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Digital wellbeing: impact on learners and educators

D2.1 Literature review and desk research report

Kadri Mettis, Janika Leoste, Sirly Väät

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Authors

Kadri Mettis

Janika Leoste

Sirly Väät

Contributors

Airina Volungevičienė
Eirini Symeonidou
Jasmina Poličnik
Josep M. Duart
Kristina Adomaitienė
Ksenija Frelih

Layout

Tina Cajnkar,

Knowledge Innovation Centre

Partners

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Introduction

The rapid integration of smartphones and digital devices into adolescents' lives has brought with it a growing body of evidence highlighting the harmful effects of excessive screen use. Emerging research suggests that the age of first smartphone acquisition plays a critical role in shaping cognitive, academic, and emotional outcomes.

In conducting this literature review, a systematic search strategy was employed. The authors identified key research questions and then queried academic databases (e.g., ERIC, Scopus, Web of Science) for publications from the past decade related to digital wellbeing, digital competence, and student academic outcomes. Inclusion criteria focused on K-12 and higher education contexts to ensure relevance to schools. Over 100 peer-reviewed studies, reports, and policy documents were reviewed, providing a comprehensive evidence base. This approach aligns with best practices for scoping reviews, ensuring that the findings synthesise a broad range of perspectives (Hossain et al., 2023).

A recent study conducted among Italian high school students found that receiving a smartphone before age 11 was significantly associated with lower academic achievement, reduced digital skills, and diminished creative media use, particularly among females and students from less-educated households (Gerosa, Losi & Gui, 2024). Early access to smartphones was linked to weaker digital competence, challenging the notion that earlier exposure automatically fosters proficiency. In fact, the study found a plateau effect at age 12, after which delayed ownership no longer produced strong benefits in terms of learning, though problematic use indicators continued to rise linearly with age of acquisition. Previous literature has also already observed a negative relationship between early smartphone ownership and academic performance (Dempsey et al., 2019, 2020; Jaalouk & Boumosleh, 2018).

These cognitive and academic challenges are closely tied to increasing levels of digital stress, as excessive engagement with devices fosters distraction, emotional fatigue, and vulnerability to cyber-related harms. Data from Filipino college students revealed a positive correlation between high digital engagement and digital stress, underscoring how immersion in screen-based activities may impair wellbeing (Giray et al., 2024). This aligns with broader findings in the literature, including Carr's (2010) assertion that excessive digital consumption reduces cognitive capacity, and Choqque-Cabrera et al. (2021), who reported elevated stress among students who frequently used their own devices. Moreover, studies focusing on early adolescents (ages 11–14) further indicate that problematic social media use is linked not only to interpersonal conflict and cyber-victimisation but also to heightened social stress (Kim et al., 2022).

This evidence points out the psychological and developmental risks associated with early and excessive device use. Concurrently more pressure is also put on educational settings to reduce the use of digital tools in learning. While some scholars have begun advocating for age-based social media regulations, such as in the Indian context (Prakash, 2025), the broader challenge remains: how to balance digital access with protective strategies that safeguard young people's cognitive and emotional health. This necessitates not only parental and institutional regulation but also pedagogical interventions that build critical awareness around device use, helping adolescents cultivate healthier digital habits from a young age.

In recent years, educators and researchers worldwide have placed growing emphasis on holistic student development, going beyond test scores to include socio-emotional wellbeing and digital skills. Student wellbeing that encompasses mental health, resilience, and social-emotional status is now recognised as both an important educational outcome and a prerequisite for learning (Hossain et al, 2023). Digital technologies have become embedded in educational ecosystems, transforming how learners and educators interact, access information, and collaborate. Therefore, digital competence (or digital literacy) has emerged as an essential 21st-century skill set, given the ubiquity of technology in learning and daily life (Mejias-Acosta et a.l, 2024). This ubiquity has given rise to the concept of digital wellbeing – a holistic consideration of how digital engagement affects the physical, mental, social, and emotional health of individuals in educational settings.

Digital wellbeing generally refers to an optimal balance between the benefits and risks of using digital technologies in one's life. Within education, digital wellbeing encompasses how technology use impacts students' and teachers' overall health, happiness, and ability to thrive in learning environments. Multiple definitions exist. For instance, Beetham (2015) framed digital wellbeing as 'the balance between the potential risks and benefits of digital engagement' in an educational context, emphasising that educators play a role in helping students manage their digital practices for positive outcomes. Similarly, Van den Abeele (2020) described digital wellbeing as 'a subjective individual experience of optimal balance and health in the use of digital technologies.' These definitions highlight that digital wellbeing is not merely the absence of negatives like screen overuse, but the presence of a positive state where individuals feel that their use of devices and online services supports their personal health and goals.

In recent years, educators and policymakers worldwide have recognised that maximising the benefits of educational technology must go hand-in-hand with emphasising wellbeing. Educational systems are thus striving to cultivate learners who are not only academically proficient but also emotionally healthy and digitally capable. Achieving this goal requires

robust instruments and frameworks to measure these domains in real-world settings, so that schools can monitor progress and inform interventions.

This report provides an in-depth literature review of existing assessment instruments and frameworks used over the past 10–15 years to evaluate student wellbeing, digital competence, academic outcomes and digital wellbeing in education, drawing on over a decade of global research (2010 onwards) from peer-reviewed journals, books, policy papers, and industry reports. Key themes include conceptual definitions and frameworks of wellbeing, digital competence, academic outcomes. Specific focus is set on digital wellbeing and factors influencing it, the role of digital competencies and learning environments, policy analyses, and evidence-based recommendations for nurturing positive digital experiences in education. The goal is to synthesise current knowledge, highlight best practices, and identify gaps where further research or policy intervention is needed to ensure that technology enhances rather than hinders the wellbeing of learners and educators.

The Positive and Negative Effects of Digital Tools in Education

The integration of digital tools into educational systems has transformed how teaching and learning take place across the globe. From online learning platforms and mobile applications to virtual classrooms and collaborative software, digital technologies are now woven into everyday educational practices. This transformation, accelerated by the COVID-19 pandemic, has enabled new modes of engagement, increased access to resources, and reshaped traditional roles of educators and learners alike.

Positive Effects of Digital Tools in Education

1. Enhanced Engagement and Motivation

Digital tools have consistently demonstrated the potential to foster student engagement through interactivity, personalised feedback, and visual learning experiences. Educational environments that implement digital storytelling and peer assessment have shown particular promise in enhancing learner reflection and motivation. For instance, a study in Indonesia integrating digital storytelling and peer review strategies among Library and Information Science students found a notable increase in student engagement and reflective learning (Prabowo et al., 2025). Similarly, law students across the UK, Ireland, and Greece expressed

increased confidence and engagement when participating in digitally simulated legal learning environments (Martzoukou et al., 2022).

2. Improved Digital Competence and Learner Autonomy

Beyond surface-level engagement, digital tools can help students cultivate essential 21st-century skills such as digital literacy, critical thinking, and self-directed learning. Metheekul's (2024) quasi-experimental study in Thailand demonstrated that well-designed digital well-being programs can significantly improve both digital competence and psychological well-being among adolescents. Likewise, research by Wang et al. (2021) across Chinese and Singaporean universities found that Digitally Enhanced Learning (DEL) platforms promoted greater learner autonomy and confidence in using digital technologies.

3. Increased Accessibility and Flexibility

One of the most widely cited benefits of digital tools is the flexibility they offer in terms of time, place, and pace of learning. Hybrid and asynchronous digital learning environments enable institutions to maintain continuity during disruptions. For example, the HyFlex+Tec model deployed during the COVID-19 pandemic in Mexico allowed students to toggle between in-person and virtual learning, ensuring academic continuity (Abbas et al., 2023). In Ghana, digital platforms allowed students to continue their education remotely despite infrastructural constraints, although challenges remained (Essel et al., 2021).

In addition, digital technologies can support inclusive education by accommodating diverse learner needs. The use of assistive tools – such as screen readers, speech-to-text applications, and adaptive input devices – has been transformative in enabling students with disabilities to participate more fully in the learning process. Classrooms augmented with these technologies can better address the diverse needs of students, exemplifying how digital innovation improves accessibility (Antoninis et al., 2020). The OECD (2021) likewise emphasises that when technology is embedded within inclusive pedagogies, it can enhance personalisation, provide real-time feedback, and improve learning outcomes for all learners. In essence, thoughtfully designed digital interventions not only offer flexibility in time and place, but also help level the playing field for students who might otherwise be left behind.

4. Support for Creative and Ethical Thinking

In more progressive educational contexts, digital tools are catalysts for deeper ethical, creative, and socially conscious learning. In an Italian case study, students participating in a course on digital wellbeing designed technology-based interventions that were not only functional but also grounded in values such as inclusivity, mental health, and ethical design (Roffarello & De Russis, 2023).

Negative Effects of Digital Tools in Education

However, alongside these opportunities, digitalisation has introduced a range of complex challenges. Educators and students alike are increasingly grappling with issues such as technostress, digital fatigue, and inequalities in access and digital competence. While digital tools can enhance engagement, autonomy, and flexibility, they may also lead to cognitive overload, reduced well-being, and widening educational gaps when not implemented thoughtfully.

1. Technostress and Digital Fatigue

Despite their benefits, digital tools are also a major source of technostress (stress induced by frequent or complex interaction with digital technology). In India, Mehrolia et al. (2021) found that technostress creators significantly diminished student satisfaction and performance in technology-enabled learning environments. Similarly, UK educators reported heightened anxiety and reduced job satisfaction due to constant online expectations and inadequate support (Bourlakis et al., 2023).

2. Cognitive Overload and Distraction

An excessive use of digital input can lead to cognitive overload, reduced attention spans, and increased off-task behaviors. Li and Liu (2022) demonstrated that Chinese college students experiencing technostress were more likely to engage in "cyberslacking"—the use of digital devices for non-academic purposes during learning sessions. Additionally, Wang and Yu (2024) found that art students in China were less likely to continue using educational mobile apps when overwhelmed by technical features, which eroded their perceived usefulness and satisfaction.

Notably, these technostress factors such as techno-overload and techno-insecurity, are not unique to China. Similar categories of stressors have been observed among educators globally, aligning with the original technostress constructs identified in workplace settings (Tarafdar et al., 2007). This suggests that teachers in many countries experience comparable challenges with new digital tools, even if specific manifestations vary by context. In other words, the phenomenon of technostress transcends any single culture, underscoring a worldwide need for strategies to manage digital demands in education.

3. Equity and Accessibility Gaps

Digital tools do not automatically translate to equitable outcomes. In contexts with poor infrastructure, limited digital skills, or socio-economic constraints, technology may increase existing inequalities. Ndibalema (2025) highlighted significant digital literacy gaps and policy

shortcomings in Sub-Saharan Africa that hindered the promotion of 21st-century skills. Similarly, in Venezuela, professors operating in underfunded institutions reported high levels of digital stress and a lack of institutional support for digital transformation (Antón-Sancho et al., 2022).

European data echo these concerns. A recent WHO survey of over 200,000 adolescents across Europe found that the prevalence of problematic social media use rose from 7% in 2018 to 11% in 2022 (WHO Regional Office for Europe, 2024). Alongside this increase, approximately 12% of teens were identified as at risk of digital gaming addiction (WHO, 2024). These trends highlight growing mental health challenges linked to digital technology among European youth, reinforcing the urgency of addressing digital wellbeing in schools.

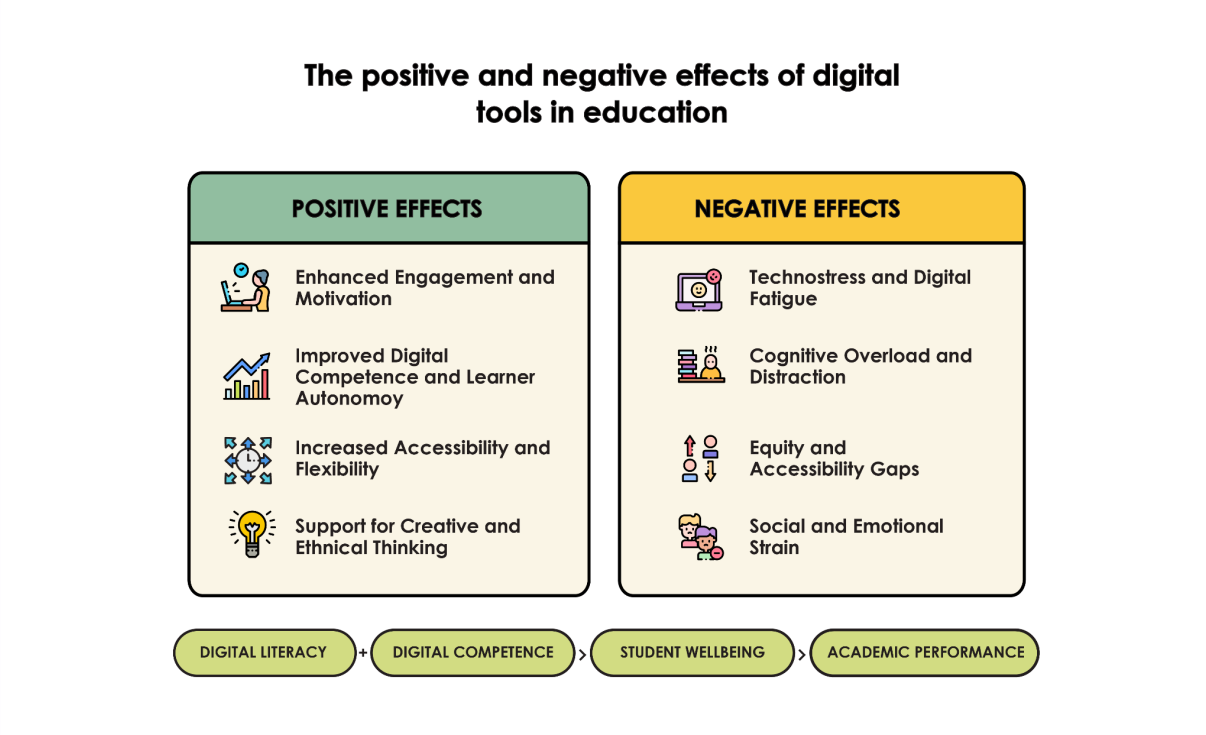
4. Social and Emotional Strain

Constant connectivity can also impose emotional and social burdens. Adolescents in Belgium reported experiencing social pressure and emotional fatigue due to expectations of constant digital availability, which disrupted their peer relationships and personal boundaries (De Groote & Van Ouytsel, 2022). Romanian educators, as examined by Stan (2022), exhibited signs of burnout when digital demands were paired with weak coping mechanisms and insufficient institutional support.

As seen from different studies, the use of digital tools can have both positive and negative impact on students' learning and wellbeing (Figure 1). The main factors influencing students and teachers wellbeing (including digital wellbeing) are digital literacy, digital competence. In the next section we give an overview of interplay between students wellbeing, digital competence and academic performance.

Figure 1.

The Positive and Negative Effects of Digital Tools in Education



Conceptual Understanding of Digital wellbeing

Defining Digital wellbeing in Education

Digital wellbeing generally refers to the optimal balance between the benefits and risks of using digital technologies in one's life. Within education, digital wellbeing encompasses how technology use impacts students' and teachers' overall health, happiness, and ability to thrive in learning environments. Multiple definitions exist. Beetham (2015) framed digital wellbeing as "the balance between the potential risks and benefits of digital engagement" in an educational context. This emphasises that teachers have a role in helping students manage digital practices for positive outcomes. More recently, Van den Abeele (2020) described digital wellbeing as "a subjective individual experience of optimal balance and health in the use of digital technologies". In other words, digital wellbeing is not merely about limiting negatives like screen overuse, but about individuals feeling that their use of devices and online services supports their personal health and goals.

Importantly, digital wellbeing is multidimensional. Johnston (2021) suggests it involves integrating technology in ways that enhance young people's learning and development,

rather than detract from it. Yue et al. (2021) proposed a three-dimensional view: (1) maintaining a healthy relationship with technology through balanced and civil use, (2) understanding the positive and negative impacts of digital activities, and (3) knowing how to manage and control factors that influence one's digital wellbeing. Gomes, Mathew, Nair, Mulasi & Yadav (2023) designed a digital wellbeing scale that noted three aspects of digital wellbeing: (1) digital mental wellbeing, (2) digital emotional wellbeing, and (3) digital physical wellbeing. Despite these emerging definitions, there is still no universal consensus on a single definition of digital wellbeing. Researchers note that the concept is context-dependent and subjective, varying by age group and individual needs. Nonetheless, a common thread is the idea of balance – achieving the benefits of connectivity, information, and creativity that technology affords, while avoiding harm to one's physical health, mental state, or relationships.

Digital wellbeing and Technostress

Digital wellbeing and technostress are two sides of the same coin. They are closely interrelated concepts that describe the psychological and behavioral outcomes of digital technology use in education and daily life. While digital wellbeing emphasises positive, balanced, and mindful use of technology, technostress focuses on the adverse psychological impact when users feel overwhelmed, inadequate, or exhausted by digital tools.

Technostress was originally conceptualised as the inability to cope with information and communication technologies (Ayyagari et al., 2011), it encompasses a range of psychological, emotional, and physiological responses triggered by digital tool use (Tarafdar et al., 2007). As digital platforms become ubiquitous in education, understanding the causes and consequences of technostress is essential for ensuring positive educational outcomes and well-being among learners and educators alike.

Digital wellbeing often functions as a protective factor against technostress. Individuals with higher levels of digital wellbeing tend to report lower anxiety, better self-regulation, and more positive emotional outcomes when using digital tools. Roffarello & De Russis (2023) demonstrated that a university course designed to promote digital wellbeing led to reduced smartphone addiction, increased self-efficacy, and more thoughtful technology use among students. By fostering critical thinking and reflective practice, the course indirectly mitigated technostress. Metheekul (2024) found that adolescents who participated in a digital wellbeing training program in Thailand showed significant improvements in digital literacy and psychological wellbeing, supporting the idea that digital wellbeing education can proactively reduce stress caused by digital engagement.

Technostress can be seen as a manifestation of poor digital wellbeing. That is, when individuals are unable to manage their relationship with technology effectively, they are more prone to stress, anxiety, and burnout. Wang et al. (2021) found that students with low digital competence experienced more technostress and academic burnout, a clear indicator that deficiencies in digital wellbeing (like poor tech self-management or awareness) lead to negative educational outcomes. Giray et al. (2024) observed a positive correlation between digital device engagement and digital stress in Filipino college students, suggesting that without a balanced digital lifestyle, increased use translates into emotional and cognitive overload.

Both digital wellbeing and technostress are influenced by digital competence—the ability to use technology effectively, ethically, and safely. Nagy & Dringó-Horváth (2024) noted that higher pedagogical digital competence was associated with reduced technostress and more confident ICT use among educators. Conversely, Shirish et al. (2021) warned that students lacking digital competence were not only more likely to experience technostress but also showed lower productivity and creativity in digital learning environments—key components of digital wellbeing.

Effective support should treat digital wellbeing and technostress not as separate issues, but as mutually reinforcing phenomena. Programs that address only technical skills may fall short unless they also foster psychological resilience, ethical tech use, and self-regulation. As seen in Feng & Liu (2024), students with strong digital literacy also reported greater autonomy and control over their learning.

The Emergence of Technostress in Education

While technostress has been a subject of research in business and educational contexts for several decades, its relevance surged during the COVID-19 pandemic (Alvarez-Risco et al., 2021; Nimrod, 2020). The sudden shift to online, synchronous, and hybrid learning models forced educators and students to rapidly adapt to unfamiliar tools and platforms, often without adequate support.

Students have been particularly vulnerable to the impacts of technostress. The constant adaptation required by digital platforms in online and hybrid learning environments has led to increased cognitive load, anxiety, and diminished learning satisfaction (Abbas et al., 2023). For example, students lacking digital competence experience higher technostress, which is correlated with academic disengagement and burnout (Wang et al., 2021). LeRoy, Kaufmann, and Lane (2024) found that technostress was a significant predictor of cognitive learning outcomes when students were required to use webcams, further linking digital stressors to academic performance.

Excessive screen use, especially at a young age, has also been shown to contribute to technostress and related issues. Early smartphone ownership is negatively associated with academic achievement, digital skills, and well-being, as shown in research conducted among Italian adolescents (Gerosa, Losi & Gui, 2024). Similarly, digital engagement among college students in the Philippines was found to correlate with heightened digital stress, aligning with findings that emphasise the emotional toll of constant connectivity and digital demands (Giray et al., 2024).

