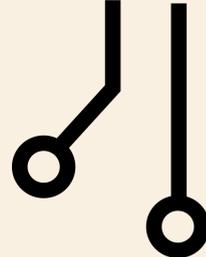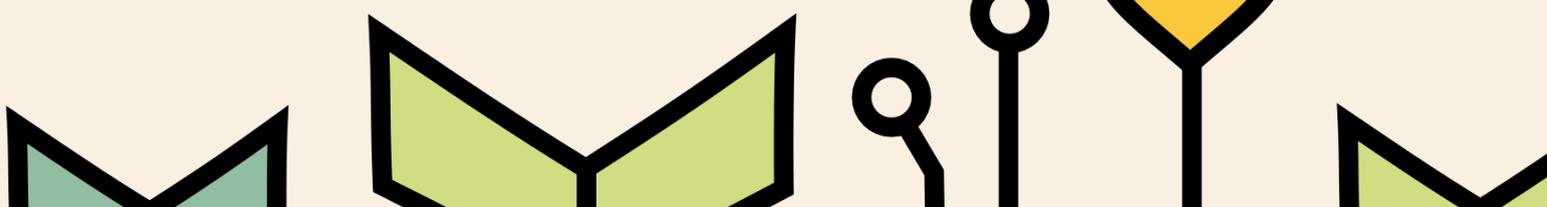# Assessment of Digital Tools and Technologies

D2.2 Assessment Report of Digital Tools and Technologies

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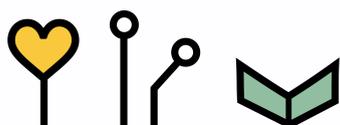
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Introduction

Digital technology is deeply woven into education, offering personalised learning, interactivity, and expanded access. However, these benefits come with new challenges to student and teacher well-being. Digital well-being in education refers to a holistic state of learners' and educators' physical, mental, and social health in technology-rich environments. When well-being is high, individuals feel safe, content, and empowered online. Conversely, unmanaged technology use can lead to technostress, the adverse psychological impact when users feel overwhelmed or exhausted by digital tools. Recent research emphasises that digital well-being and technostress are two sides of the same coin, with digital well-being acting as a protective factor against stress. This report presents a comprehensive analysis of 103 digital educational tools used in five European countries, evaluating their features across multiple categories and assessing their impact on well-being. We compute descriptive statistics (mean, median, standard deviation) for each category of tool attributes and provide distribution charts. The findings are interpreted in light of review documents, created during the WINDEE project: Literature review (Deliverable 2.1: Literature review and desk research report) and policy analysis (Deliverable 2.3: Policy Mapping Report). Interpreting the tool analysis in the light of these reviews helps us to better understand how these tools align with digital well-being frameworks (e.g. DigCompEdu) and where gaps remain in policy and practice. The goal is to identify how existing educational technologies support or undermine well-being, and how they might be improved to foster a positive, healthy digital learning environment.

Tool analysis was conducted in March-June 2025; thus, the results represent the situation at the given time of analysis. The analysed dataset consists of 103 digital educational tools listed below and documented in more detail in an Excel spreadsheet (Annex 1).

- Blue-Bot
- Opiq
- Eduten
- Moodle
- Echo360
- Classroom
- AI-La
- eMathStudio
- Silta Education
- Alfons education
- Schoolday
- TEDed
- Seesaw
- One Tablet per Child
- MySchool Malta
- Alison
- Turnitin
- LinkedIn Learning

- Coursera
- Stuudium
- Panopto
- Khan Academy
- Quizlet
- Mentimeter
- Articulate 360
- Dash & Dot robots
- Skillshare
- Clanbeat
- Triumf Health
- Helge
- Meaningful Talks
- ALPA Kids
- Moomin Language School
- GraphoGame
- SanomaPro
- Wilma
- Funzi
- Itslearning

- Kide Science
- HEI Schools
- TinyApp
- Kindiedays
- EDUKA
- Magic School AI
- Live Worksh
- e-Mokykla
- VLE Moodle
- Google Workspace
- EditAI
- MS Teams
- Baamboozle
- Padlet
- Nearpod
- Kahoot
- Duolingo
- Seterra
- CodeWeek
- Wordwall

- Tynker
- Classcraft
- Canva for Education
- Headspace for Educators
- CoSpacesEdu
- PhET Interactive Simulations
- Lego Education SPIKE
- Labster
- Century Tech
- Smile and Learn
- ClassDojo
- Google Expeditions
- EdPuzzle
- Lingokids
- The rescue adventure game
- Prodigy Math
- Kids centric Universe platform
- Common Sense Education
- NetSmartz
- Elefante Zen Meditation

- Claned
- Abitti
- Eliademy
- ThingLink
- Code.org
- Scratch
- MS Teams
- Annie Advisor

- Genially
- Miro
- Emaze
- H5P
- Vedliai
- Minecraft Education
- Socrative
- Mybe

- Exciite Platform
- GoNoodle
- Breath, Think, Do with Sesamo
- Smiling Mind
- Book creator
- Edmodo
- Elina Education

Tools span all education levels from early childhood to higher and adult education, across Estonia, Finland, Lithuania, Malta, and Spain.

Assessment of digital tools and technologies was implemented in two phases:

1) During the first phase, all partners were asked to collect digital technologies and tools that would support students' and teachers' well-being and /or would be widely used in the countries' educational system. Thus, the criteria for the tools and digital technologies to appear on the list included:
   a) widely used by school communities in the country,
   b) supports student well-being or has characteristics that allow integration of digital well-being solutions installed.

The list of tools was reviewed and discussed among partners ensuring that the same tool does not appear twice in the list of most popular unique digital technologies used in education in partner countries. The list of the tools was also reviewed in terms of its limitations and the added value to learning and teaching during partner meetings. When the list was produced, partners started preparing for the second phase of the analysis of the tools following WINDEE project Deliverable 2.1 Literature review and desk research report, as the reference document for the qualitative attributes to be selected for the tool analysis.
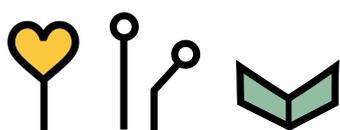
2) For each tool, qualitative attributes were coded and derived from WINDEE Deliverable 2.1 Literature review and desk research report, as well as from partner discussions during the revision phase of the deliverables. The qualitative attributes suggested were coded into the following categories:

    a) Pedagogical Approach,

    b) Socio-Emotional Development,

    c) Educational Methodology,

    d) Technological Approach,

    e) Teaching and Assessment features,

    f) Person-Specific Factors,

    g) Context-Specific Factors,

    h) Technology-Specific Factors,

    i) FAIR AI considerations (fairness, accountability, transparency in AI),

    j) Privacy and Security measures,

    k) Content Quality.

Partners were asked to analyse each tool to what extent its characteristics and qualities may be attributed to the qualitative attributes and indicate the decisions using tool selection and analysis table (see Annex 1).

When both phases of the assessment of digital technologies and tools were completed, this report was prepared showing the analysis of each category by quantifying the occurrence of specific sub-features (e.g., types of pedagogical approaches, presence/absence of privacy measures) per tool. We calculated descriptive statistics such as the average number of sub-features per tool in each category, the median and range, and standard deviation to gauge variability. We then plotted distribution charts (bar charts or histograms) for each category to visualise how common each feature or sub-factor is among the tools. In the following sections, each category from the table is examined in turn, with a summary of the data (including key statistics) and a discussion linking the results to digital well-being theory and policy context.

The authors confirm all major contributions, like study design, data collection and preparation, analysis, and writing, were made by humans. ChatGPT assisted with data analysis and text organisation only. No conclusions or decisions were delegated to AI. The authors independently reviewed and approved all work, adhering to ethical guidelines for the responsible use of AI in academic research.

1. Pedagogical Approaches

The category *Pedagogical approach* was disclosed using several foundational theories of learning, and pedagogical strategies or theories the tool was based on. It was possible to add several pedagogical strategies for every tool. The frequencies of listed pedagogical approaches are illustrated in Figure 1. The majority of tools integrate Constructivist (57 tools out of 103, 55%) and Cognitive learning (58 tools, 56%) approaches, and especially prevalent is Personalised learning (60 tools, 58%). About a quarter (26 tools, 25%) mention Connectivism, and only 2 cases note a very general pedagogy ("can support various approaches"). On average, each tool employs ~2 pedagogical approaches (mean = 1.97, median = 2), indicating many tools blend multiple learning theories in their design. The dominance of constructivist and cognitive paradigms suggests most tools focus on active, student-centred learning (constructivism) and knowledge acquisition/processing (cognitive). Personalised learning is most popular (present in ~58% of tools) reflecting a trend toward adaptivity and learner-specific pathways. Far fewer tools (25%) cite connectivism principles (emphasising networked learning and collaboration). A small number had no clear pedagogical approach listed (2 cases, possibly hardware tools without an inherent pedagogy).
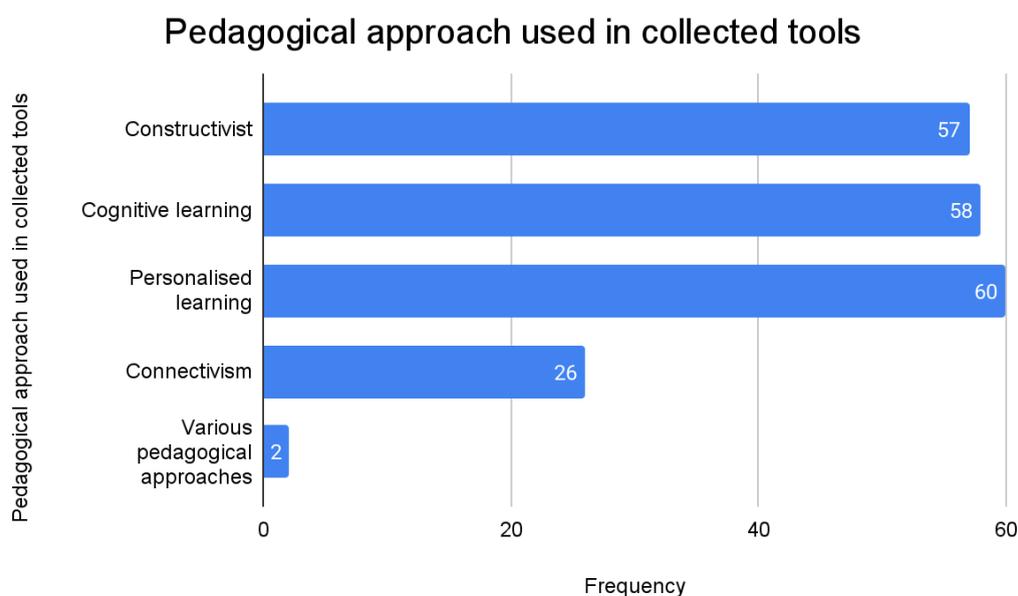

Figure 1. Pedagogical approach used in collected tools

These results align with contemporary educational design. Constructivist learning theory and personalised learning are known to improve engagement and motivation. Notably, research suggests that how technology is integrated pedagogically has a significant impact on student well-being. Instructors who thoughtfully use constructivist learning techniques (e.g. inquiry and discovery learning) with technology can enhance student enjoyment and efficacy, whereas poor integration (for example, imposing excessive multitasking or using tech in a drill-and-test manner) can increase cognitive load and stress. The data showing most tools built on active learning theories is encouraging. It implies these tools are designed for meaningful engagement rather than passive reception. This is a positive didactical characteristic of the tools supporting student digital well-being.

Engaging, student-centred activities can foster a sense of autonomy and competence, boosting students' emotional well-being. The relatively lower adoption of connectivism might indicate that fewer tools emphasise expansive networked learning or collaboration by experimenting. While collaboration is valuable, an overload of constant connectivity can also be taxing if not managed properly. Indeed, literature (Giray et al., 2024) warns that requiring students to juggle too many interactive streams or collaborative tasks at once can lead to overload and stress. The findings of this desk research suggest existing balance. Most tools support active learning (which is beneficial), and fewer push the highly networked, "always online" model to an extreme.

From a policy perspective, this trend aligns with calls for effective pedagogy in digital environments. The Council of the EU's conclusions on well-being in digital education (2022) emphasise designing digital learning that is engaging but not overwhelming. Our results show that currently the tools and digital technologies widely used in partner countries by school communities largely follow this principle, though the responsibility will be on educators to implement them appropriately. It is noteworthy that no tools explicitly mentioned behaviourist pedagogy, indicating a shift away from rote, feedback/reward-only designs toward more modern approaches. This is consistent with policy frameworks like the European Digital Education Action Plan (2025), which encourage innovative pedagogies over didactic drill software.

Overall, the prevalent pedagogical approaches in these tools are in line with best practices for well-being, emphasising active participation and personalisation. Of course, such positive assessment outcomes about the tools and digital technologies that are currently employed at school have other important contextual and personal factors in order to maintain the digital well-being state of school students and teachers. As highlighted in DigCompEdu
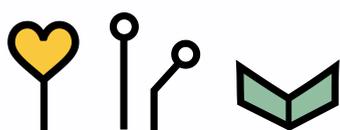
(Redecker, 2017), educators need digital competence to integrate such tools into learning, teaching and assessment in the way that maintains student well-being.

