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GOVERNING HEALTH FUTURES 2030

Digital citizenship education as a public health intervention for the health and well-being of young people



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Executive summary

Digital environments shape how young people learn, socialize, form identity and seek health information. Alongside these opportunities sit well-documented harms, including: cyberbullying; exposure to harmful and sexualized content; the sophisticated marketing of tobacco, vaping, alcohol and appearance-enhancing products; misinformation; and patterns of problematic use associated with poorer mental health and sleep. These harms are increasingly understood not as individual failings but as population-level problems with structural drivers which are collectively referred to as digital determinants of health. They therefore warrant a public health response.

Digital citizenship education (DCE) equips young people with the competencies they need for positive, critical and responsible engagement in digital environments. The Council of Europe organizes these competencies within a framework of values, attitudes, skills, knowledge and critical understanding. It defines DCE as the empowerment of young people through education to promote active participation in digital society. To date, DCE has been designed and delivered largely within the education and technology sectors. This research examines what the evidence shows when it is, instead, treated as a public health intervention for young people's health and well-being. A scoping narrative review was conducted across PubMed, Scopus, Google Scholar and grey literature (from 2015 to 2026). Out of 4,665 records, 55 studies met inclusion criteria: 45 intervention studies evaluating programmes within the wider family of DCE against health and well-being outcomes in under-25 populations and ten conceptual frameworks.

The evidence base is real but uneven. Thirteen randomized trials and 17 quasi-experimental studies show that school-based DCE, media literacy and online safety programmes reliably improve the proximal capabilities that protect health: critical appraisal of media and marketing, refusal self-efficacy, safety and privacy behaviours, empathy and bystander readiness. Effects on downstream health outcomes are smaller and more mixed but demonstrably achievable: reduced cyberbullying perpetration and associated somatic symptoms, lower susceptibility to tobacco and vaping marketing, safer interpretation of sexual media, improved body image and even increased sleep. Programmes that are grounded in behavioural theory, delivered with sufficient dose, interactive in format and evaluated beyond the immediate post-test performed best. Only eight of 45 intervention studies (17.8 per cent) were conducted in low- and middle-income countries (LMICs), where most of the world's young people live. Follow-up periods are short, samples small, economic

evaluations absent, equity analyses rare and the frameworks guiding practice engage health unevenly. No study was included that evaluated DCE against the algorithmic and AI-mediated environments young people now inhabit.

The conclusion for policymakers is that they should invest in DCE as a necessary layer of a comprehensive public health response to the digital determinants of health. It should be funded within adolescent and school health programmes rather than by education technology budgets alone; co-owned by

health and education sectors; designed to the evidence-informed standards that distinguish effective programmes; and paired with the governance of platforms, commercial practices and data, rather than relying on education by itself as a substitute for effective governance. Acting on this agenda while building the evidence infrastructure the field still lacks, particularly in LMICs, would convert DCE from a promising educational tradition into a working instrument of public health.

Key messages

- Digital harms to young people are a population health problem and digital citizenship education is one of the few scalable, school-deliverable, universal prevention and health promotion instruments available to address them.
- The evidence from the DCE interventions analysed – including 13 randomized trials – shows consistent gains in protective digital capabilities and meaningful, if heterogeneous, effects on health outcomes spanning cyberbullying, substance use susceptibility, sexual health, body image, problematic use and sleep.
- Effectiveness is conditional: theory-informed design, adequate dose and duration, interactive delivery, trained facilitators and follow-up measurements distinguish programmes that change health-relevant behaviour from those that only change knowledge.
- The evidence base is geographically inequitable: 82 per cent of studies come from high-income countries and existing frameworks rarely encode the cultural and infrastructural realities of LMICs, where investment is most needed and evidence is thinnest.
- DCE is necessary but not sufficient to prevent digital harm. Education helps young people avoid risk but more importantly it equips them with the awareness, judgement and skills to navigate online spaces safely, to act thoughtfully and responsibly in their digital interactions and to use digital tools in ways that genuinely benefit their learning, relationships and well-being. However, governance, platform accountability and data protection must address the structural exposures that education alone cannot remove.
- The health sector should co-own DCE: embedding health outcomes, health expertise and health financing into DCE would convert a fragmented educational field into a coherent public health strategy.



Introduction

Digital environments are a defining feature of young people's lives. Globally, young people aged 15 to 24 are the most connected age group, although access to reliable and affordable connectivity remains unevenly distributed (International Telecommunication Union, 2025). In many settings, childhood and adolescence are now lived partly online, with learning, friendship, play, identity formation and health information-seeking increasingly mediated through digital platforms (Hollis et al., 2020). The benefits are substantial and well described (Best et al., 2014). So are the harms: meta-analytic estimates suggest that roughly one in five young people encounter unwanted sexual content online and around one in nine experience online solicitation (Madigan et al., 2018), while data on cyberbullying victimization span wide ranges across settings and instruments (Brochado et al., 2017). Exposure to sophisticated digital marketing of tobacco, e-cigarettes, alcohol and appearance-enhancing products; algorithmically

amplified misinformation; and compulsive use being associated with depression, anxiety, body dissatisfaction and sleep disruption complete a picture of potential digital harms. Paediatric and public health bodies increasingly treat these issues as a population-level concern, rather than as a private/behavioural one (Agyapong-Opoku et al., 2025).

When harms are structural, that is to say when harms are produced by the interaction of commercial incentives, platform design and developmental vulnerability, responses that have been modelled on individual behaviour change will fail. The digital environment is now recognized as a determinant of health in its own right (Holly et al., 2025) and The Lancet and Financial Times Commission on Governing Health Futures 2030 called for digital transformations to be governed in ways that put young people's well-being at their centre (Kickbusch et al., 2021). The United Nations [UN] Committee on the

Rights of the Child's General Comment No. 25 (2021) extends children's rights, including the right to health, explicitly into the digital environment (UN OHCHR, 2021).