Educators are not immune to technostress. Studies among Venezuelan and Ghanaian faculty have shown that digital stress increases when institutional support is lacking or digital competence is low (Antón-Sancho et al., 2022; Essel et al., 2021). Gender and disciplinary differences were also observed, with female faculty in certain fields experiencing significantly more digital stress.

Quantitative studies in China have identified five key technostress factors among teachers: techno-overload, techno-complexity, techno-insecurity, techno-uncertainty, and new technology adoption (Li, Lim & Ang, 2024). The stress arising from adopting new digital tools—particularly during modality shifts—was found to significantly mediate the relationship between hybrid learning environments and student outcomes (Abbas et al., 2023).

Digital competence frequently emerges as both a buffer against and a determinant of technostress. Studies show that individuals with higher digital literacy and pedagogical digital competence experience less technostress and demonstrate more effective ICT use (Nagy & Dringó-Horváth, 2024). In learners, digital literacy promotes autonomy and reduces dependence on structured support, thereby enhancing resilience in digital learning environments (Feng & Liu, 2024).

Additionally, Wang, Zhao, and Zeng (2024) highlighted that while facilitating conditions can enhance digital informal learning, technostress moderates this relationship negatively. Thus, the presence of support structures alone is insufficient without addressing stressors associated with digital tool use.

Technostress is not only an individual burden but also a systemic issue. Addressing it requires educational institutions to rethink how digital tools are introduced, supported, and regulated. Educational interventions that build digital literacy and psychological resilience are crucial. For instance, Metheekul (2024) demonstrated that targeted digital well-being programs can significantly improve both digital competence and psychological health in adolescents.

Moreover, courses that combine technical and ethical dimensions of digital wellbeing, such as "Benessere Digitale" in Italy, empower students to become mindful users and designers of technology. Roffarello & De Russis (2023) found that students not only improved their digital

self-efficacy and reduced perceptions of smartphone addiction, but also developed innovative solutions for promoting digital well-being.

Technostress is a pressing challenge in today's digital education landscape. From students to educators, its impact can undermine learning, teaching, and overall well-being. However, through a combination of digital competence development, institutional support, and ethically grounded digital literacy programs, educational systems can better manage the risks of technostress while maximising the benefits of technology integration. Future research and practice should continue to explore multi-level interventions that support both personal resilience and systemic change in the face of rapid digital transformation.

Theoretical Models and Frameworks

Several theoretical frameworks have been developed to better understand digital wellbeing in educational contexts. One influential approach is to view digital wellbeing through the lens of digital literacy and citizenship frameworks. For example, the European Digital Competence Framework (DigComp) explicitly includes "protecting health and wellbeing" as a core digital competence under its safety domain (Vuorikari, Kluzer & Punie, 2022). Within the competence area of "safety," the specific competence is "protecting health and wellbeing" in digital contexts. This involves preventing health-related risks and safeguarding physical and mental health when interacting with digital devices, protecting oneself and others from threats like cyberbullying in digital spaces, and identifying digital resources that enhance social wellbeing and promote inclusiveness (Vuorikari, Kluzer & Punie, 2022). This integration in DigComp signals that cultivating digital wellbeing is part of being a competent technology user, not an optional add-on.

According to the DigCompEdu framework teachers are expected to empower students to manage risks and use technology safely and responsibly as part of good pedagogical practice. The Digital Competence Framework for Educators (DigCompEdu) highlights that teachers should have skills to ensure learners' physical, psychological, and social wellbeing in digital environments (Redecker & Punie, 2017). These frameworks provide structured ways to think about digital wellbeing as a set of competencies that can be taught and learned.

Digital Capability Framework by Jisc (2019) conceptualises four dimensions of digital wellbeing for individuals: personal wellbeing, workplace wellbeing, social wellbeing, and societal wellbeing. In education, this implies that a learner's digital wellbeing is influenced by personal habits (e.g. how they manage their screen time), learning environment factors (how schools support or constrain healthy tech use), social factors (peer interactions, online communities), and broader societal factors (like digital inclusion or the design of apps). A similar multi-faceted view is offered by academic theorists. Van den Abeele (2020) describes

digital wellbeing as a dynamic construct – a "dynamic equilibrium" where individuals continuously negotiate the trade-offs between advantages and drawbacks of connectivity. Her work suggests digital wellbeing is not a static state but an ongoing process of self-regulation and adaptation to one's digital life. This dynamic view is echoed by Büchi (2024), who emphasises that digital media should not be seen simply as harmful, beneficial, or to blame. Instead, they shape human communication, which is essential to wellbeing, with impacts that are neither fixed nor negligible. The digital wellbeing framework by Büchi (2024) outlines three key points: (1) digital practices are influenced by social and technological contexts; (2) these practices often bring both harm and benefits; and (3) their overall effect on wellbeing depends on the balance of these outcomes. Ongoing conceptual work is needed to unify narrow empirical studies into broader understanding.

From a psychological perspective, frameworks often incorporate concepts like self-determination theory (seeking autonomy, competence, relatedness in digital use) or PERMA (Positive Emotion, Engagement, Relationships, Meaning, Achievement) to evaluate how technology use contributes to or detracts from wellbeing. For instance, a person might experience positive emotion and social connection from online learning communities (boosting wellbeing), but excessive engagement might undermine real-life relationships or sleep (harming wellbeing). Researchers have also linked digital wellbeing to resilience and digital citizenship – how individuals cope with online challenges (like misinformation or cyberbullying) and behave ethically online. The EU's (2022) Council Conclusions on wellbeing in digital education explicitly frame it as "a feeling of physical, cognitive, social and emotional contentment" that enables individuals to engage positively in digital learning, realise their potential, act safely, and feel empowered online (Council of the European Union, 2022). This comprehensive description underscores that digital wellbeing is about flourishing in digital contexts – being safe, satisfied, and capable – rather than merely the absence of problems.

It's worth noting that theoretical discussions increasingly highlight the impact of emerging technologies and ethics on digital wellbeing. As Burr & Floridi (2020) argue, new technologies (like ubiquitous AI and automation) may be "altering our conceptual understanding of wellbeing" itself. Their multidisciplinary work on the ethics of digital wellbeing suggests that the pervasive digitisation of life raises complex issues about what it means to live a "good life" with technology. For example, AI-driven personalisation might improve convenience but also reduce human agency, or constant connectivity might offer information yet erode privacy – challenging our values and quality of life (Burr & Floridi, 2020). In summary, a conceptual understanding of digital wellbeing in education draws from multiple frameworks, but converges on viewing it as a balanced, multifaceted state of health and contentment amid digital engagement, supported by specific competencies and ethical use of technology.

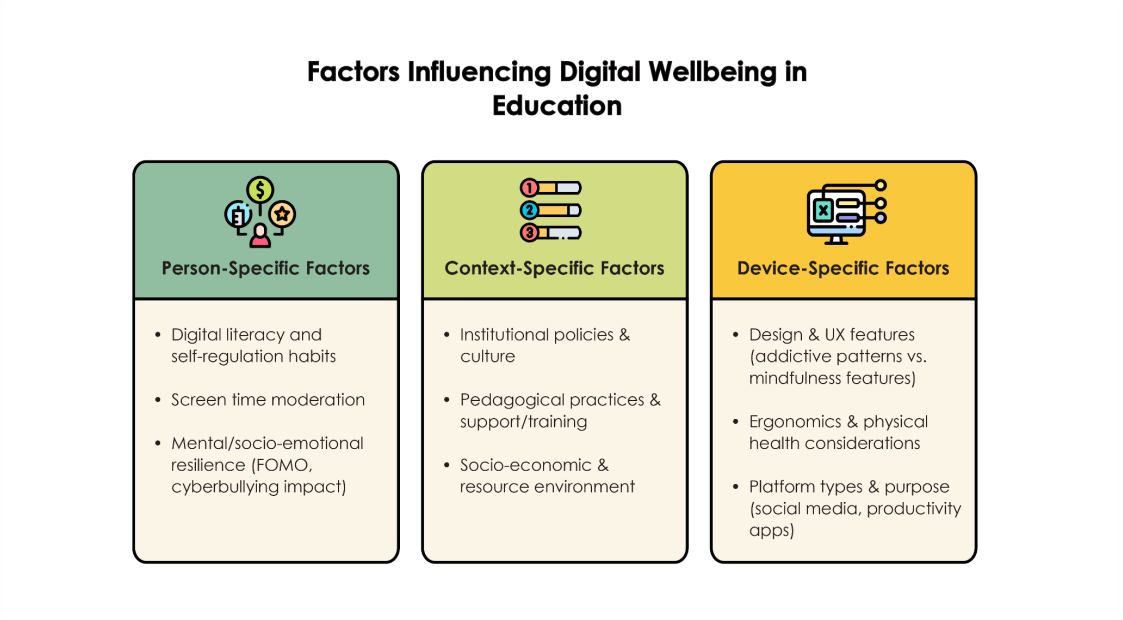
Factors Influencing Digital wellbeing

Digital wellbeing in education is shaped by a constellation of factors spanning individuals' personal attributes, the contexts in which learning takes place, and the nature of the devices and platforms being used. Emerging technologies such as artificial intelligence (AI) are also beginning to shape digital wellbeing in education. AI-driven learning platforms can personalise content and potentially reduce cognitive load, offering timely assistance to students. However, these systems introduce new concerns – for example, algorithmic bias or overly invasive monitoring – which might erode trust and increase stress if not carefully managed (ProFuturo Observatory, 2025). Thus, the design of AI in educational tools should balance innovation with ethical safeguards to support wellbeing.

We examine three categories of influencing factors suggested by Van den Abeele (2020): person-specific factors, context-specific factors, and device-specific factors. Each category sheds light on different levers that can enhance or undermine the wellbeing of students and educators in a digital world (Figure 2).

Figure 2.

Factors Influencing Digital Wellbeing in Education



Person-Specific Factors

Individual characteristics and behaviors play a pivotal role in digital wellbeing. One key factor is digital literacy – the skills and knowledge to use technology effectively and responsibly. Higher digital competencies can serve as a protective buffer, enabling users to navigate online risks and capitalise on opportunities in ways that support wellbeing. For instance, the ySKILLS project in Europe found that teens with stronger digital skills reported better social wellbeing and academic performance, suggesting a link between competence and positive outcomes. Digital literacy can foster resilience by empowering learners to critically evaluate online content, maintain privacy settings, and manage their digital footprints, thereby reducing stress and enhancing confidence (Coninck, Waechter, Haenens, 2023).

Students with low digital skills may feel overwhelmed or insecure online, heightening anxiety. Bridging digital skill gaps is therefore crucial for equitable wellbeing. Targeted interventions show that even vulnerable youth can improve their skills over time, which correlates with improved wellbeing indicators (Coninck, Waechter, Haenens, 2023).

Another person-specific factor is screen time habits and self-regulation. The amount of time spent on devices, and how that time is managed, has been extensively studied for its relationship to mental and physical health. Research on children and adolescents suggests a non-linear relationship – moderate use of digital media can be benign or even beneficial, but excessive use is often linked to adverse outcomes. For young children (preschool age), a recent large-scale study in the U.S. found that exceeding 2 hours of screen time per day was associated with significantly lower psychological wellbeing (poorer "flourishing") and more behavioral problems. Children with 3–4 hours of daily screen use had notably worse outcomes than those with around 1 hour. For example, a review noted that high social media use among teens correlates with elevated depression and suicidality rates (Burgess, 2025).

This aligns with pediatric guidelines cautioning that excessive screen exposure in early years can impede developmental wellbeing, contributing to issues like sleep disruption, attention difficulties, or delayed social skills. Among teenagers, heavy recreational screen use (particularly social media scrolling or gaming binges) has been associated with increased mental distress, anxiety, and even self-harm tendencies in some studies (Burgess, 2025). However, other research emphasises that context and content of screen time matter as much as quantity. A 12-week longitudinal study of university students using objective smartphone logs found that week-to-week variations in phone use did not predict mood or stress levels conclusively. Students who generally used their phones more did report slightly worse average moods, but this may reflect pre-existing wellbeing differences rather than screen time causing poor mood. The authors concluded that simply measuring time spent on

devices is a limited indicator; what young people do online and how it fits into their life context is pivotal. Thus, individual self-regulation skills – the ability to moderate one's device use, avoid endless scrolling, and disconnect when needed – are critical. Students who exercise control over their screen habits (setting time limits, turning off notifications while studying, etc.) often experience less tech-related stress and better focus.

Schneider and Dong (2024) share some recommendations on how to promote safe digital media use at schools:

1. Universal Strategies for All Students. Provide developmentally appropriate and consistent digital media education to all students, encourage positive peer interactions online and offline, and promote a sense of connectedness within the school. Consider smartphone policies, classroom educational efforts, school events (e.g., a phone-free day or week), and school climate initiatives that balance preventing negative consequences with promoting intentional, authentic, and responsible digital media use.

These schoolwide efforts should aim to teach students not only about concepts like digital media literacy and online privacy, but also skills such as self-management that they need to regulate their own digital media use inside and outside of the classroom. This is more than just using their smartphones less; it's about feeling empowered to control their digital environments (e.g., follow friends and accounts that make them feel good and unfollow those that make them upset or anxious or expose them to harmful content).

2. Targeted Interventions for Students Needing Additional Support. Small group behavioral interventions with specific components to strengthen skills related to digital wellness and minimise negative mental health effects of their digital media use. These may include incorporating online communication skills practice into an existing lunch bunch group or addressing the impact of being exposed to hate speech online and teaching help-seeking skills within an existing Gender and Sexuality Alliance student group. In this way, digital wellness can be incorporated into structures already in place to support students with elevated risk of unhealthy media use and mental health problems.

3. Intensive Individualised Interventions refer to one-on-one support strategies for students who are experiencing moderate to severe mental health challenges linked to their digital media use. This includes students who are in psychological distress due to involvement in cyberbullying, those showing signs of excessive digital engagement, and those who may be exhibiting symptoms of **Problematic Interactive Media Use (PIMU)**.

PIMU is a clinical term used to describe the excessive and compulsive use of interactive digital technologies such as video games, social media, streaming, or general internet use, that leads to significant impairment in a young person's emotional, social, academic, or

behavioral functioning. Common indicators include difficulty controlling usage, withdrawal symptoms when offline, and negative impacts on sleep, school performance, or relationships. Addressing PIMU typically involves targeted mental health interventions, digital literacy education, and collaboration with families and trained professionals.

These interventions can take place within the school setting or through referrals to community-based mental health specialists with experience in digital media-related behavioral health.

Developing these self-regulation strategies is a key aspect of personal digital wellbeing.

Mental and socio-emotional factors are also integral. An individual's mental health status can influence how they interact with technology and vice versa. Students struggling with anxiety or loneliness might resort to digital media for distraction or social validation, which can create vicious cycles if not managed. Social media, for instance, can amplify personal vulnerabilities – teens prone to negative self-comparisons may feel worse after viewing curated, idealised posts. The phenomenon of "fear of missing out" (FOMO) is often cited: constant connectivity can induce stress by making individuals feel they must stay online to keep up, leading to anxiety when they are offline. Moreover, exposure to cyberbullying or negative online interactions can severely undermine a student's emotional wellbeing. Being a victim of online harassment is linked with increased depression and lower self-esteem among youth. On the positive side, online social support can bolster wellbeing – for instance, learners who find niche communities or peer support networks online often report enhanced feelings of belonging and confidence (especially for marginalised groups).

These distractions show a strong correlation with lower academic performance, according to the report analysis. On average across OECD countries, students who said that they were distracted by other students using digital devices in class in at least some math lessons scored 15 points lower in mathematics than those who reported that this never or almost never happens (Langreo, 2023). The results "highlight the importance of finding effective ways to limit the distraction caused by using digital devices in class," according to the report.

It is the individual's socio-emotional capacity (such as empathy, self-esteem, and coping skills) combined with their online experiences that determines the net effect on wellbeing. Mental health considerations for educators are equally important: teachers with higher baseline stress or burnout might find continuous tech demands (like responding to emails late at night) exacerbate their strain, whereas those with coping strategies might handle digital loads more healthily (Buda & Kovács, 2024).

Wellbeing is a dynamic state that requires continuous adaptation, especially as digital technologies introduce new and evolving challenges. The rise of the online world has

significantly impacted university teachers, altering the nature of their work and, consequently, their wellbeing. As disruptive forces like post-COVID changes and artificial intelligence reshape education, it becomes crucial to equip students with adaptable, future-ready skills that allow them to work with AI, without letting technology dominate their lives. To maintain balance, teachers must model and support digital wellbeing, beginning with practices like digital detox and mindful technology use. Higher education institutions play a key role by urgently developing training programs—one focused on enhancing digital competencies and another on promoting conscious tech use and a healthy work-life balance (Buda & Kovács, 2024).

In short, digital skills, habits, and emotional resilience strongly influence how technology use translates to wellbeing outcomes.

Context-Specific Factors

The context in which digital learning occurs affects digital wellbeing. One major contextual factor is the presence (or absence) of supportive institutional policies and culture regarding technology use. Schools and universities that develop clear guidelines for healthy digital practices can set positive norms that shape behavior. For example, a district policy that enforces "device-free time" during lunch or breaks may encourage students to socialise face-to-face and reduce screen fatigue (Schneider & Dong, 2024).

Some schools have moved to ban smartphones in classrooms entirely to curb distractions and mental health impacts; while this may reduce in-class disruptions, experts note it's not a panacea, as students' online lives still influence them outside class (Schneider & Dong, 2024). A whole-school approach to digital wellbeing is often recommended. This means rather than just punitive rules (like confiscating phones), schools foster a positive digital culture through education, modeling, and support. For instance, a culture where teachers openly discuss digital citizenship and wellbeing, and where seeking help for online issues (cyberbullying, tech stress) is encouraged, can make a big difference in outcomes (Schneider & Dong, 2024).

Research by Schneider and Dong (2024) found that addressing digital wellness in a Multi-Tiered System of Supports (MTSS) framework was an effective way to promote students' healthy digital media use and mental wellbeing in U.S. schools. This systemic approach acknowledges that school context (rules, norms, support services) shapes how students engage with technology.

Pedagogical approaches and teaching practices also influence digital wellbeing. Instructors who thoughtfully integrate technology (e.g. using engaging, interactive tools in moderation and with pedagogical purpose) can enhance student wellbeing by making learning

enjoyable and efficient. Conversely, poor integration (like excessive use of dull slideware or constant multitasking demands) can increase cognitive load and stress. Studies on digital multitasking show that when students are expected to juggle multiple apps or streams of information in class, it can lead to cognitive overload, reduced comprehension, and heightened stress levels. Effective pedagogy for digital wellbeing might include strategies like tech breaks (deliberate pauses from screen work), mindful multitasking (teaching students to single-task or batch tasks), and incorporating physical movement or offline activities to balance screen time. Educators themselves must adapt teaching methods to manage their workload; during the COVID-19 pandemic, many teachers reported significant technostress when forced into full-time remote instruction without adequate training. A study on primary school teachers in China during pandemic remote teaching found that high technology use intensity did contribute to technostress, though factors like perceived support could mitigate it (Wang, Zhang, Wang, Liu and Lv, 2023). The study found that high technology use intensity did contribute to technostress, though factors like perceived support could mitigate it.

In general, schools that provide professional development on digital tools and wellbeing, as well as technical support, help reduce teacher stress and improve both teacher and student experiences (Buda & Kovac, 2024).

The broader socio-economic environment is another contextual factor. Digital inequalities can lead to very different wellbeing outcomes. Students from affluent backgrounds or well-resourced schools may have high-speed internet, updated devices, and digitally literate parents/teachers guiding them, which fosters a safer and more enriching digital learning experience (New America, 2023). In contrast, students in under-resourced settings might face connectivity issues, shared devices, or less supervision, which can cause frustration, learning loss, and feelings of exclusion. The digital divide thus has a wellbeing dimension: lack of reliable access can increase stress (e.g., a student anxious about dropping from a Zoom class due to weak internet) and reduce academic confidence. During the pandemic lockdowns, unequal home connectivity and study environments led to heightened stress and lower satisfaction for many students, especially those in disadvantaged communities (New America, 2023). Additionally, socio-economic context affects exposure to guidance on healthy tech use. Middle-class parents might impose screen time rules or model good digital hygiene, whereas in some low-income households, long work hours or limited tech knowledge can leave children to self-regulate, sometimes with negative consequences. Community factors, like whether a school has counseling services for online safety or collaborations with mental health professionals, also matter (Balica, 2021; OECD, 2025).

In summary, the context – from the micro-level of classroom practices and school policies to the macro-level of socio-economic conditions and culture – creates the environmental backdrop against which digital wellbeing is either supported or undermined. A supportive

context provides structure, education, and resources that promote balanced tech use, whereas a challenging context might introduce stressors like over-surveillance, unclear norms, or inequitable access that harm wellbeing.