2. Socio-Emotional Development

The category *Socio-emotional development* was disclosed by the indicators based on socio-emotional development theory or method the tool was based on. It was possible to add several socio-emotional development theories or methods for every tool. The frequencies of listed Socio-emotional development approaches are illustrated on Figure 2. About 92 tools out of 103 (~89%) include at least one feature targeting learners' socio-emotional development, such as frameworks or activities for emotional well-being. Common SED elements are based on established frameworks. Many tools reference competencies from the CASEL (Framework for Systemic Social and Emotional Learning) model or PERMA (framework for understanding wellbeing through five elements: Positive Emotion, Engagement, Relationships, Meaning, and Accomplishments) theory. For instance, 100 tools (~97%) incorporate community-building, collaborative reflection, or perspective-taking exercises, and 48 (~47%)tools include practices like mindfulness, mood tracking, check-ins on feelings or stress management. A significant subset (around one-third of tools) explicitly align with known Socio-Emotional Learning (SEL) frameworks: 34 (~33%) tools mention CASEL competencies (e.g. self-awareness, self-management), and 28 (~27%)mention Seligman's PERMA pillars (Positive emotion, Engagement, Relationships, Meaning, Accomplishments). About 21% of tools (22 tools) had no dedicated SEL component – 7 of these stated "not a dedicated SEL tool" and another 7 said they "are not SEL tools but can support SEL" indirectly; the rest provided no information on SEL. In short, a strong majority of digital tools now embed some socio-emotional support or at least acknowledge the importance of student well-being alongside academic content.
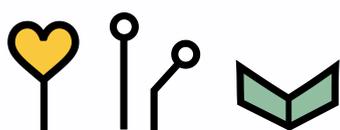
Socio-emotional development theories and methods used in tools
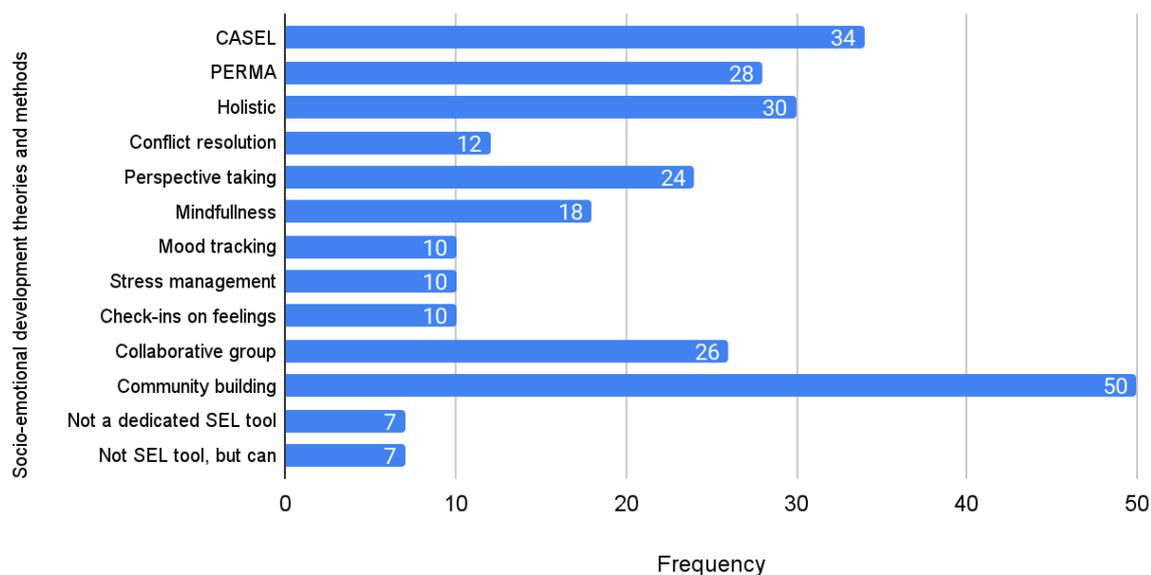
Figure 2. Socio-emotional development theories and methods used in tools.

This widespread inclusion of SEL features is a promising finding. It reflects a growing recognition that digital learning tools should nurture students' emotional and social well-being, not only cognitive skills. Research affirms that an individual's socio-emotional capacity like empathy, self-esteem, and coping skills combined with their online experiences determines the net effect of technology on well-being. Happier, more connected students tend to perform better academically and navigate digital environments more safely. By incorporating SEL elements (like mood check-ins, reflection prompts, or community forums), many tools aim to support those capacities. For example, some tools integrate mood-tracking journals or stress management tips, which can help students recognise and regulate their feelings during digital learning.

These align with recommendations in the literature that explicitly teaching self-regulation and emotional skills can protect against technostress. It is notable that some tools reference the CASEL and PERMA frameworks. This suggests alignment with evidence-based SEL models. CASEL's core competencies (self-awareness, self-management, social awareness, relationship skills, responsible decision-making) and the PERMA model of well-being are both well-regarded. By building these into tools, developers acknowledge holistic student development. This trend resonates with policy as well. The Council of Europe and national strategies increasingly call for digital well-being to include mental health and emotional support. However, the policy analysis report (Deliverable 2.3) reveals that issues like digital

overload, addiction, or mental health are often not yet systematically addressed. These tend to be mentioned only in passing in education policies. Our finding that 21% of tools offer no SEL support (and some only indirectly) indicates room for improvement, echoing this policy gap. In practice, many teachers still lack guidance on how to integrate SEL into digital teaching.

The fact that most tools do include SEL features is encouraging, but ensuring they are effectively used requires educator training. According to the literature review report (Deliverable 2.1), well-being and technostress outcomes improve when schools adopt a whole-school approach, providing universal SEL education, targeted interventions for those in need, and even individualised support for serious cases. Tools alone cannot achieve this; they need to be part of a broader supportive context.

In summary, the integration of socio-emotional development content in digital tools is a positive trend aligned with theoretical frameworks and partially with policy intentions. To fully realise these benefits, policies should more explicitly mandate or encourage SEL in digital tools (moving beyond vague mentions), and invest in teacher capacity to leverage these features. The ultimate vision is a balanced digital learning ecosystem where academic and socio-emotional growth go hand in hand, minimising stress and maximising student flourishing.

3. Educational Methodologies

The category *Educational Methodologies* was disclosed suggesting a variety of classification of learning and teaching methods or strategies which could be supported by the tool. It was possible to add several Educational Methodologies for every tool. The frequencies of listed Educational Methodologies is illustrated on Figure 3. We observe a broad adoption of modern teaching methods. Mobile learning (using smartphones/tablets for education) is the top methodology, present in 56 tools (~54% of the sample). Inquiry-based learning (learning through questioning and exploration) is identified in 45 tools (~44%), and Flipped classroom models (students review content at home, do practice in class) in 42 tools (~41%). Gamification techniques (applying game-like rewards and challenges) are noted in 37 tools (~36%), and closely behind, Game-based learning (learning through actual games or simulations) in 36 tools (~35%). Intelligent tutoring systems (AI-driven personalised tutoring) are incorporated by 24 tools (~23%), while Maker education (hands-on creation, DIY learning) is the least common, with 21 tools (~20%). On average a tool employs about 2.53 of these
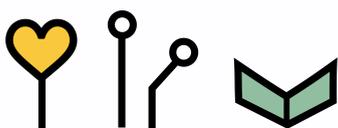
methodologies (median = 2), indicating many tools blend multiple approaches (e.g., a platform might be both gamified and support mobile & flipped learning). Some tools (around 25%) combine three or more of these methods, making them pedagogically very rich. A few tools did not specify any particular methodology, likely because they are simple utilities or hardware kits without a defined pedagogy.

Educational methodology used
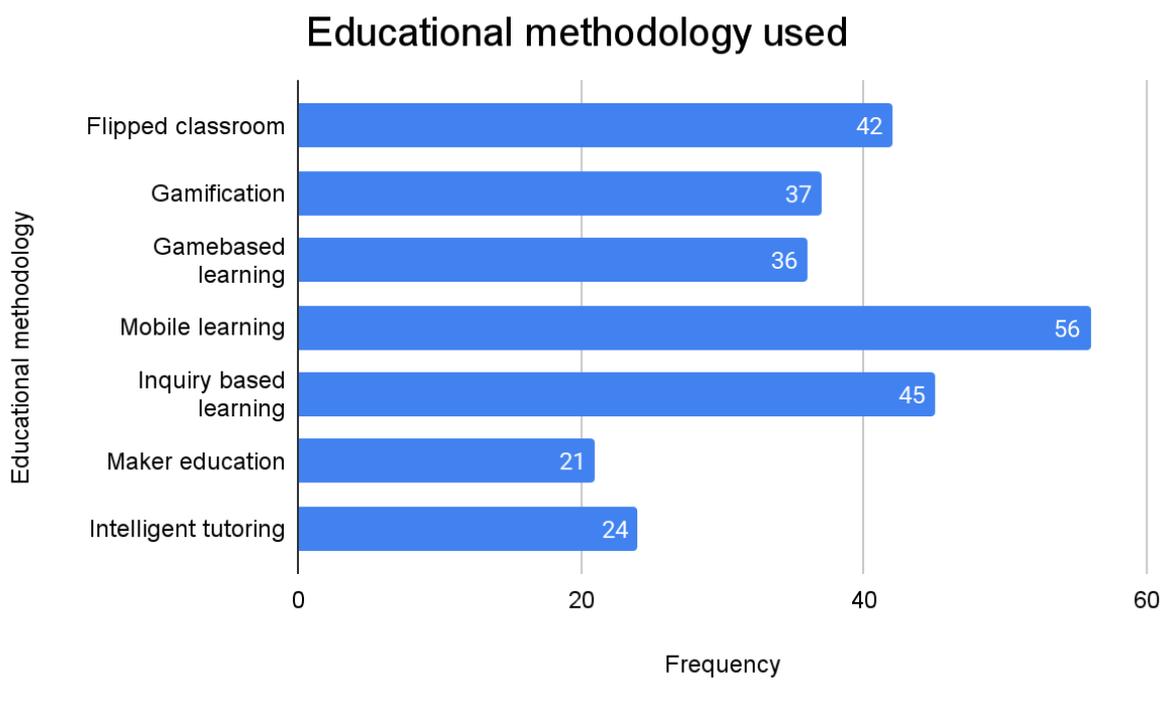
Figure 3. Educational methodologies supported in tools.

The prevalence of these methodologies suggests that digital tools are actively incorporating pedagogical strategies to increase engagement. Mobile learning being most common reflects the reality that many platforms are mobile-first or accessible on personal devices. This can improve convenience and continuity of learning, but it also means learning can extend beyond the classroom, raising considerations for well-being (screen time boundaries, off-task distraction). Inquiry-based and flipped classroom approaches, each in ~40–45% of tools, align with student-centred active learning, which is positive. A flipped model, for example, can reduce passive lecturing and free class time for interactive activities, which tends to improve understanding and reduce cognitive load and boredom. Inquiry-based activities cultivate curiosity and deeper engagement. These practices, if well supported by the tool, can enhance students' intrinsic motivation, which is an important factor in positive well-being. Gamification and game-based learning are also widely present (in about one-third of tools).

In this case, we are talking about student engagement, creativity, collaboration, and competitive adventure.

This is a double-edged sword. Game-based activities and rewards can significantly increase student engagement and enjoyment, turning learning into a more playful experience. This aligns with the Literature review report (Deliverable 2.1) highlighting the positive effect of moderate gamification on autonomy and mastery feelings. However, the use of persuasive design elements (points, leader-boards, constant feedback loops) can have downsides. Studies warn that many popular digital platforms (not just games) employ persuasive design to maximise engagement (features like auto-play, infinite scroll, notifications, and rewards) which can unintentionally foster problematic usage habits or even addictive behaviour. When educational tools heavily gamify the experience, there is a risk of encouraging a "state of constant online presence" where students feel compelled to keep interacting to earn rewards. None of the tools in our dataset appear to go to extremes of gamification (e.g., no evidence of infinite scrolling or unrelated reward systems), but the widespread inclusion of these elements means designers and educators should be mindful of balance. The Literature review report (Deliverable 2.1) suggests that gamification is most beneficial when it supports pedagogical goals and is used in moderation. Conversely, if overused it can distract from learning or create anxiety (e.g. fear of missing out on points).

On the positive side, about 23% of tools implement intelligent tutoring systems. These AI-driven systems can personalise learning pace and difficulty to individual students, often improving learning outcomes and reducing frustration by providing help exactly when needed. This directly ties into student well-being: adaptive feedback can prevent learners from feeling lost or overwhelmed. Policy documents (e.g., Estonia's and Finland's digital strategies) have noted the potential of intelligent tutoring to support students, but also highlight the need to monitor such AI for biases and effectiveness. The relatively moderate adoption of intelligent tutoring (only ~1 in 4 tools) suggests it's still an emerging feature, possibly due to the complexity of AI development. Lastly, maker education being least common might indicate that not many digital tools facilitate hands-on creation and tinkering (which often involve physical components or open-ended environments). This could be an area for growth, as maker activities are linked to creativity and can be very engaging (and provide a break from screen consumption).

In summary, the educational methodologies embraced by current tools generally support active, student-driven learning and engagement. This aligns well with recommendations for a positive digital learning environment that fosters creativity, collaboration, and critical thinking

rather than rote learning. However, the findings also flag some considerations: the popularity of gamified and mobile learning calls for guidance to ensure healthy use. Policy frameworks like DigCompEdu implicitly support these methodologies by expecting teachers to use technology in pedagogically sound ways, but they also stress the teacher's role in managing how these features affect students' well-being. For instance, a teacher using a highly gamified app might set clear limits or debrief the experience to focus on learning over competition. The data here will help inform such guidelines, so training can focus on using those in a balanced manner (e.g., how to effectively integrate gamification without overstimulation). Overall, the integration of mobile, flipped, inquiry, and game-based methods in many tools is in line with both pedagogical research and policy aims to innovate teaching. The key will be ongoing evaluation. Tools that claim such methodologies should ideally provide evidence of their efficacy. The next category, technological approach, examines the types of technology media (platforms, devices) these tools rely on, which further influences how methodologies play out in practice.

