D3.2 LED Digital Education Framework

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ABSTRACT

The Deliverable 3.2 LED Education Framework offers a holistic educational model designed to foster digital wellbeing, learner autonomy, biophilic learning environment, and emotional intelligence in upper-primary students aged 10–15. Responding to the mental health and engagement challenges exacerbated by increased reliance on digital learning during the COVID-19 pandemic, the framework uniquely integrates technological solutions with human-centric and nature-oriented educational practices. A dedicated biophilic learning hub in Latvia will pilot the framework, focusing on mixed-method evaluations and stakeholder engagement to validate the model's effectiveness and scalability. Key innovations include personalised feedback mechanisms, emotional intelligence training, autonomous learning practices, hybrid instructional modalities, and a newly developed Digital Wellbeing Assessment Tool, collaboratively designed with educators, students, and psychologists. Outcomes anticipated include enhanced student psychological wellbeing, reduced isolation, improved academic performance, and validated, scalable educational practices aligned with European policy objectives.

KEYWORDS

Digital education framework, Digital wellbeing, Biophilic learning environment, Biophilic Learning Hub, mixed methods

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List of Abbreviations and Acronyms

CA	Consortium Agreement
D	Deliverable
DoA	Description of the Action
GA	EU Grant Agreement
PC	Project Coordinator
PCO	Project Coordination Office
TL	Task Leader
SO	Specific objective
WP	Work Package

Executive Summary

The LED Digital Education Framework is a comprehensive response to the rising psychological and educational challenges faced by students in digital learning contexts. The initiative emerges from the necessity to address the adverse effects of prolonged online education, notably diminished emotional wellbeing, increased isolation, and inconsistent academic outcomes. Central to this framework are four interconnected components:

- Digital Wellbeing and Feedback Systems: Implementing personalised, immediate, and student-centric feedback mechanisms to counteract feelings of isolation and promote emotional health.
- Biophilic and Hybrid Learning Environments: Establishing a physical biophilic learning hub that integrates natural design elements to improve students' psychological states, while complementing virtual education with hands-on, nature-connected experiences.
- Autonomous and Transformative Methodologies: Equipping students with skills for autonomous learning, goal-setting, and self-regulation, supported by transformative pedagogies blending remote instruction and face-to-face interactions.
- Emotional Intelligence (EI) Development: Conducting structured EI training inspired by recognised frameworks such as CASEL, aiming to enhance students' emotional regulation, empathy, and social skills essential for holistic development.

To rigorously measure and ensure effectiveness, the LED project introduces a new Digital Wellbeing Assessment Tool co-created with stakeholders to provide reliable, context-specific evaluations of students' emotional, social, and digital health.

The Latvian pilot study will assess the framework's impact using mixed methods, measuring academic performance, psychological wellbeing, and stakeholder satisfaction. Early indicators predict significant improvements in student emotional health, academic outcomes, and overall engagement, aligning with Erasmus+ standards and educational policy priorities.

By project completion, deliverables will include detailed implementation guidelines, the validated Digital Wellbeing Assessment Tool, EI training modules, and comprehensive educator training materials, collectively aiming to promote systemic adoption and adaptation of the LED framework across Europe.

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Introduction

The LED (Learning, Engagement, and Development) Digital Education Framework is a holistic model designed to enhance upper-primary students' digital wellbeing, learner autonomy, connection with nature (biophilic design), and emotional intelligence. A confluence of challenges, ranging from the psychological toll of remote learning during the COVID-19 pandemic to concerns about excessive "screen time" and isolation, motivates this framework's development. Students aged 10–15 are at a formative stage where sustained digital engagement can impact their mental health and social development. Thus, LED's approach interweaves technology with human-centric and nature-based strategies to create a balanced learning ecosystem. The framework will be piloted in Latvia in a purpose-built, biophilic learning hub for children enrolled in remote education programs, with the intent to inform broader policy experimentation across Nordic and EU contexts. In alignment with Erasmus+ Policy Experimentation standards, the pilot will emphasise rigorous mixed-method evaluation and stakeholder collaboration to ensure scalability and evidence-based outcomes.

This document details the LED framework in four key sections. First, we examine how to enhance students' digital wellbeing and implement feedback mechanisms that counteract the emotional strains of online learning. Next, we outline the design and pilot implementation of the framework in the Latvian biophilic hub, including an evaluation plan. The third section integrates transformative methodologies that collectively underpin the framework's innovation: biophilic design, autonomous learning, hybrid learning models, and emotional intelligence training. The fourth section describes the development and validation of a new digital wellbeing assessment tool co-created with stakeholders. We conclude with expected outcomes, success indicators, and deliverables, including guidelines and materials to support educators in adopting this framework.

