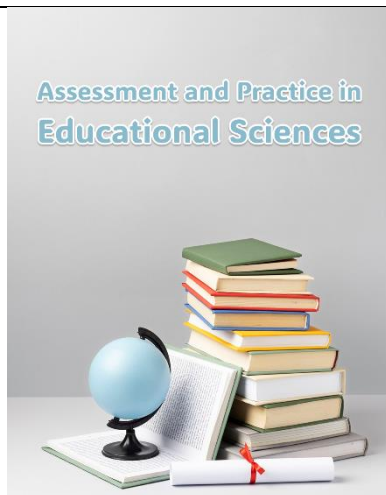




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Developing a Digital Resilience-Based Curriculum for Students: An Analysis of Ontological Foundations and Cognitive–Behavioral Implications

ABSTRACT

The present study aimed to develop a digital resilience-based curriculum for students through an analysis of its ontological foundations and cognitive–behavioral implications in order to provide a comprehensive framework for enhancing students’ adaptive capacities in contemporary digital learning environments. This study employed a qualitative exploratory design using thematic analysis and curriculum development methodology. The participants consisted of 24 experts from Tehran, including university faculty members in curriculum studies, educational psychologists, educational technology specialists, school counselors, and educational policymakers, who were selected through purposive criterion-based sampling. Data were collected through semi-structured interviews and document analysis of relevant scientific literature, policy documents, digital literacy frameworks, and educational technology standards. Interviews were transcribed verbatim and analyzed using Braun and Clarke’s six-step thematic analysis procedure. To ensure trustworthiness, member checking, peer review, audit trails, and data triangulation techniques were applied. MAXQDA 2024 software was used to facilitate coding, categorization, and thematic synthesis. The analysis revealed that digital resilience is a multidimensional construct consisting of four interconnected dimensions: ontological foundations, cognitive competencies, behavioral competencies, and curriculum design components. The behavioral dimension emerged as the most influential domain, emphasizing self-regulation in online environments, responsible technology use, safe digital behavior, and coping with digital risks. The cognitive dimension highlighted critical digital thinking, information evaluation and verification, digital problem-solving, and cognitive flexibility as essential competencies for resilient engagement in digital contexts. The ontological dimension underscored the importance of human agency, adaptive interaction with technology, digital identity formation, and ethical responsibility in cyberspace. The final curriculum framework integrated educational objectives, learning content, instructional strategies, learning activities, and authentic assessment methods designed to promote digital adaptability, ethical awareness, critical thinking, and responsible participation in technology-mediated environments. The findings indicate that digital resilience should be conceptualized as a holistic educational outcome that extends beyond technological proficiency and encompasses philosophical, cognitive, behavioral, and ethical dimensions of student development. The proposed curriculum framework provides a theoretically grounded and practically applicable model that can support students’ ability to navigate digital challenges, adapt to technological change, and participate responsibly in increasingly complex digital societies. Integrating digital resilience into curriculum planning may contribute to improved educational effectiveness, learner well-being, and long-term adaptability in the age of artificial intelligence and digital transformation.

Keywords: Digital Resilience, Curriculum Development, Digital Education, Cognitive Competencies, Behavioral Adaptation, Ontological Foundations, Digital Citizenship, Educational Technology, Artificial Intelligence, Student Development.

Introduction

The rapid expansion of digital technologies has transformed nearly every aspect of contemporary education. Digital platforms, artificial intelligence systems, online learning environments, social media applications, and technology-mediated communication tools have become integral components of students' academic and personal lives. While these developments have created unprecedented opportunities for access to information, personalized learning, collaboration, and innovation, they have simultaneously generated new forms of vulnerability and risk. Students today are increasingly exposed to information overload, digital distractions, cyberbullying, privacy threats, algorithmic manipulation, misinformation, technology dependence, and psychological stress associated with continuous digital engagement. Consequently, educational systems are confronted with the challenge of preparing learners not only to use technology effectively but also to adapt successfully to the complexities and uncertainties of digital environments. Within this context, the concept of digital resilience has emerged as a critical educational priority that extends beyond technical competence and encompasses cognitive, emotional, behavioral, and ethical capacities required for successful functioning in technologically mediated societies (1-3).