4. Technological Approaches

The category *Technological approaches* was categorised taking into account which technological solution was used for the tool. It was possible to add several Technological approaches for every tool. The frequencies of listed Technological Approaches is illustrated on Figure 4. A large majority of tools can be characterised as Interactive learning platforms (66 tools, ~64%) and/or Mobile learning apps (63 tools, ~61%). This indicates that most tools are software accessible via the web or mobile devices and designed to be interactive (as opposed to static content). About 18 tools (~18%) are explicitly described as full-fledged Learning Management Systems (LMS), and 13 tools (~13%) leverage Social Media elements (e.g., learning via social networks or social sharing features). Only a few tools incorporate cutting-edge immersive tech: Virtual Reality (VR) is used by 6 tools (~6%), Augmented Reality (AR) by just 2 tools (~2%). Similarly, Educational Robotics appears in 4 tools (~4%). These are hardware kits like robot kits or coding robots used for learning. Additionally, 18 tools fell into an "Other" category not captured by the defined labels, typically specialised software or hybrid approaches (for example, desktop applications or content repositories). Most tools fell into more than one tech category (mean ~1.5 categories per tool), reflecting how many platforms span multiple use modes (e.g., a tool can be both an interactive platform and accessible on mobile, or an LMS with social features).

Technological approaches used
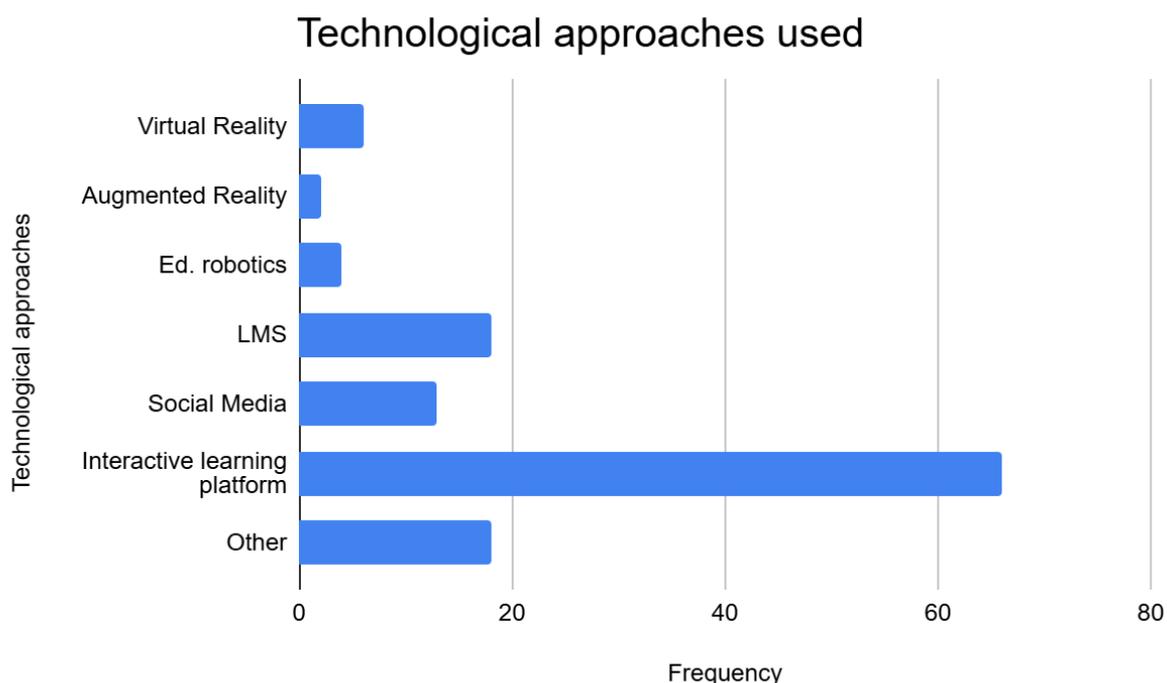
Figure 4. Technological approaches used

The dominance of interactive platforms and mobile accessibility has important implications for well-being. On one hand, it shows that educational technology is keeping pace with how students learn and communicate today, through dynamic apps on personal devices. Interactive platforms, by their nature, encourage active engagement (quizzes, discussions, simulations) rather than passive reading of material. This is generally positive. As the Literature review report (Deliverable 2.1) notes, spending an hour in a rich, interactive learning simulation may have a more beneficial effect (or at least less negative effect) on student well-being than an hour of passively scrolling through content. Active use supports the development of cognitive skills and often provides a sense of accomplishment, whereas passive consumption (especially of social media feeds) can lead to boredom or unhealthy social comparison. Moreover, mobile learning's accessibility means learning can happen anytime/anywhere, which is convenient but also blurs boundaries between school and home. If not managed, this could contribute to students feeling "always on". In fact, policy reports highlight that constant connectivity through mobile devices can cause students (and teachers) to struggle with work-life balance. Many teachers report stress when digital tasks intrude into personal time (e.g. responding to messages at all hours), and students likewise may experience pressure to be continuously available. The wide adoption of mobile platforms underscores the need for digital well-being guidelines, for example, establishing device-free times or notification curfews, as some schools have done.

The relatively smaller number of tools using AR/VR and robotics suggests that these emerging technologies are not yet mainstream in educational tools (likely due to cost and complexity). However, it's worth noting that immersive tech has distinct well-being considerations. VR, for example, can be highly engaging but may cause motion sickness or eye strain in some users also, intense immersion might be exhausting or isolating if overused. AR is less immersive but can be distracting if poorly implemented. The policy mapping report (Deliverable 2.3) identifies that none of the five countries have specific guidelines for VR/AR use in schools yet, a gap that could be addressed as these tools become more common. Meanwhile, the small presence of robotics (only 4 tools like Blue-Bot, LEGO Spike) suggests hands-on coding and robotics are still a niche. Robotics often requires tangible kits in classrooms, which depend on school resources and teacher training. Countries like Spain have initiated programs to provide schools with robotics kits to enhance digital skills. Such programs indirectly support well-being by shifting some screen time to physical interaction and by boosting engagement in STEM. Our data implies that where robotics tools exist, they should be supported by policy (funding, curriculum integration) to maximise their benefit and mitigate any frustrations (like technical setup issues) that could otherwise cause stress.

The moderate presence of social-media-like features (~13% tools) is noteworthy. Some platforms likely incorporate social learning communities or feed-based updates. Social elements can enhance learning by fostering peer support and a sense of connection. However, as literature on youth social media use shows, these features also carry risks of cyberbullying, social comparison, and distraction if not well-managed. The fact that relatively few educational tools lean heavily on social media paradigms may actually be beneficial for well-being. It limits exposure to those risks in the learning context. Instead, most tools focus on structured platforms and LMS (Learning Managements Systems) functionality where interactions are more moderated. This aligns with a cautious approach seen in policies. For example, some countries discourage the use of open social media for official school activities, favouring dedicated platforms for safety. The data also shows about 17% of tools are full LMS, and another ~47% have "Interactive platform" features (which often overlap with LMS functionality like assignments, forums, analytics). LMS are beneficial for centralising learning but can lead to information overload (many notifications, deadlines, etc.). Ensuring these systems support well-being may involve features like customisable notification settings or integration of well-being dashboards (none of which were explicitly noted in the data, but a direction to consider).
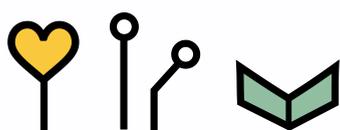
In conclusion, the technological approaches of current tools indicate a high reliance on interactive, mobile-accessible platforms. The scarcity of AR/VR suggests that policymakers and educators have a bit more time to develop well-being guidelines for those before they become widespread. A proactive approach for AR/VR guidelines would be wise (e.g., Finland's plan to create an AI and digital education framework addresses bias and safety, something similar could be done for AR/VR usage). The prevalence of mobile and web platforms underscores recommendations for schools to implement supportive policies like device policies, digital citizenship training, and whole-school digital culture approaches. A positive finding here is that most tools that are used now support interactivity, which aligns with research advocating active learning for well-being.

5. Teaching and Assessment Features

The category *Teaching and Assessment Features* was categorised taking into account which teaching and assessment features were available in the tool. It was possible to add several features for every tool. The frequencies of listed features are illustrated on Figure 5. A majority of tools include core instructional functionalities.

Teaching and assessment features
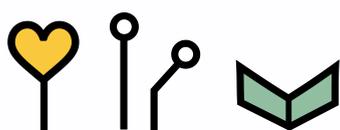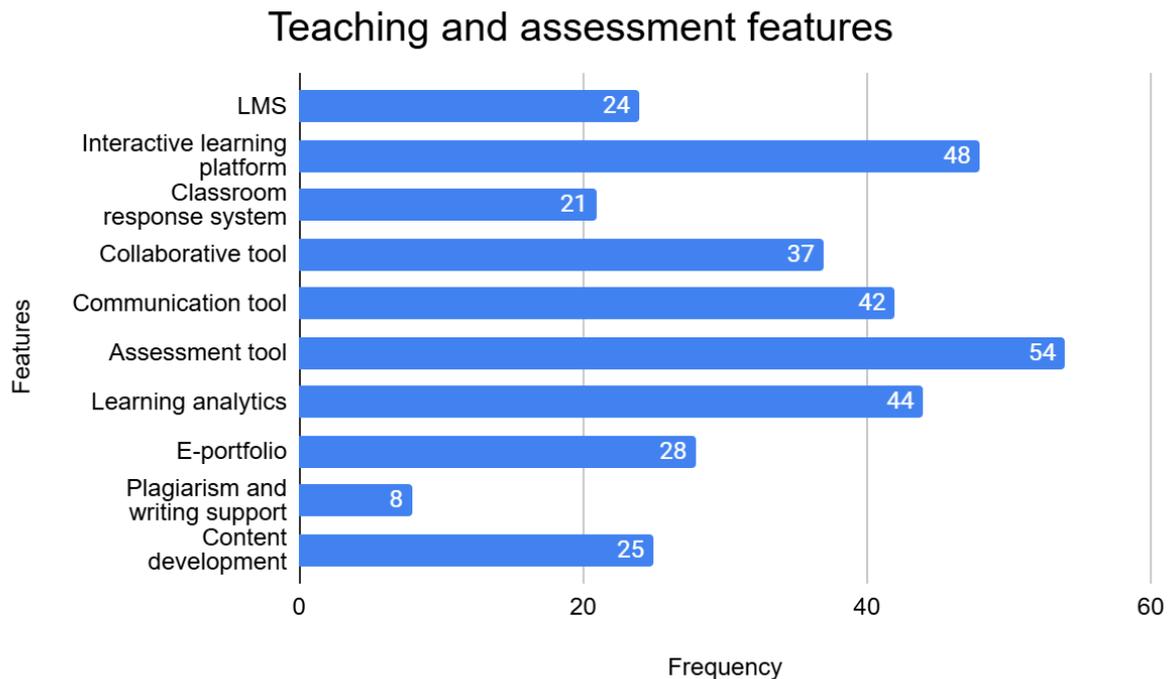
Figure 5. Teaching and assessment features

Assessment tools (e.g., quizzes, tests) are present in 54 tools (~52% of the sample), and nearly half of the tools (48 tools, ~47%) function as an interactive learning platform (facilitating various learning activities). Learning analytics capabilities (tracking student performance data) appear in 44 tools (~43%), reflecting the rise of data-driven education. Communication-related features are also common. Communication tools (messaging, class forums) are included in 42 tools (~41%) and Collaborative tools (enabling students to work together) in 37 tools (~36%). E-portfolio functions (allowing students to collect and showcase work) are found in 28 tools (~27%), and Content development tools (for creating or authoring content) in 25 tools (~24%). About 24 tools (~23%) explicitly identify as or include an LMS module, overlapping with the platform count earlier. Classroom response systems are in 21 tools (~20%) and Plagiarism/Writing support tools in 8 cases (~8%). On average, each tool has ~3 of these features (mean 3.3, median 3), indicating that many tools are multipurpose (for instance, an LMS might include assessment, communication, and analytics in one). Only a handful of tools have just one teaching/assessment feature, and none of these features are universally present, showing diversity in tool focus.

The data portrays a robust integration of teaching and assessment functionalities in digital tools. This has both opportunities and challenges for well-being. The widespread availability of assessment and analytics means that teachers and students receive a lot of feedback and

information about their learning. If used constructively, this can guide personalised support and celebrate progress, boosting student confidence. However, constant feedback or summative assessment can also heighten anxiety. Assessment stress is a known issue, and digital tools that frequently quiz or grade students might contribute to pressure if not balanced with formative, low-stakes uses. Likewise, learning analytics can be a double-edged sword: while providing valuable insights (e.g., early warning if a student is struggling), it can introduce privacy concerns and feelings of surveillance. The policy mapping noted that none of the surveyed countries have fully resolved how to use student data ethically for well-being monitoring. When implemented with care, analytics can actually reduce stress by identifying issues early and enabling timely intervention.

One encouraging sign is that collaborative and communication features are present in a large fraction of tools (~35–40%). This supports social learning, helping students feel connected even in digital environments. Literature indicates that a sense of community and the ability to ask questions or discuss with peers/teachers online can alleviate feelings of isolation or confusion that often accompany digital learning. However, constant connectivity through communication tools can blur boundaries. Many educators report that having 24/7 communication channels (email, chats) leads to expectations of immediate responses, causing workload stress. Students may similarly feel pressure to respond to group messages or keep up with discussion threads at all hours. The presence of communication tools in ~41% of analysed tools means schools need to develop norms (e.g., no-message hours, or explicit policies on response times) to protect everyone's down time. A gap highlighted in policy discussions around teacher workload and student digital well-being.