Device-Specific Factors

The specific technologies, platforms, and devices in use introduce another set of factors influencing wellbeing. Different tools have different impacts: for example, spending an hour in a rich interactive learning simulation may have a different effect than an hour scrolling a social media feed. One aspect to consider is the design features of digital platforms. Many apps and platforms used by students are engineered to maximise engagement. Social media and games employ persuasive design techniques (autoplay, infinite scroll, notifications, rewards) that can unintentionally foster problematic usage habits or even behavioral addiction. When educational platforms mimic these designs (think of gamified learning apps with constant badges or feedback loops), they can be motivating, but they also risk encouraging a state of constant online presence. Awareness is growing that some digital products leverage "manipulative UX" that can be harmful to wellbeing. For instance, competition for user attention may lead to features that are "sticky" but detrimental. Providers may overload learners with notifications or design learning management systems that encourage frequent checking, which can increase anxiety and distract from deep work. Regulators and educators are calling for more ethical design that avoids exploitative practices. DigComp 2.2 explicitly notes the importance of recognising and safeguarding against manipulative digital business practices and "embedded user experience techniques" that could harm wellbeing (Vuorikari, Kluzer & Punie, 2022). On the flip side, technology design can also promote wellbeing: some educational apps now incorporate mindfulness prompts, screen time reminders, or adaptive filters that reduce cognitive overload, aiming to support healthier use habits. The user interface and experience (UI/UX) of platforms – such as how intuitive and calming or confusing and stressful they are – directly affects users' frustration levels, mood, and willingness to engage. For example, a platform that is cluttered and non-user-friendly can frustrate learners and teachers, whereas a well-designed, accessible interface reduces tech stress and frees cognitive resources for learning.

The type of device and its ergonomics also matter. Physical health symptoms like eye strain, headaches, and musculoskeletal issues are common complaints tied to prolonged device use in education. A study among university students in Saudi Arabia found that Digital Eye Strain Syndrome (DESS) affected 72% of participants, with symptoms like blurred vision, light sensitivity, headaches, and dry eyes being frequently reported due to extensive screen time (Gushgari, Sayed & Elgzar, 2024) Contributing factors included using screens without breaks, poor posture, and excessive hours on devices each day. Notably, the majority (58%) of those

students had unsatisfactory ergonomic practices, indicating that simple interventions (like proper monitor height, lighting, the 20-20-20 eye break rule) were not widely adopted.

For younger students, heavy tablet or smartphone use has raised concerns about posture (e.g., "text neck"), sedentary behavior leading to obesity, and sleep disturbances from evening screen exposure. Device-specific recommendations are therefore important for physical wellbeing. The size and capabilities of devices can also influence cognitive load: reading long text on a small smartphone may cause more strain and less comprehension than on a larger tablet or paper. Additionally, certain technologies like virtual reality (VR) or augmented reality (AR), increasingly entering education, have their own wellbeing profiles. VR can cause motion sickness or disorientation in some users, and its intense immersiveness, while engaging, might be exhausting or isolating if used for long periods. Conversely, AR might add value without full immersion but could introduce distraction if poorly implemented.

Different categories of digital tools have distinct psychological effects. Social media platforms, often used by students informally, can be double-edged: they offer connection and identity exploration but also bring risks of cyberbullying and social comparison as noted earlier (Schneider & Dong, 2024).

Productivity and learning apps (like note-taking tools, educational games, MOOCs) generally aim to be beneficial, but if a student is juggling too many apps or finds them overwhelming, it can induce stress. Communication tools (email, messaging, class forums) are essential for collaboration but can lead to information overload or the feeling of being "always on," especially for educators who might receive messages from students and parents at all hours. Teachers frequently report that constant connectivity blurs their work-life boundaries: in one survey, over half (54%) of university lecturers felt significant stress due to technical problems and the intrusion of digital tasks into personal time (Buda & Kovács, 2024). This highlights that even for the same device (e.g., a laptop), the way it's used (checking work email at midnight vs. limited work hours) can alter its impact on wellbeing.

In sum, device-specific factors – from the micro-level of interface design and ergonomics to the macro-level of platform purpose – critically shape the user experience. Wellbeing is enhanced when technologies are user-centered, accessible, and aligned with human needs, and diminished when tech is addictive, poorly designed, or physically taxing. Recognising these factors allows educators and learners to make informed choices about what tools to use and how to use them healthily.

The Role of Digital Competencies, Learning Environments, and Curriculum Design

Given the factors above, certain levers within the education system can actively promote digital wellbeing. These include the cultivation of digital competencies (among both students and educators), the design of learning environments (online, hybrid, or face-to-face with tech integration), and the integration of wellbeing principles into curriculum design. This section examines how these elements influence wellbeing and how they can be optimised.

It is also important to recognise that digital wellbeing strategies must be tailored to cultural and infrastructural contexts. Approaches effective in well-resourced, high-connectivity schools may not directly translate to settings with limited technology access, and vice versa. For instance, a digital mindfulness program developed in a European city might need modification for a rural community with different tech usage patterns. Therefore, educators and policymakers should adapt guidelines to local realities, ensuring that interventions remain relevant and feasible across diverse regions. This implies a flexible, context-aware implementation, one that respects cultural norms and available infrastructure while pursuing the same core goals of balanced and healthy technology use.

Digital Competencies and wellbeing

Developing strong digital competencies is a cornerstone of empowering learners and teachers to maintain their wellbeing in a digital world. Digital competence refers not just to technical skills, but also to the knowledge, attitudes, and values needed to use technology wisely. When students and educators possess competencies in areas like information literacy, online communication, privacy management, and cyber safety, they are better equipped to handle challenges that arise online. For example, a student skilled in information literacy can avoid the stress of misinformation or panic from online rumors by critically evaluating sources (Vuorikari, Kluzer & Punie, 2022).

A teacher knowledgeable about privacy settings and online etiquette can model and teach safe online behavior, reducing incidents like data breaches or conflict in the classroom. Digital wellbeing itself is increasingly viewed as a competency to be learned. DigComp 2.2, as mentioned, positions “protecting health and wellbeing” as a competency area, meaning students should learn specific strategies to safeguard their health while using digital tools (Vuorikari, Kluzer & Punie, 2022). At basic proficiency, this might involve knowing simple tactics like adjusting screen brightness to prevent eye strain or recognising when an online activity is causing emotional upset and taking a break. At more advanced levels, it could include

mentoring peers in healthy tech habits or contributing to a positive digital culture. By embedding digital wellbeing into digital literacy curricula, education systems send the message that responsible and healthy tech use is a fundamental skill, as important as knowing how to operate the technology itself.

Research indicates a positive relationship between digital skills and wellbeing outcomes. An EU study found that in countries with higher average youth digital skills, adolescents reported lower perceived digital risks, suggesting that competency may mitigate some harms (Coninck, Waechter, Haenens, 2023). Another analysis showed that youths with greater self-efficacy in digital skills tended to have better social wellbeing and academic results, as they could leverage technology for social connection and learning without as many downsides. Moreover, high digital competence can foster digital resilience – the ability to recover from online difficulties. For instance, a student who has been taught about cyberbullying (how to block users, report abuse, seek support) will likely cope better and maintain their emotional wellbeing if they encounter bullying, compared to a student without that knowledge. Similarly, teachers who are digitally competent can avoid a lot of stress: they can troubleshoot tech problems, implement classroom management techniques for device use, and use digital tools to reduce their workload (such as automated grading or resource sharing platforms) (Buda & Kovács, 2024).

On the other hand, lack of competence can directly harm wellbeing. Educators have reported feeling frustrated or burned out when required to use new digital systems without adequate training, a situation that spiked during remote learning periods (Wang, Zhang, Wang, Liu and Lv, 2023). Thus, investing in digital skills training for both students and teachers is an investment in wellbeing. Programs like the European DigCompEdu framework help teachers self-assess and build needed skills, including how to support learner wellbeing via tech (DigComp 2.2., 2022).

In summary, digital competencies are not only about functional tech use; they encompass the savvy and mindset to shape one's digital environment in healthy ways. As such, they greatly influence whether educational technology use will be a source of enrichment or a source of strain.

Online and Hybrid Learning Environments

The design of learning environments plays a significant role in digital wellbeing. Over the past decade, especially catalysed by the COVID-19 pandemic, online and hybrid learning have become prevalent at all educational levels. These environments present both opportunities and challenges for wellbeing. On one hand, online learning can offer flexibility and accessibility, allowing learners to work at their own pace and balance responsibilities, which

can reduce stress for some. It can also open access to education for those who might be excluded (due to geography, health issues, etc.), potentially improving wellbeing by fulfilling learners' educational needs in otherwise impossible ways (Chung et al., 2025).

For example, the University of Würzburg in Germany implemented a state-of-the-art hybrid classroom known as the 'HybrIDD Room' as part of the CHARM-EU initiative. This high-tech learning space was designed to seamlessly connect in-person and remote students in shared real-time classes. As reported by the university (University of Würzburg, 2024), the HybrIDD Room uses interactive screens, video conferencing walls, and collaborative software to ensure all students participate equally, whether on campus or joining virtually. Early observations noted improved student engagement and social presence, suggesting that thoughtfully designed hybrid environments can mitigate some wellbeing concerns by reducing feelings of isolation among remote learners. This case demonstrates how combining physical and digital learning spaces can maintain interactivity and support student wellbeing in a post-pandemic context.

Hybrid learning (combining online and face-to-face) can mitigate some issues but also introduce complexity. A well-designed hybrid model might give students the best of both worlds – ample face-to-face social interaction and hands-on activities for emotional wellbeing, plus online components that allow personalisation and flexibility (Essel et al., 2021; Abbas et al., 2023). However, if not coordinated, hybrid setups can make students feel they are "always doing work" (some tasks online, some offline, often with overlapping deadlines) and can increase cognitive switching costs. Educators note that hybrid teaching requires careful scheduling and clarity to avoid overloading students. Key to an environment's impact is the level of interaction and community it fosters. Online platforms that include features for informal chatting, peer collaboration, and teacher feedback can help maintain a sense of community and support wellbeing by counteracting isolation.

Another environmental factor is classroom design and scheduling. In tech-rich classrooms, arranging the physical space to allow movement and off-screen time can improve comfort and attention. Some schools experiment with "device stations" or specific corners for certain activities to prevent students from staring at one screen all day. Scheduling techniques, such as incorporating short breaks between online lessons or using the "Pomodoro technique" for study sessions, help manage fatigue. Research indicates that systematic breaks (like a 5-minute pause every 25 minutes of study) improve mood and concentration compared to working for long periods without breaks (Biwer et al., 2023). By encouraging students to briefly disconnect and rest their eyes and mind, educators can mitigate digital fatigue. Additionally, teacher presence and pedagogical moderation in online forums can prevent negative experiences; active moderation deters cyberbullying or hostile interactions that would harm wellbeing.

Also, teacher presence and pedagogical moderation in online forums can prevent negative experiences – active moderation can deter cyberbullying or hostile interactions that would harm wellbeing. In MOOCs and large online classes, the absence of moderation or instructor guidance sometimes leads to toxic communication; conversely, a strong instructor presence can set a respectful tone and provide socio-emotional support, improving students' comfort in the environment. Ultimately, whether online, hybrid, or face-to-face, learning environments that are designed with wellbeing in mind lead to better outcomes.

Curriculum Design and Integration of Digital wellbeing Principles

Curriculum design offers a variety of opportunities to embed digital wellbeing into the educational experience. Rather than treating wellbeing as an external issue, many educators advocate integrating digital wellbeing principles directly into the curriculum. One approach is to include digital citizenship or digital literacy modules that cover topics such as balanced media use, internet safety, cyber-ethics, and self-care in digital contexts (Metheekul, 2024). For example, national curricula in some countries have started to address this. Finland's national curriculum includes media literacy and wellbeing as part of transversal competencies, providing a global model for education systems aiming to cultivate healthy digital habits from a young age (Finnish National Agency for Education, 2025).

These lessons teach students about the impacts of technology on health (like why too much screen time can be harmful), strategies for wellness (like mindfulness exercises or setting tech-use goals), and encourage reflection on their own tech habits. A curriculum might have students track their device use for a week and discuss how it made them feel, linking data with personal reflection to reinforce self-awareness.

Incorporating social-emotional learning (SEL) alongside technology use is another effective strategy (Panorama Education, 2021). Curricula that pair SEL competencies (such as self-awareness, self-management, relationship skills) with digital tasks help students practice managing their emotions and behavior online. For instance, an elementary lesson might ask students to identify their feelings after using certain apps or to role-play responses to cyberbullying, thereby blending digital literacy with emotional intelligence. Such integration ensures that as students learn to use tools, they also learn to cope with the emotions and social situations that arise from their use. This is important because technology can act as an amplifier of emotion – both positive and negative – and without guidance, young people may not have the regulatory skills to handle these amplified experiences.

Curriculum design that foregrounds critical thinking about technology can empower students. Harvard's "Teaching Digital wellbeing" initiative, for example, provides resources for lessons on topics like examining the "design tricks" tech companies use to keep users hooked, or identifying "thinking traps" (cognitive distortions) that can be exacerbated by social media. By making these a subject of study, students become more conscious users rather than passive consumers, which can improve their agency and wellbeing. As the Harvard project concludes, thriving with technology "is unlikely to happen by accident" – youth need "skills, strategies, and literacies to overcome challenges and support their digital agency", which curriculum can directly provide.

Curriculum design can also promote wellbeing by balancing online and offline activities and by leveraging technology for positive purposes like engagement and motivation (Prabowo et al., 2025) or flexibility and accessibility (Abbas et al., 2023). A well-designed curriculum might use digital tools to enhance learning (e.g., interactive science simulations, virtual field trips) but also deliberately include offline elements (like group discussions, hands-on experiments without devices, outdoor learning) to give students a break from screens and engage different parts of the brain. This not only prevents fatigue but also models a balanced approach to life in general. Additionally, projects that let students use technology in service of wellbeing can be empowering. For example, a high school health class might include a project to design a digital campaign about mental health or to create a video on balancing tech use – thereby students learn by doing and contributing to a culture of wellness. Curriculum policies at higher levels (state or national) can mandate inclusion of digital wellbeing topics. In some places, curriculum standards now explicitly reference digital safety and wellbeing; for instance, the UK's curriculum includes teaching about the harms of excessive screen time and the importance of sleep and physical activity as part of health education (Department for Education, UK, 2025). Such mandates ensure all schools cover these critical topics, not just the ones that opt in. However, research indicates a gap between curriculum intentions and practice. Therefore, teacher education programs are also updating curricula to prepare educators in fostering digital wellbeing.

In summary, curriculum design that intentionally weaves digital wellbeing into learning objectives can have a powerful preventative and formative effect. It can normalise conversations about healthy tech habits, build students' capacity to handle digital life, and ultimately create a learning experience that is both high-tech and high-wellbeing. Conversely, if curriculum design ignores wellbeing (for instance, by cramming in tech use without reflection or by not addressing digital challenges students face), it misses an opportunity and might even contribute to the problem. The trend in many countries is toward more holistic curricula that prepare learners not just academically, but also for the realities of living in a digital society with resilience and wisdom.

Students wellbeing, digital competence and academic performance

Student wellbeing Assessment Tools

Multiple instruments have been developed in the past decade to measure K-12 and college students' wellbeing in authentic school contexts. Quantitative self-report surveys are by far the most common approach, often administered as questionnaires for students to rate their own emotional states, engagement, or satisfaction (Hossain et al, 2023). Most wellbeing questionnaires used in educational research are multidimensional, comprising subscales that tap various facets of wellbeing (e.g. positive affect, negative affect, engagement, sense of accomplishment) (Hossain et al., 2023). Rather than inventing entirely new measures, many studies have adapted existing wellbeing scales to the school setting. For example, McLellan and Steward (2015) drew items from the European Social Survey's wellbeing module and from the UK's Every Child Matters framework to create a student survey. Similarly, Hascher's (2007) Student wellbeing Questionnaire (SWBQ) and later instruments have built on prior psychological scales but tailored them to capture wellbeing "at school". This reuse of established items helps ensure content validity, though it may not cover all school-specific aspects. A few instruments were explicitly designed for school contexts from the ground up (e.g. those by Anderson & Graham 2016, Tian 2008), but these are the exception (Hossain et al., 2023).

Notably, a scoping review of 33 studies (1989–2020) found that the vast majority (30 of 33) relied on student self-report surveys, whether in cross-sectional or longitudinal designs (Hossain et al., 2023). Only a handful employed qualitative or mixed-methods approaches (e.g. interviews, focus groups, observations) to assess wellbeing. For instance, Anderson and Graham (2016) used a mixed-method design combining semi-structured interviews with an online survey to understand student wellbeing in Australian schools. Qualitative techniques like student drawings, guided discussions, or interviews have provided richer insight in a few cases, but these are less common and typically supplement survey data rather than stand alone (Hossain et al., 2023). Overall, self-report instruments dominate due to their practicality and scalability in schools. However, heavy reliance on student questionnaires also raises concerns about biases and whether adults' definitions of wellbeing align with students' lived experiences.

A variety of named scales for student wellbeing have been validated in the past 10–15 years across different regions (Table 1). For example, Renshaw's Student Subjective wellbeing Questionnaire (SSWQ) was developed in the United States as a concise measure of

adolescents' positive functioning at school (covering joy of learning, school connectedness, educational purpose, and academic efficacy) (Renshaw et al., 2015). In China, Tian et al. (2015) introduced the Brief Adolescents' Subjective wellbeing in School Scale (BASWBSS) – an 8-item instrument distilled from a longer 2008 scale – and confirmed its strong psychometric properties (internal consistency, test–retest reliability, and convergent validity) in a sample of secondary students (Tian et al., 2015). This brief scale was shown to be a viable proxy for the longer form, making it suitable for large studies where survey length is a concern (Tian et al., 2015). Another example is the Student's wellbeing in the E-School Environment Questionnaire (Buczak & Łukasik, 2021) developed in Poland during the COVID-19 pandemic.

Table 1.

Student Wellbeing Assessment Tools

Tool Name	Purpose/Focus	Reference
Student Wellbeing Questionnaire (SWBQ)	Multi-dimensional self-report survey designed to measure students' wellbeing specifically within school contexts, by adapting general wellbeing scales to the school setting.	(Hascher, 2007)
Student Subjective Wellbeing Questionnaire (SSWQ)	Concise instrument assessing adolescents' positive wellbeing at school, covering multiple domains such as joy of learning, school connectedness, educational purpose, and academic efficacy.	(Renshaw et al., 2015)
Brief Adolescents' Subjective Wellbeing in School Scale (BASWBSS)	An 8-item scale measuring secondary students' subjective wellbeing in school; distilled from a longer earlier scale and validated for strong psychometric properties (high reliability and validity in youth samples).	(Tian et al., 2015)
Student's Wellbeing in the E-School Environment Questionnaire	Questionnaire developed to assess student wellbeing during remote (online) schooling across four domains (school conditions, interpersonal relations, self-fulfillment, health); grounded in Allardt's wellbeing theory and validated via factor analysis and correlations with established measures.	(Buczak & Łukasik, 2021
Perceived Stress Survey for Children (PSS-C)	A 13-item survey gauging perceived stress in children (ages 5–18); reliably differentiates between stressed and non-stressed youth and used to monitor changes in student stress levels (e.g., before vs. after interventions).	(White, 2014)

Based on Erik Allardt's welfare theory, it measures wellbeing across four domains – school conditions, interpersonal relationships, self-fulfillment, and health – specifically for students engaged in remote (online) learning. The developers validated this e-school wellbeing tool

via factor analysis and by correlating it with established measures (Rosenberg Self-Esteem Scale and KIDSCREEN-10 quality-of-life survey), ultimately demonstrating satisfactory reliability and validity for use in the new context of virtual schooling. These examples illustrate how wellbeing instruments have been tailored to different educational settings – from traditional schools to fully online environments – while undergoing rigorous validation (Buczak & Łukasik, 2021).

Beyond self-report surveys, a few studies have integrated physiological or observational measures to assess student wellbeing in context. For instance, a case study in a U.S. middle school examined the impact of a biophilic learning environment (a classroom redesigned with natural elements) on student stress and performance. Researchers combined quantitative and qualitative indicators: students answered a validated Perceived Stress Survey for Children (PSS-C) (White, 2014) before and after exposure to the biophilic classroom, wore heart-rate variability sensors as a biological stress index, and participated in interviews about their feelings in the space. The PSS-C, a 13-item instrument for ages 5–18, has been shown to reliably distinguish between stressed and non-stressed children. In this study, it captured changes in students' stress levels over a semester in two different classrooms, while interviews provided contextual insight. Such multi-method approaches, though less common than surveys alone, highlight the potential for triangulating student wellbeing through self-report, physiological data, and direct feedback. Overall, the literature demonstrates a rich array of tools for measuring student wellbeing – from brief rating scales to in-depth qualitative assessments – with researchers increasingly ensuring these instruments are grounded in theory and validated for the target student population.

