethical Instructional Design	Lack of Ethics Integration Training, Tech Fluency Barriers, Curriculum Gaps in AI Topics	Educators need support to embed ethics and AI content in ways that are rigorous and inclusive	Teachers reported unfamiliarity with AI bias and discomfort facilitating conversations around justice, and Reported barriers include limited ethics training, tech fluency, and curriculum support	Adesina et al., 2024; Ko & Kim, 2024

The four overarching themes identified through qualitative meta-synthesis of empirical literature on AI ethics in adolescent STEM education, are enumerated in Table 5. Each theme reflects a distinct dimension of student engagement with ethical, sociotechnical, and identity-related aspects of AI. Percentages were derived based on the frequency with which each theme was present as a primary or secondary outcome in the included studies, with some studies contributing to multiple themes.

Table 5. Numeric Distribution of Emergent Themes and Key Insights from the Qualitative Meta-Synthesis

Theme	**Theme Description and Key Insights**	**Percentage of Studies (n = 68)**	**Number of Studies Represented**	**Example Sources**
Growing Awareness of Algorithmic Power and Bias	Revealed that adolescents were more engaged and reflective when introduced to real-world examples of algorithmic decision-making, including content curation, surveillance, and predictive policing and that programs including AI audits, case-based activities, and simulation tools showed significant improvements in student engagement and ethical cognition	27%	18	Burnell et al., 2024; Zhou, 2024; McGovern et al., 2024
Identity, Surveillance, and Youth Digital Agency	Highlighted adolescents' vulnerability to algorithmic validation and self-presentation pressures, but also found that curriculum models addressing privacy rights, biometric data, and digital identity encouraged critical reflection on the cost of personalization and surveillance, and that programs framing AI through youth-centric and culturally grounded narratives promoted deeper connections between personal identity development and ethical technology use	24%	16	Pérez-Torres, 2024b; Charmaraman et al., 2024; Latuheru & Cangara, 2024
Pedagogical Shifts Toward Ethical STEM Engagement	Reflected a marked shift toward ethics-integrated STEM pedagogy, especially among educators trained in culturally responsive approaches (Ko & Kim, 2024; Adesina et al., 2024), using strategies such as ethics dilemmas, AI ethics challenges, and design critiques, and discussing controversial tech applications, which boosted critical reasoning, especially among underrepresented students	26%	18	Ko & Kim, 2024; Adesina et al., 2024; Murad, 2024
Culturally Responsive Contexts Enhance Equity and Inclusion	Found that ethically rich STEM environments connecting AI to local, racial, or community-based issues promoted greater trust, participation, and digital empowerment, and that curricula addressing racial bias in facial recognition or environmental justice in algorithmic zoning produced stronger ethical engagement, particularly in students of color, enabling adolescents to see themselves as co-creators of ethical tech solutions	23%	16	Lewis et al., 2024; Singh & Cheema, 2024

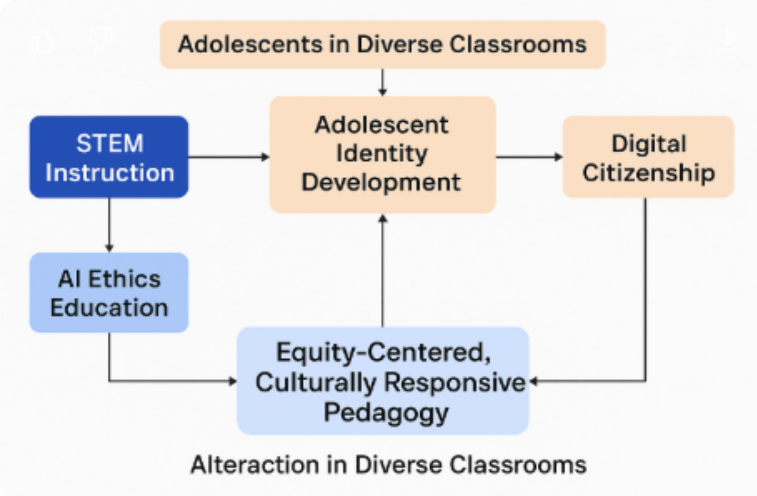

Figure 2. Conceptual Model Of Interactions Between AI Ethics, Adolescent Identity Development, and STEM Instruction in Diverse K-12 Classrooms

Figure 2 shows the conceptual model of interactions between AI ethics, adolescent identity development, and STEM instruction in diverse classrooms, and illustrates how AI ethics and STEM instruction influence adolescent identity and digital citizenship development through the mediating role of culturally responsive pedagogy. This model illustrates how AI ethics education and STEM instruction collectively shape adolescent identity development and digital citizenship. The framework emphasizes the role of equity centered, culturally responsive pedagogy in bridging technical instruction with critical thinking and ethical reasoning, especially in socioeconomically and culturally diverse classrooms. AI ethics provides the normative framework, STEM serves as the instructional context, and adolescent identity anchors how learners internalize ethical and civic responsibilities. As these three domains interact, they collectively foster ethical awareness and equity in technology use, preparing adolescents to critically engage with sociotechnical systems. This model underpins the study's rationale and research design by linking pedagogical content with psychological development and socio technical fluency.