Many tools (over half) support formative assessments and learning analytics, which aligns with trends in personalised learning but raises questions about data use and pressure. The policy analysis found a gap in systematically measuring students' digital well-being (like no national tracking of screen time or stress). Interestingly, the popularity of analytics within tools means a wealth of data is being collected at the micro level, but this isn't yet aggregated for broader insights. Policymakers could consider ways to leverage anonymised data from these tools to inform well-being initiatives, of course with strict privacy safeguards. It's also noteworthy that about a quarter of tools have portfolio and content creation features, empowering students to create rather than just consume or respond. Creative activities (making videos, presentations, coding projects, etc.) are generally positive for well-being, as they allow self-expression and can give students a sense of accomplishment. These features tie into frameworks like DigCompEdu which encourage moving students from consumers to creators of digital content. From a theoretical perspective, this can enhance the Meaning and

Achievement aspects of well-being (in PERMA terms), as students produce tangible artifacts of learning.

However, one must also consider the cognitive load. Tools packing many features could overwhelm teachers and students if not well-designed. Having an all-in-one platform with assessment, communication, content, etc., can streamline workflows (one login for everything), but it can also present a steep learning curve or interface complexity. A cluttered, confusing interface is known to frustrate users – studies show that non-user-friendly platforms raise frustration and stress levels. The fact that many tools aim to be comprehensive underscores the importance of good UX design (addressed in Technology-Specific Factors later) and training users to get the best of these features without overload.

In summary, the teaching and assessment feature profile of current tools is rich and multifaceted. This indicates that digital tools are not just about delivering content; they actively mediate many aspects of the teaching-learning process (testing, communicating, collaborating, tracking progress). If harnessed well, this can significantly enhance learning experiences by enabling immediate feedback, personalised paths, and supportive learning communities. These align with recommended practices for effective digital learning environments. Nonetheless, each feature comes with considerations. Summative assessment frequency should be balanced to avoid constant high-stakes feeling. Analytics should be transparent to students (so they know how their data is used) and leveraged to help rather than label them. Communication should be bounded to prevent burnout. Collaboration should be structured to ensure inclusivity and prevent cyberbullying. The presence of plagiarism detection tools (8 cases) shows attention to academic integrity. Plagiarism detection is important for content quality, though such tools sometimes cause anxiety among students fearful of false positives. Policies could help here by ensuring students are educated on how these tools work and framing them as learning aids (e.g., to improve citation skills) rather than just punitive. The policy mapping noted a gap in guidelines for AI in education (which includes automated plagiarism checks). Specifically, a need for frameworks covering bias and transparency in algorithms. Plagiarism and essay scoring algorithms must be fair and explainable to maintain trust and well-being. All considered, our findings suggest that while the tools provide powerful teaching and assessment capabilities, maximising the well-being benefits (and minimising stress) will depend on mindful implementation. Educators must be trained not just in using the features, but in using them responsibly. For example, identifying signs of digital fatigue or stress in the data, rather than simply assigning more tasks. Policymakers, in turn, should update training and guidelines to reflect these new digital routines (the policy reports indicate some moves in this direction, like integrating well-being

and time management topics into teacher training). Our analysis of person- and context-specific factors next will shed more light on how these tools accommodate individual differences and learning environments, which is key to their ultimately healthy use.

6. Person-Specific Factors

Under this category the factors were listed which play a role in digital well-being from a personal perspective. One key factor is digital literacy and competence. Another factor is screen time habits and self-regulation. These categories were listed when the tool had features for supporting the development of digital competence, had options to regulate notifications or screentime and self-regulation skills. Additionally, the support or features for special needs education was considered as a person-specific factor.

An overwhelming 90 tools (~87%) include features or design considerations to enhance learners' digital competence. Meaning they help users develop technology skills or assume users need a certain skill level. Additionally, 59 tools (~57%) explicitly aim to support self-regulation (helping students manage their own learning/time/behaviour online). Notably, 30 tools (~29%) mention providing support for learners with ADHD, Autism, or other special educational needs (SEN), indicating an attempt to be inclusive of neurodiversity or different learning needs. Many tools address multiple personal factors. The average tool covers ~1.74 of these factors (median = 2). In fact, 22 tools (about 21%) explicitly address all three listed factors. These tools are designed to be accessible and helpful to a broad range of learners. Only about 13% of tools did not clearly address any of these personal factors (often general tools that may implicitly require digital skills but did not mention them).

Digital competence helps build resilience by enabling learners to critically assess online information, safeguard their privacy, and effectively manage their digital presence, which can lower stress levels and boost confidence (Coninck, Waechter, & Haenens, 2023). Conversely, students with limited digital skills may experience feelings of insecurity or being overwhelmed online, which can increase anxiety. Addressing these skill gaps is therefore essential for promoting equitable well-being. Research on targeted interventions demonstrates that even vulnerable youth can enhance their digital competencies over time, leading to measurable improvements in well-being outcomes (Coninck, Waechter, & Haenens, 2023).
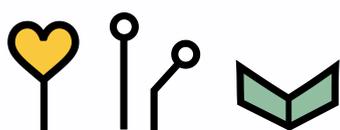
This focus on personal factors aligns strongly with the Literature review report (Deliverable 2.1) on factors influencing digital well-being. **Digital competence stands out as the most common element.** Higher digital competence (the ability to use tech effectively and safely) serves as a protective buffer enabling users to navigate online risks and make the most of digital opportunities in ways that support well-being. Our data, with 87% of tools noting digital competence, suggests that either the tools are designed in a way that it helps to develop digital competence (for example, by having an intuitive design or educational content on digital skills), or they presume a need for such skills and thus highlight it. In the Literature review report (Deliverable 2.1), one key finding was that students with stronger digital skills reported better social well-being and academic performance. They can critically evaluate online content, maintain privacy settings, and generally have more agency. Which will help to reduce stress and increase well-being. By contrast, students with low digital skills often feel overwhelmed or insecure online, which heightens anxiety.

The second major personal factor is **self-regulation,** present in 57% of tools. Self-regulation in a digital context might include features like goal-setting modules, reminders to take breaks, or tools for students to monitor their own progress and habits. This is crucial because managing one's time and attention online is a learned skill. Research cited in the literature review (Feng & Liu, 2024) found that students who exercise control over their screen habits (like setting time limits, turning off notifications while studying) experience less tech-related stress and better focus. Many tools evidently attempt to scaffold this. For example, a learning platform might have a dashboard for students to see their streaks or time spent, encouraging reflection on usage. Some tools may include "focus mode" options or encourage planning (like scheduling study tasks). By embedding such supports, tool developers acknowledge that time management and digital self-control are key to preventing technostress. Indeed, digital well-being training programs (e.g., in a study from Thailand) have shown improvements in adolescents' self-regulation skills leading to reduced anxiety and technostress. Thus, the 57% figure is promising, though it also means nearly half of the tools do not explicitly help with self-regulation. Those tools might assume the teacher provides that structure, or they might be the type of app that could inadvertently encourage excessive use (if they lack any brake on continuous engagement). This is where educators need to supplement. Even if a tool doesn't encourage breaks, teachers can impose break schedules. Encouragingly, policy recommendations for digital well-being often include building self-management skills in students (for example, Finland and Malta incorporate media literacy and self-regulation into their student curricula). Our findings underscore that many tools are ready to support this, but making it effective will require integration into teaching practice.
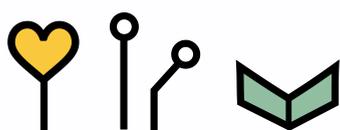
The third factor *adaptability to special needs* is present in 29% of tools. Traditionally, many ed-tech tools have been one-size-fits-all, so nearly a third now emphasising accessibility or adaptive features for special needs is a positive development. Examples might include adjustable reading speeds, gamified exercises to improve focus, visual schedules, or compatibility with assistive technologies. This resonates with the principle of universal design for learning (UDL), which suggests designing educational tools to meet a wide range of learner needs. From a well-being perspective, accommodating neurodiverse learners and those with learning difficulties is critical to avoid frustration, exclusion, and anxiety. A tool that is SEN-friendly can reduce stress for those students by providing appropriate scaffolding (e.g. chunking tasks, providing extra feedback) and by enabling them to participate more equally with peers. The policy mapping indicated that inclusive education is a common priority; for instance, Spain's and Lithuania's frameworks emphasise reducing disparities in digital readiness among schools and students. Ensuring tools are accessible and supportive to learners with attention or developmental differences directly contributes to that goal. However, it's also clear that not all tools have these features. About 71% did not mention SEN support. Policymakers and school procurement might use such data to preferentially select tools that do offer inclusive features, or push developers to incorporate them. The European Accessibility Act and Web Accessibility Directive already require certain digital products to meet accessibility standards (e.g., for visual/hearing impairments); a next step could be providing guidelines for cognitive/learning accessibility, which fewer tools currently address.

In sum, the strong representation of digital competence and self-regulation factors in our tool sample aligns with both research and policy emphasising that empowering the learner is key to digital well-being. Students who know how to use technology and manage their usage are far better equipped to handle challenges and avoid technostress. The tools seem to recognise this by incorporating skill-building and supportive features. The growing attention to special educational needs in digital tools is also heartening; it reflects a shift towards more inclusive digital learning, which correlates with better overall well-being (students feel valued and capable). That said, the responsibility is shared: tools provide the capability, but teachers and parents must often activate or encourage these supports. For example, a platform might have a built-in planner but students need to be taught how to use it effectively. There's a policy gap here in implementation. The policy analysis noted that while frameworks exist, there is often a lack of on-the-ground realisation of well-being objectives. Ensuring that digital competence and self-regulation supports in tools are actually utilised could be addressed in teacher training and student orientation for each tool. If executed well, our findings suggest that the current generation of tools provides a solid foundation to foster resilient, skilled, and self-aware digital learners, a foundational aspect of digital well-being.
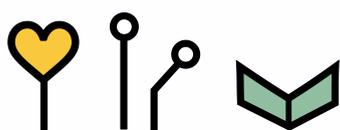
7. Context-Specific Factors

Under this category the factors were listed which influence the context in which digital learning takes place. The socio-economic environment (is the tool free or is access limited), Pedagogical approaches and practices (needs supervision or has a built-in tutoring system), supportive institutional policies and culture regarding technology use (does the tool have built in rules or support system which helps to regulate the tool usage) and how is content quality assured.

The most common context factor, noted in 67 tools (~65%), is that "access is limited". This typically means the tool's availability is constrained (Figure 6). For example, it might require a subscription, specific hardware, or only be usable within certain networks or times. In contrast, 40 tools (~39%) explicitly mention "access is free" (unrestricted use without payment or barriers). Nearly half the tools (48 tools, ~47%) indicate that they "need supervision", for example an adult (teacher or parent) oversight is recommended during use (often the case for young learners or open internet access). Importantly, 57 tools (~56%) have built-in tutoring/support systems or rule-based guidance. These tools provide internal support like guided tutorials, automatic hints, or enforcement of usage rules within the software. A minority of 12 tools (~12%) mention features aimed at "supporting mindfulness" in context, for example, promoting tech-life balance or reflective practices in usage (this could include reminders to take breaks or in-app mindfulness prompts).
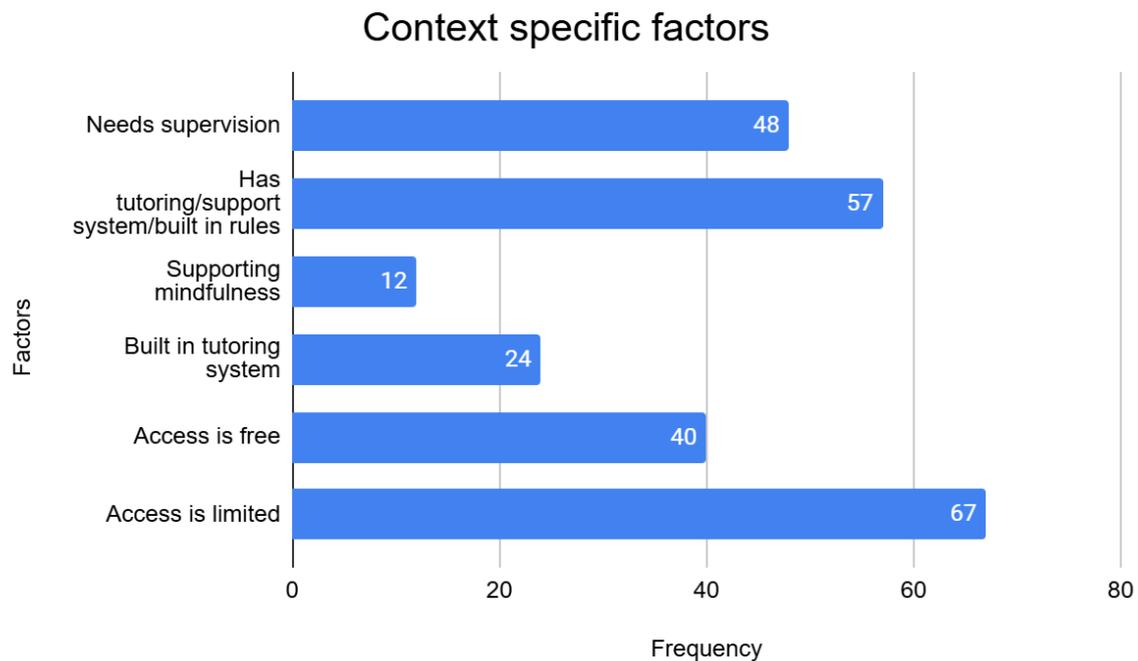
Context specific factors

Figure 6. Context specific factors

These context-related findings reveal how digital tools fit into the larger educational environment and what external supports they expect or provide. The fact that 65% have limited access highlights a critical issue: equity and infrastructure. Many tools require subscriptions, licenses, or certain devices. This can introduce a digital divide. Students in well-resourced schools or families get access, while others do not. Literature on digital well-being (Gallagher & Baum, 2023) emphasises that unequal access can increase stress and feelings of exclusion among less privileged students. During COVID-19 lockdowns, for instance, students without reliable internet or devices experienced heightened stress and lower satisfaction. Our data indicates that a majority of tools are not openly accessible to everyone (they have cost or availability constraints), which means policy initiatives to ensure equity are vital. Indeed, the policy mapping identifies closing connectivity and access gaps as a precondition for digital well-being, "equity is a precondition for digital well-being". Countries like Malta and Estonia boast near-universal connectivity which helps, but others still face infrastructure issues. The finding that 39% of tools are free is encouraging. These could be leveraged widely if awareness is raised. However, "free" sometimes means a basic version is free but full features are paywalled (freemium model). Such limitations can still create disparities (some students get only the limited version). Policies could address this by, for example, funding national licenses for certain high-quality tools to make them freely available to all schools (some countries have done this for learning platforms).