Digital resilience generally refers to an individual's capacity to cope with, adapt to, recover from, and grow through challenges encountered within digital environments. Unlike traditional conceptions of resilience that focus primarily on overcoming adversity in physical or social contexts, digital resilience addresses challenges arising from interactions with technology, online communities, artificial intelligence systems, and rapidly changing information ecosystems. Recent studies have demonstrated that resilience plays a significant role in determining learners' ability to maintain motivation, engagement, psychological well-being, and academic performance under conditions of technological uncertainty and educational disruption (4-6). Research conducted in online and blended learning environments indicates that resilient learners exhibit greater adaptability, stronger self-regulation skills, more effective problem-solving strategies, and enhanced capacity to manage digital stressors compared with their less resilient peers (7-9). These findings suggest that resilience is not merely a psychological characteristic but an educational competency that can be intentionally cultivated through appropriate curriculum design and pedagogical interventions.

The global educational disruptions caused by the COVID-19 pandemic further highlighted the importance of resilience in digital learning environments. During this period, millions of students were required to transition rapidly from face-to-face instruction to online learning formats, exposing significant disparities in digital preparedness and adaptive capacity. Numerous studies reported that students who possessed higher levels of resilience demonstrated stronger online engagement, greater satisfaction with learning experiences, and improved psychological adjustment during emergency remote education (10-12). Similarly, teacher support, instructional innovation, and positive educational relationships were found to contribute significantly to learners' resilience and overall well-being in digital contexts (13-15). These findings underscore the need for educational frameworks that systematically foster resilience rather than treating it as an incidental outcome of learning.

Recent advances in artificial intelligence have introduced additional opportunities and challenges that further increase the relevance of digital resilience. AI-powered educational technologies are increasingly being integrated into classrooms, providing adaptive feedback, personalized instruction, intelligent tutoring systems, and automated assessment tools. While these technologies offer substantial educational benefits, they also require students to develop new competencies related to critical evaluation, ethical decision-making, technological awareness, and self-regulated learning. Emerging evidence suggests that AI-supported learning environments can enhance learners' resilience, autonomy, and engagement when appropriately designed and implemented (2, 16, 17). Furthermore, AI-enhanced social-emotional learning frameworks have been shown to improve students' emotional well-being and adaptive functioning within complex digital ecosystems (3). However, the

effectiveness of these technologies depends largely on learners' ability to navigate uncertainty, regulate their behavior, and critically interpret algorithmically mediated information.

A growing body of literature has identified numerous psychological and educational variables associated with resilience in digital contexts. Self-efficacy, motivation, autonomy, mindfulness, emotional regulation, self-regulated learning, and psychological capital have consistently emerged as important predictors of resilient behavior among learners (18-20). Studies have demonstrated that resilient students tend to exhibit stronger academic engagement, greater persistence when facing difficulties, and higher levels of educational achievement (15, 21, 22). Similarly, autonomous learning practices and self-directed educational approaches have been associated with increased willingness to learn and enhanced resilience in technology-mediated settings (23-25). These findings indicate that resilience functions as a central mechanism connecting cognitive, motivational, and behavioral dimensions of learning.

The relationship between resilience and educational outcomes has also been explored in diverse disciplinary and cultural contexts. Research involving language learners, medical students, nursing students, teacher education students, and students with special educational needs has consistently demonstrated positive associations between resilience and academic success (26-28). Investigations conducted in online and post-pandemic educational settings further reveal that resilience contributes to improved learning engagement, emotional stability, adaptive coping, and long-term educational sustainability (29-31). Additionally, resilience has been linked to enhanced capacity for reflection, reduced technostress, and greater adaptability to technological change (32-34). Such findings reinforce the notion that resilience should be regarded as a foundational educational objective rather than merely a supportive psychological attribute.