Against this background, public health approaches have a crucial role to play, with digital citizenship education (DCE) representing a key instrument for protecting from harms and improving digital well-being. The Council of Europe, whose competence framework underpins much international practice, defines digital citizenship as the competent and positive engagement with digital technologies and active, responsible participation in digital society. They define DCE as the empowerment of young people through education, with the competences this requires, spanning values, attitudes, skills and knowledge and critical understanding (Barrett, 2020). The remit of DCE encompasses a range of overlapping fields and terminologies, including media literacy, digital literacy, online safety education, social media literacy and digital well-being education, which can all be understood as part of the wider DCE family. These categories of concern were built largely within the education and technology sectors, oriented towards competence, safety and responsible use, with limited integration of public health principles, equity considerations or evidence-based prevention models. DTH-Lab's concept of digital citizenship for health makes clear what is missing: effective digital citizenship sits at the intersection of digital, health and civic literacy, three skill sets that cannot be expressed fully without one another in a digital age (Eldeeb et al., 2025). Health, therefore, is not an optional extension of digital citizenship but one of its constitutive domains and its absence is a structural gap rather than

simply a lack of emphasis. A previous DTH-Lab review of 28 European DCE initiatives confirmed the gap empirically: only 57 per cent included any health component and few connected digital participation to health outcomes at all (Thu, 2025). To complement this further, this research examines the evidence for DCE as being an important component of public health responses to the digital determinants of young people's health, paying particular attention to children and young people under 25 and to low- and middle-income countries (LMICs), where the majority of the world's young people live.

These distinctions are not merely semantic; the boundaries between DCE and related fields in the digital landscape matter for a public health framing in three ways. First, the label predicts the outcome logic. Approaches to media literacy inherit explicit behavioural theories, such as message interpretation and inoculation and target named health behaviours, whereas digital citizenship works with civic and safety competence models in which health appears, if at all, as one strand among many (Austin & Johnson, 1997; Jones & Mitchell, 2016). Second, the label predicts measurability: media literacy studies typically measure validated proximal scales and sometimes behaviour, while broader digital citizenship programmes often measure knowledge and engagement only, leaving their health value unquantified. Third, fragmentation itself is a public health problem: it prevents the accumulation of comparable evidence, obscures common mechanisms and hides the field from health funders who search for health-labelled interventions.

Four research questions structure this research. First, how is DCE defined and distinguished from related concepts and why do these boundaries matter for a public health framing (RQ1)?

Second, what evidence, theoretical rationale and conceptual frameworks support positioning DCE as a public health intervention and through what mechanisms does it operate (RQ2)?
Third, to what extent does DCE reduce digital harms and empower young people to use digital media for their well-being and under what conditions (RQ3)?
Fourth, what are the critical gaps in the evidence base and the priorities for future research and investment (RQ4)?

Methods

A scoping narrative review was conducted: a scoping review architecture for systematic identification and mapping of evidence, combined with narrative synthesis for integration, informed by established scoping methodology (Arksey & O'Malley, 2005) and by the PRISMA extension for scoping reviews (Tricco et al., 2018). Reporting of study flow follows PRISMA 2020 (Page et al., 2021).

Searches were conducted in April 2026 in PubMed, Scopus and Google Scholar using three concept blocks combining intervention terms (digital citizenship, media literacy, digital literacy, online safety, Internet literacy, digital well-being, digital competencies); population terms (children, adolescents, youth, young people, students); and outcome terms (well-being, mental health, harms, cyberbullying, health behaviours, empowerment, resilience, public health). Records from 2015 onward, in English, were eligible.

Studies were included if they focused on children and young people under 25

(or samples with an under-25 majority), addressed a DCE-family educational concept and reported health or well-being relevant outcomes, including mental and physical health, digital harm reduction, health behaviours shaped by digital media and social well-being. Interventional studies and framework or conceptual papers were eligible; observational studies, reviews, editorials and protocols were excluded, as were programmes providing only technology access with no educational component and studies measuring only academic or vocational outcomes. No geographic restrictions were applied and LMIC studies were flagged for prioritized analysis.

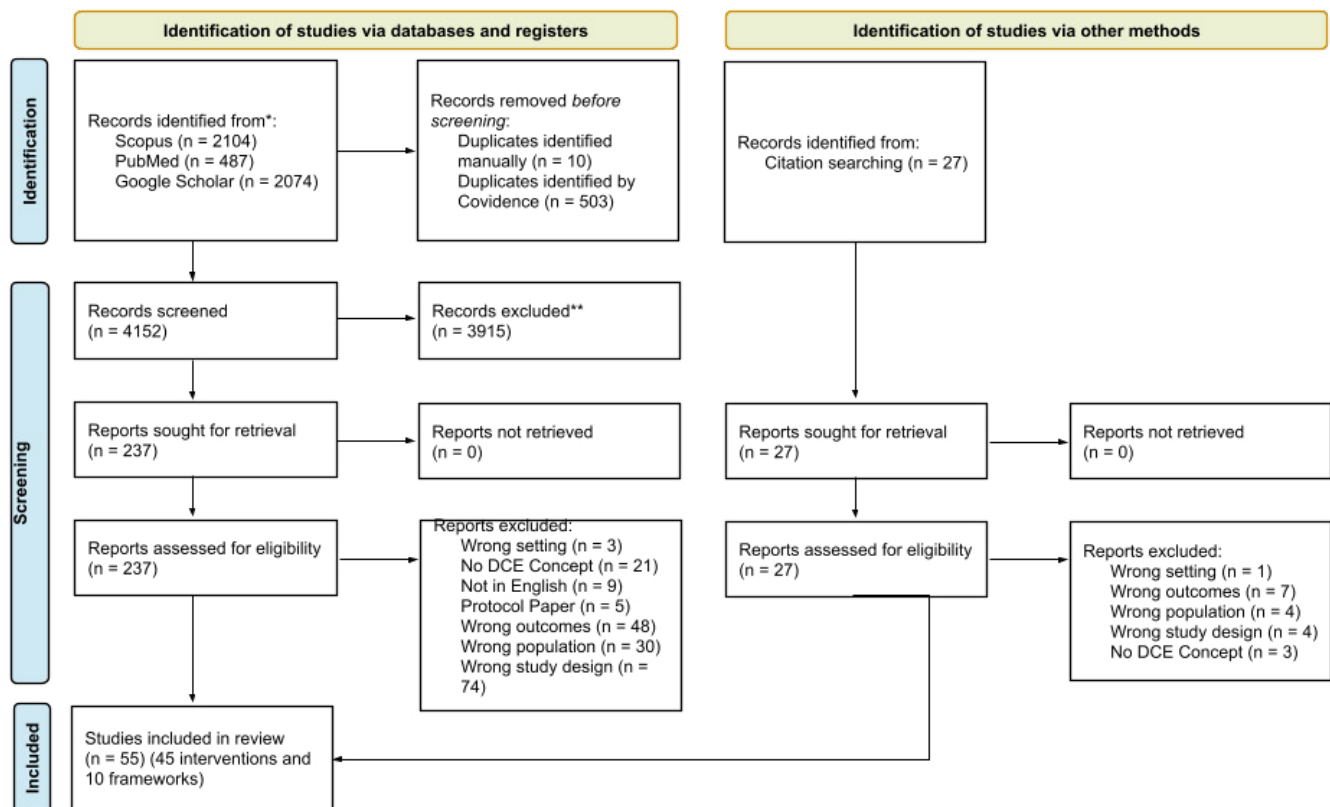
Screening was conducted in Covidence by a single reviewer. Of 4,665 records identified (Scopus 2,104; Google Scholar 2,074; PubMed 487), 513 duplicates were removed and 4,152 records screened; 237 reports were assessed in full text and 190 excluded, most commonly for wrong study design ($n = 74$), wrong outcomes ($n = 48$) and wrong population ($n = 30$), yielding 47 included studies (37

interventions, 10 frameworks). Citation searching of the reference lists of included intervention reports identified 27 additional reports, of which eight interventions met criteria, giving a final corpus of 55 studies: 45 interventions and 10 frameworks (Figure 1).