The need for supervision in ~47% of tools is also noteworthy. This typically applies to tools for younger children (needing teacher guidance) or tools that involve open internet/content (where an adult should monitor usage). It underscores that technology is not a babysitter – human oversight remains crucial. From a well-being perspective, adult supervision provides structure and safety. A teacher or parent can ensure the tool is used as intended, help the learner when they struggle, and enforce healthy limits. Conversely, in contexts where supervision is lacking (for instance, a child using an educational app at home without any guidance), there could be issues. Research has shown that when children are left to self-regulate entirely, they may misuse tools or become frustrated; middle-class households often impose screen rules, whereas in some low-income or high-workload households, children may be left alone with devices, sometimes with negative outcomes. Our data suggests nearly half of tools assume or advise that an adult be present, meaning there's an implicit dependency on context. If that supervision isn't there, the tool's effectiveness and the student's well-being might suffer. Policymakers have advocated a "whole-school approach" where teachers and parents are actively engaged in guiding digital tool use. The findings here support that: simply handing out tools isn't enough supervision and mentorship are part of the equation. Schools and parents need to be aware if a given tool expects supervision, ideally tool providers clearly communicate this (perhaps why it's noted in descriptions).

One of the most positive findings in this category is that 57% of tools have built-in tutoring or support systems. This indicates that many tools do not leave students entirely on their own. They have embedded scaffolding. Examples could include an interactive tutor that gives hints if a student is stuck, automated enforcement of time limits or content filtering, or guided pathways/rules that keep the student on track. Such internal support structures can significantly enhance well-being by reducing frustration and confusion. A well-designed tutoring system can mimic some of the benefits of teacher one-on-one support addressing student errors, providing encouragement, and ensuring the student doesn't use the tool in a harmful way (e.g., it might prevent progress until a prerequisite is mastered, rather than letting a student flounder). This aligns with the concept of intelligent support in device-specific factors. A clutter-free, guided interface reduces cognitive overload and anxiety. Our result (57% with tutoring) is consistent with the earlier note that 23% use intelligent tutoring methodology, others might have simpler rule-based guidance. The presence of these supports reflects industry efforts to ensure accessibility and quality. From a policy stance, this is promising because it means tools are trying to be self-contained and not overly rely on teacher intervention for basic help. However, there's still 43% of tools without such support, meaning those tools either assume a teacher will handle it or are simple enough not to need it. For teachers, knowing which tools have good internal support is helpful. They can be more
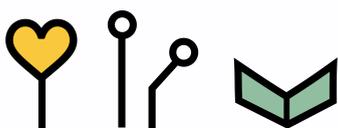
confident letting students work independently on those, and focus their attention where tools lack that support. It might be wise for schools to preferentially adopt tools with robust internal tutoring for scenarios like homework or remote learning, where teacher immediate presence is limited.

Finally, only 12 tools (~12%) mention supporting mindfulness. This is a relatively low number, implying that few tools explicitly encourage healthy tech habits (like breaks, reflection, or stress-reducing practices) within the software. This aligns with a gap identified in literature and policy. While experts recommend incorporating "tech breaks" and mindfulness into digital routines, most tools have not yet built this in. The policy mapping notes that issues like digital fatigue and healthy screen habits are generally not systematically addressed in policies or by providers yet. Our data confirms that. Only about one in ten tools proactively tries to mitigate overuse or stress through mindful design. Some exceptions might be certain well-being apps or educator-focused tools like Headspace for Educators (a meditation app for teachers) which was indeed one of the tools listed. Those explicitly focus on mindfulness, hence raising the count. But mainstream learning apps rarely say "time to pause" on their own. This is an area ripe for improvement. Developers could incorporate gentle nudges for breaks after prolonged use or end-of-session reflective prompts (e.g., "How do you feel after this activity?"). Regulators at the EU level are aware of manipulative design dangers. DigComp 2.2 added competencies about recognising and resisting manipulative user experience techniques that harm well-being. One proactive approach could be to encourage design standards for healthy usage. For instance, the EU could develop guidelines or certifications for tools that follow "well-being by design" principles (similar to how some apps now include usage timers or blue light filters).

In summary, the context factors show that digital tools do not exist in a vacuum. Their success and impact on well-being depend on the surrounding context of access, support, and usage culture. Equity remains a major concern (with many tools limited by cost or infrastructure). Supervision is emphasised by many tools, highlighting the need for involved educators and parents. The good news is many tools come with built-in support, reducing the burden on users and potentially preventing frustration. Yet, few tools take the extra step to encourage mindfulness or limit overuse. Indicating that for now, the responsibility for those aspects lies with users and educators. Policy documents recommend a "multi-tiered system of support" for digital wellness, from whole-school policies to individual interventions. Our analysis suggests that while tools can assist (through tutoring systems, etc.), humans must still set the tone, like making clear that if a tool is limited access, all students will be provided accounts to avoid inequality. If a tool requires supervision, ensuring adult presence. If a tool doesn't enforce
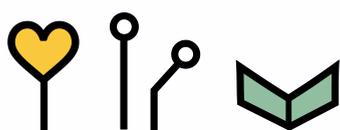
breaks, scheduling them externally. The next section on technology-specific factors will delve further into how the design of the tools themselves (notifications, gamification, etc.) can either mitigate or exacerbate stress.

7.1 Content Quality

We find that 81 tools (78.6%) include a user feedback option on content. For example, letting users rate lessons, report errors, or give suggestions. 59 tools (57.3%) mention having quality control mechanisms in place, such as editorial review processes, automated content checking, or moderation of user-generated content. Meanwhile, 31 tools (30.1%) state that their content is peer reviewed or vetted by experts (e.g., curriculum specialists or researchers). These categories overlap somewhat but indicate multiple strategies to maintain content standards. Some tools employ all three approaches, while a minority do not clearly indicate any (roughly 20% have no specific mention beyond the implication that content is teacher-created or standard-aligned).

Quality of educational content is directly tied to student well-being and learning. High-quality content ensures students learn correct information and skills, preventing confusion and frustration that can arise from errors or poor instructional design. Conversely, low-quality content can mislead students, erode their trust in the tool, and waste time (potentially leading to anxiety, especially if it affects grades or understanding). Our results indicate that the majority of tools take content quality seriously through feedback loops and review processes.

The user feedback option (78.6%) being so prevalent is notable. It shows that most tools invite teachers or students to give input on content (like flagging a mistake in an exercise, rating how helpful a resource was, or suggesting improvements). This crowdsourced approach to quality helps catch issues quickly and involves the community in co-improving the tool. For teachers, the ability to provide feedback can be empowering and ensures their voice is heard. Which can increase teacher satisfaction and indirectly benefit students (because teachers will be more inclined to continue using a tool that they feel they can help shape). For students, some tools might allow feedback too (though often it's teacher-level). This trend aligns with a more participatory philosophy in ed-tech. It also acknowledges that content needs iterative improvement and local relevance (teachers might comment if something isn't suitable for their context, etc.). From a policy angle, encouraging such feedback mechanisms is wise. It's a form of accountability and continuous improvement that doesn't rely solely on top-down regulation. It's similar to how some curricula reforms include teacher
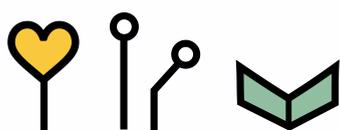
feedback loops. In terms of digital well-being, a responsive tool that fixes errors or adapts based on feedback can reduce frustration over time. A static tool that never addresses user complaints might accumulate flaws that cause recurring problems for learners. The literature didn't directly cover content feedback, but it's intuitive that a virtuous cycle of feedback and improvement leads to better content and thus a smoother learning experience.

The quality control mechanisms (57.3%) likely refer to internal processes like editorial review of content before it's published, algorithmic content moderation (for tools hosting user-generated content, e.g., forum posts or shared resources), or alignment checks with curriculum standards. That over half mentioned suggests many companies have put formal QA processes in place. For example, a content team reviews every new exercise or video for accuracy and appropriateness. Educational content often deals with sensitive or complex topics, and poor quality could mean anything from simple typos to biased or inappropriate content slipping through. For instance, an AI-generated content might introduce subtly biased examples. A quality control step would catch that and correct it, which otherwise could negatively influence student perceptions or reinforce stereotypes (impacting social well-being). In the policy mapping, while content quality wasn't a major focus, it is inherently part of providing high-quality education. Responsible technology use implies providing quality content, not just any digital content. The mention of quality control by 57% of tools is encouraging, but it also implies 43% did not explicitly mention it. Perhaps because it's assumed or because their model is different (e.g., community-curated content like OER repositories might rely on user ratings more than formal QC). It aligns with the earlier "proof of evidence on quality" (35%), some of those QC measures could be considered evidence of quality control. The difference in percentages suggests many tools do have internal QA but maybe not external validation.

Peer reviewed content (30.1%) is the strictest standard. Content has been reviewed (often blind) by external experts or academics for accuracy and pedagogical soundness. Only about a third of tools can claim this. These might be platforms developed in partnership with universities or government curricula, where content had to pass through committees or research-based evaluations. For example, some digital textbooks or assessment item banks undergo peer review similar to textbooks or academic papers. When content is peer-reviewed, educators can have high confidence in it, likely reducing their need to double-check everything, hence saving time and reducing cognitive load on teachers (a well-being plus for educators). For students, it means they are less likely to encounter inaccurate material that could confuse them. The relatively lower percentage here is expected because peer review is resource-intensive and not all content types lend

themselves to it (e.g., dynamic content created by AI on the fly can't be traditionally peer reviewed, though it could be tested in other ways). That 30% do have peer review might correspond to more static content collections or validated resources, possibly used in high-stakes contexts. It is also a marker of content credibility, which is part of digital well-being. Students should be able to trust the learning materials provided. Misinformation is not just a social media issue. If an educational app inadvertently teaches incorrect info, it can harm a student's academic progress and trust in digital learning. Our findings suggest a significant subset of tools guard against that via expert vetting.

Combining these results, it appears most tools rely on a combination of user feedback and internal review for content quality, while some also boast formal external review. This multi-layered approach to quality aligns with best practices in content development and likely improves over time. While not directly covered, one can infer that content quality is an underlying factor in how well these tools can improve outcomes without negative side effects. Poor content could even cause technostress if students find the digital materials confusing or conflicting with their textbooks. Good quality content ensures coherence, thereby reducing that stressor.

It's also worth considering that user feedback loops tie into the continuous improvement culture, which is itself a part of a positive digital ecosystem. Students see that their issues get resolved, which can increase their sense of belonging and respect in the learning process (if student feedback is considered). Teachers feeling listened to by tool providers can lead to better adoption and a virtuous cycle of improvement, ultimately benefiting students. Some policy documents encourage partnerships between developers and educators – these feedback systems are one mechanism for that partnership.

In terms of gaps, about 21% of tools didn't highlight any particular content quality measure. Those may still have them, but it raises flags to check those tools more carefully. It could be a threat if a tool is basically an open platform without oversight. Schools might be cautious using tools with user-generated content that isn't moderated or reviewed, as those could contain mistakes or even harmful material. The fact most tools do moderate and review indicates the industry is aware of those risks and acting on them.

Lastly, content quality links to equity and inclusion. Quality control helps ensure content is culturally appropriate and unbiased. If a tool lacked review, it might inadvertently include content that is insensitive to certain groups or not suitable for some contexts, which could hurt student well-being (e.g., feeling alienated or offended). Peer review and expert vetting can catch such issues (e.g., ensuring examples represent diverse names, avoiding stereotypes in
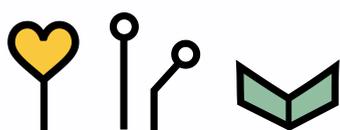
word problems, etc.). The policy mapping did note that as countries address initial digital gaps, they then turn to qualitative improvements like inclusive pedagogy and content quality checks are part of that inclusive approach.

In conclusion, our analysis reveals that content quality assurance is taken seriously by many digital educational tools, using user feedback and professional review processes. This focus on accuracy, appropriateness, and continuous improvement of content is crucial for positive learning outcomes and for maintaining user trust and satisfaction, which are core to digital well-being. By minimising frustration from bad content and preventing misinformation, these measures allow students to benefit fully from the tools' pedagogical features without undue confusion or mistrust. For educators and policymakers, it's a sign that while technology introduces a lot of content, it's not a free-for-all. There are checks akin to textbook approvals happening in the background of many products. As the field matures, we might see even more tools move into the peer-reviewed category, especially if they seek adoption at scale. Combined with robust privacy, ethical AI practices, and thoughtful design discussed earlier, content quality completes the picture of what makes a digital tool truly supportive of well-being. It's safe, fair, engaging and pedagogically sound.

8. Technology-Specific Factors

Under this category *Technology-Specific Factors* the factors were listed which from the developers' side can increase or decrease technostress and digital wellbeing. Is the tool meant for active or passive use? Does the tool have an option to switch off or control notification appearance? Does the tool incorporate gamification elements? Does the tool encourage screen breaks or not?