Despite increasing scholarly attention to resilience in educational technology research, significant conceptual and practical gaps remain. Much of the existing literature focuses on measuring resilience, identifying its predictors, or examining its outcomes, while comparatively little attention has been devoted to the development of comprehensive curriculum frameworks specifically designed to cultivate digital resilience among school students. Existing interventions often emphasize isolated skills such as digital literacy, online safety, or technological competence without addressing the deeper philosophical assumptions and developmental processes underlying resilient engagement with digital environments (1, 4, 30). As a result, educational programs frequently lack a coherent theoretical foundation capable of integrating cognitive, behavioral, ethical, and existential dimensions of digital adaptation.

From a curriculum studies perspective, effective educational programs require a clear understanding of the ontological assumptions that shape conceptions of learners, knowledge, technology, and human development. Ontology concerns the nature of reality and the relationships between individuals and their environments. In the context of digital education, ontological questions address how students understand themselves as digital agents, how technology mediates human experience, and how learning occurs within interconnected digital ecosystems. Educational theorists increasingly argue that curriculum design should move beyond instrumental views of technology and embrace more holistic perspectives that recognize learners as active participants in dynamic socio-technological networks (21, 24, 29). Such perspectives provide a foundation for designing educational experiences that promote not only technical competence but also critical awareness, ethical responsibility, adaptive flexibility, and meaningful engagement with digital realities.

The cognitive and behavioral implications of digital resilience further highlight the importance of curriculum-based interventions. Cognitively, resilient learners demonstrate critical thinking, information evaluation skills, metacognitive awareness, cognitive flexibility, and problem-solving capabilities necessary for navigating complex digital environments. Behaviorally, they exhibit responsible online conduct, self-regulation, persistence, adaptive coping strategies, and effective management of digital risks. These competencies are increasingly recognized as essential components of twenty-first-century

education and lifelong learning (1, 2, 16). Furthermore, resilience-oriented educational approaches have been shown to enhance well-being, engagement, motivation, and social-emotional functioning across diverse learning contexts (12, 13, 19).

The importance of resilience becomes even more pronounced when considering educational inequalities and contextual challenges faced by learners worldwide. Students from disadvantaged backgrounds, rural communities, and vulnerable populations often encounter additional barriers that increase their susceptibility to digital exclusion and educational disruption. Research conducted across various countries has revealed that resilience serves as a protective factor that mitigates the negative effects of socioeconomic disadvantage, technological limitations, learning disabilities, and environmental uncertainty (35-37). Consequently, curriculum initiatives aimed at fostering digital resilience may contribute not only to improved educational outcomes but also to greater educational equity and inclusion.

Given the accelerating digital transformation of education, the growing integration of artificial intelligence technologies, and the increasing complexity of students' interactions with digital environments, there is a pressing need to develop theoretically grounded and empirically informed curriculum models that systematically cultivate digital resilience among learners. Such models should integrate ontological foundations with cognitive and behavioral competencies while providing practical guidance for curriculum design, instructional implementation, and educational assessment.

Therefore, the aim of the present study was to develop a digital resilience-based curriculum for students through an analysis of its ontological foundations and cognitive-behavioral implications.

Methods and Materials

This study was conducted using a qualitative exploratory design based on thematic analysis and curriculum development methodology. Given the conceptual nature of the research and its aim of developing a curriculum model grounded in digital resilience, the study employed a purposive sampling strategy to identify participants with extensive knowledge and experience in educational technology, curriculum studies, educational psychology, digital literacy, and adolescent development. The research population consisted of university faculty members, curriculum specialists, educational policymakers, school counselors, and experts in digital education working in Tehran, Iran. Twenty-four experts were selected through purposive and criterion-based sampling. Inclusion criteria included possession of a doctoral degree in a relevant field, a minimum of five years of professional experience in education or educational research, and documented expertise in digital learning environments or student psychological development. Sampling continued until theoretical saturation was achieved, meaning that no substantially new themes emerged from subsequent interviews. The participants represented diverse academic and professional backgrounds, enabling a comprehensive exploration of the ontological foundations of digital resilience and its cognitive-behavioral implications for curriculum design. Ethical considerations were observed throughout the study, including informed consent, voluntary participation, confidentiality of responses, and the right to withdraw from the research at any stage.