To address the limitations of single-reviewer screening, an intra-rater reliability check was performed: a random subset of approximately 10 per cent of all screened records (n = 419) was independently re-screened after an interval, with decisions

compared programmatically against the original screening. Agreement was 97.4 per cent with Cohen's kappa of 0.95, conventionally interpreted as almost perfect. Data were extracted into a structured workbook covering identification, population and setting, intervention concept and components, design and outcomes and synthesis fields mapped to the four research questions. Findings were synthesized narratively by research question, with descriptive quantification of study characteristics.

Figure 1. PRISMA 2020 diagram of included studies



Results

Overview of the evidence base

The 45 intervention studies span 20 countries and eleven years of publication (from 2015 to 2026). Thirteen studies (28.9 per cent) used randomized designs (12 cluster-randomized controlled trials and one individually randomized trial), 17 (37.8 per cent) were quasi-experimental and the remainder were pre-post evaluations, pilots, mixed-methods and qualitative studies (Table 1) (Aloi et al., 2025; Bickham et al., 2018, 2021; Brandau et al., 2022; Buehler et al., 2026; Dai et al., 2025; Galli et al., 2021; Gordon et al., 2021; Gui et al., 2023; Henriksen-Bulmer et al., 2024; Jones et al., 2024; Liu et al., 2025; Lomonaco et al., 2023; Lucidi et al., 2017; McLean et al., 2017; Metheekul, 2024; Michaud et al., 2024; Nicolaidou & Venizelou, 2020; M.-J. Park & Lee, 2024; S. Park & Lee, 2026; Phelps-Tschang et al., 2016; Poompimol et al., 2024; Popovac & Fine, 2018; Risal et

al., 2024; Rivera et al., 2016; Rohr, 2023; Rothman et al., 2018, 2020; Roumelioti et al., 2025; Schreurs & Vandenbosch, 2026; Schultze-Krumbholz et al., 2018; T. Scull et al., 2021; T. M. Scull et al., 2017, 2022; T. M. Scull, Kupersmidt, Malik, & Keefe, 2018; T. M. Scull, Kupersmidt, Malik, & Morgan-Lopez, 2018; Shensa et al., 2016; Smeaton, 2023; Taibi et al., 2023; Tapingkae et al., 2020; Uludaşdemir & Küçük, 2024; Vlaanderen et al., 2020; Wang et al., 2023; Wen, 2025; Zagorscak et al., 2019). Schools were the dominant delivery platform: most programmes were curriculum-integrated or classroom-delivered in primary, secondary or tertiary settings, with a smaller group delivered in community, clinical and app-based formats. Cyberbullying and online aggression was the most common primary outcome domain (11 studies), followed by online safety and privacy, substance use prevention, sexual and reproductive health, mental health and body image and problematic use and

digital well-being. Eight studies (17.8 per cent) were conducted in LMICs: three in Thailand (Metheekul, 2024; Poompimol et al., 2024; Tapingkae et al., 2020), two in China (Liu et al., 2025; Wang et al., 2023) and one each in Indonesia (Risal et al., 2024), South Africa (Popovac & Fine, 2018) and Turkey (Uludaşdemir & Küçük, 2024).

Across the corpus, most studies found that DCE-family programmes improved the health and well-being outcomes they measured, though the pattern was typically mixed rather than uniform: 11 studies (24.4 per cent) reported beneficial

effects across all of their measured outcomes and 27 (60.0 per cent) reported beneficial effects on most, but not all, of the outcomes they assessed. Two studies reported null or largely null results (Gordon et al., 2021; Taibi et al., 2023) and two (a co-design study and a qualitative evaluation) did not report effect estimates (Aloi et al., 2025; Rohr, 2023). This pattern reflects a field in which proximal outcomes (literacy, attitudes, self-efficacy) respond reliably while distal behavioural and health outcomes respond selectively, a distinction developed under RQ3.

Table 1. Characteristics of the included intervention studies (n=45)

Characteristics	Studies (n = 45)
Study design, n (%)	
Cluster-randomized controlled trial	12 (26.7)
Randomized controlled trial	1 (2.2)
Quasi-experimental	17 (37.8)
Pre-post, single arm	9 (20.0)
Pilot Studies	3 (6.7)
Mixed methods	2 (4.4)
Qualitative	1 (2.2)
Country income group, n (%)	
High-income countries	37 (82.2)
Low- and middle-income countries	8 (17.8)
Region, n (%)	
North America	17 (37.8)
Europe and Central Asia	16 (35.6)
East Asia and Pacific	11 (24.4)
Sub-Saharan Africa	1 (2.2)
Delivery mode, n (%)	
In-person	20 (44.4)
Online	14 (31.1)
Blended	8 (17.8)
App-based	3 (6.7)
Primary health outcome domain, n (%)	
Cyberbullying and online aggression	11 (24.4)
Online safety and privacy	8 (17.8)
Substance use prevention	8 (17.8)
Sexual and reproductive health	6 (13.3)
Mental health and body image	5 (11.1)
Problematic use and digital well-being	5 (11.1)
Physical health and lifestyle	1 (2.2)
Other risk behaviours	1 (2.2)
Direction of effects on measured outcomes, n (%)	
Consistently favourable	11 (24.4)
Mixed, predominantly favourable	27 (60.0)
Mixed or unclear	3 (6.7)
Null or largely null	2 (4.4)
Not reported (design or qualitative)	2 (4.4)