Digital Competence and Literacy Assessment Tools

As education systems integrate technology and online learning, numerous frameworks and instruments have emerged to gauge students' digital competence (Table 2). Digital competence is broadly defined as the knowledge, skills, and attitudes needed to use digital tools effectively for learning and everyday tasks (Mejias-Acosta et al., 2024). One prominent international effort to assess these skills is the International Computer and Information Literacy Study (ICILS), first launched in 2013 by the International Association for the Evaluation of Educational Achievement (IEA). ICILS is a large-scale computer-based assessment of 8th grade students' abilities to use computers to investigate, create, and communicate information – effectively measuring "computer and information literacy" across dozens of countries (De Bortoli, Buckley, Underwood, O'Grady & Gebhardt, 2014). The ICILS instruments include interactive problem-solving tasks (completed on a computer) and questionnaires for students, teachers, and schools. By design, ICILS provides a standardised measure with strong technical rigor and has been implemented globally to compare student digital skills (De

Bortoli et al., 2014). Its assessment framework covers multiple competency strands (e.g. gathering information, producing information, communicating) and the test development followed extensive pilot testing and psychometric analyses to ensure cross-national validity. ICILS results have shed light on international gaps in digital literacy, and the assessment model itself stands as a well-validated tool for evaluating students' technological proficiency in a comparative context.

Table 2.

Digital Competence and Literacy Assessment Tools

Tool Name	Purpose/Focus	Reference
International Computer and Information Literacy Study (ICILS)	Standardised international assessment of 8th-grade students' computer and information literacy skills. Includes interactive computer-based tasks and questionnaires to evaluate the ability to collect, create, and communicate information using digital tools, enabling cross-country comparisons.	(De Bortoli et al., 2014)
Digital Competencies Scale (University Students)	22-item self-assessment scale for higher education students, measuring digital skills across four key domains: (1) communication and digital safety, (2) accessing and managing digital content, (3) creating digital content and media use, and (4) digital empathy. Developed and validated with undergraduates, showing a clear factor structure and high reliability.	(Mejías-Acosta et al., 2024)
DigCompSat (Digital Competence Self-Assessment Tool)	A self-assessment item bank aligned with the European DigComp 2.1 framework. Covers five main areas of digital competence (information, communication, content creation, safety, problem-solving) across proficiency levels from basic to advanced; piloted in multiple countries with evidence of strong internal consistency and cross-cultural validity.	(Clifford et al., 2020)
Europass Digital Skills Self-Assessment	Online self-rating tool for individuals to evaluate their digital skill levels (e.g., for CV/portfolio use), aligned with European digital competency frameworks. Provides a standardized profile of one's digital competencies for educational or employment contexts.	(Clifford et al., 2020)
ICT Competence Scale (Primary Education)	Assessment scale for primary school students' ICT skills, focusing on basic digital information processing and communication abilities (e.g. using search engines, email). Developed and validated using Item Response Theory to ensure reliable measurement of young learners' digital competence.	(Aesaert et al., 2014)
3F-PICTLS (ICT Literacy Scale for Secondary Students)	Multi-factor perceived ICT literacy scale for junior secondary students that evaluates everyday digital tool use and skills. Originally developed and validated in a secondary education context to measure students' practical ICT competencies.	(Lau & Yuen, 2014)

In addition to large-scale tests like ICILS, researchers have developed self-assessment scales and performance-based tests to measure digital competence at the local or national level. A recent example is a study by Mejías-Acosta et al. (2024), who created a 22-item Digital Competencies scale for university students in Latin America. Grounded in a literature review of digital skill frameworks, their instrument groups items into four key dimensions: (1) communication and digital safety, (2) accessing and managing digital content, (3) creating digital content and using digital media, and (4) digital empathy (responsible and empathic

online behavior). The scale was tested with undergraduates in Venezuela and showed robust psychometric properties, including clear factor structure and high reliability. By validating the tool in a real university classroom setting, the authors demonstrated its applicability in Spanish-speaking contexts, and suggested it could be adapted for similar environments globally. This reflects a broader trend of researchers operationalising comprehensive digital competence frameworks (such as the European DigComp (DigComp, 2022) scheme or UNESCO's digital literacy standards) into concrete survey instruments or tests. For instance, the European Commission's Joint Research Centre has developed DigCompSat, a digital competence self-assessment item bank aligned to the DigComp 2.1 framework (Clifford et al., 2020). DigCompSat covers the five main areas of digital competence (information, communication, content creation, safety, problem-solving) across proficiency levels from foundation to advanced. Pilots of this tool in multiple countries (Ireland, Latvia, Spain) with diverse age groups confirmed its internal consistency and validity, indicating the item bank accurately measures the intended digital skills across cultures (Clifford et al., 2020). Self-assessment tools like DigCompSat and the Europass Digital Skills self-assessment allow students to reflect on their own abilities while providing educators with standardised indicators of competence (Clifford et al., 2020).

Several scales have been developed to assess digital competence, targeting various educational levels. For example, Aesaert et al. (2014) designed a scale for primary students focused on basic skills like using search engines and email. Lau and Yuen's (2014) 3F-PICTLS measured ICT literacy in junior secondary students, emphasising everyday digital tool use. Uzun (2019) adapted this scale for Turkish undergraduates but did not expand it to include ethical dimensions of ICT use. Similarly, López-Meneses et al. (2020) created a tool for university students, though it mostly measured tool usage rather than learning-oriented competencies. He and Li (2019) introduced a 13-item scale incorporating advanced skills and socioethical attitudes, but it lacked full validation. Overall, these tools often focused on basic functions, overlooked socio-cultural aspects, or were limited in validation.

Beyond self-reports, performance-based assessments are also used to gauge digital skills. Some educational systems incorporate ICT tasks into exams or use project-based assignments that require students to demonstrate technology use (for example, creating a presentation, coding a simple program, or searching for information efficiently). These methods can capture applied skills, though ensuring their reliability can be challenging. A notable large-scale example is how PISA (Programme for International Student Assessment) has evolved: in 2018, PISA not only tested reading, math, and science, but also included questionnaires on students' ICT familiarity and even attempted to measure aspects of wellbeing and attitudes (Crato, 2018). In fact, the OECD made efforts to develop an instrument to measure student wellbeing alongside academic performance in PISA 2018, reflecting the interconnectedness of digital engagement, wellbeing, and achievement. At

the classroom level, many teachers employ informal assessments of digital competence – such as observing students' ability to navigate learning apps or evaluating the quality of online research in assignments – but formal standardised instruments like ICILS or DigComp-based questionnaires provide more systematic data.

Overall, the past decade's research on digital competence assessment has produced a mix of performance tests, standardised surveys, and self-assessment tools, each validated to varying degrees. These instruments have been implemented from primary schools to universities and across different cultures, underscoring the global relevance of measuring students' readiness for a digital world.

Students' digital literacy plays a critical role in shaping their self-regulation and overall engagement in learning. Higher levels of digital literacy are associated with stronger self-control, which can contribute to reduced involvement in problematic online behaviors. Moreover, students with advanced digital skills tend to experience lower levels of technostress, enabling them to navigate digital learning environments more confidently and effectively. Enhanced digital literacy also correlates with increased engagement, as students are better equipped to interact with digital tools in meaningful and productive ways. Given these multifaceted benefits, it is essential for educators and policymakers to prioritise initiatives that foster digital literacy (Peng, Danhua, Yu, Zhonggen, 2022; Ndibalema, 2025).

Academic Outcome Measures and Performance Assessments

Academic outcomes have long been measured through exams and grades, but recent years have seen diversification in how student learning is assessed, especially in alignment with 21st-century skills. Standardised tests (e.g. state or national exams, international assessments like PISA or TIMSS) remain prevalent metrics of academic achievement. These tests typically have well-established validity and reliability due to rigorous development processes and large samples. For example, standardised reading and math tests are often validated through item response theory and show high internal consistency, making them trustworthy indicators for comparisons across student populations. However, traditional tests tend to focus on knowledge and cognitive skills, which may only capture part of student "outcomes." To address this, educators have increasingly turned to performance-based assessments and other authentic measures that evaluate applied skills and complex competencies.

Performance-based assessments require students to actively demonstrate their knowledge by creating an answer or product, rather than selecting from multiple-choice options. In K-12

settings, these can include open-ended problem solving, essays, science experiments, presentations, portfolios of work, or projects. Such tasks are believed to better gauge higher-order thinking and real-world application of skills. For instance, a performance task in science might have students design and conduct an experiment on water quality and then communicate their findings in a report or presentation. This format assesses not only content knowledge but also research skills, critical thinking, and communication. Scoring is typically done with rubrics that define criteria for different levels of performance. When developed carefully, rubrics allow for consistent scoring across different raters and tasks, though achieving high inter-rater reliability requires training and calibration. Over the past decade, some education systems (e.g. project-based schools) have implemented common performance tasks as part of their assessment framework, finding them useful for guiding instruction and providing more nuanced feedback to students. It is important to distinguish between summative and formative assessments. Summative assessments are evaluative measures of learning at the end of an instructional period (e.g., final exams, end-of-term grades, or standardised tests) – they summarise what a student has achieved. Formative assessments, in contrast, are low-stakes evaluations conducted during the learning process (e.g., weekly quizzes, draft feedback, or informal observations) with the primary aim of providing feedback for improvement (Black & Wiliam, 1998). Summative measures serve accountability and certification purposes, whereas formative approaches guide day-to-day teaching and student self-regulation. Notably, these two types of assessment can impact student wellbeing differently: high-stakes summative exams might induce stress, while supportive formative feedback can enhance motivation and confidence. Effective assessment frameworks in education often blend both, using formative assessments to improve learning outcomes and summative assessments to verify and report those outcomes.

Research suggests that with clear criteria and benchmarking, performance assessments can reach acceptable levels of reliability and also demonstrate content validity (by aligning tasks with curriculum standards) and predictive validity (students' performance task scores correlating with future academic success) (Leonard, 2018). Nonetheless, widespread adoption in accountability systems has been slow due to practical challenges in administration and scoring.

Another approach to academic outcomes is portfolio assessment and continuous classroom assessment. Many schools now collect evidence of student learning through portfolios or project logs, which are then evaluated against learning objectives. These methods provide a longitudinal view of student progress and can incorporate teacher, peer, and self-assessments. Tools like the Learning Record or e-portfolios have been tried to formalise such assessments. While rich in information, ensuring the validity (that the portfolio truly reflects competency) and comparability of portfolio assessments across students can be difficult.

In addition to these innovative methods, it's important to note that academic outcome measurement often interacts with wellbeing and context. For example, some standardised testing programs have begun to include student questionnaires about their test-taking experience, motivation, or anxiety, acknowledging that these factors can affect performance. This illustrates how academic outcomes (test scores) can be used alongside wellbeing measures in research to examine correlations or causal effects.

Overall, the landscape of academic outcome assessment in the past 10–15 years is characterised by a mix of traditional and progressive tools. Standardised tests offer proven reliability and broad benchmarks, whereas performance-based and formative assessments offer depth and relevance. Both types have been used in case studies and research: from conventional exam scores serving as the dependent variable in studies of wellbeing, to experimental schools replacing exams with projects and documenting outcomes qualitatively. Increasingly, academic assessments are considered as one component of a multi-dimensional view of student success, often used in conjunction with measures of socio-emotional development and skills like digital literacy.

Evaluation of Assessment Instruments

A critical analysis of the instruments above reveals important considerations regarding their validity, reliability, sensitivity, and applicability across contexts. Each tool or framework must be scrutinised to ensure it truly measures what it purports to (validity), produces consistent and accurate results (reliability), can detect meaningful changes or differences (sensitivity), and remains relevant in diverse educational or cultural settings (applicability and fairness). Here we evaluate how well current wellbeing, digital competence, and academic assessments meet these criteria, drawing on empirical studies of their use.

Validity and Reliability of wellbeing Measures

Most student wellbeing instruments developed in recent years report acceptable psychometric qualities. In the scoping review of wellbeing studies, 24 of 30 self-report instruments had Cronbach's alpha reliability coefficients between 0.70 and 0.95, indicating good internal consistency (Hossain et al., 2023). Almost all were subjected to exploratory or confirmatory factor analysis to verify that the survey items indeed captured the intended dimensional structure of wellbeing. For example, the Student Subjective wellbeing Questionnaire (SSWQ) and the BASWBSS (Brief Adolescent School wellbeing Scale) both underwent factor analyses confirming their theorised subscales, along with checks for convergent validity with related constructs (like life satisfaction or positive affect) (Tian et al., 2015). Construct validity is generally strong when instruments are grounded in established

theories (e.g. hedonic vs eudaimonic wellbeing) and when items are reviewed by experts and stakeholders. However, the literature flags that content validity could be limited if the instrument items do not fully represent students' own concept of wellbeing. In fact, most scales were originally developed from an adult researcher's perspective, with students consulted in only a minority of cases (Hossain et al., 2023). Engaging students in the design (via focus groups, advisory panels, or feedback rounds) tends to improve the relevance of items – as seen in a few studies where student input led to more authentic indicators of school wellbeing (Hossain et al., 2023). This is an area where some existing instruments might fall short on validity: they might omit aspects of wellbeing that matter to youth (e.g. feeling "heard" at school, or creative self-expression) if those were not anticipated by adult designers.

Reliability of wellbeing surveys is typically evidenced by high internal consistency (as noted) and sometimes test–retest reliability. For instance, Tian et al. (2015) reported a satisfactory test–retest reliability for the BASWBSS over a two-week interval, meaning students' scores were stable when their true wellbeing was assumed not to have changed in that short term. One challenge to reliability can be the length of scales: very brief scales (5–10 items) risk lower reliability due to fewer items, although using highly inter-correlated items can mitigate this. Multi-dimensional scales with many items can achieve high alpha values, but one must ensure those aren't artificially inflated by redundant items. Another reliability consideration is inter-rater reliability for any observational or interview-based assessments of wellbeing. When qualitative measures are used (e.g. coding student interview responses about wellbeing), researchers must check agreement between independent raters. Few studies report on this, as qualitative measures are rare; one study that used panel discussions with students documented how themes were distilled, but quantitative reliability metrics weren't applicable (Hossain et al., 2023). In general, the self-report surveys have proven reliable in psychometric terms.

Some tools have been checked for criterion-related validity by correlating them with external criteria such as academic outcomes or behavioral indicators. For example, measures like the SSWQ have been shown to predict lower incidence of problem behaviors in adolescence (Hossain et al., 2023), supporting their criterion (predictive) validity. In terms of sensitivity, a good instrument should detect differences where expected – e.g. distinguishing students known to be struggling emotionally from those thriving, or registering improvements after a wellbeing intervention. However, an instrument that is too blunt may not register a moderate improvement in stress levels, for instance, whereas a well-calibrated one (like PSS-C for stress, or a resilience scale) would. This means a fair number of students with difficulties might score in the "normal" range (false negatives), potentially missing some at-risk youth. Such findings underline the importance of validating educational wellbeing instruments not just for reliability but for how well they flag meaningful outcomes or changes.

Validity and Reliability of Digital Competence Measures

Digital competence assessments vary widely in format (self-report vs. performance test) and thus face different validity concerns. Self-assessment questionnaires (such as DigCompSat or various digital literacy surveys) primarily measure students' perceived competence. These typically show high internal reliability because respondents tend to answer consistently across related items (e.g. a student who agrees "I can create a slide presentation" likely also agrees "I can format a document") (Clifford et al., 2020). The DigCompSat tool, for example, was found to have strong internal consistency within each DigComp area when piloted, supporting its reliability. However, a continuing validity issue with self-reports is the discrepancy between self-perception and actual skill. Students might overestimate or underestimate their true ability. To address construct validity, developers often align questionnaire items with recognised frameworks (ensuring content coverage of all important skill areas) and perform factor analyses. Mejías-Acosta et al. (2024) validated that their 22-item scale indeed clustered into the four theorised dimensions of digital competence. Another strategy is to correlate self-assessment scores with external measures like grades in computer courses or teacher ratings of student tech skills; a strong correlation would support criterion validity. Some studies (e.g. in higher education) have taken this approach, finding moderate correlations between students' self-rated ICT skills and actual performance in ICT tasks (Rodríguez, Horna, Placido & Barbuda 2024).

For performance-based digital skills tests, such as ICILS or bespoke ICT literacy exams, validity is often well-established through careful test design. The ICILS 2018 assessment, for instance, was built on a detailed blueprint of competencies and underwent international expert review (De Bortoli et al. 2014). Its content validity is high, as the tasks were explicitly mapped to the construct of computer and information literacy that countries agreed upon. Construct validity is examined via item response theory analyses that confirm items are measuring a common underlying ability. Reliability for such tests is indicated by measures like test reliability coefficients or IRT reliability, which ICILS technical reports show to be strong given the large number of tasks. A challenge here can be practical reliability – e.g., whether technical issues or unfamiliarity with the test interface might introduce error in scores. Test administrators mitigate this with standardised conditions and tutorials for students.

An emerging aspect is sensitivity to change: as digital competence is increasingly taught, some instruments are being used pre- and post-course to see if skills have improved (Schwarz, Bieg, Svecnik, Schmölz, Geppert, Gerdenitsch, 2024). A valid instrument should capture these gains if they occurred. One study in Europe used a digital literacy test for secondary students and reported it was sensitive enough to show significant score increases after a semester-long digital skills program (Yılmaz Ergül & Taşar 2023) . Conversely, if an instrument is too easy or too hard, it may suffer from ceiling or floor effects, limiting its sensitivity. Hence, many digital

competence scales include a range of difficulty or use adaptive testing to tailor item difficulty to the student's level.

Cross-cultural validity is particularly salient for digital skills frameworks, as access to technology and interpretation of items can vary by context. The EU's DigComp tools have addressed this by translating and piloting items in multiple languages and ensuring that scenarios are internationally relevant (for instance, avoiding country-specific context in questions) (Clifford et al., 2020). ICILS too goes through rigorous translation and verification processes. When digital competence instruments are transferred to new settings (say, a European survey used in Asia or Africa), researchers must re-check validity – sometimes via differential item functioning analysis – to ensure items operate similarly. Overall, digital competence instruments developed in the last decade generally boast solid psychometrics (reliability/validity), but one must consider the type of instrument: self-reports measure confidence/knowledge, while practical tests measure applied skills. Each type has its strengths and potential biases, so using them in combination can provide a fuller validity evidence (e.g. comparing self-belief and actual ability).

Validity and Reliability of Academic Outcome Measures

Traditional academic assessments (standardised tests, quizzes, exams) are typically well-validated by design. They undergo content review, alignment with curricula, piloting, and statistical analysis. Thus, their content and construct validity in measuring subject mastery is strong within the defined curriculum standards. Their reliability is also usually high. However, standard tests may not capture broader competencies and can be limited in scope validity (focusing narrowly on easily testable outcomes).

Performance-based assessments introduce more complexity in evaluation. The validity of a performance task hinges on the appropriateness of the task (does it authentically represent the desired skill) and the clarity of the rubric (does it measure the intended constructs). Studies have shown that involving teachers and domain experts in the design of performance tasks increases content validity and teacher buy-in. Reliability can be a concern if scoring is subjective. Many efforts (e.g. the Collegiate Learning Assessment, or project-based learning assessments in high schools) report inter-rater reliability to ensure two evaluators assign similar scores. When rubrics are well-defined and scorers are trained, inter-rater agreement can often reach acceptable levels (e.g. 0.8 correlation or above) – but this requires resources.

Sensitivity and specificity are less commonly discussed for academic tests except in the context of diagnostic assessments. For example, early reading assessments might report sensitivity/specificity for predicting reading difficulties. In general, academic assessments are expected to be sensitive to instruction – if teaching improves learning, test scores should rise.

Many standardised tests are indeed able to detect year-to-year growth, though sometimes ceiling effects occur for high-achievers. Performance assessments are praised for their sensitivity to deeper learning gains (students who have truly mastered analysis or creation should do much better), but some critics note they might introduce more noise (e.g. a student's creativity or test-taking strategy might affect outcomes).

