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CONSTRUCTING A DIGITAL SHIELD: A SYSTEMATIC REVIEW OF MOBILE LEARNING INTERVENTIONS FOR CYBERBULLYING PREVENTION TOWARDS PRIMARY SCHOOL EDUCATION

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Abstract: *Purpose: This study addresses a critical gap in the educational body of knowledge concerning the prevention of cyberbullying among the primary school students (aged 9-12). While the traditional bullying has been extensively studied, the increasing exposure of younger children to the online aggression has outpaced the development of the effective pedagogical interventions. Methodology: guided by Park's Pedagogical Framework for Mobile Learning, this study employs a conceptual analysis to examine the effectiveness of the gamified mobile learning applications in enhancing students' digital safety knowledge. Selected interventions, including Google Interland and Common Sense Media's Digital Passport, were analysed in terms of pedagogical structure, learner engagement, and social interaction. Findings: The analysis reveals that while current applications effectively support structured knowledge and digital citizenship awareness, their high transactional distance and individualized design offer limited avenues for collaborative reflection and interpersonal interaction. This structural imbalance highlights a critical empathy gap where learners successfully acquire theoretical knowledge about cyberbullying but lack the pedagogical and dialogic support needed to internalise socio-emotional skills for sustainable behavioural change. Significance:this study proposes a strategic framework for integrating the gamified mobile learning into primary school curriculum to address these limitations. The findings contribute to the advancement of the educational body of knowledge by highlighting the importance of mobile-mediated, game-based interventions in equipping young learners with the competencies that required to navigate and respond to cyberbullying.*

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Keywords: *Cyberbullying Prevention, Mobile, Primary Education, Digital Citizenship, instructional design*

Introduction

The Pursuit of Academic Research

The pursuit of academic research is fundamentally concerned with advancing the existing body of knowledge (BoK), which functions both as a disciplinary ontology and as a competency framework for professional practice and the curriculum design. In the field of education, where BoK is increasingly being destabilized by the rapid digitalization of childhood. Children are now engaging intensively with networked technologies well before reaching the secondary education, often without the systematic guidance on safe, ethical, and responsible use (Li, Vladez, & Du, 2025).

The discourse of the surrounding digital transformation and Education 4.0 further underscore this shift, emphasizing not only foundational competencies such as literacy and numeracy, but also on digital literacy, data literacy, artificial intelligence awareness, and global connectivity. These developments necessitate a fundamental rethinking of pedagogical models, the evolving role of teachers, and cotemporary assessment of practices (Sarkar, 2025).

Within this evolving landscape, cyberbullying is no longer confined to adolescence but has emerged as a significant risk factor within primary education. This shift reflects the increasing migration of offline peer aggression into digital environments (Rodríguez-Álvarez et al., 2021). Systematic review evidence indicates that children at the elementary level are already exposed to cyberbullying, often experiencing substantial psychosocial harm. At the same time, the traditional anti-bullying interventions have demonstrated only limited effectiveness in addressing cyberbullying outcomes (Ng, E., Chua, J., & Shorey, S., 2020).

Emerging research further had suggested that deficits in the socio-emotional competencies- particularly self-management and relationship skills- are closely associated with the overlapping patterns of offline bullying and cyberbullying among primary school pupils. This highlights the need to strengthen teachers' captivity in socio-affective pedagogy and digital citizenship education, rather than relying solely on technical or regulatory approaches (Güçlü-Aydogan et al., 2025).

Concurrently, scholarship on digital citizenship education in early childhood identifies primary schooling as a critical developmental window for the cultivating safe, ethical, and collaborative online behaviours. Such as competencies can be effectively fostered through integrated, gamified, and simulation-based learning activities embedded within core curricular domains (Chernikovaet al., 2020).

Problem Statement

Despite the proliferation of the mobile applications designed to address cyberbullying, schools continue to face a fundamental pedagogical gap. Most available tools are structured primarily around rule-based instruction- teaching children what cyberbullying and what rules apply- without sufficiently addressing the socio-emotional dimensions that required for genuine behavioural change.

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Current mobile tools frequently neglect the empathy-building and dialogic processes that are essential for the children ti internalize prosocial norms, perspective-take, and develop upstander behaviour (Chicote-Beato et al., 2024). Furthermore, the primary school students on age 9 to 12 represent a developmentally distinct population whose cognitive, social, and emotional capacities differ markedly from those of adolescents. Interventions designed without sensitivity to these developmental realities risk being either conceptually inaccessible or pedagogically misaligned with the children lived digital experiences (Sidera et al., 2021).

Despite these advancements, the current educational BoK remains limited in providing robust, integrative frameworks that connect digital citizenship, social-emotional learning (SEL), and gamified simulations within primary education. This gap underscores the need for theoretically grounded and pedagogically coherent approaches-an issue that this article seeks to address.