Percentages may not sum to 100 due to rounding

Conceptual boundaries: one family, many names, uneven health content

The included studies confirm that DCE functions as an umbrella over a family of overlapping fields rather than as a single well-bounded intervention. Across the 45 studies, authors' own labels included media literacy and its specializations (social media literacy, smoking media literacy, vaping media literacy, pornography literacy) (Buehler et al., 2026; Dai et al., 2025; Galli et al., 2021; Gordon et al., 2021; Lucidi et al., 2017; Michaud et al., 2024; S. Park & Lee, 2026; Phelps-Tschang et al., 2016; Rivera et al., 2016; Rothman et al., 2018, 2020; Schreurs & Vandenbosch, 2026; Shensa et al., 2016), digital literacy (Metheekul, 2024; M.-J. Park & Lee, 2024; Risal et al., 2024), digital health literacy (Aloi et al., 2025), online safety (Jones et al., 2024; Popovac & Fine, 2018; Roumelioti et al., 2025), e-safety (Nicolaidou & Venizelou, 2020), cyber wellness (Wang et al., 2023), digital well-being (Gui et al., 2023; Metheekul, 2024) and digital citizenship itself (Bickham et al., 2021; Tapingkae et al., 2020; Vlaanderen et al., 2020; Wen, 2025). Only around a quarter of studies used digital citizenship or digital citizenship education as their primary term (Bickham et al., 2021; Brandau et al., 2022; Liu et al., 2025; Poompimol et al., 2024; Rohr, 2023; Tapingkae et al., 2020; Vlaanderen et al., 2020; Wang et al., 2023; Wen, 2025); terms within the family of media literacy was the most common, reflecting its decades-long history of addressing substance use and sexual health prevention (e.g.

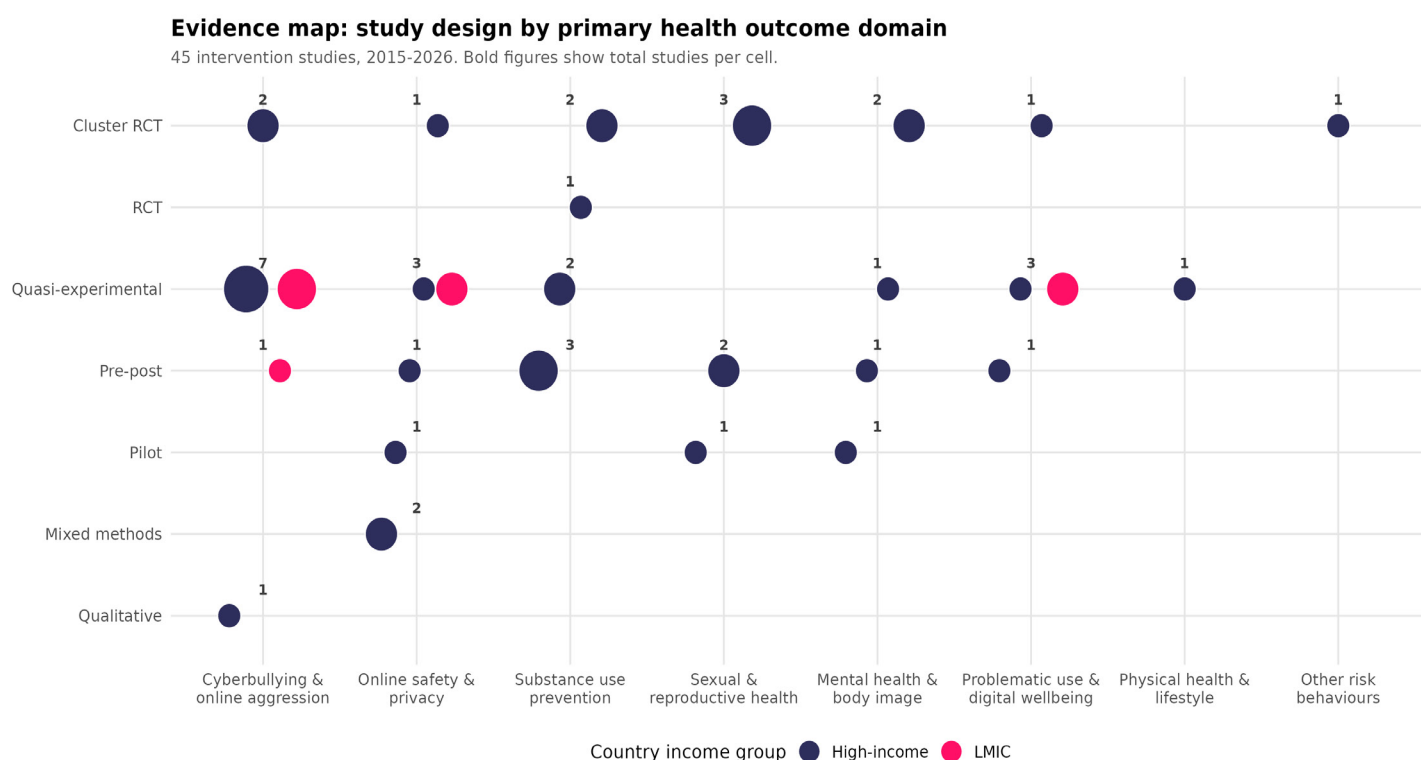
Phelps-Tschang et al., 2016; T. M. Scull et al., 2017; Shensa et al., 2016). Several programmes used multiple labels simultaneously and near-identical curricula appear under different names in different regions.

Among the frameworks, Polizzi & Harrison, 2022 and Harrison, 2022 represent the most ambitious attempt to unify work relating to flourishing an area which is explicitly well-being-centred, while Walsh et al., 2022 resolve the boundary problem pragmatically by defining online safety education as intentional behaviour-supporting education that goes beyond digital and media literacy. For public health purposes, our current research treats DCE as the umbrella term for the family of related fields, understanding the distinctions between them as design choices about mechanism and outcome, rather than as indicators of separate fields.

What the interventional evidence shows

Figure 2 maps the 45 studies by design and primary outcome domain. Two structural features stand out: randomized evidence concentrates on cyberbullying prevention and sexual and reproductive health and LMIC studies (in red) cluster in quasi-experimental designs concentrated on cyberbullying, online safety and digital well-being. Within this map, the evidence supports four substantive conclusions.

Figure 2. Evidence Map of the 45 intervention studies by study design and primary health outcome domain.



First, proximal protective capabilities respond reliably. Across virtually every programme that measured them there were improvements, often with moderate to large effects, in media and social media literacy, critical appraisal, safety knowledge and self-efficacy. Game-based formats performed particularly well on engagement and knowledge: a Thai formative-assessment game improved digital citizenship behaviours and reduced online harassment victimization (Tapingkae et al., 2020); a collaborative board game produced large knowledge gains for cyberbullying prevention (partial eta squared 0.28) alongside gains in empathy and defending intentions (Poompimol et al., 2024); and digital game-based approaches in China improved learning while reducing cognitive load (Liu et al., 2025).