Data were collected through a combination of semi-structured expert interviews and document analysis. Semi-structured interviews were selected as the primary data collection method because they provided flexibility for exploring participants' perceptions, experiences, and theoretical insights regarding digital resilience and curriculum development. An interview guide was developed based on an extensive review of the literature related to digital resilience, educational technology, curriculum theory, digital citizenship, cognitive development, and behavioral adaptation in online environments. The interview protocol included open-ended questions focusing on the nature of digital resilience, the ontological assumptions underlying human interaction with digital environments, the cognitive and behavioral competencies required for effective adaptation in technology-rich contexts, and the educational strategies necessary for fostering resilience among students. Each interview lasted

between 45 and 75 minutes and was conducted either face-to-face or through secure online communication platforms. All interviews were audio-recorded with participant consent and subsequently transcribed verbatim for analysis.

In addition to interviews, document analysis was employed to strengthen the conceptual foundation of the study. Relevant scientific articles, curriculum policy documents, educational frameworks, digital literacy guidelines, international reports on digital citizenship, and educational technology standards published between 2015 and 2025 were systematically reviewed. The purpose of document analysis was to identify recurring concepts, theoretical perspectives, and practical recommendations related to digital resilience and student development. The integration of interview data and documentary evidence enhanced the credibility and comprehensiveness of the findings by allowing triangulation across multiple sources of information.

To ensure the trustworthiness of the collected data, several qualitative rigor strategies were implemented. Credibility was enhanced through prolonged engagement with the data, member checking, and expert review of interview transcripts and preliminary interpretations. Dependability was strengthened through detailed documentation of all research procedures and analytical decisions. Confirmability was established by maintaining an audit trail and conducting peer debriefing sessions with independent qualitative researchers. Transferability was supported by providing detailed descriptions of participants, research context, and analytical processes.

The collected data were analyzed using thematic analysis following the six-phase procedure proposed by Braun and Clarke. Initially, all interview transcripts and documentary materials were read repeatedly to achieve immersion and familiarity with the data. During the second phase, meaningful units of information related to digital resilience, ontological assumptions, cognitive competencies, behavioral adaptations, and curriculum elements were identified and assigned initial codes. In the third phase, similar codes were grouped into broader conceptual categories, allowing the emergence of preliminary themes. The fourth phase involved reviewing and refining these themes to ensure coherence, internal consistency, and meaningful distinctions among categories. During the fifth phase, the themes were defined, named, and organized into a conceptual framework that explained the relationships among ontological foundations, cognitive-behavioral outcomes, and curriculum components of digital resilience. Finally, the sixth phase focused on synthesizing the findings into an integrated curriculum model that could guide the design and implementation of educational programs aimed at enhancing students' digital resilience.

The qualitative data analysis was facilitated using MAXQDA software version 2024, which enabled systematic coding, organization, retrieval, and comparison of textual data. Throughout the analytical process, constant comparison techniques were employed to examine similarities and differences across participants' perspectives and documentary sources. The final curriculum model emerged through iterative analysis and expert validation, resulting in a comprehensive framework that integrates philosophical foundations, cognitive dimensions, behavioral competencies, and educational practices necessary for promoting digital resilience among students in contemporary digital environments.