A vast majority of tools (85 tools, ~83%) require active use. Meaning the user must actively interact (click, type, solve) rather than passively watch or read. Meanwhile, 47 tools (~46%) also involve some form of passive use (consuming content like videos or readings). Over half the tools (58 tools, ~56%) employ notifications (alerts, reminders, updates to re-engage users). Similarly, 51 tools (~50%) incorporate gamification elements (points, badges, rewards, leader-boards) to drive engagement. On the other hand, only 18 tools (~18%) mention features for encouraging breaks or healthy usage habits (like reminders to pause). These numbers paint a picture of tools that are largely interactive and engagement-driven, often using persuasive design elements, but with few built-in safeguards against overuse.
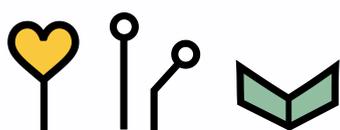
The high prevalence of active use (~83%) is a positive sign for educational value and potentially for well-being. Active engagement means learners are doing tasks (answering questions, dragging and dropping, creating content) rather than just listening or watching. Research consistently finds that active learning leads to better understanding and can keep students' minds focused, reducing the kind of mind-wandering or boredom that might come from passive consumption. Moreover, as noted earlier, active use of technology tends to be less detrimental to mood than passive use. For example, actively working through a simulation or writing an essay online is cognitively demanding but often satisfying, whereas passively scrolling can lead to feelings of lethargy or social comparison (depending on content). This aligns with educational best practice and addresses one of the classic criticisms of ed-tech (that it could make learners passive). However, almost 46% of tools also include passive elements. Which isn't necessarily bad. Some passive content like instructional videos or readings can be important for learning. The key is balance. A mix of active and passive modes can cater to different learning styles and give students a breather between interactive tasks. From a well-being standpoint, sustained active work is good but also tiring. Occasionally watching a video or reading might be a lower-stress activity to break up intensity. The risk would be if passive content became predominant or if it leads to long screen time without breaks (which ties back to lack of break reminders in tools).

The fact that 56% of tools send notifications reflects the common design approach of re-engaging users and keeping them informed. Notifications might remind students of upcoming deadlines, encourage them to return and continue learning, or alert them to feedback or messages. While useful, notifications can also be a source of distraction and anxiety. There is evidence that frequent notifications can fragment attention and create a "constant interruption" effect, leading to stress if users feel they must constantly check or respond. For example, a student trying to concentrate on homework might be pinged by an app about a new quiz, which potentially derails focus. For teachers, notification overload (from multiple tools or channels) is a documented contributor to burnout. Our finding suggests that many tools do push notifications, so a modern digital classroom could easily overwhelm students/teachers with alerts if multiple platforms are in use. It underscores the need for strategies like consolidating notifications or setting times when they're muted. Interestingly, the literature and DigComp 2.2 frameworks have started to highlight the importance of managing notifications for well-being. Making users aware of "manipulative design" and encouraging control over one's notification settings. For now, it appears tool developers liberally use notifications as engagement tools, which places some responsibility on users to adjust settings or on educators to guide appropriate use (e.g., advising students to turn off non-critical notifications during study time).
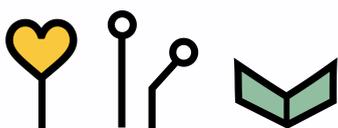
Similarly, nearly half the tools (~50%) use gamification elements. This indicates that using game psychology to motivate learners is extremely common. Points, badges, leader-boards can drive competition or a sense of achievement. The benefit is increased engagement and often enjoyment. Many students find gamified tasks more fun, which can reduce negative emotions associated with learning. Gamification can also provide clear goals and feedback, which helps with motivation. However, the potential downside is that it can create extrinsic motivation at the expense of intrinsic (students might focus on earning points rather than valuing the learning itself). More critically for well-being, as mentioned, an overly gamified environment may pressure some students or encourage addictive behaviour (like constantly checking rankings). The literature on persuasive design warns that features intended to maximise time-on-platform (like reward loops) can foster problematic usage habits. In our context, if a student becomes obsessed with maintaining a streak or remaining atop a leader-board, stress and anxiety could result. About half of tools having such elements means educators should monitor how students respond. The tools themselves rarely have a setting to de-gamify, so it's about how they're framed. For instance, a teacher might emphasise personal progress over competition, or turn off leader-boards if they prove counterproductive. On a system level, the EU's interest in ethical design could eventually encourage moderation, not overloading with too many reward mechanisms.

Crucially, only ~18% of tools encourage breaks or healthy use internally. This echoes what we saw in Context factors (mindfulness support ~12%). It shows that at the micro level of interface, few tools take the initiative to suggest "hey, you've been working for 30 minutes, how about a rest?". This lack of break encouragement is a concern because users (especially young ones) might not self-regulate well. Long sessions without rest can lead to eye strain, mental fatigue, and diminishing returns on learning. The literature (Gushgari, Sayed & Elgzar, 2024) cites the 20-20-20 rule (every 20 minutes, look at something 20 feet away for 20 seconds) to reduce eye strain but a tool would have to prompt that, or a teacher would. Only a handful of tools, likely those specifically focused on well-being (or some learning platforms that recently added gentle nudges), do this. It's an area where we expect growth. There is an emerging trend of apps including wellness reminders (for example, some video conferencing tools now prompt people to take breaks after long meetings). In education, the policy recommendations urge integrating mindfulness and time management training for students, but the tools aren't yet built that way. Perhaps as awareness grows, more will follow suit. For now, it means educators should manually implement break schedules when using these tools.
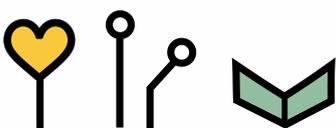
The combination of high engagement features (notifications, gamification) and low internal regulation (break reminders) in our findings reinforces a key point: digital tools are designed to maximise engagement but not necessarily to maintain balance. This places the responsibility on external stakeholders such as teachers, parents and students themselves to promote healthy and mindful use of educational technology. Policymakers might consider encouraging developers to integrate optional well-being settings, such as a "focus mode" to limit notifications or classroom features that automatically schedule breaks. Additionally, students' perspectives on creating learning environments that better meet their needs are considered vital. Designing learning spaces with and for students is a crucial first step in fostering well-being in the classroom. The same principle applies to the development and selection of digital learning tools, with both students and teachers playing an active role in collaborating with EdTech providers to ensure tools are relevant, balanced and supportive. Furthermore, national policymakers should involve school staff and students in the testing phase of digital education solutions before committing to large-scale investments. Some progress has been made, as reflected in guidelines such as the new EU Digital Principles, which call for technology that "enhances people's well-being", but these principles still need to be translated into practical and inclusive design practices.

On a positive note, the fact that most tools are actively engaging and only ~45% passive means the majority of student time on these tools will likely be mentally stimulating. Active learning correlates with better academic outcomes and can keep students in a more positive, alert mental state. The challenge of distraction from notifications and the intensity of gamification can be mitigated with conscious practices. For example, teachers can instruct students to turn off app notifications during class (or use do-not-disturb modes), and can frame gamified aspects as a fun bonus rather than the focus (reducing anxiety over points).

The literature review report (Deliverable 2.1) suggests that user interface and user experience (UI/UX) design directly affects frustration levels. A cluttered design with too many competing elements (pop-ups, flashing badges, etc.) can overwhelm users. Many notifications and gamification elements contribute to that clutter. Conversely, a calm and intuitive interface supports focus. Though we didn't directly evaluate UI aesthetics in our data, the high incidence of engagement features might imply many interfaces are quite "busy". DigComp 2.2 explicitly notes the importance of recognising manipulative digital practices and calls for more ethical design. Encouragingly, we did find in FAIR AI factors that 36 tools claim "proof of evidence on quality", possibly meaning they've tested their design's impact, and 58 focus on "ensuring accessibility" (including usability). These are signs of some developers prioritising user-friendly design (discussed next in FAIR AI section).

In summary, the technology-specific features highlight a classic tension in ed-tech. Maximising engagement versus ensuring well-being. The majority of tools clearly prioritise engagement through interactivity, notifications, and game elements, which can greatly enhance learning outcomes and make digital education lively. This is in line with pedagogical goals and even some well-being aspects (engaged students often feel more accomplished and less bored). However, without checks, these same features can lead to over-engagement or stress. The scant presence of break reminders shows that self-regulation features have not kept pace. Therefore, the findings support recommendations that students (and teachers) be taught digital self-regulation skills. For example, how to manage notifications, when to step away from the screen, etc. These are part of digital well-being education. From a policy viewpoint, it may be worth developing certification standards for ed-tech tools that adhere to certain well-being criteria (like no excessive notifications by default, option for focus mode, provides usage insights to users). Right now, the market is driven by user engagement metrics, but if schools start valuing and demanding well-being-friendly features, developers will adapt. Our data suggests a few have started (those ~17% encouraging breaks), but it's far from the norm. As educators implement these tools, being armed with knowledge about their design features can help them proactively manage classroom use to protect well-being. Next, we examine FAIR AI and Privacy/Security factors, which relate to how transparently and safely these tools operate.

8.1 FAIR AI Considerations

Just over half of the tools (58 tools, ~56%) explicitly state measures for ensuring accessibility (making the tool usable for all, including those with disabilities). About 36 tools (~35%) provide proof of evidence on quality, meaning they have some validation of effectiveness or quality assurance (e.g., peer-reviewed studies or certifications). 18 tools (~18%) mention using fair data for training. Implying that any AI algorithms or content are built on unbiased or representative datasets. Only 14 tools (~14%) refer to monitoring bias in their algorithms or content (actively checking for and mitigating bias). Additionally, 13 tools (~13%) gave no information on any of these FAIR AI aspects, meaning they do not advertise any particular fairness or transparency measures.

These findings provide insight into how much developers are considering the ethical and quality dimensions of their digital tools, which have indirect but important implications for well-being and trust. The most common aspect, ensuring accessibility (56%), overlaps with what we saw under Person-specific factors and context. Making sure tools are accessible is
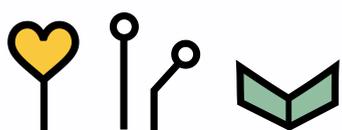
both an equity and legal matter. High accessibility means more students can use the tool effectively, including those with disabilities or special needs, which as discussed contributes to an inclusive, lower-stress learning environment for all. It's encouraging that over half the tools emphasise compliance with standards like WCAG (web content accessibility guidelines) to support visual/hearing impaired users, and perhaps considerations for cognitive accessibility. In the EU, accessibility is mandated for public sector digital services, and educational platforms often fall under that. This corresponds with policy, for example the European Accessibility Act and national policies requiring educational materials to be accessible. Many tools citing this suggest the industry is responding, which is good for student well-being. A tool that ensures, for instance, screen-reader compatibility or text-to-speech for dyslexic students will reduce frustration for those students and ensure they're not left behind. Accessibility can also cover language accessibility (multiple language options) which in multilingual regions reduces stress by allowing learning in one's native language.

The second most common, proof of evidence on quality (~35%), indicates that about one-third of tools have some form of external validation or quality control process. This might mean the tool has undergone academic research trials showing its effectiveness on learning outcomes or well-being. It could also mean internal quality assurance such as expert review of content to ensure accuracy. From a well-being perspective, using tools that are known to be effective can prevent wasted time and frustration. A tool that has proven impact likely engages students meaningfully rather than confusing them. It also builds trust among educators, which reduces teachers' stress about whether adopting the tool is worthwhile. The fact that 36 tools claim this suggests a positive trend toward evidence-based ed-tech. However, it also implies ~65% of tools did not mention such evidence. Perhaps because they haven't been studied or they're new. This gap echoes the literature's note that there are still gaps and limitations in current measurement of digital tool outcomes. Educators and policymakers consistently ask for evidence of efficacy, and our data shows some tools heed this call. In policy terms, some countries require or encourage ed-tech products to demonstrate effectiveness. Strengthening this could push more tools to invest in rigorous evaluations (which ultimately benefits well-being because it filters out tools that don't work or have harmful side effects).

Only around 18% mention fair data usage and 14% mention bias monitoring. These are relatively low figures, indicating that the majority of tools did not publicly address how their AI or content algorithms handle fairness and bias. In an educational context, this could be concerning. If, for example, a tool uses an AI tutor or automated grading, fairness is critical. Biased data could disadvantage certain groups of students (e.g., speech recognition

working worse for certain accents, or an algorithm that systematically gives lower marks to essays by non-native speakers due to bias in training data). The low numbers suggest that either most tools don't employ complex AI (so they felt it not applicable to mention), or that they have not made efforts to communicate their fairness practices. The policy mapping explicitly identified the development of an AI in education framework covering bias detection and algorithmic transparency as a gap that needs filling. Our results underscore this. Very few developers are proactively saying "we monitor our system for bias and ensure our training data is fair," which likely means these practices are not yet standard. It's an area ripe for policy action. For instance, the forthcoming EU AI Act (though not education-specific) will require transparency and risk mitigation for AI. Educational tools might fall under that if they are high-impact. The Better Internet for Kids strategy and DigComp also emphasise that children's digital services should be safe and free from unfair profiling. The education policy analysis noted a particular gap in guidelines about AI-driven personalised learning and data protection. So, the fact that only ~14% monitor bias likely reflects the absence of requirements to do so currently. This is an area where improvement would directly contribute to digital well-being. If students and teachers trust that the tool's recommendations or scores are fair and unbiased, it reduces anxiety and builds trust in digital systems. Conversely, if an algorithm is unfair, it could seriously harm a student's academic confidence or opportunities.

Interestingly, ~13% of tools provided no info on these aspects, meaning they do not advertise any fairness/accessibility/privacy by design. These might be smaller apps or older tools that haven't caught up with the trend of highlighting ethical features. It's possible some do things internally but don't mention them. However, transparency is part of the equation. If stakeholders don't know, they can't evaluate trustworthiness. The presence of "no info" tools indicates that not all developers see this as a selling point yet, or they themselves haven't prioritised it.