Lastly, the applicability in diverse contexts for academic measures can be an issue. Standardised tests often need cultural and language adaptation when used internationally. Even within a country, a test normed on urban students might not be entirely fair to rural students if context differs. That said, academic tests are more straightforward to adapt than wellbeing measures since the content (math, science) is more universal, aside from language translation issues. Projects and performance tasks, if too specific, might not generalise: for instance, a science project requiring certain equipment may not be feasible in under-resourced schools. Thus, frameworks like PISA aim for context-neutral questions, and project-based assessments may allow flexibility in materials.

In summary, the instruments across all three domains generally demonstrate solid reliability and validity within the contexts they were developed: wellbeing surveys reliably measure subjective student perceptions, digital literacy tools capture tech skills, and academic assessments evaluate knowledge and thinking skills. Each, however, comes with caveats: wellbeing instruments must ensure they reflect students' perspectives to maximise validity; digital skill assessments must balance self-report and actual skill evaluation; and academic measures must expand beyond rote outcomes to truly reflect meaningful learning. Sensitivity to change and cultural fairness emerge as common themes to watch when deploying these tools broadly.

Interplay Between Wellbeing, Digital Competence, and Academic Success

An important aspect of modern educational assessment is understanding how different domains of student development interact. Rather than viewing socio-emotional wellbeing, technological proficiency, and academic achievement in isolation, researchers and practitioners are increasingly interested in integrated frameworks that capture multiple dimensions and the relationships among them. Several studies in the past decade have explicitly examined the intersections – for example, how a student's wellbeing might influence their academic performance, or how digital skills could moderate the relationship between

engagement and success. This section explores instruments and frameworks that span multiple domains and the insights gained about their interplay.

One clear trend is the inclusion of wellbeing and engagement measures alongside academic assessments in large-scale studies. The OECD's PISA 2018, for instance, not only tested academic skills but also incorporated a student wellbeing questionnaire, acknowledging that academic outcomes do not occur in a vacuum (Crato, 2018). This interdisciplinary approach yielded data showing correlations between students' life satisfaction, school belonging, and their academic results, highlighting that students who feel safe and happy at school tend to perform better academically. Although PISA's wellbeing instrument was relatively brief (covering aspects like test anxiety, sense of belonging, and general life satisfaction), it marked a significant step in integrating socio-emotional indicators into academic evaluations (Crato, 2018). It effectively created a framework where educational success is viewed through both cognitive and non-cognitive lenses. Similarly, many national education surveys now pair academic test results with background surveys that include technology access/usage and socio-emotional scales, allowing researchers to analyse, for example, how digital engagement relates to homework completion or how stress relates to exam performance.

At the school and classroom level, some assessment frameworks deliberately merge domains. For instance, the Panorama Student Survey (used in various U.S. districts) combines scales for social-emotional learning (SEL) competencies, school climate, and engagement, which can be examined alongside students' grades and test scores. Peer-reviewed analyses of Panorama data have shown that certain SEL skills (like self-management or a growth mindset) correlate moderately with academic improvements (Panorama Education, 2021). While Panorama's tools are mostly self-report surveys, the way they are used – in tandem with academic data – exemplifies the interdisciplinary assessment concept: educators get a dashboard of academic and wellbeing indicators together, to identify students who may need support in either area.

Specific research studies provide more direct evidence of interplay. Wang et al. (2021) investigated how university students' digital competence affected their psychological wellbeing and academic engagement during COVID-19 remote learning. They conceptualised digital competence through the lens of self-determination theory, viewing it as a skill that can reduce stress (by making technology-mediated learning smoother) and enhance autonomy. Their survey of 695 students found that digital competence had an indirect positive effect on academic outcomes by preserving wellbeing: students with stronger digital skills experienced lower cognitive load and academic burnout in online courses, which in turn led to higher engagement and presumably better performance (Wang, Zhang, Wang & Li, 2021). In their model, digital competence was the strongest

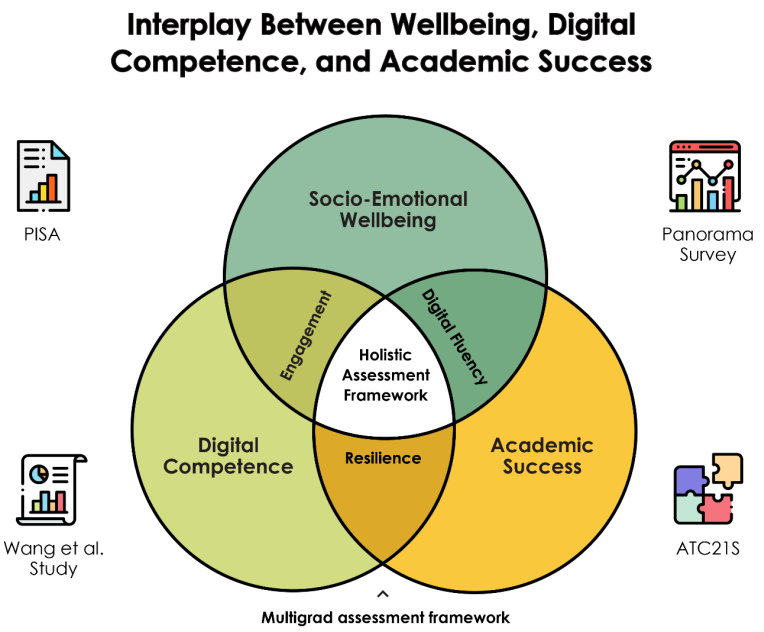
predictor of online learning engagement among the factors studied, and it worked by alleviating the mental strain that can impair both wellbeing and learning. This suggests that in technology-rich learning environments, digital skills and wellbeing are intertwined; a student lacking digital know-how may feel frustrated or anxious and consequently disengage academically, whereas a digitally fluent student can focus on learning content, maintaining both productivity and morale. Such findings underscore the need for assessments that do not silo domains – for example, an intervention might aim to boost ICT skills as a route to improving academic resilience.

Another domain interplay is observed between wellbeing and academic behavior/attitudes. Studies on social-emotional learning (SEL) programs often measure both SEL outcomes (like improved self-efficacy or empathy) and academic outcomes (grades, test scores) to evaluate impact. Many have found that improvements in SEL, which is closely tied to wellbeing, correspond to modest gains in academic metrics, reflecting a synergistic effect. A meta-analysis in 2011 (Durlak, Weissberg, Dymnicki, Taylor & Schellinger, 2011) found an average 11-percentile-point gain in achievement for students who participated in SEL programs, even though the programs primarily targeted attitudes and behaviors. The implication is that assessment frameworks should perhaps treat student development holistically – a single "score" or profile might include cognitive skills, emotional health, and even digital citizenship. While there isn't one gold-standard instrument that captures everything, combining multiple validated tools can function as an integrated framework. The challenge is to make sense of multi-dimensional data.

Some researchers have gone further to design interdisciplinary assessment tasks. The ATC21S (Assessment and Teaching of 21st Century Skills) project, for instance, developed tasks that measure collaborative problem-solving – blending cognitive problem-solving with social skills and often involving digital interfaces (Comfort, 2015). These tasks required students to work together (social domain) via a computer platform (digital domain) to solve academic-type problems (cognitive domain). The scoring of such tasks produced data on communication, teamwork, and problem-solving effectiveness. Similarly, newer "scenario-based assessments" sometimes incorporate elements that touch multiple domains: e.g., a scenario might require critical thinking (academic), ethical decision-making (social-emotional values), and information literacy (digital competence) all at once. While still in piloting stages, these approaches point to a future where assessment is more integrative by design, not just in analysis.

Figure 3.

Interplay Between Wellbeing, Digital Competence, and Academic Success



Multiple domains, one integrated view

In summary, the interplay between wellbeing, digital competence, and academic results is increasingly recognised and reflected in assessment frameworks (Figure 3). Researchers are actively exploring how improvements or struggles in one domain manifest in others. Interdisciplinary frameworks – whether it's linking survey results to test scores, or designing tasks that tap multiple competencies – provide a more nuanced picture of student development. The evidence broadly suggests positive correlations: better wellbeing often coincides with better academic performance, and strong digital skills can facilitate academic engagement. However, capturing these links requires a thoughtful combination of tools. The current state-of-the-art is to use multiple instruments in combination (for example, a wellbeing questionnaire + a digital skill test + academic records) rather than a single all-encompassing tool.

Policy Analysis and Identification of Gaps

With the growing awareness of digital wellbeing, policymakers and educational leaders worldwide have begun to formulate policies and guidelines to address technology's impact on learners and educators. This section reviews existing policies and frameworks related to digital wellbeing in education, examines how well they address key issues (responsible tech

use, data privacy, digital ethics, etc.), and identifies gaps or shortcomings. Understanding the current policy landscape is crucial for developing evidence-based recommendations to create a positive digital learning environment.

Existing Policies and Frameworks on Digital wellbeing in Education

Several countries and international bodies have introduced policies that explicitly or implicitly cover aspects of digital wellbeing. At the international level, the European Union (EU) has been proactive. In 2022, the Council of the EU adopted the "Council Conclusions on Supporting wellbeing in Digital Education," a policy document highlighting the importance of promoting digital wellbeing across education and training contexts.

These conclusions acknowledge that digital technologies have a "significant impact on learners' and educators' lives" and call for actions to address challenges like inclusion, cyberbullying, disinformation, and mental health in online environments. The EU's approach emphasises not only mitigating risks but also empowering schools to harness technology in ways that enhance wellbeing (for instance, using digital tools for inclusion of marginalised learners, fostering contentment and self-confidence through digital projects). In line with this, the European Commission updated the Digital Competence Framework (DigComp, 2022) to version 2.2 in 2022, explicitly integrating digital wellbeing: under the competence area "Safety," DigComp now defines a competence on protecting health and wellbeing, detailing knowledge, skills, and attitudes needed for individuals to safeguard themselves and others. This includes concrete elements like understanding ergonomic risks, mental health impacts, and using tools like privacy settings or content filters as part of staying safe and well online.

Similarly, the DigCompEdu (2017) framework for educators incorporates wellbeing, expecting teachers to be capable of ensuring learners' wellbeing while using technology and to teach digital citizenship that covers health and wellbeing topics.

These frameworks have influenced national curricula and teacher training programs across Europe, embedding digital wellbeing into standards and assessments of digital skills.

Another major policy area is online safety and digital citizenship education. For instance, Australia's eSafety Commissioner and the UK Council for Internet Safety provide guidelines that schools should educate students about online wellbeing, covering safe social media use, cyberbullying prevention, and balancing time online (UK Council for Internet Safety, 2020). The United States, while more decentralised in education, has seen state-level initiatives and

resources from organisations like Common Sense Media to guide schools in adopting "Responsible Use Policies" that include wellbeing clauses (e.g. discouraging excessive screen time during school, promoting respectful online behavior). The ISTE (International Society for Technology in Education) standards for students and teachers include elements of digital citizenship which overlap with wellbeing, such as advocating for students to cultivate digital identity and manage their digital lives in healthy ways (ISTE Standards 2016).

Moreover, professional organisations have begun to address educator wellbeing in digital contexts; for example, the OECD has discussed policies for supporting teacher wellbeing amid digital transformation, encouraging school partnerships to help manage the emotional and digital challenges teachers face (OECD, 2025).

In terms of data privacy and digital ethics, there are robust laws and guidelines that indirectly support digital wellbeing by protecting users from exploitation and harm. Key examples are laws like COPPA (Children's Online Privacy Protection Act), CIPA (Children's Internet Protection Act), and FERPA (Family Educational Rights and Privacy Act) in the U.S., which mandate protections for minors' data and regulate internet safety in schools.

In Europe, the General Data Protection Regulation (GDPR) imposes strict rules on how student data can be collected and used, with principles of data minimisation and consent that align with respecting student wellbeing and autonomy (European Parliament and Council of the European Union, 2016). The EU's focus on cybersecurity, through initiatives like the proposed Cyber Resilience Act, also ties into wellbeing by aiming to ensure the digital tools in use are secure and not prone to breaches or misuse that could distress users (European Commission, 2024).

Additionally, some education ministries have issued screen time guidelines. For example, Canada and some Scandinavian countries have national health recommendations for maximum recreational screen time for children (often 1-2 hours for young kids, excluding homework) and encourage schools to follow age-appropriate device use policies in line with those health guidelines (Nordic Welfare Centre, 2025). During COVID-19, ministries of education worldwide disseminated guidelines on healthy remote learning, which included advice like maintaining routines, encouraging physical activity breaks, and watching for signs of student mental health issues.

Industry and non-profit initiatives also form part of the policy landscape. Tech companies like Google and Apple have introduced "digital wellbeing" features (app timers, focus modes) on devices, and while these are user settings rather than formal policies, some schools have incorporated them into their practice (e.g., a school might instruct students on using iOS Screen Time features to self-monitor). At the policy level, companies are increasingly being held accountable. The French government banned smartphones in schools for students up to

age 14 in 2018 (Beardsley, 2018), citing student wellbeing and focus. Similarly, China introduced regulations to limit gaming time for minors to combat digital addiction. These national policies reflect growing concern for youth digital wellbeing, although their implementation and effectiveness vary.

Overall, there is a patchwork of policies addressing digital wellbeing from different angles – digital literacy frameworks, online safety laws, educational standards, and even device usage rules. Global organisations like UNESCO also emphasise a humanistic approach to digital transformation in education, advocating for learner wellbeing and inclusion (UNESCO, 2019). However, until recently, few policies used the specific term "digital wellbeing"; it is often embedded in broader concepts like safety, health, or citizenship. The trend in the 2020s is a more explicit acknowledgment, as seen in EU documents and some national strategies, that digital wellbeing is a policy priority in its own right, cutting across health, education, and technology domains.

Gaps in Policies and Responsible Technology Use

Despite these developments, significant gaps remain in the policy framework for digital wellbeing in education. One gap is the implementation gap – policies exist on paper, but practical support and enforcement can lag. For instance, while many countries urge schools to teach digital citizenship (including wellness), not all teachers feel prepared to deliver this content, and curricula may not allocate sufficient time for it. There is often a lack of assessment for digital wellbeing competencies; unlike math or reading, we seldom measure how well students can self-regulate their tech use or demonstrate digital empathy. This means accountability for teaching these skills is low. Furthermore, policies around teacher training in digital wellbeing are sparse. Teachers shoulder the responsibility of guiding students, but policies rarely mandate training educators to manage their own tech stress or model healthy behaviors. A teacher who is expected to answer emails 24/7 and gets burnt out is less capable of cultivating student wellbeing. Yet, few educational systems have policies ensuring teacher digital work-life balance or providing systemic support for teacher technostress beyond generic wellness programs. The Frontiers study in Hungary (Buda & Kovács, 2024) concluded that without institutional policies to maintain boundaries (like not expecting instant responses at all hours), the pressure of digital work will continue to erode university teachers' wellbeing. This is indicative of a global gap: the wellbeing of educators in the digital environment is not as robustly addressed as student wellbeing in most policy dialogues.

Another gap lies in comprehensiveness and coherence. Policies often tackle specific issues (screen time limits, cyberbullying, data privacy) but may fail to offer a holistic strategy for digital wellbeing. For example, a school might have an Acceptable Use Policy (AUP) that details what students can or cannot do on school devices (like no social media during class), but it might not include positive guidance such as strategies for time management or a section on mental health resources if tech use becomes overwhelming (Joseph, 2025).

Responsible use policies frequently emphasise compliance and risk avoidance rather than proactive wellbeing promotion. Moreover, digital ethics issues – such as the impact of AI on student autonomy, or the need for informed consent when using data-driven educational software – are only beginning to be discussed. There is a policy gap in clarifying ethical guidelines for EdTech: schools need criteria to evaluate whether a new app or platform aligns with wellbeing principles (e.g., does it protect student data? does it have addictive features? is it accessible and inclusive?). Without such guidelines, schools might adopt technologies that inadvertently harm wellbeing (like a platform that monitors students excessively, creating a surveillance culture). The New America report (Cao & Li, 2023) pointed out that some EdTech tools prioritise data collection over student agency and wellbeing, and current privacy laws, while protecting data, can sometimes inadvertently restrict beneficial uses or confuse educators.

This suggests a need for more nuanced policies that balance privacy, security, and wellbeing. Ensuring student data is protected (to prevent harms like exposure of personal info or profiling) while also ensuring students and teachers have agency and clarity in how data is used.

Data privacy and protection is an area with both strong policies and notable gaps. Laws like FERPA and GDPR provide frameworks, but many teachers and students remain only vaguely aware of their rights and responsibilities under these laws (Cao & Li, 2023). Policies don't always translate into practice; for example, a study by Educause (Park & Vance, 2021) found that students do care about data privacy and want transparency, but institutional policies on data are often buried in fine print or not communicated in student-friendly ways. Similar issues are pointed out by Anderson (2022).

This lack of awareness can undermine wellbeing, as students might feel anxious or mistrustful if they suspect their data is being misused, or alternatively they might unknowingly consent to invasive practices. Additionally, emerging technologies like AI-driven learning analytics present a policy gap: how to ensure algorithms are fair, transparent, and in service of student wellbeing? There is limited policy guidance on the use of AI tutors or monitoring software (some schools deployed proctoring software during remote exams that led to student stress and privacy concerns, often before clear guidelines were in place). The rapid pace of tech

advancement often outstrips policy development, leading to reactive measures rather than proactive planning.

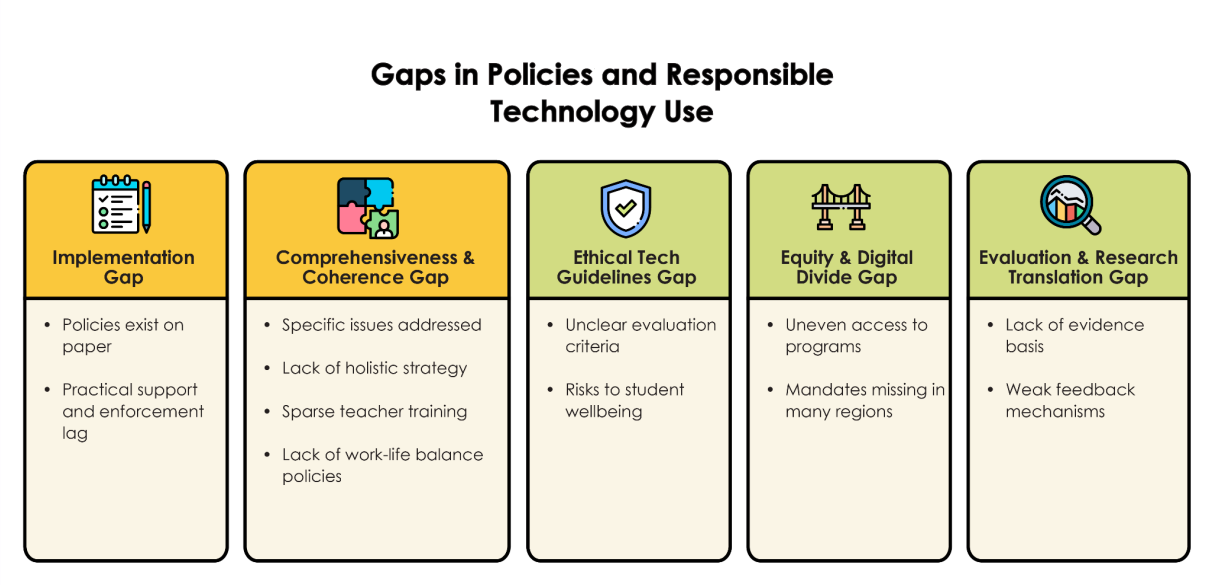
The digital divide also manifests as a policy gap. While infrastructure programs exist (e.g., broadband expansion, device donation), fewer policies tackle the experiential divide – the difference in guidance and support students receive on healthy tech use. Students in well-funded schools might have digital wellness programs, whereas those in under-resourced schools might not, exacerbating inequities. A holistic policy would ensure all students, regardless of background, receive education on digital wellbeing. The absence of such mandates in many regions is a gap to fill.

Finally, there is a gap in evaluation and research translation. Many policies have been set without a strong evidence base (out of urgent necessity or public pressure). For example, smartphone bans are enacted in some places without clear consensus from research, which is still mixed on how directly phones cause harm versus how they are used.

There's a need for policies to be continually informed by up-to-date research – a feedback loop currently weak in many systems. Few education departments systematically measure outcomes of their digital wellbeing initiatives. This lack of monitoring means potential gaps or unintended consequences of policies might go unnoticed.

Figure 4.

Gaps in Policies and Responsible Technology Use



In summary, while progress has been made in policy responses to digital wellbeing challenges, gaps persist in implementation, comprehensiveness, educator support, ethical tech guidelines, equity, and evidence-based refinement (Figure 4). Recognising these gaps is the first step to addressing them through improved policy design and enforcement.