Findings and Results

The study involved 24 experts from Tehran who participated in the qualitative phase of the research. Of the participants, 9 (37.5%) were university faculty members specializing in curriculum studies and educational sciences, 5 (20.8%) were educational psychologists, 4 (16.7%) were specialists in educational technology and digital learning environments, 3 (12.5%) were educational policymakers and curriculum planners, and 3 (12.5%) were school counselors and digital literacy practitioners. The participants possessed between 7 and 28 years of professional experience, with a mean professional experience of 16.4 years. Regarding academic qualifications, 20 participants held doctoral degrees and 4 held master's degrees with extensive executive experience in educational organizations. The diversity of professional backgrounds and experiences

contributed to a comprehensive understanding of the ontological, cognitive, and behavioral dimensions of digital resilience and enriched the process of curriculum model development.

Table 1. Main Themes, Subthemes, and Frequency of References Related to the Digital Resilience Curriculum

Model		
Main Theme	Subtheme	Frequency of References
Ontological Foundations	Human agency in digital environments	41
Ontological Foundations	Adaptive interaction with technology	37
Ontological Foundations	Digital identity formation	35
Ontological Foundations	Ethical responsibility in cyberspace	32
Cognitive Dimensions	Critical digital thinking	46
Cognitive Dimensions	Information evaluation and verification	44
Cognitive Dimensions	Digital problem-solving	39
Cognitive Dimensions	Cognitive flexibility	36
Behavioral Dimensions	Self-regulation in online environments	48
Behavioral Dimensions	Safe digital behavior	45
Behavioral Dimensions	Responsible technology use	42
Behavioral Dimensions	Coping with online risks	40
Curriculum Components	Learning objectives	38
Curriculum Components	Learning content	34
Curriculum Components	Teaching-learning strategies	43
Curriculum Components	Assessment methods	31

Table 1 presents the major themes and subthemes extracted through thematic analysis. The findings indicate that digital resilience is a multidimensional construct integrating philosophical, cognitive, behavioral, and educational elements. Among the cognitive dimensions, critical digital thinking (46 references) and information evaluation and verification (44 references) emerged as the most frequently cited competencies, highlighting experts' concerns regarding misinformation, algorithmic influence, and digital decision-making. Within the behavioral domain, self-regulation in online environments received the highest number of references (48), suggesting that experts perceive the ability to manage attention, emotions, and online behavior as the cornerstone of digital resilience. Furthermore, safe digital behavior (45 references) and responsible technology use (42 references) were repeatedly emphasized as essential outcomes of curriculum implementation. In the ontological dimension, human agency in digital environments obtained the highest frequency (41 references), reflecting participants' belief that students should be viewed as active and autonomous agents rather than passive consumers of technology. Collectively, these findings indicate that the proposed curriculum should foster students' capacity to critically understand, ethically engage with, and adaptively navigate digital ecosystems.

Table 2. Relative Importance of the Main Dimensions of the Proposed Digital Resilience Curriculum Model

Dimension	Frequency	Percentage (%)	Rank
Behavioral Dimension	175	27.9	1
Cognitive Dimension	165	26.3	2
Ontological Dimension	145	23.1	3
Curriculum Design Dimension	142	22.7	4
Total	627	100.0	-

The results shown in Table 2 demonstrate that the behavioral dimension constituted the most prominent component of the proposed curriculum model, accounting for 27.9% of all coded references. This finding suggests that experts considered observable behavioral competencies, including digital self-regulation, responsible online conduct, and risk-management skills, as the most immediate indicators of digital resilience among students. The cognitive dimension ranked second with 26.3% of the total references, emphasizing the importance of critical reasoning, information literacy, reflective judgment, and digital problem-solving abilities. The ontological dimension represented 23.1% of all references, indicating that participants regarded philosophical understandings of human–technology interaction as a foundational but often overlooked aspect of curriculum development. The curriculum design dimension accounted for 22.7% of references, reflecting the need to translate theoretical

principles into practical educational objectives, learning experiences, instructional methods, and assessment procedures. Overall, the relatively balanced distribution across dimensions suggests that digital resilience should not be conceptualized solely as a behavioral skill set but rather as an integrated framework combining philosophical assumptions, cognitive competencies, behavioral adaptations, and pedagogical structures.