Literature Review

The Body of Knowledge (BoK) as a Validity Condition

The Body of Knowledge (BoK) in education can be understood as the codified set of concepts, terminologies, practices, and competencies that define what count as valid knowledge and professional expertise within the field. It functions as a reference system against which theories, tools, and interventions are evaluated, while simultaneously rendering "knowledge gaps" visible and thus justifying new lines of inquiry.

In the domain of school bullying, a substantial BoK has been established around the traditional face-to-face interaction, encompassing definitions, prevalence, psychosocial correlates, and evidence-based prevention programmes (Li et al., 2022). However, the emergence of the cyberbullying has exposed the limits of extending this existing BoK without critical adaption. While cyberbullying shares core elements with traditional bullying-such as intentional harm, repetition and power imbalance- it is further characterised by persistent connectivity, potentially unlimited audiences, and the anonymity or invisibility of perpetrators. These features may intensify victimisation experiences, often leaving victims to suffer without witnesses or clear evidence (Dennehy et al., 2020).

Recent reviews indicates that many measurement instruments and definitional frameworks in youth cyberbullying research fail to adequately capture these distinctive characteristics. This has resulted in inconsistencies in measurement and challenges for children in recognising and reporting their own experiences as cyberbullying (Zhang et al., 2022). Consequently, the validity of the current educational BoK is increasingly contingent upon its ability to incorporate digital-specific constructs, including platforms affordances, anonymity, content persistence, and device-mediated behaviours.

Expanding the BoK, therefore, requires not only the refinement of conceptual definitions and measurement tools (Zhang et al., 2022), but also the validation of new delivery mechanisms for prevention and intervention, particularly within mobile environments, where significant proportion of cyberbullying interactions now occur (Mathimbi, P., 2025). Emerging frameworks for mobile-based bullying interventions emphasises that prevention strategies must be explicitly designed for smartphone-mediated contexts, positioning social interaction, media affordances, and the design of awareness tools as central pedagogical considerations rather that peripheral elements.

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In this respects, mobile technology should not be viewed merely as a delivery channel, but as a critical test of whether the educational BoK can meaningfully engage with children lived digital experiences.

The cyberbullying Landscape in Primary Schools

The "tween" demographic (ages 9-12) now represents a critical developmental period for the onset digital aggression, as children begin engaging with mobile devices, and early forms of social media while still lacking fully developed socio-emotional and metacognitive competencies (Sidera et al., 2021). Systematic reviews focusing on elementary and lower-secondary students indicate that both cyberbullying and the cybervictimisation are already prevalent at the primary school, with reported victimisation rates ranging between 14% and 30%. Notably, many children are simultaneously involved in both traditional and cyber forms of bullying (Sidera et al., 2021).

Importantly, both qualitative and quantitative evidence indicates suggest that many young learners do not interpret or label their experiences as "cyberbullying". Instead, such incidents are often normalised or dismissed as "jokes," "drama," or typical online interactions, reflecting a limited understanding of key definitional elements such as harm, repetition, and power imbalance (Dennehy et al., 2020). A global review further highlights significant inconsistencies in how cyberbullying is defined and communicated to children, with many measurement instruments failing to explicitly incorporate these core criteria. This lack of clarity undermines children's ability to recognise and report their own victimisation experiences (Zhang et al., 2022).

Barriers to disclosure and help-seeking are also widely documented. Young people frequently report reluctance to seek help due to fears of losing access to their devices, scepticism regarding adults' ability to understand or effectively intervene, and the perception that online harm is difficult to verify-particularly in cases involving anonymity or impersonation (Ansary, N., 2019). Large-scale syntheses indicate that a substantial proportion of victims-often a quarter or more-do not disclose cyberbullying incidents to adults (Zhu et al., 2021).

The platforms through which primary-aged children encounter cyberbullying also differ from those associated with older adolescents. While teenagers are more likely to report victimisation on mainstream social media platforms, younger children are disproportionately exposed through online games, video-sharing platforms, and in-platform messaging systems (Evangelio et al., 2021). These environments often integrate play, competition, and social interaction, thereby blurring the boundaries between playful banter, conflict, and abusive behaviour.

Collectively, these findings reveal a significant gap in pedagogical vocabulary and conceptual understanding. Current curricula and teaching practices frequently fail to provide developmentally appropriate language and frameworks for identifying digital aggression, particularly within gaming and entertainment contexts that dominate children's online experiences (Sidera, Serrat, & Rostan, 2021). This gap reinforces the need to expand the educational BoK to include age-appropriate constructs of digital harm, clearly defined roles (e.g., victim, perpetrator, bystander), and accessible reporting pathways.