Recommendations for a Positive Digital Learning Environment

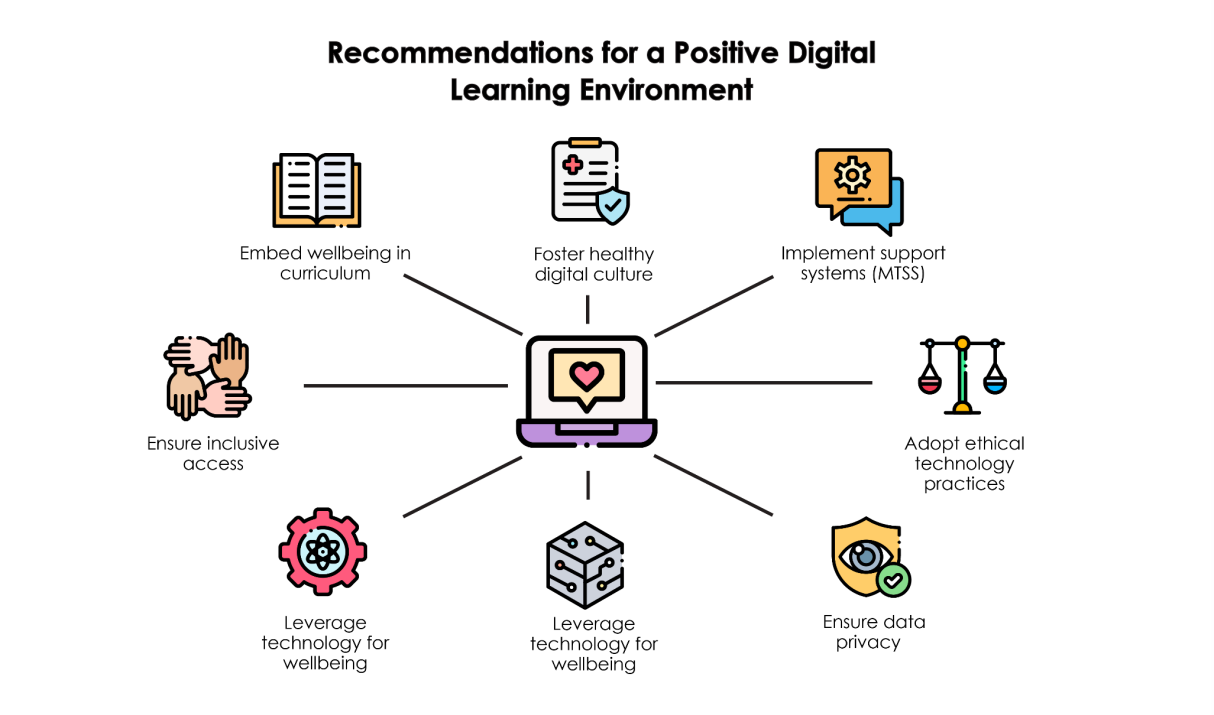
Drawing on the literature and identified gaps, the following evidence-based principles and recommendations are proposed to cultivate a positive digital learning environment that supports wellbeing for all stakeholders:

Embed Digital wellbeing in Curriculum and Instruction: Education authorities should integrate digital wellbeing topics into curricula at all levels. This includes teaching students about safe and balanced technology use, information literacy, and coping strategies for online stress. Schools can adopt digital citizenship programs that cover mental health online, cyberbullying prevention, and respectful communication. Ensure that these lessons are age-appropriate and occur regularly (not one-off assemblies). For example, implement modules where students reflect on their screen time, discuss scenarios of unhealthy vs. healthy tech use, and practice skills like using privacy settings or reporting concerns.

Promote a Healthy Digital Culture in Schools: School leaders should establish a culture that values wellbeing as much as technological adeptness. This might involve setting norms such as device-free spaces/times (e.g., no phones during breaks to encourage physical play) (Schneider & Dong, 2024), or encouraging mindful use (teachers and students agreeing to take short stretch breaks during long computer sessions). Encourage open conversations about the impact of technology on life. Initiating discussions about how students feel about social media trends or remote learning experiences. A positive digital culture also means cultivating "digital detox" as a skill: schools could have occasional "unplugged days" or challenges where the community practices low-tech activities, reinforcing that it's okay (and healthy) to disconnect at times (Figure 5).

Figure 5.

Recommendations for a Positive Digital Learning Environment



Support Systems for Digital Wellness: As suggested by recent educational research (Schneider & Dong, 2024), adopt a Multi-Tiered System of Supports (MTSS) for digital wellbeing.

Provide universal interventions for all students, such as general lessons on digital wellbeing, guidelines for screen time, and incorporation of wellbeing checks in classes. All teachers should integrate simple practices (like beginning class with a short mindfulness moment). Identify students (or staff) who show signs of tech-related stress or problematic use and offer targeted group sessions. Counselors, librarians, or tech coaches could run these.

For individuals facing severe issues (e.g., internet addiction, cyberbullying trauma), ensure access to counseling or professional support. Develop referral pathways so that such students can get help from mental health professionals who understand digital contexts.

Support and Train Educators: Teachers and staff need support to manage their own digital wellbeing and to confidently teach these concepts. Professional development should cover strategies for teacher wellbeing in tech-rich environments (time management, setting boundaries for availability, handling technostress) (Buda & Kovacs, 2024), as well as pedagogical techniques to foster student wellbeing. Training could include how to recognise when a student is overwhelmed by technology (e.g., disengaging, anxious when asked to use a device) and how to intervene supportively. Schools should also review their expectations of teachers' connectivity. For example, avoid policies that require teachers to answer emails late at night, and encourage a work-life boundary such as not sending

non-urgent messages after hours. By modeling balanced tech use and self-care, teachers will be more effective role models for students.

Implement Ethical and Safe Technology Practices: Develop or update acceptable use policies (AUPs) and tech procurement policies with wellbeing in mind. When choosing educational software or devices, consider their impact on student health. The following questions could help guide the decisions: Does the software protect student privacy? (Chung et al., 2025). Does it avoid manipulative design that could lead to overuse? Does it have accessibility features to accommodate all learners? Is the tool in compliance with privacy laws (FERPA, GDPR) and is it transparent about data usage? Incorporate student and parent input when drafting tech policies. Their perspectives can highlight issues (like students feeling stressed by being required to be on camera all the time in virtual classes) that administrators might overlook. Policies should clearly address cyberbullying (with reporting mechanisms and consequences) and ensure content filtering balances protecting students with not over-blocking useful resources. Regularly communicate these policies to students and parents in clear, accessible language.

Ensure Data Privacy and Digital Rights: Set up strong data protection standards so that students and educators feel secure. Conduct audits of the data collected by educational apps in use and minimise what is gathered to only what is pedagogically necessary (Chung et al., 2025). Be transparent – for instance, inform students if activity monitoring software is used, and explain why and how the data is handled. Empower students with knowledge of their digital rights (e.g., they can request to see what data is stored about them). By treating privacy as integral to wellbeing, schools build trust. In policy terms, push for alignment with frameworks like the EU's concept of digital citizenship that includes rights like privacy, identity, and wellbeing as intertwined (Council of the European Union, 2022). Advocate at higher levels if needed – e.g., encourage education departments to issue clear guidelines on using AI ethically in classrooms or on avoiding surveillance-like environments that could harm the psychological safety of students.

Leverage Technology for wellbeing: The solution isn't to eliminate tech, but to use it thoughtfully as part of wellbeing efforts. Schools can deploy digital tools that enhance wellbeing: examples include apps for mindfulness or mood tracking that students can use as part of health education, online platforms that make it easier for parents and teachers to collaborate on supporting a student (improving the support network), or using analytics to proactively identify students who might be struggling (e.g., noticing if a student hasn't logged in for days and triggering an outreach). However, these should be opt-in and carefully managed to avoid privacy invasion. Some universities have success with wellbeing portals that centralise resources which could be adapted for secondary schools. The goal is to signal that technology can be part of the solution (for example, connecting a lonely student to a

mentor online, or providing cognitive behavioral therapy exercises via an app) when used intentionally.

Inclusive and Equitable Access: Address the socio-economic factors by ensuring all students have equal opportunity to develop digital wellbeing. This includes continuing efforts to close the digital divide (providing devices, internet access to those in need) (Chung et al., 2025), so that disadvantaged students are not forced into unhealthy usage patterns (like using a smartphone for homework leading to multitasking with social apps due to lack of a computer). Additionally, provide targeted support for students with special needs – for instance, those with visual impairments need assistive tech to avoid eye strain, and neurodivergent students might need personalised settings to reduce sensory overload. An inclusive digital environment is one where tools and teaching methods are adapted to diverse needs, which in turn supports everyone's wellbeing by reducing frustration and exclusion.

Moreover, the provision of assistive technologies in schools is an essential component of inclusive digital wellbeing. Tools such as screen readers, text-to-speech software, alternative input devices, and other adaptive technologies enable students with disabilities, language barriers, or limited connectivity to participate fully in learning (UNESCO, 2020). Across Europe, the availability of assistive educational technology has increased over the last five years; however, its effective use remains uneven due to gaps in teacher training, funding, and integration into mainstream digital education practices (European Agency for Special Needs and Inclusive Education, 2022). These disparities suggest that merely providing technology is not enough – educators and support staff must be equipped to use these tools effectively. Strengthening professional development and resources in this area is crucial so that inclusive digital strategies truly reach all learners. In sum, designing a positive digital learning environment must include accessible platforms and assistive resources that accommodate diverse learner needs, thereby embodying the principle that digital wellbeing is for everyone.

Monitoring and Continuous Improvement: Establish metrics to monitor digital wellbeing in the school. Just as schools track academic performance, they can track indicators of wellbeing: conduct periodic surveys about students' and teachers' experiences with technology (e.g., asking about stress, engagement, sense of safety online) (Buda & Kovacs, 2024). Use these data to identify problem areas (maybe students report frequent headaches from device use – prompting a push on ergonomics education (Gushgari et al., 2024), or teachers report high technostress – prompting IT support improvements). Create channels for ongoing feedback; perhaps a student digital council that meets with school leadership to discuss digital life at school. At a higher policy level, ministries could incorporate digital wellbeing indicators into school inspection or quality assurance frameworks, ensuring it remains on the agenda.

By implementing these recommendations, educational ecosystems can move toward a more human-centered digital transformation, one that recognises learners and educators as whole people whose wellbeing is fundamental to their success. The emphasis is on balance, support, and intentional design of both policy and practice. Technology in education should be a tool that enriches learning while safeguarding the health and happiness of those who use it – achieving this is a shared responsibility of policymakers, educators, students, and the broader community.

Real-World Examples of School Digital Detox Initiatives in Europe

Across Europe, schools and governments have launched **"digital detox"** initiatives – from nationwide smartphone bans to local school programs – aimed at improving students' wellbeing and focus. Below we examine several case studies, including national policies and school-level implementations, highlighting their scope, motivations, strategies, stakeholder engagement, and reported outcomes.

France: National Smartphone Ban in Schools

Nature of the initiative: France implemented a nationwide ban on student use of mobile phones and similar devices in primary and middle schools (up to about age 14–15) via a 2018 law (French Ministry of Education, 2018). During school hours (including breaks and activities on school premises or trips), phones, tablets, and smartwatches must be turned off and kept out of sight – effectively giving children a "digital pause" from constant connectivity. While students are still allowed to bring their devices to school (the law doesn't forbid possession if they are powered off), many schools encourage storing them in lockers or collected pouches for the day. Limited exceptions are permitted for explicit educational use, medical needs, or disabilities, as defined in each school's internal policy. In 2024, building on the initial law, France's Ministry of Education even piloted a stricter "digital break" experiment (Willsher, 2024) at ~200 secondary schools, requiring students to hand over phones at reception, with the aim of extending this practice nationwide if deemed successful.

Key motivations: The smartphone ban was driven largely by concerns over student wellbeing, focus, and healthy development. French officials cited rising evidence that excessive screen time and social media use were harming children's mental and physical health – affecting their sleep, attention spans, physical activity levels, and social development. A presidential commission's report in 2024 reached a "very clear consensus on the direct and indirect negative effects" of rampant device use on youth, describing overexposure to screens as

detrimental not only to kids but to "society and civilisation". By enforcing a phone-free school environment, the government sought to reduce digital distractions, improve classroom focus, and encourage students to engage in face-to-face interaction during the school day. The Education Minister at the time framed the ban as a detox measure against screen addiction and a way to help children "rediscover the value of being present" without constant phone alerts.

Implementation and stakeholder engagement: France's ban was enacted through legislation and took effect uniformly across public schools, meaning compliance was mandated in school charters by law. Schools updated their internal rules to reflect the prohibition and procedures (e.g. requiring phones to be *éteints et rangés* – turned off and put away – on campus). Enforcement is typically handled by teachers and school staff, with potential confiscation or disciplinary measures if students are caught using devices during school hours. French policymakers did involve educational stakeholders in shaping the approach; for instance, the 2018 law emerged from campaign promises and debates on how to curb cyberbullying and distractions. Some initial parental concerns – such as the ability to reach children during emergencies – were allayed by clarifying that students could still keep phones off in their bags, accessible after school. By 2024, seeing persistent smartphone-related issues, the Ministry consulted school leaders for the pilot requiring device collection. This trial was explicitly supported by the Education Minister and informed by the expert commission's findings on youth digital health. Overall, France's strategy has been a top-down policy push, accompanied by public messaging about digital wellness.

Reported outcomes: Quantitative nationwide evaluations of the French ban's impact are still limited. However, anecdotal observations from schools and early studies elsewhere suggest positive effects. French teachers have reported calmer environments and more attentive students in class after the ban, according to media reports. The rationale for the policy is bolstered by external research: for example, a UK study (Beland & Murphy, 2015) found that secondary schools which banned phones saw test scores improve by over 6%, with the largest gains among lower-achieving students. This improvement was equated to adding an extra week of instruction per year, underscoring how removing distractions can benefit academic outcomes. French officials have cited such evidence and early feedback to justify the ban. Additionally, the ongoing 2024 "digital break" experiment will provide data on compliance and effects when phones are fully surrendered at school; its success is being measured by indicators like student attention, incidence of bullying, and feedback from teachers and pupils. Early indicators from comparable initiatives elsewhere (see Netherlands below) show reduced cyberbullying and improved student focus in phone-free schools, outcomes French authorities hope to mirror. It is worth noting that some skepticism remains – for instance, whether banning phones merely delays issues until after school – but France's case has become a flagship example of a national-level digital detox policy aimed at student wellbeing.

Belgium: Regional School Phone Ban

Country and level: In Belgium's Francophone region (Wallonia-Brussels Federation), the government recently moved to ban smartphones in primary schools and the first years of secondary school (roughly ages 6–14). This policy, announced in 2024, makes French-speaking schools in Wallonia and Brussels among the latest in Europe to adopt a school device ban (Haeck, 2024). The rule prohibits student use of mobile phones on school premises for the covered grade levels. It aligns with Belgium's decentralised education system – the initiative was taken by the regional (community-level) authorities responsible for education, rather than the federal government.

Nature of the initiative: The ban in Wallonia-Brussels is a comprehensive in-school phone prohibition for younger students. Many schools have interpreted it as requiring students to either leave phones at home or deposit them upon arrival. For example, one international school near Brussels already had students start each day by placing their phones in lockers, with any unauthorised use leading to confiscation until day's end. This model of "phone lockers" or morning collection is expected to be replicated widely as the official policy takes effect. The ban targets non-educational use; like similar policies elsewhere, there may be allowances for using devices under teacher supervision for pedagogical reasons, but generally the school day is intended to be phone-free for those grade levels.

Key motivations: Belgian authorities and educators cite growing concerns around smartphones as drivers for this policy. Chief among these are:

- Distraction and academic focus: Phones are seen as a major source of distraction in class, contributing to shorter attention spans and off-task behavior. Officials want to refocus students on learning by removing the temptation of social media and messaging during lessons.
- Cyberbullying and misuse: There is worry that smartphones facilitate bullying (e.g. hurtful messages, sharing photos) and even the harassment of teachers (such as surreptitiously filming classes). A total ban is viewed as a way to curb these problems on school grounds.
- Mental health and wellbeing: Excessive screen time and social media use have been linked to anxiety and other wellbeing issues in youth. Belgian policymakers, like their French counterparts, are responding to public concern that constant connectivity is harming children's social development and mental health. The ban is partly a preventive measure to encourage more offline social interaction and physical activity during breaks.

These motivations were highlighted by experts and stakeholders during the policy's development. For instance, a professor involved in advising noted that earlier attempts to

merely *manage* phone use (instead of banning) had failed – schools found it hard to enforce moderate rules given students' strong attachment to their phones. This set the stage for a stricter stance.

Implementation strategies and engagement: The Wallonia-Brussels phone ban emerged from a political coalition agreement and was developed in coordination with school networks. Even before it formally passed, hundreds of schools did not wait – they proactively instituted their own bans in anticipation of the official policy. This suggests substantial buy-in at the school level. The regional education federation (Wallonie-Bruxelles Enseignement) actively promoted a clear stance of "no phones at school," issuing guidance to schools on enforcement. Enforcement strategies include the use of phone lockers or collection at the start of the day and clear consequences (like confiscation) for breaches. Stakeholder engagement has involved: school directors (many of whom support the ban to "bring peace" to school halls), teachers' groups (who reported difficulty teaching amid constant phone distractions), and parents. Some initial opposition came from parents concerned about contacting children, but schools have communicated that urgent messages can go through the school office, as was routine before smartphones. The education ministers of Belgium's communities also discussed aligning their approaches; notably, Flanders (the Dutch-speaking region) has let schools decide individually, while Wallonia chose a regulated ban, indicating different stakeholder views across the country. The Francophone community's move was also influenced by observing France and the Netherlands taking similar measures, creating regional momentum for a unified policy.

Reported and anticipated outcomes: As the Wallonia-Brussels ban is being rolled out, formal outcome data is not yet available. However, expected outcomes have been voiced by educators and experts based on early experiences and analogous cases: they anticipate calmer, more focused classrooms and improved student interaction. "*A total ban now has the benefit of clarity: It will bring peace in schools. There won't be any cyberbullying, teachers won't be filmed, [and] the attention span will be trained,*" said one Belgian media & technology professor about the policy. Many school principals predict reduced incidents of online harassment during school hours and a revival of face-to-face socialising during breaks (e.g. students playing on the playground instead of staring at screens). These qualitative benefits were observed in individual schools that implemented bans early: one school director in Brussels noted that without phones, conversation and playground activities returned, reversing the previous scene where "the table tennis tables were empty" and students were glued to their screens. Though broad data is pending, the *political rationale* for the ban has been supported by international studies linking reduced smartphone use to better academic and wellbeing outcomes. For example, UNESCO's 2023 report noted that removing phones in school correlated with improved learning outcomes in parts of Europe, and other EU countries (like Spain, Italy, and Greece) that have limited phone use also report smoother classroom management. Belgian officials will likely monitor indicators such as

student disciplinary records, bullying reports, and perhaps even academic performance over the coming semesters. If outcomes mirror those in France or the Netherlands, Belgium's phone-free schools could see more engaged learners – but if challenges arise (such as students resisting or finding workarounds), adjustments and additional digital education efforts may be needed. The rollout thus far suggests a strong commitment to making the school environment phone-free, with the understanding that this is one piece of the larger puzzle of digital wellbeing.

The Netherlands: Ban on Phones in Classrooms

Country and policy level: The Netherlands has recently instituted a nationwide policy banning mobile phones, tablets, and smartwatches in classroom settings, which took effect on January 1, 2024 (Reuters 2023; Kassam, 2024). This measure covers most secondary schools (and was later extended in guidance to primary schools), targeting device use during instructional time. Students may still carry their phones, but devices cannot be used in class unless explicitly allowed for a lesson's purpose or in special cases (health needs, learning disabilities). The policy was introduced as a government directive (supported by an agreement with schools) rather than immediately as a hard law, giving schools flexibility in implementation with a warning that formal legislation would follow if compliance was insufficient by mid-2024.

Nature and implementation: The Dutch approach emphasises "phones out of the classroom by default." Schools were encouraged to craft their own methods to achieve this – for example, some schools require students to keep phones in lockers or in designated pouches during class, while others allow phones on person but strictly silenced and unused. The Education Minister Robbert Dijkgraaf explicitly stated that "*even though mobile phones are intertwined with our lives, they do not belong in the classroom*" when they distract from learning. The ban's implementation was a collaborative effort: it resulted from an agreement between the Ministry of Education, school boards, and educational organisations, indicating broad stakeholder consensus on the need to curb distractions. This consensus-building meant that by the time the policy took effect, many schools and teachers were on board and had plans in place. To support the rollout, the ministry provided guidelines and highlighted that if voluntary measures failed, legal enforcement would be imposed, underscoring the government's resolve. Notably, the policy allows educational use of devices – teachers can still leverage smartphones or tablets in lessons when pedagogically relevant (e.g. for a digital skills module or using an app as a learning tool), but such usage is at teacher discretion and tightly scoped.