Second, effects on health and behavioural outcomes are achievable but selective and strongest where programmes descend from established prevention lineages. For cyberbullying, randomized trials show reduced perpetration with downstream reductions in somatic symptoms such as headaches, stomach aches and sleep problems (Zagorscak et al., 2019), and improved bystander responses (Vlaanderen et al., 2020). In the quasi-experimental Medienhelden evaluation, a clear dose-response pattern was observed in which only the longer programme reduced perpetration, and improved empathy, self-esteem and subjective health (Schultze-Krumbholz et al., 2016). In sexual and reproductive health, the Media Aware family of cluster-randomized trials repeatedly improved sexual health knowledge, contraception self-efficacy

and intentions across school and college settings (T. M. Scull et al., 2019, 2022; T. M. Scull, Kupersmidt, Malik, & Keefe, 2018). In substance use, smoking media literacy improved consistently and, in a family-based online randomized trial, reduced childhood substance use itself (T. M. Scull et al., 2017), while recent programmes reduced vaping susceptibility (Dai et al., 2025; Michaud et al., 2024) and doping-relevant attitudes and supplement use (Lucidi et al., 2017). Physical health endpoints are rare but notable: a media reduction programme increased sleep by roughly 25 minutes per night and improved after-school activity (Bickham & Slaby, 2012).

Third, mental health and well-being outcomes are the newest and most instructive frontier. A body image social media literacy pilot improved body esteem and reduced disordered-eating risk factors among adolescent girls (McLean et al., 2017) and an app-based self-compassion and social media literacy programme improved body appreciation and appearance anxiety (Buehler et al., 2026). The Vibe Check cluster-randomized trial found transient negative effects immediately after the intervention that converted into positive effects on emotion regulation and well-being at the two-week follow-up, demonstrating a sleeper-effect pattern with direct implications for how and when programmes are evaluated (Schreurs & Vandenbosch, 2026). Contrary to these, a large Australian cluster trial of social media literacy found largely null effects on depressive symptoms and self-esteem (Gordon et al., 2021) and an Italian digital well-being trial improved perceived support and reduced some problematic behaviours without moving life satisfaction (Gui et al., 2023). The honest reading is that universal school programmes can shift well-being-adjacent outcomes, but effects

on distal mental health endpoints are small, conditional and easily missed by immediate post-tests.

Fourth, the conditions that mediate effectiveness are increasingly legible. Programmes that are grounded in behavioural theory, deliver sufficient doses over multiple sessions, use interactive and participatory methods, train their facilitators and measure beyond immediate post-test consistently outperform brief, didactic, one-off formats. Cautionary findings reinforce the point: paradoxical shifts in normative beliefs in a smoking media literacy trial (Shensa et al., 2016) and the transient discomfort observed in Vibe Check (Schreurs & Vandenbosch, 2026) show that even well-designed universal programmes can have unintended consequences, and that adverse or unintended effects, which most studies never measure, have a place in every evaluation. Promising practices that policymakers can already draw upon are summarized in Table 2.

Table 2. Promising practices: exemplar programmes with design features and approaches

Programme (study)	Design and setting	Approach	Why it is promising
Media Aware (T. M. Scull et al., 2019, 2022; T. M. Scull, Kupersmidt, Malik, & Keefe, 2018)	Cluster RCTs; US secondary schools and community colleges	Web-based media literacy education for sexual and reproductive health, adaptable across adolescent and young adult settings	Replicated favourable effects on knowledge, self-efficacy and intentions across multiple trials; scalable online delivery with low marginal cost
Medienhelden (Schultze-Krumbholz et al., 2016)	Quasi-experimental; German secondary schools	Curriculum-based cyberbullying prevention with short and long variants delivered by trained teachers	Dose-response pattern: the longer programme improved perpetration, empathy, perspective-taking, self-esteem and subjective health, informing minimum-dose decisions
Vibe Check (Schreurs & Vandenbosch, 2026)	Cluster RCT; Belgian secondary schools	Social media literacy targeting cognitive and affective processing, emotion regulation and digital flourishing	One of the first trials to measure well-being outcomes directly and to detect delayed (sleep) benefits alongside transient early discomfort, demonstrating the value of follow-up measurement
Take the Challenge (Bickham & Slaby, 2012)	Quasi-experimental; US middle schools	Media education promoting reduced and managed screen use with alternative activities	Moved distal physical health markers, including approximately 25 minutes more sleep per night and increased after-school activity
Game-based digital citizenship suite (Liu et al., 2025; Poompimol et al., 2024; Tapingkae et al., 2020)	Quasi-experimental and pre-post; Thailand and China	Formative-assessment and collaborative digital games teaching digital citizenship behaviours and cyberbullying prevention	LMIC-developed and culturally adapted; large knowledge gains (partial eta squared up to 0.28) and reduced harassment behaviours with highly engaging formats
Online safety with counselling integration (Risal et al., 2024; Uludaşdemir & Küçük, 2024)	Quasi-experimental; Indonesia and Turkey	Cyberbullying awareness education and e-module group interventions embedding digital ethics	Demonstrates feasible, low-cost formats delivered through existing school and university structures in middle-income settings