1. Enhancing Digital Wellbeing & Feedback Mechanisms

Psychological and Emotional Impacts of Digital Learning: Prolonged reliance on digital learning can pose significant psychological challenges for youth. Studies during the pandemic's remote learning phase showed that many months of e-learning combined with social isolation had negative effects on students' mental health. Over half of students reported feeling sad, depressed, nervous, or irritable, alongside a marked decrease in motivation to learn. Adolescents in virtual-only schooling reported more stress, anxiety, and persistent depressive symptoms compared to those attending in-person classes (Vaillancourt et al., 2021). Younger adolescents (ages 11–13) similarly experienced increased emotional disorders, sleep disturbances, and internet/gaming overuse when normal school routines were disrupted. On the positive side, digital learning during lockdown did improve some technical skills and self-directed learning habits, but these benefits were overshadowed by widespread decreases in wellbeing and academic performance. These findings highlight the imperative to actively support students' emotional needs and sense of connection in any technology-mediated education model.

Validated Tools for Measuring Digital Wellbeing: To monitor and improve digital wellbeing, the LED framework incorporates validated psychometric instruments that capture students' emotional and social health in digital contexts. One such measure is the Schutte Emotional

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Intelligence Scale (SEIS), a 33-item validated scale of emotional intelligence focusing on perception, understanding, and management of emotions (Schutte, et al, 1998). Higher emotional intelligence (as gauged by SEIS or similar tools) has been associated with better stress coping and social adjustment in teens, making it a relevant indicator of wellbeing in online learning environments. Another relevant instrument is the Interpersonal Reactivity Index (IRI), a well-established 28-item measure of empathy across four subscales: Perspective Taking, Empathic Concern, Personal Distress, and Fantasy (Davis, 1980). The IRI provides insight into students' capacity for understanding others' feelings and maintaining social connectedness. In a digital context, higher empathy may protect against cyberbullying and feelings of alienation. Together, these tools allow educators to quantify dimensions of digital wellbeing such as emotional regulation, social empathy, and feelings of isolation. For instance, a student with low scores in Empathic Concern (IRI) and Managing Own Emotions (SEIS) might be flagged as at-risk for digital disengagement or distress, prompting supportive interventions. Beyond SEIS and IRI, the framework draws on emerging "digital wellbeing" scales (e.g. the Digital Wellbeing Scale with subdomains for mental, social, and physical health in tech use) to specifically measure the balance between screen time and wellbeing (Santos et al., 2023). All assessment tools will be administered with informed consent and with attention to age-appropriate language, ensuring a safe space for students to report how digital learning is affecting them.

Student-Centred Feedback Systems to Reduce Isolation: A core strategy in LED is the implementation of feedback mechanisms that actively counteract digital isolation. Research shows that prompt, personalised feedback in virtual settings can create a sense of "teacher presence" and immediacy that buffers against student loneliness. For example, Martin et al. (2020) found that the shift to virtual learning offers new opportunities for real-time feedback, which, if used effectively, can "establish immediacy and reduce isolation time for virtual learners". In practice, the framework encourages tutors to provide immediate, personalised feedback through their physical presence and regular check-ins at the hub. Instead of students waiting for digital responses, they receive real-time support, guidance, and encouragement from adults who are physically there, helping them feel seen, valued, and emotionally supported.

Peer feedback is another student-centred approach: structured peer-review sessions and collaborative projects allow students to regularly interact and support each other academically and socially (Gikandi & Morrow, 2015). By guiding students on how to give constructive feedback to classmates, the framework not only enhances learning outcomes but also builds a virtual community that mitigates isolation. Social presence is maintained through face-to-face meetings and mentorship pairings so that every learner has channels for expressing concerns and celebrating achievements with others. Importantly, feedback tone and personalisation are emphasised. Research suggests feedback is most motivating when delivered in a conversational, encouraging tone that addresses students' specific misconceptions (Hattie & Timperley, 2007). In the LED model, tutors are trained to use "voice notes" and personalised comments (instead of generic marks) to create a warmer, humanised feedback process. This practice ties in with self-determination theory – feedback that supports a student's sense of autonomy, competence, and relatedness will foster greater intrinsic motivation and wellbeing. For instance, a teacher might

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praise a student's unique approach to a problem (competence), invite them to set a personal goal for next time (autonomy), and relate the task to a group effort or real-world context (relatedness).