Key motivations: The driving motivations in the Netherlands were closely aligned with those in other countries: improving academic focus and safeguarding student wellbeing. Officials were influenced by mounting evidence that smartphones in class lead to multitasking and

interruptions that hurt student performance. Minister Dijkgraaf cited scientific research showing phones are a "disturbance" to learning, emphasising the need to protect students' ability to concentrate. The policy's announcement came amid broader concerns in Dutch society about youth screen time and mental health. Additionally, the success of early adopter schools within the Netherlands provided motivation. For instance, Calvijn College (a secondary school network) had banned phones across its campuses a few years earlier; administrators there observed that prior to the ban "*walking through the corridors… all the children were on their smartphones [and] conversations were missing*", which signaled an erosion of social culture at school. Such firsthand accounts, along with research on distractions, underlined the need for a nationwide policy. There were also concerns about equity: some education experts noted that phone distractions can exacerbate achievement gaps – with more vulnerable students losing learning time – so a ban was seen as a way to promote equal opportunity in the classroom.

Stakeholder engagement: The rollout of the Dutch classroom phone ban was marked by consultation and phased encouragement. Rather than impose an immediate top-down law, the Ministry worked with school associations to get buy-in. In late 2023 the government "*urged schools*" to start implementing bans, which many did voluntarily. The recommendation was soon extended to primary schools as well, reflecting growing support. Researchers were also engaged in this process – for example, as schools prepared to go phone-free, a team at Radboud University partnered with some to evaluate the impact (see below). There was some resistance from a minority of stakeholders: about 20% of parents, teachers, and students in one school's survey initially opposed a ban (citing reasons such as the need to reach students, or a pedagogical belief in teaching responsible phone use rather than outright prohibition). These concerns were addressed through dialogue; schools reassured parents that emergencies could be handled via school phones, and educators discussed alternative ways to integrate technology. Overall, the strong coalition between government and school leaders, plus visible success stories, helped overcome objections. By the time of implementation, the policy had broad acceptance as a necessary step to improve the learning environment.

Reported outcomes: Early evidence from the Netherlands' phone ban is encouraging on multiple fronts. A study by Radboud University researchers captured a "before and after" snapshot at two secondary schools that eliminated phone use on campus in 2024. Just three months post-ban, about 20% of students reported feeling less distracted in class without their smartphones, and teachers noted students were more attentive and focused on schoolwork. The researchers concluded that from a cognitive standpoint, the ban had an overall positive effect on student engagement. In addition, many students observed improvements in their social life at school: more real-life interactions during breaks and higher quality face-to-face conversations, as opposed to everyone retreating into screens. Correspondingly, the schools saw a reduction in cyberbullying incidents, since students were offline at school and not

perpetuating conflicts via social media during the day. These findings validate the ban's intended benefits – confirming that removing phones can create a calmer, more focused and socially connected school atmosphere. School leaders at Calvijn College described a transformation: "*what we had lost, we got back – students playing and talking to each other, and a lot less interruptions in lessons*". On the academic side, while it's early to measure long-term grade impacts, the expectation (in line with prior studies) is that sustained attention in class will yield academic gains. Dutch educators also point out ancillary benefits such as students potentially breaking phone dependency habits and learning to be present. However, outcomes have not been uniformly positive for every student. Surveys found about 37% of students admitted they missed their phones or felt some frustration, with a few saying they felt "forced to socialise" when they weren't in the mood. This highlights that adaptation takes time and that not all students immediately embrace a phoneless environment. Despite this, a majority have adjusted well – roughly 40% said they actually enjoyed their breaks more without phones after a few months. Teachers and principals overwhelmingly prefer the new rule, even as they remain attentive to students' feelings. The Dutch case thus demonstrates tangible benefits (better concentration, social wellbeing) while also underscoring the need to support students through the change. The government has indicated that if compliance remains high and results stay positive, the agreement may simply continue; if not, binding legislation will ensure the policy endures. The initial success has been influential: the Netherlands' move was noted across Europe, adding momentum in countries like Belgium, Ireland, and France to consider or strengthen similar bans.

United Kingdom: School-Led Digital Detox

Context and initiative: In the UK, there is no nationwide law banning student smartphones, but many schools have instituted their own policies to address digital wellbeing. *Stroud High School* in Gloucestershire, England, offers a notable case of a school-driven "digital detox" initiative at the secondary level. Stroud is a state secondary school (ages 11–18, predominantly girls) that gained national attention for its proactive approach to smartphone overuse and social media issues among students (Hill, 2017). In 2017, the school's leadership introduced a new policy restricting phone use by year group and launched programs to encourage periods of going offline. Under the policy, pupils in Years 7–9 (ages ~11–14) were banned from using phones entirely during the school day, even during breaks. Older students had graduated permissions – for instance, Years 10–11 could use phones only at lunch, and sixth-formers (16–18) were allowed phones more freely on site but never during lessons. To complement these rules, the school organised events like a week-long "Digital Detox Week" in which both students (about 400 participants) and staff voluntarily gave up their smartphones and personal devices, even at home, for a full week.

Motivations and drivers: The initiative at Stroud High was driven by mounting concern for students' wellbeing and a recognition that smartphone habits were negatively impacting

school life. School administrators observed issues such as: excessive social media "addiction," anxiety around online image and peer comparison, and even unhealthy behaviors tied to digital tracking. Notably, the phone clampdown was partly sparked by reports that some girls had become obsessed with fitness apps (step counters, calorie trackers) and were skipping meals to meet targets. There were also incidents of online pressures, like students feeling compelled to send or receive explicit images, which a group of Stroud girls courageously spoke out against in an open letter to their peers. Deputy Headteacher Cindi Pride explained that constant social comparison via Instagram/Snapchat was "hugely detrimental" to girls' self-esteem, fueling envy and body image issues. A school-conducted survey underscored the problem: almost 75% of Stroud students said they checked or responded to social media "constantly," and over half were taking their phones to bed each night – yet more than half of the younger students admitted *they wished to feel more in control* of their device use. This revealing "*cri de coeur*" from students – indicating they wanted help with self-regulation – was a major driver for the school to act. In summary, student wellbeing, mental health, and academic focus were the key motivations, with issues like cyberbullying, sexting, distraction in class, and sleep deprivation all intertwined with unbridled smartphone use.

Implementation strategies: Stroud High's approach combined strict rules with education and stakeholder engagement. The phone-use rules by grade were clearly communicated and enforced by staff – for example, younger students found using a phone might have it confiscated until day's end. But rather than rely on punishment alone, the school sought to create a culture of digital wellness. They collaborated with stakeholders at multiple levels: students, parents, feeder primary schools, and even local government and health services. Notably, students were involved as *agents of change*. The administration supported student-led initiatives such as the aforementioned open letter campaign about sexting, which empowered students to define healthy boundaries online. The school also worked with local primary schools to start digital wellbeing education early, and partnered with mental health professionals to deliver workshops on issues like social media's impact on self-image. During the Digital Detox Week, the school created a supportive environment – acknowledging it would be challenging for teens to abstain from devices. They likely offered alternative activities and encouraged students to reflect on their experiences. Participation was voluntary but widespread (hundreds took part), indicating effective buy-in. School staff modeled the behavior as well by giving up their own devices that week, underlining the message that *everyone* can benefit from unplugging. Throughout implementation, the messaging from Stroud was not "technology is evil" but rather "let's find balance." As one student participant observed, "*The technology in itself isn't the problem – it's how people use it*", echoing the school's philosophy that education, not just restriction, is key to long-term digital wellbeing.

Outcomes and observations: Stroud High's digital detox efforts yielded qualitative improvements in student wellbeing and behavior, as reported by both students and staff.

During the phone-free week, students noted several benefits: they had more free time and felt less stressed when not constantly checking notifications or social media. One 16-year-old student reflected that the detox wasn't as hard as expected – after a couple of odd days, "*by the end of the week I didn't miss it [the phone]*". She also experienced academic and health gains: without the nightly smartphone habit, she got more sleep and found it much easier to concentrate on homework, completing assignments in far less time than usual and with better quality. In her words, "*that week I did the best homework I'd done in a while… I woke up having eight hours' sleep and woke up feeling better*", a striking testament to the benefits of a short-term digital detox. School staff observed that, with phones out of sight, students engaged more with each other – e.g. talking across the lunch table instead of texting, and being more present in lessons (less sneaking glances under the desk). These outcomes align with the broader pattern seen in other phone-ban contexts: improved focus, better in-person socialisation, and fewer online incidents during school hours. Another positive outcome was heightened awareness and behavior change. The fact that over half the students wanted to control their usage (from the pre-survey) and then willingly participated in the detox suggests the initiative succeeded in opening a dialogue and empowering students to rethink their habits. Some impacts went beyond the week itself – students and families were prompted to set their own rules (like no phones at dinner or before bed) after experiencing the benefits of unplugging. Importantly, Stroud's leadership and students both emphasise that these measures are part of a learning process. Rather than a permanent ban for older teens, the school allowed graduated privileges, aiming to teach responsible use as students mature. The deputy head stressed that simply banning devices isn't a standalone solution: "*Education is the solution… Children need to learn to self-regulate. They're not being given the opportunity to do that if their phones are just taken away*", reflecting a view also shared by some researchers. Thus, an observed "outcome" of Stroud's approach is a more nuanced student understanding of digital balance. The initiative has been held up as a model within the UK, illustrating how a school community can rally to improve digital wellbeing. It shows that when given support and a structured challenge, students themselves can recognize the value of disconnecting – a valuable lesson that could have lasting effects on their relationship with technology.

Across Europe, both national governments and individual schools have implemented a variety of digital detox strategies aimed at reducing student distraction, improving wellbeing, and fostering more engaged learning environments. France and the Wallonia-Brussels Federation in Belgium have enacted sweeping school-level smartphone bans, driven by concerns over mental health, cyberbullying, and academic focus. These policies typically prohibit mobile phone use during the school day and have been associated with calmer classrooms, increased peer interaction, and reduced disciplinary issues. Similarly, the Netherlands introduced a national agreement banning phones in classrooms, with early results indicating improvements in concentration, social connection, and reduced screen dependency. At the local level, schools such as Stroud High School in the UK have adopted

creative approaches like Digital Detox Weeks, combining device restrictions with wellbeing education and student leadership. These initiatives demonstrate that when digital restrictions are combined with stakeholder engagement and clear communication, schools can successfully reshape digital habits and create learning environments more conducive to wellbeing and academic success.

Recommendations for Future Research and Practice

To move toward more holistic and effective assessment of student wellbeing, digital competence, and academic outcomes, future research should build on the lessons learned and address the gaps identified. Below are evidence-based recommendations for refining assessment methodologies and developing new or improved tools. These recommendations also include strategies for piloting and validating instruments in diverse educational settings – from high-tech digital classrooms to nature-integrated learning environments – to ensure broad applicability.

1. Co-creation of Assessment Instruments with Stakeholders: One clear way to improve content validity and relevance is to involve students, teachers, and other stakeholders in the development of assessment tools. As the scoping review indicated, only a few studies to date have consulted students in instrument design, but those that did found value in capturing students' own conceptions of wellbeing (Hossain et al, 2023). Future assessment development should adopt a participatory design approach – for example, organising workshops with students to identify what wellbeing means to them or what digital skills they consider important, and using that input to generate survey items or performance tasks. This can ensure that important contextual or cultural factors (which experts might overlook) are included. Moreover, involving teachers and counselors can help align instruments with practical school contexts (making sure questions are interpretable, ensuring the feasibility of observational checklists, etc.). Such co-creation not only yields more valid instruments but also fosters buy-in, making it more likely the tools will be used as intended in real settings. Researchers designing the next generation of wellbeing scales or digital literacy tasks should therefore budget time for stakeholder interviews, focus groups, and pilot feedback sessions, rather than relying solely on top-down theoretical construction.

2. Development of Integrated Assessment Frameworks: Building on the interplay discussion, there is a need for frameworks that systematically integrate multiple domains of student development. Future research could work on creating and validating a combined assessment tool that measures academic skills, socio-emotional wellbeing, and digital

competence in a coherent way. For example, researchers might develop a scenario-based assessment where students are given a collaborative problem to solve on a computer (measuring academic and digital skills) and also periodically self-report their stress or use coping strategies during the task (measuring aspects of resilience or wellbeing). Such integrated tasks would provide data on different domains under the same conditions, allowing for a nuanced analysis of how they interact for each student. While challenging to design, there have been initial efforts in this direction (such as tasks measuring collaborative problem solving that inherently blend social and cognitive skills). Another approach is an assessment framework with parallel instruments: for instance, a package that includes a wellbeing questionnaire, a digital skills test, and an academic quiz, meant to be administered together and reported on collectively. The key recommendation is to not treat these assessments as isolated modules but to plan them together. By aligning scales (e.g., using similar rating formats), timing, and reporting formats, integration and comparison become easier. Over time, data from such frameworks could inform an index of holistic student development. Pilot programs could test integrated assessment days where students complete a suite of activities covering all domains, with researchers monitoring how feasible and informative this is. Importantly, any new framework should be validated thoroughly – ensuring that combining assessments doesn't inadvertently affect student performance (for example, does taking a wellbeing survey first influence how a student later performs on a test or vice versa?). Careful experimental design in pilot studies can test ordering effects and ensure the integrated approach is sound.

3. Embrace of Mixed-Methods and Triangulation: Future assessments should leverage both quantitative and qualitative methods to capture the richness of student experience. While large-scale use of qualitative methods is hard, researchers can incorporate qualitative elements in standard assessments. For instance, adding a few open-ended questions at the end of a wellbeing survey can provide context for the numerical scores (e.g., "What was the biggest challenge for your wellbeing this month?"). Natural language processing techniques are improving, meaning such open responses could be analysed systematically for common themes. Likewise, teacher observations or narrative evaluations can be collected in parallel with quantitative data. A recommendation is to develop protocols for brief qualitative check-ins that can be feasibly done in schools – such as short focus group discussions each term that supplement survey findings. These qualitative insights can help explain trends in the quantitative data (why wellbeing dipped or spiked, etc.) and ensure no important aspect is missed due to the limits of predefined survey items. Funders and school administrators should be encouraged to support mixed-methods evaluation designs, even if they require more effort, because the payoff is a deeper understanding that can inform more targeted interventions.

4. Continuous Validation and Localisation: Given the cultural and contextual limitations noted, it is crucial that as instruments are used in new settings or with new populations, researchers undertake continuous validation studies. This means not assuming that a scale validated a decade ago in one country is automatically valid today elsewhere. Future research should replicate factor analyses, reliability checks, and validity tests (e.g., correlating with external criteria) whenever an instrument is adapted to a new language, age group, or learning environment. If discrepancies are found, the instrument may need modification (rewording items, adding new items, removing biased ones). Localisation is especially important: even if the core of an instrument remains, adding a few custom questions to address local issues can make it far more useful. For example, a wellbeing survey used in a highly competitive school culture might include specific items about exam stress or peer competition, whereas one used in a community with conflict or trauma might include items about feeling safe or supported. Researchers should also explore measurement invariance through techniques like multi-group confirmatory factor analysis to confirm that an instrument measures the construct equivalently across different groups (e.g., by gender, by culture). If invariance doesn't hold, they should adjust the instrument or at least refrain from direct comparisons. Future studies might publish not just the instrument but also a recommended process for ongoing validation – essentially a guide for other researchers or educators on how to check if the tool is working as intended in their specific context. This would improve the tool's robustness and trustworthiness when scaled.

5. Increasing the Sensitivity of Measures: To address the subtlety issue, researchers can work on improving the sensitivity of instruments. This could involve adding more items or using more nuanced response scales to capture gradations of change in wellbeing or other constructs. Another promising avenue is the use of Ecological Momentary Assessment (EMA) or frequent short surveys, which can detect fluctuations over time rather than relying on a single snapshot. For example, an app that prompts students weekly (or even daily) to rate their mood or stress could generate a more sensitive indicator of wellbeing changes than a one-time survey. While intensive, EMA methods have been used in mental health research and could be adapted for school use on a limited scale (perhaps during particularly stressful periods like exam weeks). These could serve as early warning indicators. In digital competence, adaptivity in tests could improve sensitivity – by zeroing in on each student's skill threshold, we better detect improvements in specific sub-skills. Researchers developing computer-based assessments should continue to incorporate adaptive algorithms and test-retest measures to see if small improvements (for instance, after a short training module) are captured by the instrument. In academic assessments, moving toward curriculum-based measures that are administered regularly (like brief weekly quizzes) can yield a more sensitive trend line of student learning, rather than just pre/post tests.

6. Holistic Data Platforms: On the practical side, we recommend developing or refining integrated data platforms for schools that can bring together multiple data streams (academic, SEL, etc.). This is more of a recommendation for implementation: researchers in ed-tech and data science can collaborate with educators to create dashboards where a teacher can see a student's "profile" across wellbeing survey results, tech skill assessments, and academic performance at once. Some early versions exist, but they often require significant manual data entry or are limited to one domain. A cohesive platform that auto-imports data from various assessments and analyses patterns (for example, flagging students who have low wellbeing but high absenteeism and dropping grades) would operationalise the holistic assessment concept. Pilot studies could evaluate whether such dashboards improve teacher decision-making or student support. Importantly, these systems should be designed with privacy and ethics in mind, as they deal with sensitive personal data.

7. Innovating in Biophilic and Digital Contexts: For special contexts like fully digital or nature-based learning, new or adapted tools should be developed and tested. For digital environments, researchers might design a "digital wellbeing" scale that measures how students feel about and manage their online learning (including issues like screen fatigue, online social connection, and tech frustrations). The Polish E-School wellbeing Questionnaire is a start in this direction (Buczak, & Łukasik, 2021); it could be expanded or similar tools created for different age ranges and languages, then validated. In outdoor learning settings, one could incorporate measures of attention restoration or physical engagement with nature (there are existing scales in environmental psychology that could be borrowed). Perhaps a brief attention test or a mindfulness scale could be paired with regular wellbeing surveys in these environments to capture benefits of nature exposure. We recommend pilot projects in schools that have outdoor learning programs, using a mix of traditional measures and new nature-specific indicators (like the use of PSS-C and HRV in the Green School study (Angelopoulou et al., 2022), to build an evidence base and refine those instruments.

8. Longitudinal and Cross-domain Studies: Future research should also focus on longitudinal studies that follow students over time with repeated multi-domain assessments. This would help establish causal directions and track development. With robust longitudinal data, one could refine instruments to be predictive. Interdisciplinary longitudinal datasets are still relatively rare; researchers should seek funding for such projects and ensure that both academic and non-academic measures are included at each wave.

In summary, the future of assessing student wellbeing, digital competence, and academic outcomes lies in breaking down silos and using innovative, inclusive approaches. By co-designing instruments, integrating multiple measures, harnessing technology for more frequent and fine-grained data collection, and rigorously validating tools in every context they are used, we can create a more complete and accurate picture of student

development. This will enable educators to support each student's growth in a balanced way and researchers to better understand the interplay of factors that lead to successful, healthy learners.

Synthesis of Findings and Theoretical Knowledge Base

Bringing together the extensive literature on digital wellbeing in education, several key insights emerge. First, digital wellbeing is a multifaceted construct that demands a holistic understanding. It encompasses physical health (e.g. preventing eye strain and fatigue), mental and emotional health (e.g. managing stress, avoiding anxiety from online pressures), and social health (e.g. feeling connected and safe in digital communities). The review highlighted that digital wellbeing is not merely the absence of negative outcomes, but the presence of a positive state where individuals feel content and function optimally in a technology rich environment. Achieving this state requires balancing the opportunities of digital learning with its challenges. Theoretical frameworks like DigComp and Yue's 3-dimensional model converge on the idea that digital wellbeing involves both capabilities (skills, knowledge) and mindsets (awareness, self-regulation). In practice, this means digital wellbeing can be taught, learned, and supported through intentional strategies, much like any other competency.