Table 3. Final Curriculum Framework for Developing Students' Digital Resilience

Curriculum Element	Key Components Identified
Educational Objectives	Critical awareness, digital adaptability, ethical responsibility, autonomous learning
Learning Content	Digital citizenship, online safety, media literacy, algorithm awareness, digital ethics
Teaching Strategies	Problem-based learning, collaborative inquiry, reflective activities, simulation-based learning
Learning Activities	Digital scenario analysis, misinformation detection exercises, cyber-risk management tasks, reflective journals
Assessment Methods	Performance assessment, digital portfolios, authentic tasks, self-assessment and peer-assessment
Expected Outcomes	Cognitive flexibility, digital self-regulation, responsible digital participation, resilience against online threats

Table 3 illustrates the final curriculum framework developed through synthesis of the qualitative findings. The proposed curriculum model begins with clearly defined educational objectives focused on cultivating critical awareness, adaptability, ethical judgment, and learner autonomy within digital contexts. The recommended learning content extends beyond technical skills and incorporates topics such as digital citizenship, media literacy, algorithmic awareness, and ethical decision-making. Participants strongly emphasized the need for active teaching approaches, including problem-based learning, collaborative inquiry, and reflective pedagogies that encourage students to engage critically with real-world digital challenges. The suggested learning activities are designed to simulate authentic digital experiences and enable students to develop practical resilience strategies in response to misinformation, cyberbullying, privacy threats, and technological uncertainty. Assessment methods move beyond traditional examinations and emphasize performance-based evaluation, digital portfolios, self-reflection, and peer feedback to capture students' actual competencies within digital environments. Finally, the expected outcomes of the curriculum encompass cognitive flexibility, enhanced self-regulation, responsible participation in digital communities, and increased resilience when confronted with online risks and challenges. Taken together, these findings support the development of a comprehensive digital resilience curriculum capable of preparing students to navigate contemporary digital environments in a critical, ethical, and adaptive manner.

Discussion and Conclusion

The purpose of the present study was to develop a digital resilience-based curriculum for students through an analysis of its ontological foundations and cognitive-behavioral implications. The findings revealed that digital resilience is a multidimensional construct consisting of interconnected ontological, cognitive, behavioral, and curricular dimensions. The thematic analysis demonstrated that self-regulation in online environments, critical digital thinking, information evaluation, safe digital behavior, and human agency in digital contexts constituted the most prominent components of the proposed curriculum model. Furthermore, the behavioral dimension emerged as the most influential aspect of digital resilience, followed by cognitive competencies, ontological foundations, and curriculum design elements. These findings suggest that effective preparation of students for contemporary digital environments requires a comprehensive educational framework that extends beyond technological literacy and incorporates philosophical, psychological, and behavioral dimensions of learning.

One of the most significant findings of the study was the central role of behavioral competencies within the digital resilience framework. The high frequency of references related to self-regulation, responsible technology use, and safe online behavior indicates that experts perceive resilience primarily as an adaptive behavioral capacity. This finding is consistent with previous research demonstrating that successful functioning in digital environments depends largely on learners' ability to regulate

attention, manage emotions, control impulses, and respond constructively to technological challenges. Studies have repeatedly shown that self-regulated learners exhibit higher levels of resilience because they are capable of adapting their behaviors in response to changing educational demands and technological conditions (5, 7, 24). Similarly, research on online learning environments has indicated that behavioral self-regulation serves as a protective factor against digital distraction, technological stress, and disengagement, thereby enhancing educational outcomes and psychological well-being (8-10). The prominence of behavioral competencies in the present study therefore reflects the practical reality that resilience is ultimately manifested through adaptive actions and decision-making processes within digital spaces.