Finally, to ensure these systems truly reduce isolation, the framework incorporates feedback on feedback: students periodically complete short surveys about how supported and connected they feel by the digital feedback practices. This meta-feedback loop allows continuous improvement. In summary, by using timely, personal, and dialogic feedback channels, the LED framework counteracts the anonymity and isolation that often plague online education. Students remain connected to peers and educators, sustaining the human touch that is vital for digital wellbeing.

2. Design & Pilot of the LED Framework

Strengths and Limitations of Current Digital Education Models: The LED framework builds on the lessons learned from existing digital and hybrid learning models. Traditional fully online programs offer flexibility and personalised pacing, but often at the cost of student engagement and equity. A common limitation has been the "one-size-fits-all" approach to e-learning tools, which may produce only modest gains in academic achievement. Indeed, a systematic review of ICT in education concluded that while technology can enhance learning in specific subjects or when closely integrated with pedagogy, overall effects on student performance have been inconsistent. Many digital initiatives have shown "little improvement in performance" unless paired with innovative teaching strategies and support. This underscores the need for a multidimensional approach like LED that merges technology with wellbeing and pedagogical innovations. Another limitation of past models is the digital divide – students from disadvantaged backgrounds often lack access to devices or stable internet, hampering the effectiveness of purely digital strategies. LED addresses this by providing a physical hub with high-quality connectivity and devices for those who need them, ensuring no learner is left behind due to infrastructure issues.

Current models also struggle with student motivation and autonomy. On one hand, flipped classrooms and adaptive learning systems have empowered some learners to take charge of their learning; on the other, many students lack self-regulation skills, leading to disengagement or procrastination online (Yang, 2022). The strength of digital models lies in their capacity for personalisation and LED leverages these strengths by incorporating personalised learning pathways. However, LED also explicitly tackles the self-regulatory gaps by training students in goal-setting and reflecting on progress (see Section 3), rather than assuming all students will naturally thrive in self-paced environments. Finally, purely in-person traditional schooling excels in social interaction and hands-on experiences but can be rigid and slow to innovate. Blended learning models attempt to capture the best of both, and evidence suggests they can achieve superior outcomes. A meta-analysis of 30 studies (Yu, Xu, & Sukjairungwattana, 2022) found "blended learning outcomes are significantly higher than traditional learning outcomes with a medium effect size" ($d \approx 0.36$). This indicates that combining online and face-to-face elements can yield improved performance and student attitudes. LED embraces this principle by integrating remote instruction with in-person sessions, aiming to maximise engagement, convenience, and effectiveness. In summary, the framework's design acknowledges current models' strengths

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(flexibility, personalisation, social interaction in class) while addressing their weaknesses (isolation, uneven quality, low motivation) through an intentional fusion of digital, biophilic, and socio-emotional components.

Pilot Implementation in a Biophilic Learning Hub (Latvia): The pilot of the LED framework will take place in a specially designed "biophilic learning hub" in Latvia. This hub is a physical learning space infused with nature-centric design elements – ample natural light, indoor greenery, natural materials (wood, stone) in the decor, and flexible seating that can be arranged to view outdoor scenes. The hub serves as a communal point for remotely enrolled students to attend their online classes in a supportive environment, where they can receive immediate, real-time feedback from adults, engage in social interaction, and benefit from supplementary emotional and wellbeing activities. Students continue to attend their regular online classes for core academic instruction (delivered via an established e-learning platform or virtual school) while spending a certain number of days each week at the hub. The goal is to utilise biophilia (humans' affinity for nature) to reduce stress and mental fatigue accumulated during screen-heavy days. Indeed, research in school environments has shown that biophilic features like natural patterns, daylight, and views of greenery can significantly lower student stress and improve attention. In one case study, middle schoolers in a biophilic classroom (with nature-inspired design elements) had better heart rate variability (an indicator of stress recovery) and achieved test score gains three times higher than peers in a standard classroom (Browning & Determan, 2024). Our Latvian pilot hub draws on these findings: its layout includes quiet nooks with plants for individual study (providing "refuge" and calm), open areas with nature views for group work ("prospect" to stimulate creativity), and even biophilic technology like virtual aquariums or bird-song soundscapes during breaks to create a soothing atmosphere.