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Mobile Learning and Gamification

Mobile learning (m-learning) refers to the use of portable devices digital devices (e.g., smartphones, tablets) to facilitate learning across multiple contexts, enabling interactions that extend beyond the constraints of time and location and often blending formal and informal learning environments (Evangelio et al., 2021). In primary education, m-learning is particularly salient, as the same devices are used for communication, entertainment, and social interaction-thereby serving as potential sites for both learning and cyberbullying.

Gamification, defined as the application of the game design elements- such as points, levels, challenges, feedback and rewards-within non-game contexts, has emerged as promising approach to enhancing engagement and persistence in m-learning environments. Systematic reviews and empirical studies across primary and K-12 settings consistently report that gamified mobile learning systems can improve students' motivation, time-on-task and learning outcomes compared with traditional or non-gamified instruction (Jamilah, J., 2025). For example, a gamified mobile learning system for elementary science has been shown to significantly enhance both learning achievement and motivation relative to non-gamified mobile learning and conventional classroom instruction (Jamilah, J., 2025).

Furthermore, future-rich gamified applications- incorporate adaptive levels of difficulty, immediate feedback and engaging visual design-have been found to outperform minimalists design in primary-level learning contexts, resulting in higher accuracy and sustained engagement over time (Nand et al., 2019).

Across subjects and age groups, meta-analyses and scoping reviews identify several key factors that determine the effectiveness of the gamified applications in primary education:

- Alignment with curriculum goals and competency development
- Immediate and meaningful feedback supporting user interaction
- Integration of assessment and learning analytics for progress monitoring
- Ethical considerations, including data protection and sustainability
- Accessibility ad inclusivity
- Support for "flow" defined as the optimal balance between challenges and learner skills that sustains deep engagement (Evangelio et al., 2021)

When these elements are effectively integrated, teachers are more likely to perceive gamified applications as both pedagogically valuable and practically implementable within classroom settings (Vázquez-Cano et al., 2023). This with flow theory, which posits that immediate feedback and optimally challenging tasks promote sustained engagement and improved learning outcomes. Gamified mobile interventions operationalise these principles through continuous feedback loops and adaptive difficulty, both of which have been empirically associated with enhanced cognitive performance and learner motivation (Zolfaghari et al., 2025).

In the specific domain of digital safety and cyberbullying prevention, evidence suggest that interventions integrating socio-emotional competencies-such as empathy and self-regulation-alongside school climate initiatives and online safety education can significantly (Kasturiratna et al., 2024). While most existing interventions still rely on classroom-based lessons, recent frameworks for mobile-focused bullying awareness argue that context-sensitive, mobile-delivered interventions- potentially gamified- are necessary to meet children where cyberbullying actually occurs (Mathimbi, P., 2025).

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Taken together, positioning gamified m-learning as a pedagogical vehicle for digital citizenship education and online conflict management is both theoretically grounded and increasingly supported by empirical evidence. More importantly, it offers a concrete pathway for operationalising an expanded educational BoK-one that moves beyond describing digital risks to embedding developmentally appropriate, simulation-based, and feedback-rich learning experiences within the everyday digital practices of primary school learners.

A closer examination of prominent cyberbullying prevention application reveals a consistent structural pattern where the majority are designed as high transactional distance, individualized learning experiences. Tools such as Google Interland, Digital Passport, and Band Runner are built around self-directed, rule-based interaction with little opportunity for peer dialogue, collaborative reflection, or the perspective-taking. This design pattern is not incidental where it reflects the broader tendencies in educational app development to priorities scalability, ease of development, and standardized the content delivery over the more complex and resource intensive socio-emotional learning processes (Mathimbi, 2025).

As a result, these tools are structurally ill-equipped to cultivate the empathy, foster dialogic engagement, or support the kind of interpersonal reflection that the literature consistently identifies as necessary for meaningful behaviour change. This structural limitation which the "empathy gap"- forms the central analytical lens of the present review, and its identification emerges directly form mapping existing interventions against the socialization and transactional distance dimensions of Park's Mobile Learning Framework.

A Social-Ecological Comparison of Contemporary Cyberbullying Interventions

The current of technology-based anti cyberbullying solutions is characterised by extreme design heterogeneity, spanning serious games, Ai-driven real time prompts, digital health interventions (DHIs), and comprehensive whole-school frameworks (Chen et al, 2023; Serritella et al., 2025). However, meta-analytic evidence reveals a stark disparity in their operational effectiveness. The digital health interventions and basic technology tools yield highly mixed empirical outcomes when treating the cyber aggression (Chen et al., 2023).

A critical meta-analysis by Lan, Law, and Pan (2022) provides a clear explanation for this variance through a socio-ecological lens: interventions that explicitly integrate interpersonal interactions and stakeholder agency achieve higher effectiveness than those confined strictly to isolated, intrapersonal learning patterns.