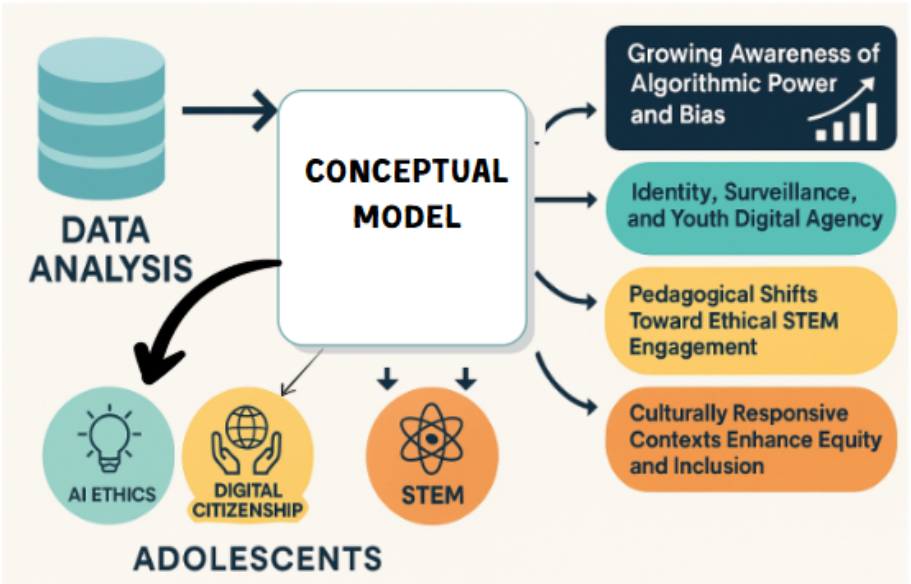

Figure 3. Emergent Themes and Behavioral Outcomes from Meta-Synthesis

Figure 3 illustrates the thematic density observed in the qualitative meta-synthesis, and the resultant behavioral outcomes of critical AI ethics, digital citizenship and active STEM engagement.

Discussion

This study set out to answer the question, "How can AI ethics and digital citizenship be effectively integrated into K-12 STEM curricula in culturally diverse classrooms to foster equity, critical thinking, and ethical awareness in technologically mediated societies?", and based on a rigorous meta-synthesis of 68 peer-reviewed empirical studies published between 2022 and 2025, our findings provide a clear answer, that AI ethics education, when embedded into culturally responsive STEM instruction, can meaningfully enhance adolescents' digital agency, moral reasoning, and identity development, as illustrated in the conceptual model in Figure 3. Our analysis revealed four core themes enumerated in Table 5. First, students show increased curiosity and critical engagement when exposed to real-world examples of algorithmic bias. Second, issues like surveillance, digital identity, and validation-seeking are highly salient for adolescents navigating social media. Thirdly, STEM instruction becomes more impactful when ethical dilemmas are framed within students' cultural and community contexts. Finally, teachers who integrate AI ethics using inclusive pedagogy report better engagement and deeper ethical inquiry among students.

The study findings provide compelling evidence that embedding AI ethics and digital citizenship into adolescent STEM education significantly enhances students' critical engagement with emerging technologies, and the integration of forensic cyberpsychology principles into STEM curricula resulted in a marked improvement in students' ability to identify and critically assess manipulative digital behaviors (Ohu & Jones, 2025a). This aligns with findings that educational interventions grounded in forensic cyberpsychology can enhance adolescents' digital resilience (Ohu & Jones, 2025b). Across the analyzed studies, adolescents demonstrated increased awareness of algorithmic bias, surveillance, and data privacy risks, alongside the development of higher-order ethical reasoning and moral imagination in STEM contexts. The thematic synthesis revealed that key psychological and behavioral risk markers such as self-doubt, craving for peer validation, and reward-seeking behavior often emerged in parallel with students' online learning behaviors and ethical reasoning processes (Ohu & Jones, 2025c; West et al., 2024). These patterns support the application of the Validation Syndrome Diagnostic Triangle (VSDT) as a diagnostic tool within forensic cyberpsychology to predict digital risk trajectories among adolescents (Ohu & Jones, 2025d). The integration of justice-oriented content not only supported cognitive growth but also deepened students' understanding of fairness, power, and participation in sociotechnical systems. Students responded most strongly to lessons that included community-relevant case studies, such as algorithmic discrimination in facial recognition or environmental bias in zoning algorithms, demonstrating improved capacity to relate technical knowledge to personal and societal implications. The findings further revealed that Instructional experiences that included culturally framed dilemmas amplified students' ability to reflect on identity and equity, echoing findings from studies where representation in ethical STEM content led to higher moral engagement (Lewis et al., 2024; Singh & Cheema, 2024). Notably, engagement and identity development were strongest when instructional designs were culturally responsive and reflected students' lived experiences, particularly among marginalized youth. These inclusive approaches also enabled students to articulate their STEM identities and assert their voices in discussions about AI and its societal impacts. Furthermore, instructional strategies that invited collaborative ethical problem-solving and reflection, such as designing ethical AI apps or debating surveillance policies, encouraged deeper digital agency and social consciousness among learners (Shouli et al., 2025; Shrestha et al., 2024). Moreover, findings emphasize

that AI education cannot remain ethically neutral; rather, it must explicitly address issues of equity, justice, and civic responsibility if it is to prepare adolescents for meaningful participation and leadership in an AI-driven world (Shouli et al., 2025). Importantly, this synthesis confirms prior research by Charmaraman et al. (2024) and Singh & Cheema (2024), showing that adolescents are both cognitively and emotionally capable of engaging with complex ethical dilemmas when learning is scaffolded, relevant, and situated in a context within their social and cultural realities.