The schedule and curriculum of the pilot are co-developed with local educators to align with national education standards while embodying LED principles. Tutors (both those delivering online lessons and on-site facilitators) are trained in the framework's approaches. For instance, how to conduct hybrid lessons that start online and conclude with an in-person activity, or how to weave emotional intelligence exercises into daily routines. A typical hybrid module might be: an online lecture or simulation introduces a concept (e.g., climate change in geography), and later that week at the hub, students collaboratively build a small model ecosystem or take a nature walk to collect samples, applying and deepening their knowledge through direct experience. Telepresence technology is also utilised: if a specialised tutor or a student cannot be physically present, telepresence robots or live video streaming ensure they can participate virtually in the hub activities, maintaining inclusivity.

Mixed-Methods Evaluation Strategy: To rigorously assess the pilot's impact, a comprehensive mixed-method evaluation will be deployed, focusing on three primary outcomes: academic performance, student wellbeing, and stakeholder satisfaction. Quantitative measures will include academic records (grades or standardised test scores) tracked before and after implementation, as well as wellbeing scores from surveys administered periodically. For wellbeing, we will use instruments like the SEIS, IRI and the newly developed digital wellbeing tool (see Section 4) to quantify changes in stress, loneliness, and engagement. We anticipate, for example, a target of at

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least a 40% improvement in students' self-reported psychological wellbeing scores after one academic semester in the LED program (relative to baseline), a figure in line with outcomes of school-based wellbeing interventions in research (Durlak et al., 2011). We will also analyse rates of digital isolation by including survey items such as "I feel isolated when learning from home" and expecting a statistically significant reduction in agreement with such statements over time (e.g., a drop in mean isolation score by >0.5 SD). Academic performance will be analysed using a pre-post comparison. Key performance indicators might include improvements in end-of-term exam scores or project-based assessment results. For instance, if the baseline math test average was 70%, a successful pilot might aim for an average of 80% post-intervention, or significantly higher gains than a comparison group of peers not in the program.

Qualitative evaluation will complement these numbers by capturing student and tutor experiences. We will conduct focus groups and one-on-one interviews with students at mid-point and end-point, asking them about their motivation, sense of wellbeing, and any challenges faced. Their feedback may reveal nuanced insights. For example, a student might describe feeling "more confident and less anxious" due to the EI training sessions, or a teacher might note improved class participation on hybrid lesson days. Parent and educator satisfaction surveys (Likert-scale and open-ended questions) will gauge broader acceptance of the model. The satisfaction of stakeholders is crucial for scaling the framework; thus, a Positive Pilot Evaluation from the majority of participants (e.g., >80% of students and educators rating the experience as positive) is an explicit success criterion.

The evaluation will follow a mixed-methods convergent design, wherein quantitative and qualitative data are collected in parallel and then triangulated to draw conclusions. For example, if we observe an improvement in wellbeing scores, interview data may help attribute this to specific aspects of the framework (e.g., "The garden space makes me happy to come to school" corresponding to stress reduction). Conversely, if an expected improvement is not seen in the data, qualitative responses might explain why (e.g., technical issues, scheduling conflicts, etc.). All data will be disaggregated by demographic variables to ensure the framework is benefiting various groups equitably (for instance, checking that both boys and girls, and students with different learning needs, all show positive trends). The mixed-method approach aligns with Erasmus+ standards for policy experimentation, providing robust evidence of effectiveness as well as contextual understanding. Ultimately, the evaluation findings will inform refinements to the LED framework before any broader rollout. By documenting both measurable impacts and personal experiences, we aim to produce a rich evidence base to support policy recommendations and future adaptation of the model across the EU.

3. Integrating Transformative Methodologies

Biophilic Design in Digital/Hybrid Education: Integrating nature into the learning process is a cornerstone of the LED framework. Biophilic design posits that environments with natural elements promote reduced stress, improved concentration, and greater overall wellbeing. Outcomes which are highly pertinent to students who otherwise spend hours in front of screens. The framework incorporates biophilic principles not only in the physical hub design (as detailed earlier) but also in pedagogical choices. Research supports the educational benefits of nature