For those that did mention these factors, ensuring accessibility being top aligns with both moral and legal incentives. The high number likely includes many who simply state compliance with GDPR and accessibility standards, which is becoming boilerplate. Indeed, in Privacy (next section) we see a large majority claim GDPR compliance, which ties into fairness too (data protection fairness). The GreenComp (EU's Digital Competence framework for sustainability) even highlights ethical AI and sustainable digital practices as competencies, showing a conceptual shift linking these issues to digital well-being (e.g., avoiding manipulative algorithms is part of being well digitally).

From a well-being standpoint, these FAIR AI factors contribute to creating a safe and trustworthy digital learning environment. A tool that is accessible, unbiased, and proven effective is much more likely to produce positive experiences and outcomes, thereby enhancing well-being. Conversely, a tool that is inaccessible to some, possibly biased, and unproven could cause frustration, injustice, or harm learning, negatively affecting well-being. Our findings show that we are part-way there. Accessibility is on the radar, quality evidence is somewhat there, but fairness/bias transparency is lagging. The policy analysis across countries revealed that while many policies mention data protection and inclusion, explicit digital well-being integration is still emerging. One clear distinction found was that, countries more advanced in digital infrastructure (like Estonia, Malta) are now focusing on qualitative aspects like pedagogy and well-being, whereas others still bridging basic access have to tackle that first. It stands to reason that as basic access issues are resolved focus will shift more to these FAIR AI issues.

The relatively large proportion of tools (~35%) having proof of quality is worth highlighting as a good practice. Educators and schools may use that information in decision-making. It also correlates with Content Quality measures (we found about ~30% tools said they are peer-reviewed, likely overlapping with these). Such external validation could be one way to indirectly gauge a tool's effect on well-being (for instance, if research on a tool shows it reduces math anxiety, that would be an excellent sign).

In summary, our analysis of FAIR AI factors suggests that concepts of fairness, transparency, and evidence-based practice are emerging but not uniform in digital educational tools. Over half address accessibility, aligning with inclusive education goals and contributing to equity (thus well-being). Around one-third demonstrate a culture of evidence and quality control, which is crucial for trusting and effective ed-tech. But only a minority tackle the thornier AI ethics issues like bias, indicating a need for stronger guidelines or incentives. As the EU and national bodies develop policies for AI in education, we expect these numbers to rise in future years. More tools will hopefully start advertising "no bias detected" or "algorithm transparency" as selling points. Until then, educators should be mindful when using tools with algorithmic components, remaining alert to potential biases and ensuring human oversight of automated decisions (e.g., double-checking an AI grade). Tools that gave no info on these aspects might warrant a closer look or caution in adoption. The next section on Privacy and Security will complement this, as it deals with data protection and safety assurances which are intimately connected to fairness and trust in ed-tech.
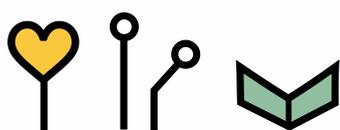
8.2 Privacy and Security

A vast majority of tools (79 tools, ~77%) declare that they are GDPR compliant (in compliance with EU data protection law). Similarly, 77 tools (~75%) say they have a privacy policy in place, and 67 tools (~65%) are transparent about data collection (informing users what data is collected and how). 56 tools (~54%) claim to have strong measures in place for security (e.g. encryption, cybersecurity safeguards). About 39 tools (~38%) explicitly state that students have privacy and control over their data (features allowing users to manage or delete their data, control visibility, etc.). 19 tools (~18%) mention that the system asks for identifiable parental consent when creating accounts (to comply with child consent laws, usually for users under 13–16 depending on country). Only 2 tools (~2%) indicate they do not collect personal data at all, which is an extremely small minority (Figure 7).

These numbers reveal that privacy and security are highly prioritised in the design and marketing of most educational tools, which is reassuring. The near ubiquity of GDPR compliance and privacy policies (around three-quarters of tools) aligns with the regulatory environment. Since 2018, GDPR has set a baseline that any service handling personal data of EU citizens (including students) must follow certain principles (lawfulness, purpose limitation, data minimisation, etc.). For educational tools, this is critical. Schools and parents need assurance that students' personal information is safe.

Our data suggests that most vendors are indeed making this explicit. In terms of well-being, this contributes to a sense of safety and trust. If a tool mishandled data or had frequent breaches, it could cause significant anxiety among educators and families, and possibly harm students (via exposure of personal info). That 75%+ have transparent policies means users at least are informed. The policy mapping indicated that all countries largely rely on frameworks like GDPR for student data protection. Spain's education laws reference national implementations of GDPR for schools. Our findings mirror that. Essentially, compliance with data protection laws is now a standard part of educational tool offerings, indirectly supporting well-being by safeguarding students' rights and safety online.
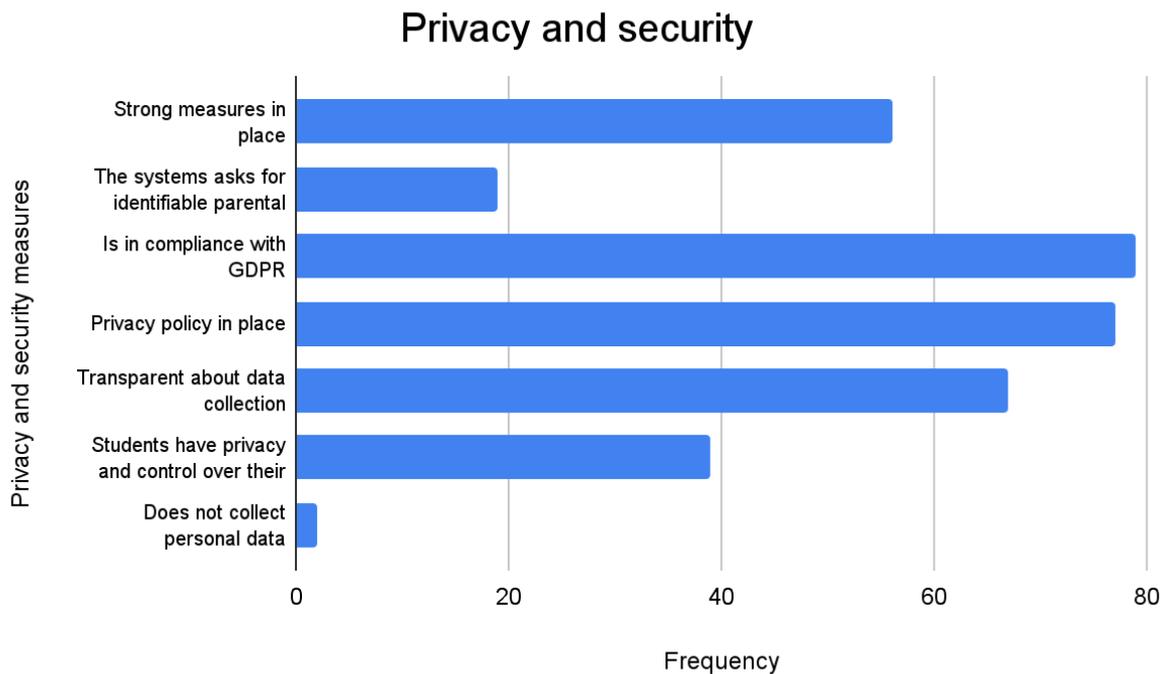
Privacy and security

Figure 7. Privacy and Security measures claimed by the tools

About 65% say they are transparent about data collection, which overlaps with having a privacy policy, but implies they likely provide accessible information on what data is gathered (some may even have dashboards for users to see their data). Transparency is crucial for digital well-being because it empowers users. When students and teachers know what information is recorded (e.g., location, activity logs, assessment results), they can make informed decisions and feel more in control. The literature emphasises that feeling in control of one's digital environment is a component of digital well-being. Tools that are clear about data practices help build that control and trust.

Strong security measures (54%) being cited indicates that over half the tools proactively advertise their cybersecurity aspects like end-to-end encryption, regular security audits, compliance with ISO security standards, etc. This is important not just for protecting data from hackers but also for ensuring continuity of service (preventing disruptions via cyber attacks). For well-being, strong security means lower risk of incidents that could cause panic or harm. The fact that nearly half did not mention it doesn't necessarily mean they lack security. They might just not highlight it. But those that do likely use it as a trust signal. Given rising cyber threats, it's good to see many focusing on it. Policy frameworks (like the EU's Better Internet for Kids) stress cyber resilience in education. Our data suggests many tools align with that by design.

That 37.9% of tools give students privacy and control over their data is a forward-leaning feature. Examples might include allowing students to download or delete their data, control profile visibility or sharing settings, or choose what is displayed to others. This aligns with the idea of treating students not just as data subjects but as agents. It also resonates with modern digital citizenship principles, that young people should learn to manage their digital footprint. The literature on digital well-being suggests that when individuals feel they have control over their personal data and online identity, it reduces anxiety and promotes a sense of safety. Only about a third of tools enabling this shows it's not yet standard, but it is emerging. Given that minors' data often require special handling, it's encouraging that some tools empower them in this way under adult oversight.

The parental consent measure (18.4%) addresses compliance with laws requiring parental permission for children under a certain age to use online services (COPPA in the US, GDPR-K in Europe sets age 16 by default, often lowered to 13 by countries). Only 19 tools flagged this, possibly because not all tools are aimed at young children, or because in school deployments consent might be handled by the school on behalf of parents. Still, that about one in five bring it up shows awareness. It is directly tied to policy. For example, Estonia and Malta have regulations on getting parental sign-off for digital services used by kids. For well-being, parental involvement can be positive. It keeps parents informed and engaged in their child's digital learning, potentially opening communication about usage and any issues. On the flip side, if tools lack proper consent flows, they risk legal issues and eroding trust if parents discover their child was using something without their knowledge. So this is an area where perhaps not all tools need it (some target older students or just teachers), but those that do should implement it.

Finally, only 2 tools (1.9%) claim to collect no personal data. It indicates nearly every tool collects something identifying (like names, contact info, usage data). The two that don't might be offline software or very privacy-preserving by design (for example, some hardware kits or open resources that don't require login). For the rest, data collection is the norm, which underscores why compliance and security measures above are so critical. There was perhaps a time when some ed-tech bragged "no student data needed", but with personalisation and analytics being so prevalent, data is usually integral. As long as it's handled responsibly, this is acceptable within the privacy framework. However, it reminds us that schools should ensure data processing agreements are in place and minimal data is collected as needed (data minimisation principle). The policy analysis noted lack of systematic monitoring of well-being indicators as a gap. Interestingly, all these tools collecting data could in theory provide such
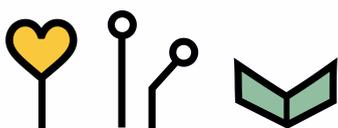
indicators if aggregated (like average screen time, etc.), but that would raise its own privacy concerns.

Overall, the strong privacy posture of most tools is good news for digital well-being. Privacy and well-being are linked. If users trust a platform to respect their privacy, they feel safer and more comfortable using it. The transparency and control measures, some tools provide empower students and teachers, aligning with the notion of informational self-determination. The emphasis on GDPR compliance and security reflects how policy has effectively set expectations. An example of policy directly supporting well-being by mandating protective measures. In practice, incidents like data leaks or misuse (which can be very distressing events in a school community) may be less likely with these tools, and if policies are followed, parents and students are informed about their rights (like requesting data deletion, etc.). One potential area for improvement is making privacy information more student-friendly. Only some tools likely provide simplified notices or involve students in managing their data. Education policy could encourage including digital privacy education alongside tool usage (teaching students to review what data they share, how to adjust settings).

To conclude, our analysis shows privacy and security are largely well-addressed by current digital educational tools, aligning with regulatory requirements and contributing to a safer digital learning environment. The focus on GDPR compliance, clear privacy policies, and security suggests the industry has internalised baseline standards. This supports policy observations that while a lot is happening in infrastructure and training, not all of it is explicitly under a "well-being" label, yet indirectly these measures protect well-being. One might say privacy/security is one area where policy intent (protecting students) and implementation by tools is strong. A contrast to mental health integration which is still weak. Schools and educators should still perform due diligence (checking those policies and measures), but they can take some comfort that most tools have done their homework on privacy. Moving forward, continuing to enforce and requiring more user control or algorithm transparency in privacy policies, could further empower users. But relative to other dimensions, privacy is a success story. Trust is the foundation of using digital tools. If students or parents feared their data would be misused, it would undermine all potential benefits. Our data suggests trust can be maintained as a priority. Finally, we will consider Content Quality to complete the picture. As a tool could be perfectly secure and feature-rich, but if its educational content is poor or harmful, well-being and learning suffer.
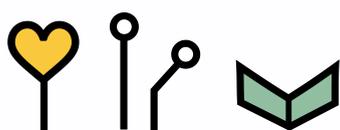
9. Discussion and Recommendations

The analysis above provides a comprehensive look at how digital technologies and tools used now in several European countries align with factors influencing digital well-being. Most tools support active, student-centred pedagogies. Many incorporate socio-emotional learning elements. They employ engaging methodologies (mobile, gamification, etc.) while expecting thoughtful integration by educators. They consider individual differences (digital literacy and SEN support) and contextual needs (supervision, access). They heavily use persuasive design features (notifications, rewards) but rarely self-regulate usage. They have made strides in privacy/security and accessibility (likely due to policy drivers) and they generally strive for content accuracy and quality through feedback and review. These findings point to several areas of strength and a few gaps when viewed against the literature and policy frameworks:

9.1 Alignment with Digital well-being Frameworks

The tools' emphasis on active learning, SEL, and personal factor support resonates with frameworks like DigCompEdu, which expects educators to use technology in ways that enhance learners' well-being, engagement, and inclusion. DigCompEdu explicitly highlights the teacher's role in ensuring learners' physical and psychological well-being in digital environments. Our analysis shows tools provide many of the features teachers need to do this. For example, tools support collaboration and communication (social well-being), include SEL and self-regulation aids (emotional well-being), and cater to different abilities (inclusion). However, a tool is only as good as its use. Educators must skill-fully employ these features. Thus, one recommendation is to strengthen teacher training on digital pedagogies and well-being. Many countries have digital competency frameworks for teachers (e.g., Spain's Marco de Competencia Digital Docente, Lithuania's guidelines aligning with DigCompEdu). These should integrate specific guidance on using tool features to support well-being. For instance, how to leverage a platform's SEL tools to address technostress, or how to configure notifications to minimise distraction. The literature noted that educators with higher pedagogical digital competence experience less technostress themselves and can better
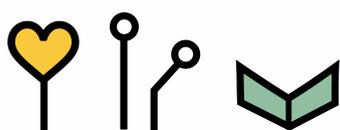
support students. Thus, investing in teacher upskilling (beyond basic ICT, into nuanced areas like balancing screen time, reading analytics for student well-being signals, etc.) is crucial. Our findings provide concrete content for such training. Teachers can be taught about the importance of scheduling breaks (since most tools won't do it), about moderating gamification, about employing tutoring features effectively, etc.