The primary behavioural pathway for success across these ecological models relies heavily on targeted empathy activation (Torgat et al., 2023). When an intervention architecture successfully triggers empathy within the digital ecosystem, it drastically improves cyber-bystander behaviour, shifting passive observers into active defenders (Torgat et al., 2023). Therefore, the anti-cyberbullying design must transcend basic text delivery and activity incorporate interactive, multi-stakeholder dynamics.

The Technological and Structural Determinants of Individualized App Design

Despite the clear empirical superiority of the socio-ecological, interpersonal designs, the broader educational application marketplace remains deeply entrenched in individualized learning patterns. This structural bias is driven by two main factors:

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- Scalable AI Customization: The rapid advancement of artificial intelligence and machine learning algorithms allows that the digital platforms to dynamically adapt content to individual learning styles, personal interest, and unique academic paces, making hyper-personalized learning programmatically efficient (Ling et al., 2020; Villegas-Ch et al., 2024).
- User-centric Flexibility: Modern application design heavily prioritizes highly flexible, user-centric modes that cater to distinct, solo user goals- ranging from specific skill-building to exam preparation across diverse age demographic (Khan et al., 2025).

This systematic focus on the individualization is the digital continuation of a historical educational struggle where ongoing effort to balance the efficiency of mass education with the reality of the individual learner variability (Dockterman, 2018). By leveraging programmatic levelling, personalized feedback loops, and individual motivational mechanics (such as solo point trackers and badges), the developers have successfully optimized the personal cognitive metrics (Outhwaite et al., 2023).

However, this success has come at a steep cost. By optimizing apps almost exclusively for the solo user, the EdTech industry has systematically neglected the collaborative, ecological spaces where social-emotional learning actually occurs. It reduces McLain's (2014) concept of "extender" applications- which are meant to facilitate identity development and deep experiential learning- into highly sophisticated, yet ultimately solitary, cognitive tracks (El Gazi et al., 2024). This directly aligns with the limits of Park's Type 2 mobile environments, where high transactional distance isolates the user from the social dialogue necessary for attitudinal transformation.

Deconstructing the Digital "Empathy Gap" and Digital Friction

This structural bias in app design directly feeds into and exacerbates the "empathy gap" in digital space. Within contemporary cyberbullying literature, the empathy gap explicitly defines as the profound disconnect between an individual's internal capacity for empathy and their actual execution of prosocial actions in digital social contexts. While empathy stands as the single strongest predictor of positive bystander intervention, it remains critically underdeveloped and superficially designed with modern technology-based interventions (Cai et al., 2024).

This gap is further complicated by how the empathy changes when it moves from the physical world to digital spaces. In traditional face to face bullying contexts, the cognitive empathy (perspective-taking) functions as a robust, automatic protective factor. However, empirical tracking reveals that standard cognitive empathy exhibits significantly weaker protective effects within the cyberbullying environments (Graf et al., 2019).

Because the digital platforms lack on immediate physical, auditory, and visual feedback, an individual's normal empathy mechanisms face a form of digital friction; the psychological signals are muted by the architecture of the screen. When the apps treat empathy as a passive informational topic to be read about individually, rather than an active, simulated social experience, they fail to bridge this disconnect (Hu et al., 2023).

To close this gap, the instructional designers cannot rely on standard, the individualized personalization models. Instead, they must intentionally design mobile applications that

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leverage sustainable gamification to create immersive, interpersonal, and multi-stakeholder simulations. Only by forcing the users to navigate the social consequences of choices within a shared digital ecology can an app overcome this digital friction, bridge the empathy gap, and transform passive bystanders into active digital citizens (Lan et al., 2022; Cai et al., 2024).

Key claim & evidence

Table 1: Evidence base for key conceptual and design claims

Claim	Evidence Strength	Reasoning	Citations
Cyberbullying is conceptually distinct from traditional bullying and must be explicitly defined in the educational BoK.	Strong	Multiple systematic reviews identify unique characteristics of cyberbullying-such as anonymity, persistent connectivity, and wide audience reach-alongside inconsistencies in definitions and measurement, indicating limitations in directly extending traditional bullying frameworks	Li et al., (2022).
Cyberbullying significantly affects primary school-aged children, whi often struggle to recognise and report such experiences.	Strong	Evidence from systematic reviews and primary-level studies demonstrates notable prevalence, overlapping victim-perpetrator roles, barriers to disclosure, and conceptual ambiguity among children aged 8-12	Chicote-Beato et al, (2024).
Gamified mobile learning enhances learner motivation and outcomes, making it a promising approach for digital safety education	Strong	Extensive K-12 research and review studies consistently report increased engagement and improved learning outcomes when gamification elements-such as feedback, flow, and learning analytics-are effectively integrated.	Jamilah, J. (2025).