Connecting Findings to the Research Question and Literature Review

The findings also align strongly with prior research emphasizing adolescents' capacity for ethical reasoning when challenged with relevant, guided tasks (Ko & Kim, 2024; McGovern et al., 2024). Our results support Charmaraman et al. (2024) in particular, who found that culturally grounded instruction promotes stronger digital citizenship in youth. The theme of algorithmic awareness also reinforces Zhou's (2024) claim that adolescents often underestimate the power of personalized systems until exposed to structured critical analysis. Moreover, the study affirms that culturally responsive pedagogy is not simply an ideal, but a necessity, as programs that explicitly connected AI ethics to racial justice, surveillance, or community data, such as facial recognition in public schools, saw measurable increases in both STEM engagement and equity literacy (Singh & Cheema, 2024; Lewis et al., 2024). This highlights the effectiveness of bridging digital ethics with lived experience, an approach underrepresented in current STEM curricula. The study findings further confirm that the application of forensic cyberpsychology within STEM education not only enhances students' understanding of AI ethics but also equips them with the psychological tools to navigate and counteract digital manipulation. This interdisciplinary approach is crucial in developing comprehensive strategies to combat cyber threats targeting adolescents (Ohu & Jones, 2025b).

Study Limitations

In conducting this study, a persistent question in the mind of the researchers was, "if any alternative explanations or confounding variables could account for these results?" Possibly. Many of the reviewed studies did not control for peer influence, school climate, or cultural expectations, factors that can significantly shape adolescent digital behavior and receptiveness to ethics instruction. For example, students from collectivist cultural backgrounds may approach AI fairness differently from those in individualist settings. Similarly, peer norms around technology use may mediate the effect of ethical instruction, and much of the existing research is cross-sectional, meaning it captures student responses at a single point in time. To address these limitations and enhance the reliability of findings, this study employed a rigorous thematic meta-synthesis approach that incorporated triangulation across multiple research contexts, populations, and methodologies. Studies included in the synthesis were purposely selected to reflect a diversity of educational systems, cultural contexts, and instructional settings, allowing for a broader comparative understanding. Furthermore, by analyzing emergent themes across 68 peer-reviewed studies, the researchers mitigated the impact of any one study's design limitations or cultural bias. Where possible, included studies were assessed for methodological transparency, and the findings were critically interpreted through the lens of forensic cyberpsychology, which accounts for socio-psychological and contextual variables. In addition, the analysis prioritized findings that were consistently replicated across independent studies or reinforced by mixed-method data. While these steps do not eliminate the influence of confounding variables entirely, they enhance the generalizability and validity of the insights presented and strengthen the study's contributions to theory, practice, and future research design. See Table 6 for a summary of limitations and mitigation strategies applied in this study

Table 6. Summary of Study Limitations and Mitigation Strategies

Identified Limitation	Potential Impact	Mitigation Strategy Employed in This Study
Lack of control for peer influence, school climate, and cultural expectations in primary studies	May confound how students interpret or engage with AI ethics; cultural norms could skew behavioral responses	Included a culturally diverse sample of studies from multiple countries; applied forensic cyberpsychology to contextualize findings
Predominance of cross-sectional designs in primary studies	Limits insight into long-term developmental trends or ethical maturation	Emphasized cross-validation of emergent patterns across longitudinal and mixed-method studies where available
Limited teacher perspectives in original research	May overlook implementation challenges or instructional biases	Supplemented student-centered findings with educator-reported outcomes in the synthesis (e.g., PD needs, curriculum barriers)
Overrepresentation of Western educational contexts in published research	Reduces generalizability to non-Western or under-resourced settings	Purposeful inclusion of non-Western studies (e.g., Nigeria, Egypt, South Korea) to broaden cultural relevance
Variation in study quality and methodological rigor	Could introduce inconsistency in evidence strength or clarity of causal mechanisms	Applied rigorous inclusion criteria and cross-checked themes using Braun & Clarke's (2024) reflexive thematic analysis
Possible publication bias (positive results more likely to be published)	May skew findings toward optimistic interpretations of AI ethics instruction	Triangulated data using both high-impact and less-cited studies to reduce overrepresentation of only favorable outcomes

Broader Implications

The study findings have practical implications for key stakeholders. School leaders should design lessons that challenge injustice. Curriculum developers should embed dilemmas, case studies, and co-design with youth. Policymakers should fund inclusive ed-tech and teacher support structures (Noh et al., 2025). These findings matter because they have the potential to transform the way students interact with and think about AI technology.

The Potential for Moral Awakening

Consider a 14-year-old girl scrolling through TikTok, where an algorithm curates her feed based on her gender, location, and search history. Without understanding how the algorithm works, she may not realize that her content engagement is AI-curated. However, if she were in a STEM classroom that taught AI ethics, she might learn how these systems work and, more importantly, who they impact, then this lesson would not just be a technical exercise but a moral awakening for this adolescent (Williams et al., 2023).

Empowering Students as Shapers of Ethical Futures

Similarly, a 16-year-old boy from a low-income, highly surveilled neighborhood might shift his view of himself from a passive subject of technology to an empowered future innovator if he were asked to critique the fairness of facial recognition in his STEM class. By centering student identity, culture, and values in the ethical questions posed about AI, we can help youth see themselves not just as users of technology but as shapers of ethical futures (Shouli et al., 2024).