Gaps and priorities

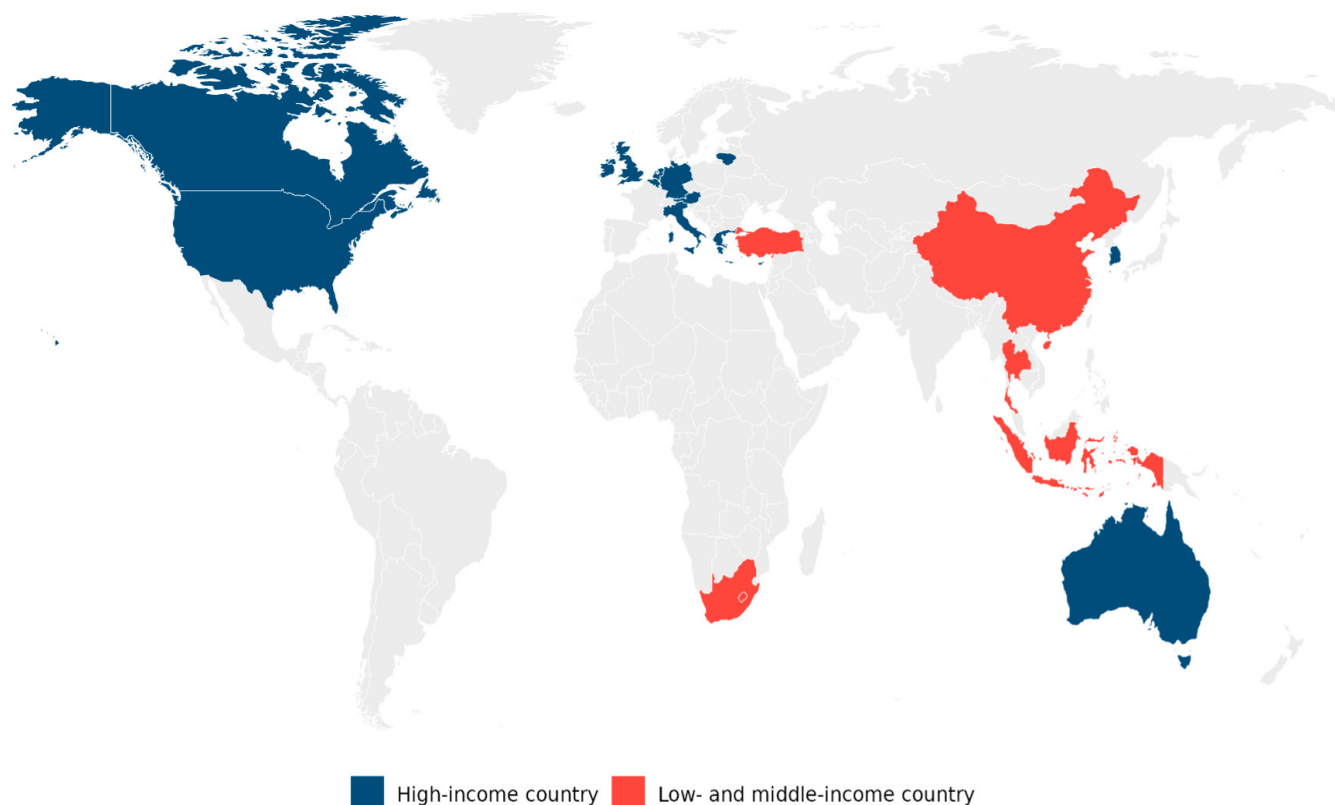
Five gaps define the research and investment agenda. The first and most consequential is geographic inequity. Only eight of 45 intervention studies (17.8 per cent) were conducted in LMICs, none in low-income countries and entire regions with the world's largest youth populations, including South Asia, Latin America, the Middle East and nearly all of Africa, are absent from the intervention evidence (Figure 3). This is not because the problems are absent: connectivity among young people in LMICs has expanded much faster than the protective ecosystems around it and the two LMIC-oriented frameworks in this review (Herkanaidu et al., 2021; Raza et al., 2023) exist precisely because imported programmes fail without cultural and infrastructural adaptation. The LMIC studies that do exist – in Thailand, China, Indonesia, South Africa and Turkey – demonstrate feasibility with low-cost, school-embedded and game-based formats, but they are middle-income settings with relatively strong school systems; the transferability frontier remains untested.

Second, the evidence architecture is thin beyond the post-test. Follow-up beyond three months is rare and the one trial with even a two-week delayed measurement changed its own conclusions by including it. Small samples, single-school studies and unreported implementation fidelity limit causal confidence outside the cyberbullying and sexual health clusters. Third, measurement is fragmented: proximal literacy scales proliferate without standardization, validated health outcomes are the exception, adverse effects are almost never assessed and no included study reported an economic evaluation of any kind. This leaves cost-effectiveness, the currency of public health investment

decisions, entirely unquantified. Fourth, equity is under-analysed within studies as well as between countries: few studies report effects by gender, socioeconomic status, disability or minoritized status, despite evidence that digital harms concentrate along exactly these gradients (Agyare & Null, 2025). Fifth, the field has not yet caught up with the environment it addresses: no included intervention targeted algorithmic curation, recommender systems or generative AI, even as new frameworks (Specht & Saunders, 2026; Stewart & Rodgers, 2025) map the competencies these environments demand.

The corresponding research priorities follow directly: co-designed, culturally adapted effectiveness trials in LMICs using the existing feasibility base as a platform; longer follow-up with pre-registered behavioural and health endpoints; a core outcome set spanning proximal capabilities, harms, empowerment and adverse effects; embedded economic evaluation; equity-stratified analysis as a default; and rapid-cycle evaluation of AI-era curricula.

Figure 3. Geographic distribution of the 45 included intervention studies



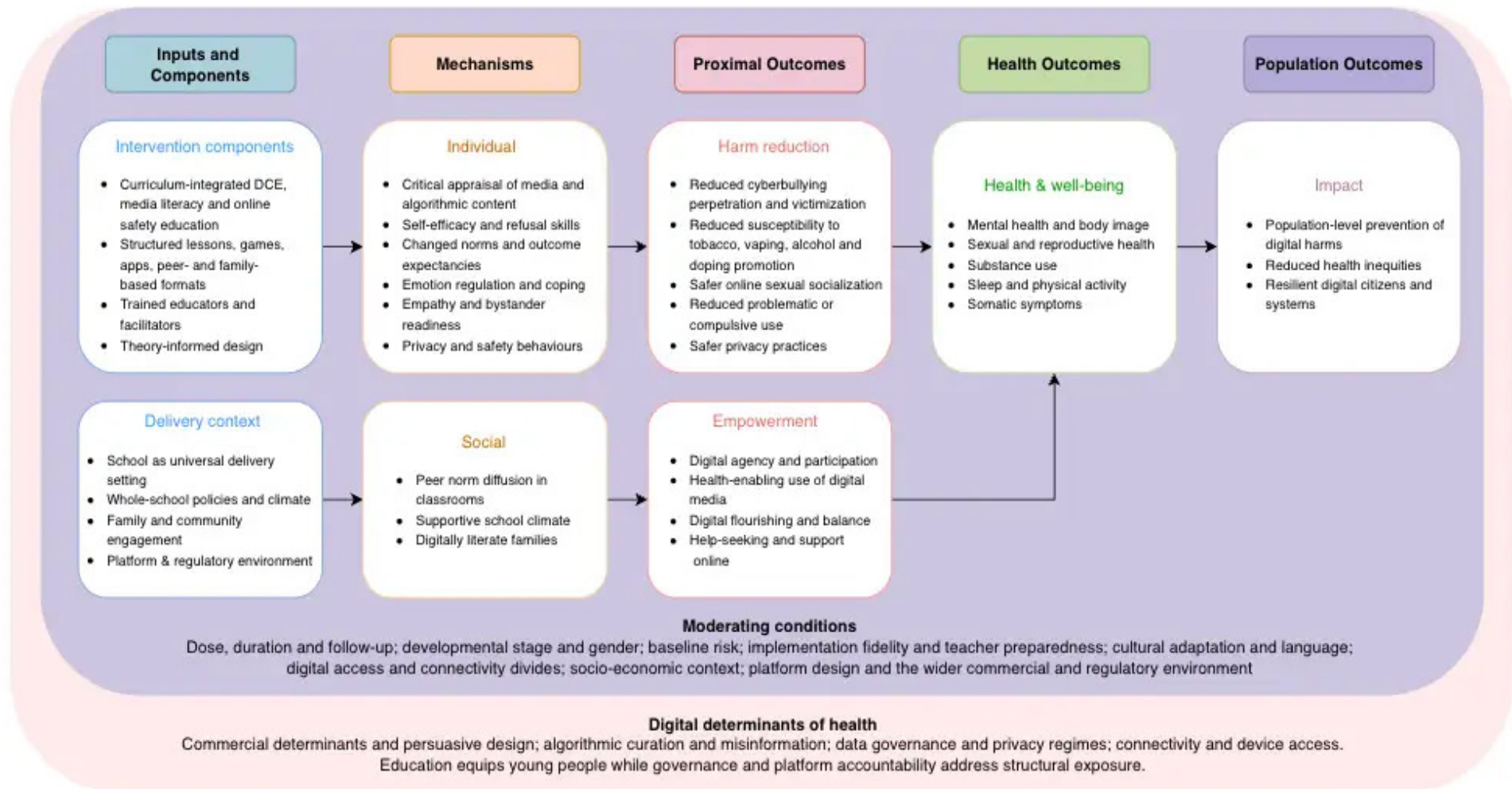
LMIC studies (red) were conducted in China (2), Thailand (3), Indonesia (1), South Africa (1) and Turkey (1) which are middle income countries; no included study was conducted in a low-income country.