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integration: studies have linked views of greenery and natural light in classrooms with lower cortisol levels and anxiety in students, as well as higher test scores compared to traditional classroom settings. The LED framework uses nature as both context and content for learning. For example, science lessons often involve outdoor observation or experiments with plants and water, melding curriculum with hands-on contact with natural phenomena. In language arts, students might read or write poetry about nature during designated outdoor reading time. Even virtual activities can leverage biophilia: the framework might use digital nature simulations (like an interactive ecosystem app) to teach systems thinking, thereby blending technology with an experience of "virtual nature." The hybrid scheduling ensures students have regular intervals of outdoor or nature-based learning to counterbalance indoor screen time ("green time" to balance "screen time"). According to Attention Restoration Theory, engagement with natural environments helps replenish students' directed attention (Ohly, et al., 2016), which can be drained by intense cognitive tasks on computers. We expect to see improved on-task behaviour and less mental fatigue in students following biophilic sessions. Moreover, nature-based learning inherently invites curiosity and multi-sensory engagement, which can rekindle enthusiasm in learners who might feel burnt out by conventional online classes. In sum, biophilic integration is not an add-on but woven into the framework's pedagogy, promoting a healthier, calmer, and more stimulating learning experience that aligns with developmental needs of young adolescents.

Autonomous Learning and Goal-Setting: Empowering students to take charge of their learning is another key dimension. The LED framework includes structured modules on self-directed learning skills, recognising that autonomy must be cultivated, especially for students transitioning to more independent learning formats. Building on self-regulated learning (SRL) theory, we operationalise autonomy through regular goal-setting, self-monitoring, and reflection exercises. At the start of each week or unit, students create personal learning goals (e.g., "I will complete two extra math problem sets" or "I want to improve my essay's organisation"). These goals are recorded in a digital learner portfolio or app which tracks progress and provides prompts. Students then track their own progress toward these goals, with the system sending gentle reminders or congratulatory feedback as appropriate. Research indicates that when learners "take the initiative to set learning goals and then monitor, adjust, and evaluate their cognition and behaviour to achieve them," their academic outcomes and motivation improve. We thus train students in techniques like keeping a study log, using checklists for tasks, and doing weekly self-evaluations of what worked or what needs change in their study habits.

To support this, tutors adopt a coaching role. Each student meets (virtually or in-person) with a tutor bi-weekly to review their goals and discuss any hurdles. This fosters accountability but also provides scaffolding for those struggling with self-regulation. For example, a student who failed to meet a goal of finishing a book might, with the tutor's help, identify distractions and set a more specific plan (like reading 20 pages each night before bed). Students' progress will be monitored and visualised with person specific Excel Sheets. (e.g., a checklist completion percentage). Such monitoring makes the abstract concept of "progress" more tangible and motivating. Autonomous learning is also enhanced through choice: whenever possible, students are given options in their learning activities (choice of project topic, choice of book, or choice of role in a group task), which increases their intrinsic engagement. By practicing goal-setting and making choices in a

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supported environment, students gradually build the executive function skills and confidence needed for lifelong self-directed learning. Over the course of the pilot, we expect to see growth in students' self-reported autonomy and self-efficacy. These can be measured by scales or questionnaires (e.g., "I feel in control of my learning" – agree/disagree) and qualitatively through student reflections. Success in this area might manifest as students taking initiative beyond requirements. For example, forming study groups, pursuing extra projects, or teaching peers – behaviours indicative of a developing autonomous learner.

Hybrid Learning Models (Remote + In-Person): The LED framework leverages a hybrid learning model that combines the scalability and resource richness of remote instruction with the irreplaceable benefits of face-to-face interaction. The structure is deliberately flexible, but one illustrative model is the "remote theory, in-person practice" approach: core instruction, lectures, and routine practice happen online, while higher-order activities (labs, discussions, presentations) happen during in-person sessions. This plays to the strengths of each format. Remote lessons (delivered via live video or interactive modules) can efficiently disseminate content and utilise multimedia (videos, simulations, quizzes) without time and space constraints. Students can replay recorded lessons as needed, allowing differentiation and self-paced learning. Meanwhile, the in-person days activate social learning and application of knowledge. Students might engage in a hands-on science experiment, conduct a group debate, or build something tangible, applying concepts learned online. This not only deepens understanding but also hones collaboration and communication skills that are harder to develop in isolation. By interweaving the two modes, hybrid learning also keeps students' experience varied and less monotonous, which is important at ages 10–15 to sustain attention.