Second, the factors influencing digital wellbeing are interconnected. Person-specific factors (such as a student's digital literacy level or a teacher's coping skills) interact with context (school culture, peer norms, policies) and device factors (platform design, type of media) to shape outcomes. For example, a teenager with strong self-regulation skills (person factor) in a school that promotes healthy digital habits (context factor) might navigate a potentially addictive app (device factor) without ill effect, whereas another teen without that support could struggle. No single factor alone determines wellbeing; rather, it's the interplay – a point underscored by many researchers. The concept of digital wellbeing as a dynamic equilibrium captures this interplay well: individuals are constantly adjusting to find balance as their circumstances and technologies evolve. One implication is that interventions should also be multifaceted. Technical fixes (like app timers) help, but should be combined with education and supportive environments to be truly effective. Best practices hence often involve comprehensive programs – for instance, a school that institutes device limits (technical/control measure), teaches why it's important (educational measure), and fosters alternatives like clubs and sports (environmental measure) is likely to see better wellbeing outcomes than one that does just one of these.

The literature consistently points to the importance of digital competencies and literacy as enablers of wellbeing. Being digitally skilled goes beyond operating devices; it includes knowing how to maintain privacy, how to critically consume media, how to communicate kindly online, and how to recognise when technology is harming or helping you (Council of the European Union, 2022). This reinforces the idea that digital wellbeing and digital literacy and digital competence are intertwined. A finding that educational frameworks have begun to acknowledge by integrating wellbeing into digital skill sets (Council of the European Union, 2022). Studies like ySKILLS (Coninck, Waechter, Haenens, 2023) and others show that improving digital skills can lead to improved outcomes like higher social wellbeing and lower perceived risks, implying that initiatives to close digital skill gaps also have wellbeing benefits.

Another key insight is that contextual support and policies make a difference, but current efforts are often insufficient. Schools that actively cultivate a positive digital climate (through rules, teacher training, student engagement, etc.) see fewer issues like distraction and cyberbullying and more reporting of problems when they do occur (Schneider & Dong, 2024). However, many teachers report feeling they are "winging it" when it comes to guiding digital wellbeing, due to lack of formal training or inconsistent policy support (this was evident in studies on technostress where institutional backing was crucial for alleviating stress) (Buda & Kovacs, 2024; Wang et al., 2023).

Policy analysis revealed significant gaps, particularly in translating high-level ideals into everyday practice and ensuring equity. Not all students benefit equally from digital wellbeing initiatives. Often those in underserved communities have less access to them, which suggests an area requiring policy attention (for example, funding for counselors or digital coaches in high-need schools). Additionally, while safety issues like cyberbullying are frequently addressed, more subtle issues like the emotional impact of surveillance, the ethics of AI in classrooms, or the importance of student voice in digital matters are still emerging on the policy scene.

In terms of best practices, the emerging consensus is on a balanced approach rather than an extreme. An earlier tendency might have been to demonise technology (e.g., "screens are bad for kids"), but research now emphasises nuance: technology can be beneficial or harmful depending on how it's used and who is using it. Best practices thus include teaching moderation and mindfulness, rather than outright bans except in cases where necessary (like banning phones during tests to prevent cheating but not banning during all school hours if not needed). Many sources advocate for student involvement in crafting solutions – for example, forming student committees to discuss digital wellbeing issues, or involving students in creating peer-to-peer campaigns about healthy tech use (Schneider & Dong, 2024). Peers can influence each other significantly; a trend of, say, taking a "digital sabbath" once a week might catch on more if promoted by students themselves.

Technology itself is also part of best practices: ironically, the right tech tools can enhance wellbeing (e.g., apps that guide meditation, or platforms that adapt learning to reduce frustration). The key is deploying them intentionally, based on evidence. There's a growing trend in EdTech to include wellbeing analytics, for example detecting if a student's engagement is dropping or if a normally active student suddenly disengages, which could flag a wellbeing issue. Privacy considerations aside, this trend shows that wellbeing is becoming a design focus, which is a positive direction.

Emerging trends in the field of digital wellbeing in education include:

A shift from viewing it as individual responsibility to a shared responsibility of schools, families, tech companies, and students themselves. This is seen in calls for whole-school approaches and corporate accountability in design (Council of the European Union, 2022).

Greater attention to educator wellbeing: recognising that teacher stress from tech overuse (emails, platform fatigue, etc.) needs addressing, as teachers can't pour from an empty cup. Some school systems now schedule "email-free evenings" or provide extra planning time to handle tech tasks – small but significant steps.

Focus on younger children: historically, teens were the focus, but new research (like the early childhood scoping review) highlights even toddlers and young kids are using digital devices and need guidance. We see emerging guidelines in various countries on recommended exposure for under-5s, and even interactive e-books or apps being designed with infant wellbeing in mind (like calming content, parental involvement features).

Integration of wellbeing into digital competency frameworks globally: beyond the EU, other regions are likely to follow suit in updating their standards. Organisations such as the African Union and ASEAN have begun discussions on digital literacy that includes wellbeing facets (though formal frameworks are in progress).

Research on interventions: There's increasing empirical study of what interventions truly work – for example, trials of mindfulness programs for digital stress, or curricula interventions like the Harvard Digital Detox lesson series. Early results are promising – showing reduced anxiety and improved self-regulation among participants – which will inform future practice.

Technology advancements: AI and adaptive systems are double-edged – a trend to watch is how AI tutors or companions could support student wellbeing (e.g., an AI that notices a student is frustrated and offers encouragement or alerts a teacher). At the same time, the ethics of AI mean this trend must be carefully managed to avoid exacerbating issues (like students depending on AI emotionally).

Despite many insights, the review also highlights gaps requiring further research or policy attention. Measurement of digital wellbeing is still a challenge – scholars note the lack of consensus on definitions leads to varied metrics. Future research needs to develop reliable tools to assess digital wellbeing in different age groups and contexts. Another gap is longitudinal evidence on long-term outcomes: we need to know more about how childhood digital habits impact adult wellbeing, or how interventions in high school might influence college success. Policy-wise, a gap exists in aligning the interests of EdTech businesses with wellbeing. Additionally, more work is needed on inclusive strategies – e.g., tailoring digital wellbeing approaches for neurodiverse students or understanding cultural differences in attitudes towards technology (what works in one culture might not in another, and global research should reflect that diversity). Finally, the COVID-19 pandemic was a massive unplanned experiment in digital learning; the full analysis of its effects on wellbeing is still emerging. Early data shows mixed impacts. Increased screen time and isolation harm, but some students thrived with self-paced learning.

In conclusion of the synthesis, the knowledge base suggests that while digital technologies pose real risks to wellbeing, they also hold considerable promise for enhancing education when harnessed correctly. The task ahead is to continue building an ecosystem of research, practice, and policy that maximises the positives and minimises the negatives. This involves not just reacting to problems, but proactively designing digital education for human flourishing – an aim that is increasingly recognised as essential in our journey through the 21st-century learning landscape.

Gaps and Limitations in Current Measurement Approaches

Despite the progress in developing and applying various assessment tools for student wellbeing, digital competence, and academic achievement, significant gaps and limitations persist. Researchers have highlighted several challenges that need to be addressed to improve the accuracy, inclusivity, and usefulness of these measurements. Here we outline key shortcomings in current approaches, including issues of contextual relevance, integration difficulties, and cultural bias, as identified in recent literature.

Fragmentation and Lack of Consensus: One fundamental gap is the lack of consensus on what domains or indicators constitute student wellbeing. As O'Neill et al. (2023) noted, the construct of "student wellbeing" has been conceptualised in various ways, leading to a fragmented body of work (Hossain et al., 2023). Different studies and instruments emphasise different facets (some focus on hedonic happiness, others on purpose or relationships),

making it hard to compare results or integrate findings. This fragmentation means there isn't a single "standard" wellbeing metric, akin to a test score that schools universally track. While diversity in approaches can be positive, it also indicates a gap: the field has yet to converge on a core set of wellbeing outcomes for students. This also extends to digital competence, where multiple frameworks (DigComp, ISTE standards, national ICT standards) exist – they overlap considerably, but differences in emphasis (e.g. coding skills vs. information literacy) can lead to disparate assessment focuses. Without consensus, it's challenging to create integrated assessments; one study might measure "resilience and school climate" while another measures "life satisfaction and engagement," both under the banner of wellbeing, yielding results that aren't directly comparable or combinable.

Contextual Limitations and Relevance: Many instruments suffer from being context-bound or not fully adaptable to different learning environments. For example, a survey developed in Western schools may include items that assume certain classroom conditions or cultural norms that do not hold elsewhere. The scoping review found that very few wellbeing instruments had been designed with non-Western contexts in mind (Hossain et al., 2023). Indeed, the previously mentioned report recommends more research in non-Western settings because current tools might not capture culturally specific aspects of wellbeing. An instrument might ask about "having fun with lots of friends at school," which might not resonate the same way in a culture where schooling is seen in more formal terms. Cultural bias in item content and interpretation is a real limitation; translations are not enough if the underlying construct doesn't map well onto local conceptions of wellbeing or digital skill. For instance, an engagement survey might assume physical presence ("I feel safe in my classroom") which is less relevant online, while an e-learning context has other issues (like "I have a quiet place to study at home"). The development of the E-School wellbeing Questionnaire in Poland was one response to this gap, creating new items suited to remote learning (Buczak & Łukasik, 2021). But in general, rapid shifts to digital learning (e.g., during COVID-19) exposed a shortcoming: many existing wellbeing and engagement scales weren't validated for online schooling. Similarly, in outdoor or nature-based programs, standard academic or wellbeing assessments might not fully capture benefits like improved attention or stress reduction unless they're supplemented with context-specific measures (e.g. the use of heart rate variability in the Green School study, which is not a typical school metric) (Angelopoulou, Zaverdinou, Bacopoulou, Chrousos, Giannakakis, Kanaka-Gantenbein, Mavrogeni, Charalampopoulou, Katimertzi, & Darviri, 2022).

Data Integration Difficulties: Another limitation lies in combining data from different instruments. Because wellbeing, digital skills, and academics are often measured separately (with different tools on different scales), educators face challenges in integrating these data for a coherent picture. Technically, it's difficult to merge qualitative data (say, student interview insights about their wellbeing) with quantitative scores (like a math test result) in any

automated way. Even combining multiple surveys can be challenging if they use different rating scales or if administration timing differs. For example, a student might take a wellbeing survey in September and a digital skills test in March; linking those results to year-end grades requires careful data management and may be confounded by the time gap. There are also logistical burdens – administering multiple instruments eats up instructional time and may lead to survey fatigue, potentially compromising data quality. Because of this, some schools administer only one type of survey per year, missing out on multi-domain assessment. The lack of an integrated tool means that making connections (like identifying a student whose drop in wellbeing preceded a drop in grades) often relies on manual analysis by teachers or researchers. This gap points to a need for more unified or at least synchronised assessment systems.

Sensitivity and Specificity Trade-offs: As noted, certain instruments—especially brief screening tools—may not be finely tuned to detect moderate changes in wellbeing or may yield false negatives and false positives (Goodman, 1997). A prominent example is the Strengths and Difficulties Questionnaire (SDQ), a widely used behavioral screening instrument for children and adolescents aged 3 to 16. The SDQ assesses five domains: emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems, and prosocial behavior (Goodman, 1997). While practical and broadly validated, the SDQ has shown limitations in sensitivity, meaning it can sometimes fail to identify students with internalising difficulties or subtle wellbeing issues. This presents a cautionary example: if a school relies solely on a single brief survey like the SDQ for high-stakes identification of "at-risk" students, it may overlook those who require support (false negatives) or incorrectly flag students who are not truly struggling (false positives). Similarly, academic early warning systems that consider only grades may miss underlying emotional or behavioral challenges—for instance, a student may perform adequately academically while experiencing a sharp decline in wellbeing. These concerns highlight the need for multi-method assessment approaches and the careful matching of instruments to developmental stages and local context. For example, a resilience scale validated for high school students may not be appropriate for use with elementary-aged children, yet schools sometimes extend instruments across age groups without re-validation.

Limited Use of Mixed-Methods: While mixed-methods (quant + qual) assessments are touted as best practice to get a full picture, in reality they are underutilised. The scoping review showed only one mixed-method study out of 33, and a few qualitative (Hossain et al., 2023). This suggests a gap in depth of understanding – quantitative surveys can tell us “what” level or correlation, but often not “why” or “how” the student experience is shaped. The limited qualitative data in assessments might lead to interventions that don’t address root causes (e.g. knowing 30% of students feel disconnected is useful, but knowing why – perhaps revealed in focus groups – is crucial to intervention). The reason for this gap is obvious:

qualitative assessments are time-consuming and harder to scale. But it remains a limitation that much of our measurement in education skims the surface.

Rapidly Evolving Competency Definitions: In the digital domain particularly, the target is moving. The skills that were considered "digitally competent" in 2010 will not be the same in 2025 (for example, knowledge of safe social media use or misinformation discernment is more critical now). Thus, some instruments can quickly become outdated or incomplete. If a digital literacy test doesn't cover smartphones or social media, it might miss a chunk of relevant skills today. The maintenance and updating of instruments is a challenge; not all are revised frequently. Wellbeing constructs can also evolve (e.g., the rise of the concept "digital wellbeing" as a new facet of student wellness in the age of smartphones). Current measurement approaches might not account for these emerging constructs, leaving a gap in what is measured versus what is actually impactful.

Cultural and Equity Considerations: Finally, a significant limitation is ensuring that instruments are fair and meaningful for diverse student groups. Some research points out that certain survey questions might be interpreted differently by students of different backgrounds, affecting validity. For example, self-report scales assume a level of self-reflection and openness that may be influenced by culture or personality. There's evidence that in some cultures, students tend to choose middle options (moderacy bias) while in others they might use the extremes more freely, which can bias comparisons. Similarly, a stress questionnaire might yield different baseline levels in a high-pressure academic culture versus a more relaxed one, not purely due to actual stress differences but due to norms about reporting stress. These nuances mean that simply exporting an instrument to a new context without re-validation can produce misleading results. The gap here is the need for localisation and norming: many tools lack local norms or adjustments. Additionally, the mode of administration (paper, online, oral) can impact who gets included – e.g., online surveys might exclude those without good internet or comfort with the interface, skewing data in low-resource settings. This is a limitation when trying to do global comparisons or implementations.

In sum, current measurement approaches, while advanced in many respects, still face issues of incompleteness and context mismatch. They might not capture the full spectrum of student development, may not transfer well across different environments (traditional vs remote vs outdoor), and often remain siloed by domain. The next section will offer recommendations to address these gaps – suggesting how researchers and practitioners can refine instruments, integrate data streams, and ensure culturally responsive, holistic assessment of students going forward.

Conclusion

Digital wellbeing in educational ecosystems is a critical domain at the intersection of technology, pedagogy, and health. This comprehensive review has highlighted that digital wellbeing is an evolving concept – one that has grown from concerns about screen time into a richer dialogue about how to help learners and educators flourish in a world where digital media are omnipresent. Across the literature from 2010 onward, there is clear evidence that technology's impact on wellbeing can be both profoundly positive and negative. On one side, we see enhanced learning opportunities, connectivity, personalised education, and innovative tools that can support mental health. On the other hand, we find issues like distraction, stress, cyberbullying, addiction, and burnout. The net effect on any individual depends on a web of influencing factors: personal habits and skills, the context and support systems around them, and the design of the technologies they use.

Over the last 10–15 years, significant strides have been made in measuring student wellbeing, digital competence, and academic outcomes, yet the journey toward truly holistic assessment is ongoing. This report's systematic analysis reveals a variety of instruments and frameworks used worldwide each contributing valuable insights into student development. We found that many tools, especially self-report questionnaires and standardised tests, come with strong evidence of validity and reliability in their intended contexts (Clifford et al., 2020; Hossain et al., 2023). Researchers have been creative in adapting and validating instruments for new purposes, such as gauging wellbeing in remote learning during a pandemic or evaluating stress reduction in biophilic classrooms with both surveys and biometric data. These efforts underscore a global recognition that education must address the whole child – emotionally, technologically, and academically.

At the same time, this review highlights important limitations. There is still no universal approach for student (digital)wellbeing, and cultural/contextual differences mean one size seldom fits all (Hossain et al., 2023). Digital competence assessments must keep pace with changing technology, and academic assessments must evolve to measure deeper learning without sacrificing rigor. Perhaps most critically, integrating data across these domains remains a challenge, though it is increasingly demanded by policymakers and practitioners seeking to understand how factors like anxiety, engagement, and digital access impact learning outcomes.

The interplay between socio-emotional wellbeing, digital skills, and academic success is evident in research. Happier, more connected students tend to do better in school (Hossain et al., 2023), and tech-savvy students can leverage digital tools to enhance learning and resilience (Wang et al., 2021). This interplay invites us to break down traditional silos in

assessment. The recommendations urge a path forward where assessments are more collaborative in design, more comprehensive in scope, and more sensitive to the nuanced realities of students' lives. By piloting integrated frameworks, continuously validating tools in diverse settings, and employing both numbers and narratives in understanding student growth, future research can develop robust methods to capture what matters.

For learners, especially children and youth, guidance and education in navigating the digital world are as essential as the academic curriculum. They need not only the know-how to use tools but also the wisdom to use them in ways that support their wellbeing. For educators, professional capacity-building and supportive working conditions are vital so that they can confidently integrate technology without compromising their own health or that of their students. Educational institutions must therefore embrace a dual mission: digital excellence and digital wellness. The findings of this review suggest that these goals are not in conflict but complementary – fostering digital wellbeing can enhance learning outcomes, as students who are healthy and balanced are more engaged and open to learning, and teachers who feel supported are more effective.

Policy and leadership have a strong role to play in mainstreaming digital wellbeing. Encouragingly, recent years have seen more frameworks and policies explicitly addressing it, from the EU's strategic documents (Council of the European Union, 2022) to school district policies on responsible use. Yet, gaps remain, and it will require concerted effort to fill them. Policymakers should consider digital wellbeing as an integral part of educational quality. By instituting requirements, funding research-informed programs, and holding schools accountable for safe and healthy digital environments, they can embed wellbeing into the fabric of education systems.

In synthesising best practices intentionality stands out. Digital wellbeing will not happen automatically; it requires intentional design – of technologies (to be humane and inclusive), of lessons (to include wellbeing skills), of schedules (to allow rest and offline time), and of policies (to protect and empower users). Schools and universities that have taken intentional steps, whether through wellness committees, revised tech policies, or curriculum innovation, serve as models demonstrating improvements in student focus, reduced incidents of online harm, and better morale. These examples illustrate that while the challenges are significant, they are not insurmountable.

From the global perspective, it's evident that context matters. Solutions in one country might need adaptation in another. Nonetheless, the core issues – finding balance, ensuring safety, promoting health – are universal. International collaboration and research can accelerate progress by sharing what works in different settings, from high-tech environments to low-resource ones. Initiatives like UNESCO's focus on the human-centered digital

transformation of education and OECD's examination of school wellbeing partnerships are paving the way for more cohesive global action.

Finally, this review also underscores that digital wellbeing is an ongoing journey. As technology continues to evolve (with AI, virtual reality, and beyond on the horizon for education), new opportunities and risks will emerge. A strong theoretical and practical foundation – built from the work synthesised here – will be needed to navigate those changes. Further interdisciplinary research, including voices of educators, psychologists, technologists, students, and parents, will enrich our understanding. Building a theoretical knowledge base for digital wellbeing means continuing to refine models of how digital life intersects with human wellbeing, and ensuring those models inform real-world practices and tools.

In conclusion, measuring student wellbeing, digital competence, and academic outcomes is not an either/or proposition – it is a necessity for 21st-century education. The instruments and frameworks reviewed here demonstrate that it is feasible to assess these domains in real-world school settings and obtain meaningful data. As this field progresses, we envision assessment systems that not only evaluate learning but also actively inform and improve it, guiding interventions that support students' holistic development. The ultimate success will be when every school can confidently answer: How are our students doing (in terms of happiness and health), how are they learning (in terms of knowledge and skills), and how are they ready for the digital world – and when the answers to all three inform each other. Such a future will require continued research, innovation, and collaboration to ensure our measurement tools are up to the lofty task of nurturing well-rounded, thriving learners.

Ensuring digital wellbeing in educational ecosystems is essential for creating learning environments where both learners and educators can thrive. By recognising digital wellbeing as a fundamental component of education, we can better prepare students not only to succeed academically and professionally in a digital society, but also to lead healthy, fulfilling lives. The insights and recommendations from this literature review serve as a roadmap for stakeholders at all levels to take informed and proactive steps toward that goal. The overarching message is one of balance and empowerment: with mindful use, supportive communities, and smart policies, technology can be used to empower learners and educators without compromising their wellbeing. Achieving this balance is critical for the sustainable, positive transformation of education in the digital age.

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WINDEE

Short description of WINDEE

WINDEE is a policy experimentation project aimed at improving the digital well-being of students and educators in educational settings across Europe. It addresses the lack of understanding, strategic approaches, and coherent policies concerning the mental, emotional, physical, and cognitive impact of digital education.

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