DCE as a public health intervention?

Interventions that reach whole populations of young people through settings they already occupy are the classic instrument for such exposures and schools provide exactly this reach. Notably, several included interventions are direct descendants of established public health programmes: smoking media literacy grew out of tobacco prevention (S. Park & Lee, 2026; Phelps-Tschang et al., 2016; Shensa et al., 2016), media literacy for performance and appearance-enhancing substances out of doping prevention (Galli et al., 2021; Lucidi et al., 2017) and pornography literacy out of comprehensive sexual health education (Rothman et al., 2018, 2020).

DCE is, in this sense, not a new bet for public health but an extension of its most proven school-based prevention lineages into the digital exposure environment. Across the 45 interventions, a consistent causal architecture recurs, summarized in the logic model in Figure 4. Programme components (structured curricula, interactive lessons, games and apps, peer and family formats, trained facilitators) act through individual mechanisms with strong theoretical pedigrees: critical appraisal of media and marketing messages, self-efficacy and refusal skills, corrected norms and outcome expectancies, emotion regulation, empathy and bystander readiness and protective privacy behaviours. Social cognitive theory (Bandura, 2001), inoculation theory (McGuire, 1964) and the message interpretation process model (Austin & Johnson, 1997) were the

Figure 4. Logic model linking digital citizenship education to public health outcomes



most frequently invoked foundations and theory-informed programmes systematically outperformed atheoretical ones. These mechanisms produce proximal outcomes in two registers that mirror harm reduction (less cyberbullying, lower susceptibility to harmful marketing, safer sexual media interpretation, reduced compulsive use) and empowerment (digital agency, health-enabling use, digital flourishing and help-seeking). Proximal outcomes, in turn, shape measurable health endpoints, from somatic symptoms to sleep.

Walsh et al. (2022), synthesizes 199 evidence sources for Australia's national framework, grounding online safety education in the characteristics of effective school-based prevention: whole-school approaches, trained teachers, adequate dose, developmentally appropriate and engaging methods, avoidance of scare tactics and continuous evaluation, explicitly linked to the World Health Organization's (WHO) health-promoting schools model. Harrison (2022) and Polizzi & Harrison (2022) supply the positive teleology that harm-avoidance framings lack, defining cyber-flourishing as the goal and cultivating cyber-wisdom as the means. Makama et al. (2025) analyse legal, technological and educational responses to problematic social media use and conclude that literacy-based approaches are the most viable population strategy, proposing intrinsic social media literacy as a preventive design. Awad & Connors (2023) show how bystander microinterventions can be embedded within prevention programmes to protect minoritized youth. Two frameworks explicitly address LMIC contexts: Herkanaidu et al. (2021) require every topic and activity to pass through a cultural mask fitted to local realities, piloted in Thailand and Raza et al. (2023) contextualizes digital citizenship for

Pakistani schools. The emerging AI-era frameworks (Specht & Saunders, 2026; Stewart & Rodgers, 2025) extend the same critical-literacy logic to algorithmic and generative systems, though, as RQ4 shows, no included intervention has yet operationalized them (Table 3).

Taken together, the rationale is coherent: DCE addresses population-level exposures through school-deliverable universal prevention, operates through well-theorized behavioural mechanisms and is guided by frameworks that increasingly encode prevention science. What the rationale does not claim is sufficiency. As the logic model makes explicit, education equips young people while the surrounding digital determinants of health, commercial design, algorithmic curation and data governance remain matters for regulation and platform accountability (Holly et al., 2025; Kickbusch et al., 2021). DCE is one necessary layer of a comprehensive response, not a substitute for governance.

Table 3. Conceptual frameworks included in the review (n=10) and their treatment of health and well-being

Framework (source)	Origin and scope	Core orientation	Treatment of health and well-being
Best practice framework for online safety education (Walsh et al., 2022)	Australia; national, schools F-12	Five elements and 22 effective practices grounded in prevention science, whole-school approaches and rights-based education	Explicit: well-being promotion and harm prevention are the framework's declared purpose, linked to health-promoting schools
Cyber-flourishing educational model (Harrison, 2022)	UK; school-based, whole-school	Integrates deontology, utilitarianism and virtue ethics into cyber-rules, cyber-wisdom and cyber-flourishing	Explicit: flourishing (authentic well-being through moral online life) is the stated end goal
Cyber-wisdom framework (Polizzi & Harrison, 2022)	UK; conceptual and classroom practice	Neo-Aristotelian virtue ethics; four components spanning literacy, reasoning, self-reflection and motivation	Explicit: framed around human flourishing online amid risks such as abuse and misinformation
Intrinsic social media literacy (Makama et al., 2025)	Global; strategy-level	Compares legal, technological and educational responses to problematic social media use; enhances social media literacy through public relations mechanisms	Explicit: designed as a preventive strategy against problematic use and associated mental health harms
Young people online education framework (Herkanaidu et al., 2021)	Less developed countries; piloted in Thailand	Evidence-driven construct with a distinctive cultural mask element requiring cultural adaptation of all content	Implicit: harm-focused (cyberbullying as core theme) with well-being addressed through safety
Digital citizenship framework for schools in Pakistan (Raza et al., 2023)	Pakistan; secondary schools	Contextualizes Ribble's digital citizenship elements into four themes for cyber civility and digital safety	Implicit: cites health, wellness and psychological risks as rationale; competencies remain safety-oriented
Cyber life framework (Lambert, 2022)	United States; school systems	Three touchpoints: information literacy, technology skills, cybersecurity and cyber safety	Minimal: oriented to responsibility and security cultures rather than health outcomes
Critical AI media literacy framework (Stewart & Rodgers, 2025)	United States; education, AI era	Critical media studies lens on layered bias in AI; guiding questions for empowered engagement	Minimal to implicit: empowerment focus; health consequences of algorithmic systems not operationalized
FUTURES framework (Specht & Saunders, 2026)	UK; higher education, generative AI	Seven human capability domains for an AI-rich world, including resilience and well-being	Implicit: well-being named as a capability domain alongside digital fluency and ethical judgement
Social media microintervention framework (Awad & Connors, 2023)	United States; youth bystanders	Adapts microintervention strategies for responding to microaggressions and cyberbullying on social media	Explicit: motivated by mental health harms to minoritized youth; positions strategies for prevention programmes