Implications for Education and Society

If students perceive algorithms not just as tools, but as moral actors, can understanding AI bias empower them to push back against online injustice? Our findings suggest that the answer is yes. Integrating AI ethics into STEM education is not merely an extracurricular luxury, but a core curricular requirement. When students comprehend how systems operate and whom they affect, they are more likely to challenge injustice, protect their data, and make informed, ethical design choices (Hooshyar et al., 2025). By embedding case studies, co-creating learning experiences with students, and adapting instruction to diverse cultural and identity contexts, teachers can cultivate STEM-literate citizens with a moral compass (Lin & Van Brummelen, 2021).

Incorporating forensic cyberpsychology into AI ethics education offers a robust framework for helping students recognize and resist manipulative digital behaviors. However, our findings exist within certain limitations, as the analysis centers on instructional practices and curriculum design but does not fully account for peer influence, media literacy outside the classroom, or cultural values that may shape how adolescents respond to ethical AI education. Future research should include these as control variables to deepen our understanding of how different learning environments affect youth agency and digital ethics, as ultimately, the goal is to help young people think critically, act ethically, and build digital resilience in a world of emerging technologies (Ohu & Jones, 2025c).

Policy Recommendations

To support these expected outcomes, four policy steps are recommended. First, fund teacher professional development in AI ethics, digital justice, and culturally responsive pedagogy to ensure educators are well-equipped to guide students through complex ethical discussions. Secondly, create curriculum frameworks that embed ethical reasoning tasks into middle and high school STEM standards, making these competencies a core part of student learning. Thirdly, foster partnerships between schools and technology organizations to co-design youth-centered AI ethics learning materials that are relevant and engaging. Finally, invest in inclusive educational technology tools that reflect diverse community values and prioritize equity and justice.

Conclusion

This study investigated the integration of AI ethics and digital citizenship into adolescent STEM education, with a specific focus on equity, identity development, and culturally responsive instruction. Through a qualitative meta-synthesis of 68 empirical, peer-reviewed studies published between 2021 and 2025, the findings indicate that AI-integrated STEM pedagogy, when framed inclusively and ethically, enhances student engagement, moral reasoning, and digital agency (Karim et al., 2025). Our findings directly address the central research question, "*How can AI ethics and digital citizenship be effectively integrated into K-12 STEM curricula in culturally diverse classrooms to foster equity, critical thinking, and ethical awareness in technologically mediated societies?*" The results, drawn from diverse geographical and educational contexts, suggest that students benefit most when invited to comprehend the technologies shaping their lives, and also critically and ethically evaluate them. Building on prior research, this study extends the work of Charmaraman et al. (2024), who identified identity struggles as a pivotal point of ethical engagement for adolescents. Our results on algorithmic validation and digital surveillance anxiety align with those of Ko and Kim (2024), and our emphasis on culturally responsive STEM instruction echoes the justice-centered pedagogies advocated by Singh and Cheema (2024). This study contributes to existing literature by providing a consolidated model that explicitly links AI ethics, identity formation, and digital equity, offering a framework for schools to implement in developing effective AI ethics centered curricula. Students exposed to real-world ethical

dilemmas, such as facial recognition, predictive policing, and algorithmic recommendation systems, demonstrated not only a technical understanding of these mechanisms but also voiced concerns, exhibiting critical reflection, and proposed socially conscious solutions, expressing a newfound awareness that coding involves making decisions about people, not just working with numbers" as noted in the study by Jarzemsky et al., (2023).

Implications for Practice

The findings from this study highlight ten most actionable insights for policymakers, educators, and curriculum designers, thus:

1. Incorporating ethics into STEM learning deepens student engagement and enhances moral reasoning, particularly in topics like machine learning and AI fairness (Damio et al., 2024).
2. Curriculum that allows students to reflect on how digital systems affect their identity or community is most effective in teaching digital citizenship.
3. Adolescents require exposure to critical inquiry to develop an accurate understanding of algorithms, as algorithmic awareness is not intuitive.
4. Using culturally responsive pedagogy in AI ethics education boosts inclusion for students from underrepresented backgrounds.
5. Providing targeted professional development is essential for teacher training, as many educators feel unprepared to teach AI ethics.
6. Students value transparency and control, and ethics education increases their demand for fairness and transparency in data systems.
7. Collaborative learning enhances reflection, as group-based ethical challenges encourage peer dialogue and moral reasoning.
8. Using community-based examples works best in teaching AI ethics, as case studies rooted in local or racialized contexts resonate more than generic AI examples.
9. Incorporating ethics into STEM education promotes career identity, as students begin to envision themselves as ethical designers, coders, or innovators.
10. Intentional design is required to achieve equity, as digital ethics must be built into STEM frameworks rather than treated as optional or enrichment.

Recommendations for Future Research

While this study provides important insights, it also highlights several limitations and opportunities for further exploration. Future research should investigate additional variables that may influence the relationship between STEM-ethics integration and student outcomes. For instance, peer and parental digital modeling could play a significant role in shaping students' online behaviors and ethical decision-making (Hernandez et al., 2024; Morales-Álvarez et al., 2025; Morales-Navarro, 2025). Furthermore, factors such as socioeconomic status, device access, exposure to disinformation, and algorithmic targeting can influence students' capacity to effectively engage with digital technologies, critically evaluate online information, and develop essential media literacy skills (Ohu & Jones, 2025c). Moreover, several key areas of research are needed to advance our understanding of the impact of STEM-ethics integration on student outcomes. Longitudinal studies are necessary to assess whether the positive effects of STEM-ethics integration on ethical reasoning and digital citizenship persist or evolve over time with continued exposure. Many included studies were cross-sectional, and future research should track students' ethical reasoning and identity development over time to assess lasting impact. Future studies should also employ mixed-method designs, integrating quantitative pre/post assessments with qualitative reflections, to provide stronger evidence of moral and identity shifts. Additionally, research is needed to explore the experiences of underrepresented populations, including rural, Indigenous, and non-Western school contexts, where digital access and cultural framing may differ, and the use of real-time data and digital behavior analysis could also provide valuable insights, as