The efficacy of hybrid models is supported by research: beyond the meta-analytic evidence of improved outcomes, studies report that students often prefer a blend of online and offline learning as it gives both flexibility and social structure (McGee & Reis, 2012). Similarly, in-person time includes both structured activities and unstructured social or play time, acknowledging the importance of peer bonding and downtime for wellbeing. A critical aspect of the hybrid model is ensuring equity and inclusion: not all students may be able to attend in-person equally (due to distance or health issues). The expected outcome of the hybrid approach is a learning experience that is engaging, adaptable, and effective – students should show not only academic gains but also greater enjoyment of learning and connection with their peers and tutors. Anecdotally, we anticipate hearing students say things like "I love the days at the hub because I get to see my friends and do cool projects" and also "I like that I can do some work from home where I'm comfortable." These sentiments, combined with measurable performance and wellbeing improvements, will validate the hybrid model's success.

Emotional Intelligence and Empathy Training: Recognising that emotional and social skills are as crucial as academic skills, the LED framework embeds a dedicated Emotional Intelligence (EI) training component. This is based on the understanding that improved emotional regulation, empathy, and social skills contribute to better collaboration, reduced bullying, and enhanced mental health for students. We incorporate a structured curriculum inspired by evidence-based Social and Emotional Learning (SEL) programs such as the CASEL framework (Collaborative for

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Academic, Social, and Emotional Learning) (Mahoney & Weissberg, 2019). The training is delivered through weekly workshops (30–45 minutes) at the hub, facilitated by a tutor. Each session might focus on a specific competency: for example, self-awareness (identifying one's emotions and triggers), self-management (techniques for calming down, such as deep breathing or mindfulness exercises), social awareness (recognising others' feelings, perspective-taking), relationship skills (active listening, teamwork, conflict resolution), and responsible decision-making. Activities are interactive and age-appropriate: a session on empathy might involve role-playing scenarios where students practice responding to a classmate's problem, guided by the facilitator to notice body language and tone (tying back to the IRI measure of empathic concern). A session on managing anxiety might teach cognitive reframing strategies and have students create a "coping skills toolbox" with strategies they can use when stressed during online exams or in-person presentations.

The training uses proven techniques. For instance, emotion labelling (having students regularly name what they are feeling) builds self-awareness and has been shown to reduce emotional intensity. We encourage use of a digital mood-tracker app where students log how they feel each day in a simple emoticon or colour format; this data helps them and their mentors notice patterns (e.g., "I feel worried on Monday mornings" might prompt a discussion or support). Mindfulness practices are also introduced, since mindfulness in schools has been linked to improved focus and mood. A short breathing or visualisation exercise might start each day (either at home via a guided audio or together at the hub), bringing a moment of calm and readiness to learn.

Evidence for the effectiveness of such training is robust. Research has found that increasing adolescents' emotional competencies can improve their resilience and even academic performance (Ruiz-Aranda et al., 2012). We anticipate similar outcomes in our pilot: by explicitly teaching skills like recognising and coping with emotions, students will be better equipped to handle frustrations of learning (such as a difficult assignment or technical issues online) without feeling overwhelmed. They will also likely show improved behaviour and collaboration. Tutors may observe fewer conflicts during group work and more instances of students supporting each other (for example, a student noticing a peer looking upset and asking if they're okay – a simple yet powerful sign of empathy in action).

To reinforce the training, the framework creates an emotionally supportive pedagogy across all subjects. Tutors are trained in strategies like validating student feelings ("I see that you're frustrated by this problem; that's understandable"), using restorative practices for discipline, and encouraging a growth mindset (emphasising effort and learning from mistakes). Additionally, a peer-mentor system is established: older students or "digital buddies" mentor younger ones, creating vertical relationships that build empathy and leadership. These practices cultivate a classroom (physical and virtual) culture where emotions are respected rather than suppressed.

The EI training's effectiveness will be measured both quantitatively and qualitatively. We might use the SEIS or other EI assessment tools at baseline and after an academic semester to see if there are gains in students' emotional intelligence scores. We also expect reductions in incidents of bullying or disruptive behaviour (tracked through teacher reports or school records) and increases in positive peer interactions (perhaps captured through sociometric surveys asking students who

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they find supportive, etc.). Student self-reports might reveal improvements too: e.g., more students agreeing with statements like "I know how to calm myself down when I feel stressed" or "I can understand what my classmates are feeling". These soft outcomes are critical to the framework's holistic success; our goal is to develop not only smarter students, but kinder and more resilient ones. By combining biophilic, autonomous, and hybrid academic strategies with deliberate emotional-social development, the LED framework aims to educate the "whole child" for the digital age.