9.2 Policy Gaps and Actions Needed

On the policy side, the analysis suggests some gaps remain between what tools offer and what policies mandate or support. For example, mental health and digital fatigue are not yet systematically addressed in policy or by most tools (only ~17% tools encourage breaks). Policymakers should consider establishing guidelines or certification for "digital well-being compliance" of educational tools. This could include criteria like: the tool allows setting time limits or break reminders, the tool's gamification is adjustable, the tool provides data to monitor student workload or stress (e.g., time-on-task dashboards), etc. A seal of "well-being Friendly Digital Tool" could incentivise developers to build in these supports. It parallels how accessibility is now expected. well-being-related features could become standard if driven by policy expectations. Additionally, monitoring and data on well-being is a gap. While tools collect lots of data, this isn't synthesised to inform policy. Authorities could collaborate with EdTech providers (in privacy-compliant ways) to gather anonymised insights on usage patterns, engagement drops (potentially indicating disengagement or stress), etc. The policy mapping recommended establishing indicators for student digital well-being (like tracking screen time, or incident rates of cyberbullying). Tools could feed into such indicators. For instance, LMS data could report average homework screen time per week. Data that could inform national guidelines (if too high, perhaps curricula need adjustment to avoid overload).

Another gap is the explicit integration of well-being in curriculum and school culture. Tools can provide means (SEL modules, etc.), but policy needs to ensure schools use them in a coordinated way. A recommendation here is to adopt a whole-school digital well-being policy. Schools should articulate how they use technology in a way that supports student well-being (e.g., device-free lunch breaks as mentioned in literature, limits on homework on screens, using tools' analytics to spot struggling students). Our analysis supports this by showing the tools have capabilities that can be harnessed (analytics, SEL, communication with counsellors perhaps). Indeed, Malta's example of weaving mental health support into its digital strategy (with helplines and lessons on healthy use) could be a model for others. Countries should consider multi-tiered support. Basic digital wellness education for all (using
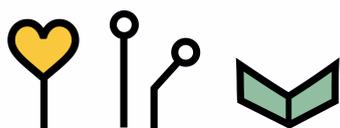
tools' SEL features), additional support via tools for those who show signs of technostress (maybe guided by analytics or teacher observations), and professional mental health services integrated for severe cases (possibly leveraging communication tools for referrals). The literature provides evidence that such multi-level interventions can improve outcomes.

9.3 Technostress and Over-Engagement

Our findings highlight a subtle technostress risk. Tools are very engaging by design, which can lead to techno-overload. Tarafdar et al. 's (2007) technostress framework (cited in literature) includes factors like techno-overload, techno-invasion (blurring work-life), techno-complexity. We see potential for overload (too many notifications, tasks), invasion (tools extending learning into home with mobile use, notifications at any time), and complexity (multiple features to learn). To mitigate these, educators and administrators should streamline tool usage. Policies can encourage an ecosystem approach. Maybe have one integrated platform with all needed features instead of 5 different apps (though our analysis suggests many tools are multi-feature, which could help here). Also, digital wellness training for students is key. Teach them strategies to manage notifications, focus techniques for online work, and how to leverage self-regulation support in tools. Such training should be embedded from early ages, as recommended in various reports. It's not enough to give tools; students need guidance on using them healthily.

9.4 Ethical and Safe Design

We found few tools that address manipulative design or AI bias. This is a forward-looking gap to fill. As AI becomes more prevalent in ed-tech (recommendation engines, automated tutoring, etc.), policies should require transparency (students should know when they're interacting with AI vs a human, what data the AI uses) and an option to appeal or override AI decisions (like a teacher can adjust an AI-generated grade). The policy mapping explicitly cites the lack of an AI in the education framework as a gap. Adopting one (perhaps in line with the EU's AI Act) would push more tools to implement bias monitoring and fairness measures (which only ~14–18% do now). This will directly protect well-being by preventing algorithmic discrimination or opaque systems that cause confusion or unfair outcomes.

9.5 Student Agency and Inclusion

Our analysis underlines the importance of giving students a sense of control, whether through privacy settings, personalisation choices, or opportunities to provide feedback. Policies and educators should actively promote student agency in digital learning. For example, allowing students to customise aspects of their learning apps (such as themes or pathways) can increase their sense of ownership and comfort, while encouraging them to report issues and participate in solutions, such as forming student tech committees to collaborate with staff on tool use. Additionally, fostering the development of online tools that allow teachers, students and parents to make reasonable adjustments ensures that students with specific needs can participate in education on an equal basis, thereby enhancing well-being across the whole school system. This approach ties into digital citizenship, positioning students not merely as consumers but as active shapers of their digital learning environment. It also reflects the Council of the EU's concept of empowerment in digital environments. Our findings on user feedback and data control features indicate that some infrastructure for this already exists, but the culture in schools needs to make better use of it.

9.6 Continuous Research and Evaluation

We should note that our analysis is based on data provided by tools and our interpretations based on analysis of literature and documents. It's also essential to validate if these features indeed have the intended positive effects. An analysis of the literature reveals that it is often called for more research on the impact of digital interventions on well-being. We recommend that schools and researchers collaborate to monitor outcomes when adopting tools. For example: Does a tool with SEL features actually reduce student stress or improve classroom climate compared to a tool without? Are notifications causing distraction in practice, or do students adapt? Gathering such evidence can inform better design tweaks or usage guidelines. Some tools claimed "proof of quality". Ideally more will undergo independent studies that also consider well-being metrics (not just test scores). Over time, this will build an evidence base to choose tools not only on academic efficacy but also on well-being impact.

In conclusion, the current landscape of digital educational tools is quite advanced in supporting various dimensions of digital well-being, but the responsibility for realising those benefits lies with how they are implemented in schools. Policymakers and educational leaders should act on the insights from this analysis. Ensure equitable access (so all the

positive features actually reach every student). Update policies to address emerging issues like screen time guidelines and AI ethics in education. Invest in teacher and student training for healthy digital practices. Push for a design paradigm where well-being is as fundamental as functionality. This might include working with developers to incorporate more wellness features and to maintain high standards of safety, privacy, and content quality. As multiple frameworks (DigComp 2.2, UNESCO's ICT Competency Framework for Teachers, etc.) converge on the idea that safe, effective, and mindful use of technology is part of digital competence, the findings here provide concrete guidance on where we are doing well (privacy, engagement, inclusion) and where to improve (balance, mental health integration, ethical AI).

By closing the remaining policy gaps and fostering collaboration between educators, students, and tool developers, we can create a digital education ecosystem that not only supports learning outcomes but also actively promotes the well-being of all participants. Reducing technostress, supporting mental health, and preparing students for a balanced relationship with technology throughout their lives. Each category we examined offers an avenue for action from adjusting pedagogical strategies and classroom management in light of tool capabilities, to advocating for product features and policies that guard against the unintended consequences of those very capabilities. The overall message is optimistic. The tools available today contain many of the ingredients needed for a healthy digital learning environment. With informed use and targeted improvements, they can truly help education systems realise the vision of technology that empowers and does not harm.
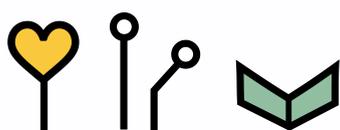
Conclusion

In this analysis, we evaluated current digital educational tools against a comprehensive set of well-being criteria, drawing on both our empirical data and the insights of Deliverable 2.1 (literature review report) and Deliverable 2.3 (policy mapping report). The findings depict a digital learning landscape that has made significant progress in enabling positive experiences. Most tools are learner-centric, interactive, and mindful of privacy and inclusion. Yet one that also requires deliberate strategies to mitigate new forms of stress and ensure no learner is left behind. Key takeaways include:

● Educational tools now commonly incorporate pedagogies and features supportive of well-being. They actively engage students in learning (constructivist, inquiry-based approaches), provide social and emotional support (SEL frameworks, collaborative tools), and cater to personal needs (digital literacy scaffolding, SEN accommodations). They also largely adhere to privacy, security, and quality norms, creating a safer and more trustworthy digital environment than in the past. These developments align with policy goals of fostering safe, empowering digital education and reflect a maturation of the ed-tech industry in recognising its role in student well-being.

● On the other hand, the design choices that make tools engaging can, if unregulated, contribute to technostress. Ubiquitous notifications, gamified reward loops, and the permeation of learning into home life via mobile access blur boundaries and can overload students and teachers. The analysis revealed that few tools self-impose limits or encourage downtime. A gap that must be filled by educator practices or future design changes. Additionally, while many tools have SEL components, around 20–30% do not, and not all learners may benefit equally unless educators actively leverage those features. The uneven attention to AI ethics (bias/fairness) is another area to monitor, as algorithmic decision-making in education should be fair and transparent to uphold student confidence and equity.

● The synergy between tool capabilities and policy frameworks is evident. GDPR pushed widespread privacy compliance, and accessibility mandates spurred tools to be inclusive. Policymakers should now tackle the more nuanced well-being aspects. Establishing guidelines on healthy tool use (screen time, notification management in schools), embedding digital well-being outcomes in curricula (so that using these tools becomes an opportunity to teach students about balance and self-regulation), and formalising requirements for tools regarding mental health considerations (for instance, requiring that learning analytics dashboards include well-being indicators, or that high-use apps provide break features by

design). As recommended in Deliverable 2.3, a more coherent and explicit integration of well-being in digital education policy is needed. Our recommendations:

○ **Educators**. Leverage the strengths of tools (engagement, personalisation, SEL) while consciously counteracting their downsides. Set class norms for tech use (e.g., device breaks, notification-free periods), use data insights to support struggling students (not to overburden them), and encourage student voice in how tools are used. Engage with the feedback mechanisms, report issues, suggest improvements. So tools continue to evolve in user-friendly ways. By doing so, teachers act as mediators who ensure technology serves pedagogy and student well-being, not the other way around.

○ **Tool Developers.** Consider well-being an integral part of UX design. Simple additions like optional break reminders, configurable notification settings (perhaps a "school mode"), and transparency dashboards for students can make a big difference. Continue the good practices in privacy/security and content quality, and extend them: for example, perform user studies on stress factors in your app and address them. Collaborate with psychologists and educators when designing gamification to ensure it remains fun, not stressful. Demonstrating a commitment to "well-being by design" could become a competitive advantage as schools become more discerning.

○ **Policymakers and School Leaders**. Develop clear policies at school/district and national levels that set expectations for digital tool usage that prioritise well-being. This includes professional development focusing on digital well-being, establishing IT procurement criteria that include well-being features (not just cost and functionality), and monitoring implementation (perhaps via surveys on student/teacher digital stress levels annually). Encourage a culture where well-being is part of digital competence. Consider multi-stakeholder committees (educators, students, parents, developers) to periodically review the impact of ed-tech on student well-being and advise on course corrections.

The current generation of digital educational tools provides a robust platform to advance both learning and well-being. They embody many recommendations from the DigComp 2.2 and DigCompEdu frameworks by offering features that, if used correctly, can reduce stressors (e.g., confusion, isolation) and promote positive experiences (engagement, collaboration, achievement). Yet, the mere presence of features is not a panacea. It requires what the literature calls a "balanced, mindful use of technology". Achieving that balance is an ongoing process of refinement in practice, guided by continuous research and feedback.
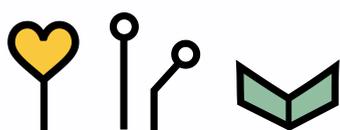
To conclude, our analysis is largely optimistic. It shows that educational technology, often maligned for its potential harms, is in fact increasingly being designed and deployed with well-being in mind. The tools are not perfect, but they are improving and, coupled with informed pedagogical strategies and supportive policies, can become a cornerstone of a digitally enriched education system that nurtures students' academic growth and their overall well-being. By addressing the identified gaps stakeholders can ensure that the digital transformation of education leads to healthier, happier, and more resilient learners and teachers. In the words of one policy document, the goal is to ensure "digital transformation in schools supports mental, social, and emotional health". This report's findings and recommendations aim to help make that vision a reality, guiding the evaluation and adoption of tools in a way that fully realises their promise while safeguarding the human element at the heart of education.

Annex 1. Tool analysis spreadsheet

See additional Excel spreadsheet "Annex 1 to D2.2 Tool analysis".

Note. Image by Freepik.

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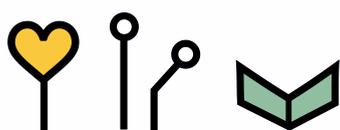
WINDEE

Short description of WINDEE

WINDEE is a policy experimentation project aimed at improving the digital wellbeing 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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