Methodology

Review Design

This study adheres to a systematic review protocol that formulated in accordance with the Preferred Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines. Given that the primary research objective is to evaluate how existing cyberbullying prevention applications that align with established educational theories into the systematic selection process in lieu of a quantitative meta-analysis. The conceptual analysis uniquely suited for clarifying key constructs, like juxtaposing underlying design methodologies, and synthesizing broader theoretical and pedagogical implications (Mathimbi, 2025).

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Search Strategy

A comprehensive and systematic literature search was executed across five prominent academic databases: Scopus, Education Resources Information Center (ERIC), Web of Science, Google Schoolar, and PsycINFO. The search window was restricted to publications released between January 2019 and December 2025 to ensure contemporary relevance within a rapidly evolving technological landscape. The primary Boolean search string applied all databases was configured as follows:

(*"cyberbullying" OR "cyber-bullying" OR "online bullying") AND (mobile learning" OR "m-learning" OR "mobile application" OR "gamification") AND ("primary school" OR "elementary school" OR "primary school" OR "primary education" OR "children")*

To guarantee thematic exhaustiveness, secondary keyword clusters were deployed to capture adjacent constructs, targeting domains such as *digital citizenship, social-emotional learning, empathy development, digital, digital safety education,* and *online aggression intervention.*

Eligibility Criteria

To ensure a rigorous and transparent selection process, explicit inclusion and exclusion criteria were established prior to the literature search.

Inclusion Criteria:

- Peer-reviewed journal articles and conference proceedings published in English between January 2019 and December 2025.
- Studies evaluating mobile-based or gamified interventions specifically targeting cyberbullying prevention or digital safety education.
- Research focusing on primary school-aged cohorts (approximately between 7-12 years) or frameworks directly transferable to this demographic.
- Conceptual, empirical, or review-based papers addressing the theoretical foundations, design logic, or evaluation of mobile digital safety tools.

Exclusion Criteria:

- Studies focusing exclusively on the secondary or higher education populations.
- Interventions lacking a distinct digital or mobile learning component.
- Grey literature, doctoral dissertations, master's thesis, and non-peer-reviewed commentaries or editorial pieces.
- Publication falling outside the designated years between 2019- 2025 timeframe.
- Studies restricted purely to algorithmic detection mechanisms devoid of pedagogical application.

Screening and Selection

The initial database search yielded and aggregate of 474 records (Scopus: n = 124; ERIC: n = 76; Google Scholar: n = 143; PsycINFO: N = 42). Following the removal of 118 duplicate entries, 356 unique records were retained for title and abstract screening. At this stage, 287 records were excluded based on predefined criteria, primarily due to the irrelevant target populations (n = 98), the absence of mobile or digital learning component (n = 87), non-peer-reviewed status (n =62), and publication dates outside the specified chronological range (n = 40).

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Subsequently, a straight full-text review was performed on the remaining 69 articles. Of these, 47 were excluded due to:

- Population or age mismatch (n = 15)
- Absence of mobile learning elements (n = 12)
- Non-peer-reviewed status (n = 9)
- Chronological incompatibility (n = 7)
- Redundant outcome reporting (n = 4)

Ultimately, 22 studies met all eligibility criteria and were included in the final synthesis. The complete screening and selection workflow is graphically in the PRISMA flow diagram Figure 1.