4. Developing and Validating a Digital Wellbeing Assessment Tool

Co-Design of an Inclusive Assessment Instrument: A major innovation in the LED project is a new Digital Wellbeing Assessment Tool tailored for school-aged learners. We recognise that existing wellbeing surveys often overlook the specific context of digital/hybrid learning, and many were created from an adult perspective. To ensure our tool is valid and relevant, we employ a co-design process with input from psychologists, educators, and the students themselves. This participatory approach follows best practices highlighted in recent research: involving youth in the design of wellbeing measures leads to more authentic and valid indicators. For instance, Hossain et al. (2023) found that most student wellbeing instruments were developed by researchers alone, but in the few cases where students were consulted (through advisory groups, focus groups, panel discussions), the resulting questionnaires captured aspects of wellbeing that adults hadn't considered. Inspired by these findings, we will organise workshops where participating students (our target age group) brainstorm and share what "wellbeing" means to them in the context of remote learning. Through guided activities (like drawing their day or expressing feelings about online vs. offline school), students might highlight issues like feeling heard by tutors, having friends to chat with, or managing screen fatigue. These insights directly inform the content of our assessment tool, ensuring it covers domains that truly matter to students (e.g., sense of connection, digital fatigue, autonomy in learning, etc.). Tutors and school counsellors will also provide input on what behaviours or signs they observe that signal a student is thriving or struggling in a digital environment. For example, a teacher might note "when a student turns camera off and doesn't participate, it's a warning sign", this could lead to an item about engagement behaviour. Psychologists in the team will help translate these ideas into clear, age-appropriate survey items and performance tasks. The goal is a tool with strong content validity backed by stakeholder relevance.

Structure and Content of the Tool: The Digital Wellbeing Assessment Tool will likely be multi-dimensional. Based on literature and our co-design process, we anticipate key dimensions such as: Emotional Wellbeing (e.g., stress, anxiety, enjoyment related to digital learning), Social Wellbeing (e.g., feelings of isolation or belonging with peers online), Physical Wellbeing (e.g., screen time management, sleep quality, eye strain), and Adaptive Skills (e.g., ability to self-regulate tech use, seek help when needed). It will combine several types of measures: (1) a self-report questionnaire for students with Likert-scale items (e.g., "I feel lonely during online classes" or "I take breaks when using devices to help myself feel better"), (2) a short scenario-based test or game that gauges decision-making (for example, presenting a dilemma like whether to continue studying on a computer late at night or get sleep, to see how students prioritise wellbeing), and (3)

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possibly a teacher/parent observational checklist for triangulation (e.g., teacher rates how often the student appears distracted or disengaged in virtual class). By using multiple methods, we address different aspects of wellbeing and mitigate biases of any single method.

Pilot Testing with Latvian Students: Once a draft of the tool is prepared, we will pilot it with a sample of students in the Latvian hub (and possibly a partner school for additional data). During the pilot, we will examine both the psychometric properties and user experience of the tool. Reliability is a primary concern – we aim for internal consistency (Cronbach's α in each domain ideally above 0.8 for robust reliability) and test–retest reliability (administering the survey twice a few weeks apart to see if it yields stable results in the absence of major changes). We will perform item analyses to eliminate or revise questions that don't correlate well with their intended scale or that students find confusing. Exploratory factor analysis (and later confirmatory factor analysis with a larger sample) will be used to verify that items group into the intended factors (emotional, social, etc.) and to adjust the tool's structure if necessary. For example, we might hypothesise an "emotional distress" factor, but if the data show that students distinguish between anxiety and fatigue as separate factors, we'd refine the model accordingly. We will also validate the tool's construct validity by correlating it with existing validated measures: for instance, we may administer a general youth wellbeing survey or the SEIS/IRI alongside it. We would expect our Digital Wellbeing scores to positively correlate with overall wellbeing and emotional intelligence, and negatively correlate with measures of depression or loneliness, consistent with convergent and divergent validity.

Ensuring Inclusivity and Cultural Relevance: Special attention is given to making the assessment inclusive for diverse learners. This means using clear, jargon-free language (the tool will be available in Latvian, and potentially Russian or other languages as needed for local minorities). We'll apply Universal Design for Learning (UDL) principles in the format, such as reading aloud items for those with reading difficulties, and using some visual analogue scales (smiley faces or thermometers to rate feelings) for younger or less verbal students. For students with special needs (like autism or ADHD), we consider their input and may include items or observations specifically pertinent (for example, an item about sensory overload from screens). The pilot phase will actively seek feedback from these students and their parents to ensure the tool is fair and comfortable for them. We realise one size may not fit all, and flexibility or alternate forms of the tool might be provided (like a shorter version or a more visual format).