The findings also emphasized the importance of cognitive competencies, particularly critical digital thinking, information verification, cognitive flexibility, and digital problem-solving. These results align with contemporary perspectives that conceptualize resilience as an active cognitive process involving interpretation, evaluation, and adaptation rather than mere resistance to adversity. In increasingly complex digital ecosystems characterized by misinformation, algorithmic personalization, and information overload, students must develop sophisticated cognitive skills to evaluate sources, identify biases, and make informed decisions. Previous studies have similarly highlighted the relationship between resilience and cognitive engagement, demonstrating that resilient learners tend to exhibit greater metacognitive awareness, reflective thinking, and learning adaptability (6, 21, 34). Research has further shown that cognitive flexibility enhances learners' ability to cope with uncertainty and rapidly changing technological environments, thereby strengthening their capacity for resilient adaptation (22, 26, 27). Consequently, the findings support the argument that digital resilience should be viewed not only as a behavioral outcome but also as a cognitive competence that can be cultivated through purposeful educational experiences.

Another important finding concerns the ontological foundations of digital resilience. Participants consistently emphasized concepts such as human agency, digital identity formation, adaptive interaction with technology, and ethical responsibility in cyberspace. This finding extends existing research by suggesting that digital resilience is rooted in deeper philosophical assumptions regarding the nature of human beings and their relationship with technology. While much of the previous literature has focused on measurable psychological variables, the present study highlights the necessity of examining how students perceive themselves as active agents within digital environments. This perspective is compatible with contemporary educational theories that advocate for learner-centered and agency-oriented approaches to digital education (14, 23, 29). By emphasizing agency, the proposed curriculum moves beyond viewing students as passive recipients of technological influences and instead positions them as reflective participants capable of shaping their digital experiences. Such an approach is particularly important in an era characterized by increasing reliance on artificial intelligence and algorithmic decision-making systems.

The emergence of ethical responsibility as a key ontological component also deserves attention. Digital environments increasingly expose students to ethical dilemmas involving privacy, misinformation, intellectual property, online communication, and AI-generated content. Consequently, resilience cannot be understood solely in terms of psychological adaptation but must also include the capacity to make responsible and ethical decisions in technologically mediated contexts. This finding is supported by recent studies emphasizing the importance of social-emotional learning, moral reasoning, and responsible digital citizenship in promoting sustainable engagement with technology (1, 3, 16). Educational programs that neglect ethical dimensions may successfully develop technical skills while failing to prepare students for the broader societal consequences of digital participation.

The findings further revealed that curriculum design elements should integrate educational objectives, learning content, instructional strategies, learning activities, and assessment approaches that explicitly target digital resilience. Participants strongly emphasized active learning methodologies such as problem-based learning, collaborative inquiry, authentic

assessment, and reflective practice. These recommendations correspond with previous research demonstrating that resilience is most effectively developed through experiential and learner-centered educational approaches rather than through passive transmission of information (21, 23, 24). Active learning environments encourage students to confront challenges, experiment with solutions, reflect on outcomes, and develop adaptive coping strategies, all of which contribute to resilience development. Furthermore, authentic assessment methods such as portfolios, performance tasks, and reflective journals provide opportunities for evaluating students' ability to apply resilience-related competencies in realistic situations.

The increasing integration of artificial intelligence into educational systems provides an additional context for interpreting the findings. Recent studies indicate that AI-supported learning environments can strengthen resilience by promoting self-regulation, personalized learning, and adaptive feedback mechanisms (2, 17, 30). However, these technologies simultaneously create new challenges requiring learners to develop critical awareness and responsible technology use. The present study supports this dual perspective by emphasizing both the opportunities and risks associated with digital transformation. The inclusion of algorithm awareness, digital ethics, and critical evaluation within the proposed curriculum framework reflects growing recognition that resilience in AI-mediated environments requires more than technical proficiency. Students must learn to critically understand how digital systems influence information access, decision-making processes, and social interactions. In this regard, the findings align closely with emerging scholarship advocating the integration of resilience, digital literacy, and AI literacy within educational curricula (1-3).