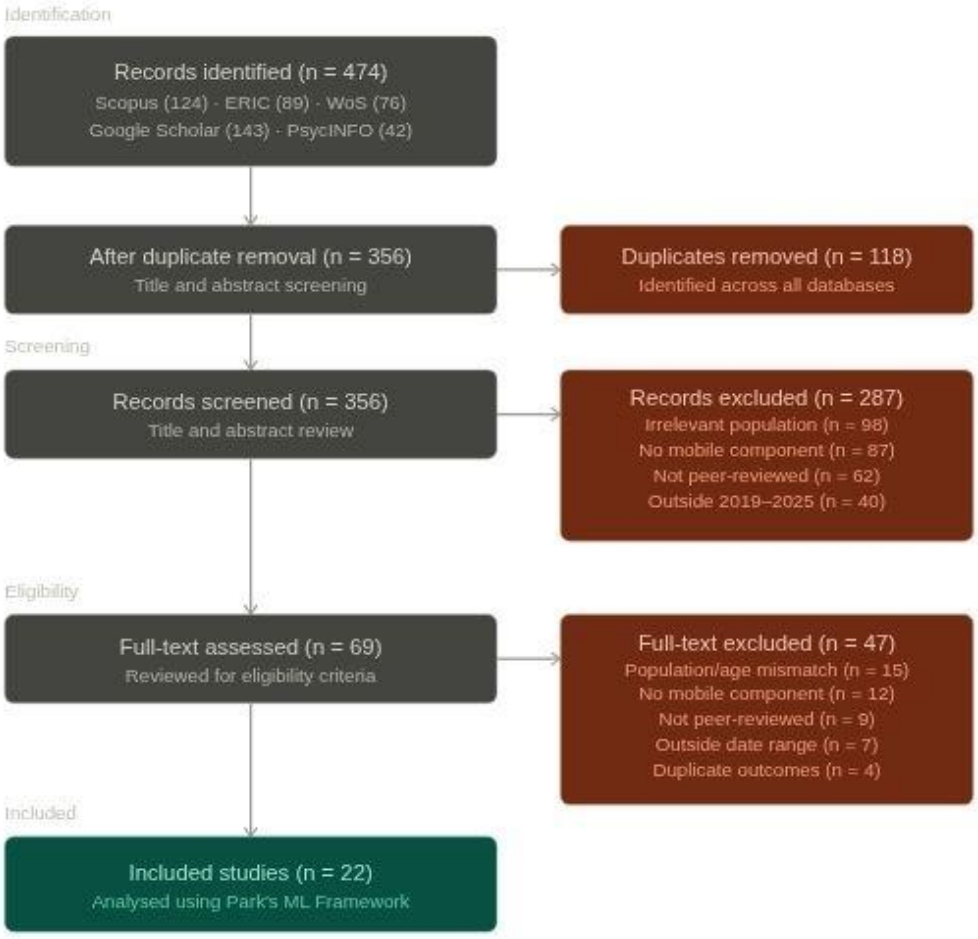

Figure 1 PRISMA Flow Diagram of the Study Selection and Screening Process

The analytical framework guiding this study is derived from Park's mobile learning frameworks, which extends Transactional Distance Theory (TDT) by conceptualising m-learning along two mapping m-learning experiences along two key dimensions (Elyakim et al., 2019):

1. Transactional Distance (High vs Low): Refers to the psychological and communication gap between learners and instructors or the boarder learning community. This distance is influenced by the balance between instructional structure and opportunities for dialogue.

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2. Socialized vs Individualized Activity: Describes whether learning interaction are primarily oriented toward content and technology (individualised) or involve with peers and instructors (socialised).

Based on the dimensions, Parks identifies four categories of mobile learning environments: high transactional distance- individualised, high-transactional distance socialised, low transactional distance-individualised, and low distance-socialised. Notably, the low transactional distance-socialised (Type 3) configuration is considered optimal, as it minimises psychological distance through rich interaction, collaborative engagement, and continuous dialogue among learners and instructors (Elyakim et al., 2019).

This framework is particularly well-suited for analysing cyberbullying prevention applications, as it enables a distinction between tools that merely transmit information and those that actively facilitate interpersonal interaction, reflection, and socio-emotional engagement. Such dialogic and socially mediated elements have been in meta-analytical evidence as critical components of effective cyberbullying prevention interventions (Chicote-Beato et al., 2024).

Table 2: Positioning of cyberbullying prevention tools within Park's Mobile Learning framework

App/ type	TD & Activity	Main strength	Main pedagogical limits	Citation
Interland, Digital passport, Band Runner	Predominantly type 1: High transactional distance, individualised learning	Clear rule-based instruction, engaging gamified elements, effective for developing basic digital safety knowledge.	Limited opportunities for in-app peer interaction, weak support for perspective-taking and empathy development	Siddiqui, S., & Schultze-Krumbholz, A. (2023).
Classroom-embedded games/VR like Conectado, VR PSI	Moving towards Type 1, Low transactional distance, socialised learning	Facilitated shared experiences, promote empathy, discussion and reflective dialogue	Require structured facilitation, less scalable and not fully plug-and-play	Wienrich, C., Horn, V., Krauss, J., & Bürger, A. (2024).

Results

Categorization and the Empathy Gap

Conceptual mapping of leading cyberbullying and digital safety applications reveals a clear dominance of high transactional distance-individualised (Type 2) mobile learning configurations. These tools are typically characterised by structured, game-like activities that are completed independently, with limited opportunities for synchronous or dialog peer interaction (Reche et al., 2022).

Three prominent examples illustrate this pattern, first, Google Interland (Be Internet Awesome) is a rule-based, web-based game designed to develop procedural knowledge, such as password

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security and safe online behaviour. However, interaction is largely unidirectional, occurring between the learner and the system rather than within a social learning context (Reche et al., 2022).

Second, Common Senes Media's Digital Passport emphasises individual competency development through badges and certification mechanism. Empirical evaluations of similar "digital passport" models indicate that while such tools are effective in improving knowledge acquisition and perceived usefulness, they have limited impact on social interaction patterns or collaborative learning processes (Mathimbi, 2025).