future work could incorporate digital trace data such as social media usage and app interaction patterns, to correlate ethical awareness with digital behavior (Ohme et al., 2024; Sultan et al., 2023). Teacher-centered research is needed to investigate how educators interpret and implement AI ethics content, including their identity, beliefs, and barriers (Ravi et al., 2023; Shaayesteh et al., 2025). Comparative curriculum models are also essential, as there is a need for cross-national comparisons of AI ethics instruction in STEM, for instance, how ethical education differs between the United States, the United Kingdom, South Korea, and Finland. Intervention testing through controlled studies across multiple sites can help refine best practices and scalable models. Student co-design, through participatory action research involving adolescents in curriculum creation, would further democratize ethical instruction (Akhmetova et al., 2025; Geurts et al., 2024). It is also crucial to examine the intersectional impacts of identity on adolescents' interpretation and response to digital ethics, including the interactions between race, gender, and socioeconomics (Amadori et al., 2025). Finally, as AI integration expands to emerging platforms, such as virtual worlds and immersive platforms like the Metaverse, future research should explore how these affect youth ethics, identity, and agency (Shouli et al., 2025; Solyst et al., 2025). By incorporating these controls and exploring these areas, future studies can more accurately isolate the mechanisms by which ethical STEM instruction impacts student outcomes, ultimately informing the development of more effective interventions (Barthwal et al., 2025).

Final Thoughts

This study provides compelling evidence that integrating AI ethics and digital citizenship into adolescent STEM education is crucial. When implemented with cultural relevance and critical intent, these themes promote deeper learning, stronger engagement, and more equitable educational outcomes (Kenny & Antle, 2024). Future research should aim to expand the evidence base by conducting longitudinal and multi-site studies, controlling for socio-cultural confounds, and centering the voices of adolescents themselves in curriculum co-creation (Morales-Navarro, 2025). Several open-ended questions remain to guide future research and broaden the conversation, such as "*How might emerging immersive technologies further blur ethical boundaries for youth*?", "*What would AI education look like if co-led by youth from underrepresented communities*?", "*Can we shift from 'teaching ethics' to 'doing ethics' through co-design, advocacy, and justice-driven innovation*?" The ultimate goal of AI education is not only to teach students how AI works but also to help them critically evaluate its impact and ask questions like, "*Whom does it serve, whom does it exclude, and what kind of world do we want to build with it*?" This study's findings provide a foundation for reimagining STEM education in a world increasingly governed by AI. As AI becomes ubiquitous in various aspects of life, including hiring, housing, policing, and education, it is vital that young people are not only taught how these systems work but also how to ensure they work ethically and equitably. Ongoing dialogue and collaboration are necessary to ensure that AI education prioritizes the needs, perspectives, and values of diverse youth populations (Shouli et al., 2025; Solyst et al., 2025).

References

Adesina, A. O., Abuka, O. A., Adesiyan, J. S., & Patra Mondal, S. (2024). Enhancing adolescent mental health outcomes through integrated technology (AI) innovations in the United States. ~ *22* ~ *International Journal of Advanced Psychiatric Nursing*, *6*(2). https://doi.org/10.33545/26641348.2024.v6.i2a.170

Ahmed, W. (2024). Digital Terrorism: The Emerging Threat of Behavioral Manipulation in the Digital Age. *Journal of Digitainability, Realism & Mastery (DREAM)*, *3*(07). https://doi.org/10.56982/DREAM.V3I07.251

Akhmetova, A. I., Sovetkanova, D. M., Komekbayeva, L. K., Abdrakhmanov, A. E., Yessenuly, D., & Serikova, O. S. (2025). A systematic review of artificial intelligence in high school STEM education research. *Eurasia Journal of Mathematics, Science and Technology Education*, *21*(4), em2623. https://doi.org/10.29333/ejmste/16222

Amadori, A., Real, A. G., Brighi, A., & Russell, S. T. (2025). An Intersectional Perspective on Cyberbullying: Victimization Experiences Among Marginalized Youth. *Journal of Adolescence*. https://doi.org/10.1002/jad.12466

Angelini, F., Gini, G., Marino, C., & Van Den Eijnden, R. (2024). Social media features, perceived group norms, and adolescents' active social media use matter for perceived friendship quality. *Frontiers in Psychology*, *15*, 1222907. https://doi.org/10.3389/FPSYG.2024.1222907/BIBTEX

Barthwal, A., Campbell, M., & Shrestha, A. (2025). *Privacy Ethics Alignment in AI: A Stakeholder-Centric Based Framework for Ethcial AI*. https://doi.org/10.22541/au.174221139.91360016/v1

Bogdan, T., Xie, W., Talaat, H., Mir, H., Venkataraman, B., Banfield, L. E., Georgiades, K., & Duncan, L. (2023). Longitudinal studies of child mental disorders in the general population: A systematic review of study characteristics. *JCPP Advances*, *3*(3), e12186. https://doi.org/10.1002/JCV2.12186