The findings also contribute to the broader literature on psychological well-being and educational engagement. Numerous studies have reported positive associations between resilience and learner well-being, motivation, academic persistence, and educational achievement (12, 18, 19). The proposed curriculum model incorporates these relationships by emphasizing competencies that support both academic success and psychological adaptation. For example, self-regulation, critical thinking, and adaptive coping not only enhance students' ability to manage digital challenges but also contribute to increased confidence, autonomy, and emotional stability. Research involving online and blended learning environments consistently demonstrates that resilient learners maintain higher levels of engagement and persistence even under adverse conditions (4, 11, 13). Therefore, the curriculum model developed in this study may serve as a valuable framework for promoting both educational effectiveness and student well-being.

Another noteworthy aspect of the findings is their relevance for educational equity and inclusion. Previous studies have demonstrated that resilience serves as an important protective factor for learners facing socioeconomic disadvantages, technological barriers, learning disabilities, and environmental uncertainties (35-37). By focusing on adaptability, agency, and self-regulation, the proposed curriculum offers a framework capable of supporting diverse learner populations. Rather than assuming equal access to resources or uniform learning experiences, the model recognizes that students encounter digital environments from different social, cultural, and economic positions. Consequently, resilience-oriented curricula may help reduce educational inequalities by equipping learners with competencies that enable them to navigate challenges more effectively regardless of contextual constraints.

The findings are also consistent with studies examining the role of teacher support, social support, and positive educational relationships in fostering resilience. Research has shown that supportive learning environments significantly enhance students' capacity to cope with academic and technological challenges (13, 14, 38). The curriculum framework developed in this study reflects this perspective by emphasizing collaborative learning, reflective dialogue, and learner-centered pedagogies. Such approaches create opportunities for students to develop resilience not only as an individual characteristic but also as a socially constructed capacity supported by meaningful educational relationships.

Overall, the findings suggest that digital resilience should be conceptualized as a comprehensive educational outcome integrating ontological understanding, cognitive competence, behavioral adaptation, ethical responsibility, and curricular support. The proposed curriculum framework offers a theoretically grounded and practically applicable model for preparing students to thrive in increasingly complex digital environments. As educational systems continue to evolve under the influence of digital transformation and artificial intelligence, the development of resilience-oriented curricula may become one of the most important priorities for contemporary education.

One limitation of the present study is that the proposed curriculum model was developed primarily through qualitative inquiry involving experts from a single metropolitan context. Although the participants represented diverse professional backgrounds, their perspectives may not fully capture the experiences and needs of students, teachers, and educational stakeholders in other regions or educational systems. In addition, the study focused on conceptual model development rather than empirical implementation, which limits conclusions regarding the effectiveness of the proposed curriculum in real-world educational settings.

Future research should focus on the empirical validation of the proposed curriculum model through pilot implementation studies in schools. Researchers may investigate the effectiveness of specific curriculum components in enhancing students' digital resilience, examine developmental differences across age groups, and explore potential variations across cultural and socioeconomic contexts. Longitudinal studies are also needed to determine whether resilience-oriented curricula produce sustained improvements in students' cognitive, behavioral, and psychological outcomes over time.

Educational practitioners and policymakers should consider integrating digital resilience as a core component of curriculum planning and educational reform initiatives. Schools should provide learning experiences that promote critical thinking, ethical digital participation, self-regulation, and adaptive problem-solving. Teacher professional development programs should include training related to resilience-oriented pedagogy, digital citizenship, and responsible technology integration. Furthermore, curriculum developers should design assessment systems that evaluate authentic resilience-related competencies rather than focusing exclusively on traditional academic outcomes, thereby preparing students to navigate future digital challenges with confidence, responsibility, and adaptability.

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Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

All ethical principles were adhered in conducting and writing this article.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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