Discussion

This review set out to examine what the evidence shows when DCE is treated as a public health intervention rather than simply an educational one. Three findings stand out. First, DCE-family programmes reliably improve the proximal capabilities that protect health, including critical appraisal of media and marketing, refusal self-efficacy, safety and privacy behaviours and bystander readiness, with 13 randomized trials among the supporting evidence. Second, effects on downstream health outcomes are smaller and more heterogeneous but demonstrably achievable across cyberbullying, substance-use susceptibility, sexual health, body image and sleep. Third, effectiveness is conditional: theory-informed design, adequate dose, interactive delivery and follow-up measurement distinguish programmes that shift health-relevant behaviour from those that only shift knowledge. The evidence base, however, is geographically inequitable and silent on the algorithmic environments young people now inhabit.

These findings position DCE as a credible public health instrument. Public health has long acted on population exposures before the evidence is complete, intervening where mechanisms are coherent, proof of concept exists and risks are manageable, while continuing to build evidence through implementation (Goldstein, 2001; Hill, 1965). DCE meets that standard. The exposures are universal and consequential; the mechanisms are well theorized and empirically supported; randomized proof of concept exists in multiple outcome domains; delivery infrastructure (schools) already exists at population scale; and the marginal risks, transient discomfort and paradoxical norm shifts in a minority of studies are detectable and preventable through design. The alternative to investment is not neutrality: it is the continuation of a fragmented, education-sector-only field whose health potential remains unrealized, alongside digital environments whose commercial logic will not restrain itself.

This evidence connects directly to the digital determinants of health agenda and to the Governing Health Futures 2030 vision of digitally enabled health systems co-created with young people (Kickbusch et al., 2021). DCE is part of the capability-building layer of that vision: it is how young people can become the informed, empowered digital citizens that value-based digital transformation presumes. But the review's findings caution against two failure modes. The first is health-blind DCE, in which citizenship education proliferates without adequate consideration of health outcomes, health expertise or health measurement, the pattern already documented in Europe (Thu, 2025) and now visible globally. The second is education-alone public health, in which literacy programmes are asked to compensate for exposures that only regulation, platform accountability and data governance can reduce. The logic model developed here is explicit that moderating conditions and digital determinants surround every pathway; recommendations must therefore pair educational investment with governance.

Development partners and national governments should fund DCE as a line item within adolescent health and school health programmes, not solely within education technology budgets. Priority should go to LMIC adaptation and effectiveness trials that build on the existing Thai, Indonesian, South African, Turkish and Chinese feasibility base; to programmes meeting minimum evidence-informed design standards (theory-specified, multi-session, interactive, facilitator-trained, follow-up-measured); and to embedded economic evaluation so that within five years the field can state a cost per case of harm averted. Ministries of health and education should co-own DCE through joint governance, mirroring the health-promoting schools architecture: health

sectors contribute technical support on content, outcome frameworks, surveillance linkages and clinical referral pathways, while education sectors contribute curricula, teacher development and delivery. Health and well-being competencies should be mandatory strands of national digital citizenship curricula and DCE indicators should enter school health monitoring. The World Health Organization (WHO), the United Nations Children's Fund (UNICEF) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) should align their respective digital literacy, child online protection and health promotion instruments into a single coherent standard, with an explicit LMIC adaptation protocol of the kind the cultural-mask approach demonstrates.

DCE investment must be paired with action on the digital determinants themselves: age-appropriate design codes; restrictions on marketing of harmful commodities to minors; algorithmic transparency sufficient for independent health research; and data protection that treats children's data as a protected class, consistent with General Comment No. 25 (UN OHCHR, 2021). Platforms should co-finance independent evaluation of educational countermeasures to harms that their design contributes to, without controlling the research agenda. Young people themselves should hold structured roles in the design and governance of DCE programmes, putting into practice the participation rhetoric of digital citizenship.

Funders should commission a core outcome set and ensure that adverse-effect measurement and equity stratification are conditions of funding, while researchers embed these into trial design; both should prioritize an adequately powered, multi-country

LMIC cluster-randomized trial with 12-month follow-up; and both should invest in rapid evaluation capacity for AI-era digital citizenship curricula so that education keeps pace with the environments it prepares young people for.

Digital environments will shape the health of this generation of young people (Holly et al., 2025; Kickbusch et al., 2021). The evidence assembled here shows that DCE – understood broadly as the family of media literacy, online safety and digital well-being traditions – is a viable, school-deliverable, mechanism-grounded public health instrument. DCE has a reliably positive effect on the capabilities that protect health. When well-designed, it can demonstrably shift

health outcomes and is inexpensive relative to the harms it addresses. It also shows a field that public health has not yet claimed: fragmented in concept, concentrated in high-income countries, unmeasured in cost and silent on the algorithmic systems now mediating young people's lives. Eliminating that shortfall, by investing, integrating, governing and researching as recommended here, would convert DCE from an educational aspiration into what the evidence suggests it can be: a fundamental component of the public health response to the digital determinants of young people's health and well-being.

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About DTH-Lab

DTH-Lab is a global consortium of partners working to drive implementation of The Lancet and Financial Times Commission on Governing Health Futures 2030's recommendations for value-based digital transformations for health co-created with young people. DTH-Lab operates through a distributive governance model, led by three core partners: Ashoka University (India), DTH-Lab (hosted by the University of Geneva, Switzerland) and PharmAccess (Nigeria).

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