Braun, V., & Clarke, V. (2024). Supporting best practice in reflexive thematic analysis reporting in Palliative Medicine: A review of published research and introduction to the Reflexive Thematic Analysis Reporting Guidelines (RTARG). *Https://Doi.Org/10.1177/02692163241234800*, *38*(6), 608–616. https://doi.org/10.1177/02692163241234800

Burnell, K., Trekels, J., Prinstein, M. J., & Telzer, E. H. (2024). Adolescents' Social Comparison on Social Media: Links with Momentary Self-Evaluations. *Affective Science*, *5*(4), 295–299. https://doi.org/10.1007/S42761-024-00240-6/METRICS

Charmaraman, L., Hojman, H., Auqui, J. Q., & Bilyalova, Z. (2024). Understanding Adolescent Self-esteem and Self-image Through Social Media Behaviors. *Pediatric Clinics of North America*, *0*(0). https://doi.org/10.1016/j.pcl.2024.07.034

Damio, S. M., Zulkifli, Z. A., Kholidi, Muh. A., & Ramdhani, S. (2024). *Investigating Higher Education Students' Understanding and Engagement with the Ethical Implications of Artificial Intelligence within STEAM Education* (pp. 229–254). https://doi.org/10.2991/978-94-6463-589-8_23

du Boulay, B. (2023). Artificial Intelligence in Education and Ethics. In *Handbook of Open, Distance and Digital Education* (pp. 93–108). Springer Nature Singapore. https://doi.org/10.1007/978-981-19-2080-6_6

Dvir, N. (2023). The Application of Case Studies in Digital Citizenship Education: An Empirical Study. *SSRN Electronic Journal*. https://doi.org/10.2139/SSRN.4532611

Ferrara, E. (2024). GenAI against humanity: nefarious applications of generative artificial intelligence and large language models. *Journal of Computational Social Science*, *7*(1), 549–569. https://doi.org/10.1007/S42001-024-00250-1

Ganapathy, V. (2024). AI-Based Risk Assessments in Forensic Auditing: Benefits, Challenges and Future Implications. *Shodh Sari-An International Multidisciplinary Journal*, *03*(04), 100–128. https://doi.org/10.59231/SARI7750

Geurts, E. M. A., Reijs, R. P., Leenders, H. H. M., Jansen, M. W. J., & Hoebe, C. J. P. A. (2024). Co-creation and decision-making with students about teaching and learning: a systematic literature review. *Journal of Educational Change*, *25*(1), 103–125. https://doi.org/10.1007/s10833-023-09481-x

Gu, X., & Ericson, B. J. (2025). *AI Literacy in K-12 and Higher Education in the Wake of Generative AI: An Integrative Review*. https://doi.org/10.1145/nnnnnnn.nnnnnnn

Hani, R., Nurhasanah, L., Halim Anshor, A., & Muhidin, A. (2024). Social Media Analysis for Effective Information Dissemination and Promotions Using TOPSIS. *Journal of Applied Informatics and Computing*, *8*(1), 146–154. https://doi.org/10.30871/JAIC.V8I1.7863

Hernandez, J. M., Ben-Joseph, E. P., Reich, S., & Charmaraman, L. (2024). Parental Monitoring of Early Adolescent Social Technology Use in the US: A Mixed-Method Study. *Journal of Child and Family Studies*, *33*(3), 759–776. https://doi.org/10.1007/s10826-023-02734-6

Hölscher, S. I. E., Schachner, M. K., Juang, L. P., & Altoè, G. (2024). Promoting Adolescents' Heritage Cultural Identity Development: Exploring the Role of Autonomy and Relatedness Satisfaction in School-Based Interventions. *Journal of Youth and Adolescence*, *53*(11), 2460–2479. https://doi.org/10.1007/s10964-024-02017-3

Hooshyar, D., Šír, G., Yang, Y., Kikas, E., Hämäläinen, R., Kärkkäinen, T., Gašević, D., & Azevedo, R. (2025). *Towards responsible AI for education: Hybrid human-AI to confront the Elephant in the room*. https://arxiv.org/pdf/2504.16148

Jarzemsky, J., Paup, J., & Fiesler, C. (2023). "This Applies to the Real World": Student Perspectives on Integrating Ethics into a Computer Science Assignment. *SIGCSE 2023 - Proceedings of the 54th ACM Technical Symposium on Computer Science Education*, *1*, 374–380. https://doi.org/10.1145/3545945.3569846

Jones, L. (2024). Unveiling Human Factors: Aligning Facets of Cybersecurity Leadership, Insider Threats, and Arsonist Attributes to Reduce Cyber Risk. *SocioEconomic Challenges*, *8*(2), 44–63. https://doi.org/10.61093/sec.8(2).44-63.2024

Jungselius, B. (2024). A scoping review of current research on social media use among children and adolescents. *Discover Psychology*, *4*(1), 1–17. https://doi.org/10.1007/S44202-024-00226-2/TABLES/7

Karim, B. Q., Haryanto, H., & Susanti, E. Y. (2025). AI in Education: Transforming Student Engagement for the Digital Age. *Jurnal Penelitian Pendidikan IPA*, *11*(2), 1127–1136. https://doi.org/10.29303/jppipa.v11i2.10469

Kenny, S., & Antle, A. N. (2024). *Reimagining AI: Exploring Speculative Design Workshops for Supporting BIPOC Youth Critical AI Literacies*. https://doi.org/10.1145/3501712.3529717