Third, ThinkUKnow's Band Runner prioritises rapid decision-making and hazard recognition over reflective or dialogic engagement. Although integrated safety features-such as direct links to support services-enhance accessibility, they do not fundamentally alter the underlying individualised learning design (Wienrich et al., 2024).

In contrast, interventions that incorporate social interaction, role-play, and multi-stakeholder engagement (e.g., students, teachers, and parents) demonstrate more substantial outcomes. Meta-analyses and systematic reviews consistently indicate that programmes integrating interpersonal dialogue and participatory elements outperform those relying solely on individualised learning (Ng, E et al., 2020). For instance, serious games such as Conectado, when implemented alongside structured classroom discussions, explicitly aim to foster empathy and perspective-taking by allowing students to experience cyberbullying scenarios form the victim's perspective (Reche et al., 2022).

Similarly, virtual reality (VR)-based cyberbullying interventions have been shown to induce cognitive dissonance and empathetic responses by simulating experiences such as personal space invasion. These effects are particularly pronounced when followed by guided social debriefing, with learners reporting strong emotional and reflective engagement (Wienrich et al., 2024).

Collectively, these findings support the presence of an "empathy gap" in current mobile-based cyberbullying interventions. While widely used applications are effective in developing conceptual and procedural understanding of cyberbullying, their high transactional distance and limited socialisation constrain their ability to cultivate deeper socio-emotional competencies. These include empathy, self-regulation, and upstander behaviour-skills that have been consistently identified as critical targets in effective primary school interventions (Chicote-Beato et al., 2024).

Discussion

Implications for the Body of Knowledge and Practice

Findings from primary level cyberbullying preventions programmes consistently indicate that socio-emotional competencies-particularly emotional regulation, empathy, and positive school climate-play a central role in effective intervention outcomes (Builds, R., Miedes, A., & Oliver, M., 2019). Meta-analysis evidence further demonstrates that programmes are significantly more effective when they incorporate interpersonal learning activities, such as cooperative learning, group discussions, and role-play, as well as the active involvement of multiple stakeholders, including teachers, parents, and peers (Polanin et al., 2021).

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These findings suggest that the current educational body of knowledge (BoK) requires a conceptual shift beyond foundational digital literacy-typically focused on rules, definitions, and procedural knowledge-towards a more integrative model includes Digital Emotional Intelligence (DEI). Within this expanded framework, several core competencies emerge as critical:

- the development of empathy and perspective-taking in online interactions
- the cultivation of self-esteem and emotional self-awareness, which are associated with lower involvement in cyberbullying behaviours (Touloupis & Athanasiades, 2022)
- the promotion of bystander-to-upstander behaviours, including the willingness to intervene, seek help, and support victims (Chicote-Beato et al., 2024).

In this context, active and gamified ICT-based appraoches-such as serious games, interactive quizzes, and digital storytelling-are particluarly valuable, as they enable learners to simulate real-world social situations. These approaches foster critical self-reflection and deepen students' understanding of the consequences of cyerbullying behaviours (Reche et al., 2022).

This reinforces the argument that mobile learning should not be conceptualised merely as a content delivery channel, but rather as simulation environment for social interaction and conflict negotiation. By embedding learners within interactive, feedback-rich scenarios, gamified m-learning environments can support the development of socio-emotional competencies that are essential for meaningful cyberbullying prevention.

From a theoretical perspective, this shift represents a necessary expansion of the educational BoK-one that integrates cognitive, behavioural, and socio-emotional dimensions within digitally mediated learning environments. From a practical standpoint, it underscores the need for educators and designers to prioritise interaction, reflection, and social engagement when developing the mobile-based interventions for primary school learners.

Strategic Integration: The "Blended" immunisation Model

Evidence across cyberbullying prevention interventions suggests that neither purely digital nor purely face-to-face approaches are sufficient when implemented in isolation. Systematic reviews and meta-analysis consistently report small but significant overall effects of anti-cyberbullying programmes, with stronger outcomes observed when the digital tools are embedded in broader, ecological, school wide strategies (Siddiqui, S., & Schultze-Krumbholz, A., 2023).

In response, this study proposes a blended "immunisation" model, which integrates the strengths of both mobile learning and socially mediated pedagogical practices. The model is structured around three key phases:

- phases 1: Gamified Activation (Type 2 – High Transactional Distance, Individualised) Structured, gamified mobile applications are used as stimulus materials to activate prior knowledge, raise awareness, and elicit initial emotional responses related to cyberbullying scenarios."
- Phase 2: Socialised Reflection (Type 3 – Low Transactional Distance, Socialised) Learning transition into guided, socially mediated activities, including classroom discussions, cooperative tasks, role-play, and reflective dialogue based on in-game decisions (Reche et al., 2022).
- Phase 3: Critical Engagement and Dialogue

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In-app elements- such as scores, badges, or scenario outcomes- are leveraged as prompts for collective critique and discussion. For example, students may be asked to evaluate alternative responses (Was this the best action?), (What could be done differently?), aligning with evidence that programmes incorporating interpersonal interaction and stakeholder agency yield more effective outcomes (Lan et al., 2022).