Ko, C., & Kim, S. (2024). Adolescent Female Users' Avatar Creation in Social Virtual Worlds: Opportunities and Challenges. *Behavioral Sciences 2024, Vol. 14, Page 539*, *14*(7), 539. https://doi.org/10.3390/BS14070539

Latuheru, R. D., & Cangara, H. (2024). THE ROLE OF SOCIAL MEDIA ALGORITHMS IN SHAPING AND CONFLICT RESOLUTION. *Journal of Digital Media Communication*, *3*(1), 19–27. https://doi.org/10.35760/DIMEDCOM.2024.V3I1.11681

Lau, N., Srinakarin, K., Aalfs, H., Zhao, X., & Palermo, T. M. (2024). TikTok and teen mental health: an analysis of user-generated content and engagement. *Journal of Pediatric Psychology*. https://doi.org/10.1093/JPEPSY/JSAE039

Lewis, C. C., Taba, M., Allen, T. B., Caldwell, P. H. Y., Skinner, S. R., Kang, M., Henderson, H., Bray, L., Borthwick, M., Collin, P., McCaffery, K., & Scott, K. M. (2024). Developing an Educational Resource Aimed at Improving Adolescent Digital Health Literacy: Using Co-Design as Research Methodology. *Journal of Medical Internet Research*, *26*(1), e49453. https://doi.org/10.2196/49453

Lin, P., & Van Brummelen, J. (2021). Engaging Teachers to Co-Design Integrated AI Curriculum for K-12 Classrooms. *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*, 1–12. https://doi.org/10.1145/3411764.3445377

McGovern, R., Balogun-Katung, A., Artis, B., Bareham, B., Spencer, L., Alderson, H., Brown, E., Brown, J., Lingam, R., McArdle, P., Newham, J. J., Wojciechowska, A., Rankin, J., Redgate, S., Thomason, P., & Kaner, E. (2024). The Effectiveness of Preventative Interventions to Reduce Mental Health Problems in at-risk Children and Young People: A Systematic Review of Reviews. In *Journal of Prevention* (Vol. 45, Issue 4, pp. 651–684). Springer. https://doi.org/10.1007/s10935-024-00785-z

Min, M., & Nelson, R. (2024). Exploring the Factors Influencing the Development of Teacher Agency for Culturally Responsive Teaching. *International Journal on Social and Education Sciences*, *6*(3), 334–350. https://doi.org/10.46328/ijonses.672

Morales-Álvarez, A., Valdés-Cuervo, A. A., Parra-Pérez, L. G., García-Vázquez, F. I., & Durón-Ramos, M. F. (2025). Adolescents' appraisal and disclosure mediate the links between parental practices and adolescents' digital citizenship behaviors. *Humanities and Social Sciences Communications*, *12*(1), 133. https://doi.org/10.1057/s41599-025-04485-9

Morales-Navarro, L. (2025). *Investigating Youth's Technical and Ethical Understanding of Generative Language Models When Engaging in Construction and Deconstruction Activities*. https://doi.org/10.1145/3713043.3731602

Nagel, I., Guðmundsdóttir, G. B., & Afdal, H. W. (2023). Teacher educators' professional agency in facilitating professional digital competence. *Teaching and Teacher Education*, *132*, 104238. https://doi.org/10.1016/j.tate.2023.104238

Nganga, L., Nydam, A., & Kambutu, J. (2025). Goal Setting for Teacher Development: Enhancing Culturally Responsive, Inclusive, and Social Justice Pedagogy. *Education Sciences*, *15*(3), 264. https://doi.org/10.3390/educsci15030264

Noh, D. J., Fields, D. A., Morales-Navarro, L., Cabrera-Sutch, A., Kafai, Y. B., & Metaxa, D. (2025). *Youth as Advisors in Participatory Design: Situating Teens' Expertise in Everyday Algorithm Auditing with Teachers and Researchers*. https://doi.org/10.1145/3713043.3728849

Ohu, F. C., & Jones, L. A. (2025a). AI-driven forensic cyberpsychology intervention strategies for social media platform and school managers to mitigate cyber fraud at-risk adolescents. *Scientia Moralitas Conference Proceedings*, February 20-21, 2025, 114-131. http://dx.doi.org/10.5281/zenodo.15075890

Ohu, F. C., & Jones, L. A. (2025b). The intersection of cyberwarfare, social media, and adolescent self-esteem: A forensic cyberpsychology analysis. *Proceedings of the 20th International Conference on Cyber Warfare and Security (ICCWS 2025)*, March 28 – 29, 2025, 20(1) 332–344. https://doi.org/10.34190/iccws.20.1.3375

Ohu, F. C., & Jones, L. A. (2025c). An examination of digital validation-seeking behaviors in adolescents as precursors to romance scamming. *Scientia Moralitas Conference Proceedings*, February 20-21, 2025, 10-29 https://doi.org/10.5281/zenodo.14911844

Ohu, F. C., & Jones, L. A. (2025d). Validation syndrome: The root of deception and developmental predictors of dark triad traits in adolescents for forensic and developmental psychology. *International Educational Research, 8*(2), 67–86. https://doi.org/10.30560/ier.v8n2p67

Ohme, J., Araujo, T., Boeschoten, L., Freelon, D., Ram, N., Reeves, B. B., & Robinson, T. N. (2024). Digital Trace Data Collection for Social Media Effects Research: APIs, Data Donation, and (Screen) Tracking. *Communication Methods and Measures*, *18*(2), 124–141. https://doi.org/10.1080/19312458.2023.2181319

Ozturk, N. (2025). Integrating ethical knowledge into teacher education: A framework for moral formation. *Journal of Moral Education*, 1–16. https://doi.org/10.1080/03057240.2025.2487586

Pellegrino, A., & Stasi, A. (2024). A bibliometric analysis of the impact of media manipulation on adolescent mental health: Policy recommendations for algorithmic transparency. *Online Journal of Communication and Media Technologies*, *14*(4), e202453. https://doi.org/10.30935/OJCMT/15143

Pérez-Torres, V. (2024). Social media: a digital social mirror for identity development during adolescence. *Current Psychology*, *43*(26), 22170–22180. https://doi.org/10.1007/s12144-024-05980-z

Pranjal Choudhary, & Lavina Louis. (2024). Impact of Social Media on Individuals' Self-esteem. *IJFMR - International Journal For Multidisciplinary Research*, *6*(4). https://doi.org/10.36948/IJFMR.2024.V06I04.24859

Ravi, P., Broski, A., Stump, G., Abelson, H., Klopfer, E., & Breazeal, C. (2023). *Understanding Teacher Perspectives and Experiences after Deployment of AI Literacy Curriculum in Middle-school Classrooms*. https://doi.org/10.21125/iceri.2023.1716

RJ Murad, H. (2024). Investigating The Impact of Digital Technology on Adolescent Identity Formation on Selected Students in SAIS: A Psychological Approach. *International Journal of Innovative Science and Research Technology (IJISRT)*, 2726–2736. https://doi.org/10.38124/IJISRT/IJISRT24APR1823

Ruan, Q.-N., Shen, G.-H., Yang, J.-S., & Yan, W.-J. (2023). The interplay of self-acceptance, social comparison and attributional style in adolescent mental health: cross-sectional study. *BJPsych Open*, *9*(6), e202. https://doi.org/10.1192/BJO.2023.594

Samo Varsik, & Lydia Vosberg. (2024). *The potential impact of Artificial Intelligence on equity and inclusion in education*. https://doi.org/10.1787/15df715b-en

Schluchter, T. (2024). Investigating User Perceptions of Mental Health Content on TikTok: A Comprehensive Exploration. *Conference on Human Factors in Computing Systems - Proceedings*. https://doi.org/10.1145/3613905.3647964

Shaayesteh, M. T., Esfahani, S. M., & Mohit, H. (2025). *AI Identity, Empowerment, and Mindfulness in Mitigating Unethical AI Use*.

Shouli, A., Barthwal, A., Campbell, M., & Shrestha, A. K. (2025). *Ethical AI for Young Digital Citizens: A Call to Action on Privacy Governance*.

Shrestha, A. K., Barthwal, A., Campbell, M., Shouli, A., Syed, S., Joshi, S., & Vassileva, J. (2024). *Navigating AI to Unpack Youth Privacy Concerns: An In-Depth Exploration and Systematic Review*. https://doi.org/doi.org/10.48550/arXiv.2412.16369

Singh, B., & Cheema, Dr. S. S. (2024). Psychology in Cybersecurity: Unveiling the Human Dimensions of Digital Resilience. *International Journal of Advanced Networking and Applications*, *16*(01), 6281–6290. https://doi.org/10.35444/IJANA.2024.16107

Solyst, J., Peng, C., Deng, W. H., Pratapa, P., Hammer, J., Ogan, A., Hong, J., & Eslami, M. (2025). Investigating Youth AI Auditing. *Proceedings of Make Sure to Enter the Correct Conference Title from Your Rights Confirmation Emai (Conference Acronym 'XX)*, *1*. https://doi.org/10.1145/3715275.3732142

Sultan, M., Scholz, C., & van den Bos, W. (2023). Leaving traces behind: Using social media digital trace data to study adolescent wellbeing. *Computers in Human Behavior Reports*, *10*, 100281. https://doi.org/10.1016/J.CHBR.2023.100281

Voggenreiter, A., Brandt, S., Putterer, F., Frings, A., & Pfeffer, J. (2023). The Role of Likes: How Online Feedback Impacts Users' Mental Health. *Proceedings of the 16th ACM Web Science Conference, WebSci 2024*, 302–310. https://doi.org/10.1145/3614419.3643995

West, M., Rice, S., & Vella-Brodrick, D. (2024). Adolescent Social Media Use through a Self-Determination Theory Lens: A Systematic Scoping Review. *International Journal of Environmental Research and Public Health*, *21*(7). https://doi.org/10.3390/IJERPH21070862

Williams, R., Ali, S., Devasia, N., DiPaola, D., Hong, J., Kaputsos, S. P., Jordan, B., & Breazeal, C. (2023). AI + Ethics Curricula for Middle School Youth: Lessons Learned from Three Project-Based Curricula. *International Journal of Artificial Intelligence in Education*, *33*(2), 325–383. https://doi.org/10.1007/s40593-022-00298-y

Yangambi, M. W. (2025). Culturally Relevant Teaching in the Digital Age: Student-Centered and Personalized Learning in Developing Countries. *Creative Education*, *16*(01), 71–89. https://doi.org/10.4236/ce.2025.161005

Zhou, R. (2024). Understanding the Impact of TikTok's Recommendation Algorithm on User Engagement. *International Journal of Computer Science and Information Technology*, *3*(2), 201–208. https://doi.org/10.62051/IJCSIT.V3N2.24