Empirical research on location-based and blended mobile learning further supports this approach, demonstrating that when instructional design and facilitation strategies are intentionally structured to reduce transactional distance, learners report lower perceived psychological distance and improved learning outcomes (Elyakim et al., 2019).

Similarly, primary-level cyberbullying prevention programmes that are embedded within the formal curriculum and supported by teacher and parent involvement have been shown to enhance students' emotional self-awareness, problem-solving abilities, and responsible technology use (Builds et al., 2019).

Taken together, this blended model operationalises an expanded educational BoK by integrating cognitive, behavioural, and socio-emotional dimensions within a coherent pedagogical sequence. It positions mobile learning not as a standalone intervention, but as a catalytic component within a broader, socially grounded learning ecosystem aimed at strengthen children's resilience against cyberbullying.

Ethical and Privacy Challenges in Mobile Learning

A critical constraint on scaling mobile learning (m-learning) interventions for cyberbullying prevention lies issues of data privacy and ethics. Existing reviews of digital interventions emphasise the need to balance accessibility and personalisation with robust safeguards against data misuse-particularly for children under the age of 13, who are protected under regulatory frameworks such as the Children's Online Privacy Protection Act (COPPA) and equivalent national regulations (Rattanawiboonsom et al., 2025).

Empirical studies examining educational and cyberbullying-related applications highlights several key risks. First, many freely available tools that rely on third-party software development kits (SDKs) and analytics systems that may collect behavioural and personally identifiable data beyond what is pedagogically necessary (Thun et al., 2021). Such as practice raise concern regarding data minimisation and proportionality in educational technology design.

Second, there is growing emergence of AI-based detection applications (e.g., CyberAid), which analyse children's digital communications to identify the potential cyberbullying incidents. While these tools may support parental monitoring and early intervention, they also introduce significant ethical concerns related to surveillance, informed consent, data storage, and the potential erosion of children's digital autonomy (Thun et al., 2021).

In response, a robust educational body of knowledge (BoK) for cyberbullying preventions must incorporate explicit ethical and design criteria for the selection and development of m-learning applications. These include:

- Data minimisation and anonymisation, ensuring that only essential data are collected and processed

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- Transparent and accessible privacy policies, enabling schools, teachers, and parents to make informed decisions
- Privacy-preserving analytics, which allow educators to monitor learning progress and engagement without accessing or exposing sensitive personal communications (Rattanawiboonsom et al., 2025).

Without these safeguards, the cyberbullying prevention tools risk becoming unintended vectors of surveillance, exploitation, or mistrust. This not only undermines ethical standards in educational but may also reduce students' willingness to engage authentically with digital safety interventions.

Conclusion

Drawing on findings from a PRISMA-informed systematic review of 22 studies and guided by Park's mobile learning framework, this study reveals a clear concentration of primary school-oriented cyberbullying prevention tools within high transactional distance-individualised (Type 2) designs. While these applications effectively deliver procedural knowledge and raise awareness, they remain structurally limited in fostering the social, emotional, and dialogic processes that empirical research consistently identifies as critical for effective cyberbullying prevention. This structural limitation- the "empathy gap"- emerges as a defining characteristic of current mobile interventions for this age group.

These findings underscore the need to expand the educational body of knowledge (BoK) beyond the conventional digital literacy frameworks to incorporate Digital Emotional Intelligence (DEI) as a central component of cyberbullying education. In particular, embedding mobile learning applications within blended pedagogical models- where characterised by low transactional distance and socially mediated interaction which offers a promising pathway for addressing this empathy gap.

Furthermore, the integration of the privacy-by-design principles is essential to ensure that such interventions remain ethically grounded and developmentally appropriate for young learners, that particularly given the cognitive and socio-emotional distinctiveness of the primary school age group (7-12years).

Taken together, this study advances the field by reconceptualising the mobile learning nor merely as a content delivery mechanism, but as a socio-emotional and interactive learning environment. In doing so, it also provides a theoretically grounded and particularly actionable framework for aligning m-learning that based on cyberbullying interventions with the contemporary understandings of effective and ethical educational practice.

Future research might productively examine the co-design of low transactional distance mobile tools with primary school educators and students, and empirically evaluate the impact of empathy-centred, dialogue-based on mobile interventions on cyberbullying attitudes and the behaviours in naturalistic classroom settings.

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