Validation and Iteration: After pilot data is collected, we'll refine the assessment tool iteratively. The final step of validation could involve a larger field trial beyond the pilot hub, perhaps in multiple schools across Latvia or partner Nordic countries, to test generalisability. We will use statistical techniques to verify that the tool works equivalently across different groups (checking for any bias by gender or cultural background using measures of measurement invariance). Only after the tool demonstrates strong reliability ($\alpha \geq .80$), validity, and usability will we publish it as a project deliverable. The outcome will be a Digital Wellbeing Assessment Tool that educators and researchers can use to monitor student wellbeing in digital/hybrid settings, filling a gap in current assessment practices. This tool will enable schools to identify students who might be struggling with the online transition or thriving in it, allowing targeted interventions. For example, if a

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student's results show low social wellbeing, the school counsellor can proactively facilitate peer engagement opportunities or mentoring for that student.

Through co-design and rigorous validation, we ensure the tool is evidence-based and inclusive. The process itself also benefits the students involved – by participating in co-design focus groups and reflecting on wellbeing, students become more aware and invested in their own wellbeing. This reflects the ethos of the LED framework: student voice and agency are at the heart of educational innovation. By the end of the project, we aim to deliver not just an assessment tool, but also a framework for schools to regularly assess and discuss digital wellbeing as an integral part of educational outcomes, much like academic progress.

Indicators of Success: The LED Digital Education Framework pilot will be deemed successful if it achieves several key outcomes. Foremost, we expect at least a 40% improvement in students' psychological wellbeing indicators (such as reductions in self-reported stress or anxiety levels) from baseline, as measured by our assessments and standardised scales. We also target a statistically significant reduction in feelings of digital isolation – for instance, if X% of students initially reported frequent loneliness in online learning, we aim to cut that proportion by half. Academic performance metrics should show positive trends, whether through improved test scores, project outcomes, or portfolio quality, without any decline in core subject learning despite the time allocated to wellbeing and EI activities. Qualitatively, students should express greater engagement and enjoyment in learning, and tutors should observe better participation and attitude. Finally, satisfaction surveys are crucial: a strong majority of students and educators (>=80%) should rate the pilot positively, indicating they find the approach beneficial and feasible. Constructive feedback from these surveys will be used to further refine the framework.

Deliverables: At the conclusion of the project, we will produce a comprehensive Pilot Framework Documentation detailing the LED model, implementation guidelines, and case study results from the Latvian hub. This will serve as a blueprint for other schools or regions interested in adoption. We will also release the Digital Wellbeing Assessment Tool (with manuals for administration and interpretation) as a free resource. Additionally, we will develop Emotional Intelligence Training Modules (lesson plans, activities, and handouts) that educators can use to replicate the SEL component of the framework. As part of knowledge dissemination, the team will author a mock research article summarising the study (including abstract, methods, results, discussion) to contribute to the academic literature on innovative learning environments. Essentially modelling what a journal publication from this experiment would look like, thereby aiding peer review and scholarly communication of our findings. Finally, Educator Training Materials will be created, including a handbook and workshop slides on implementing hybrid-biophilic learning and fostering emotional wellbeing in students. These materials align with Erasmus+ objectives to provide toolkits for scaling and policy integration. By packaging our insights and materials, we ensure that the LED framework can be tested and adapted in other Nordic and EU educational contexts, ultimately contributing to systemic improvement in how digital education is delivered and experienced by learners.

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Conclusion

The LED Digital Education Framework represents a forward-looking, research-grounded approach to primary education in the digital era. By intertwining digital innovation with nature-rich experiences, learner autonomy, and emotional intelligence cultivation, the framework addresses the multifaceted needs of students aged 10–15 and beyond. The pilot in Latvia will demonstrate how a biophilic learning hub can serve as a locus for balancing "screen time" with "green time," reducing the stress and isolation that often accompany remote learning. Early indicators suggest that providing students with voice and choice, supportive feedback, and socio-emotional tools yields a more engaged and resilient learner. A successful pilot will not only benefit the students involved but also provide a proof of concept for education policymakers. The mixed-method evidence generated will inform Erasmus+ and other stakeholders about effective strategies to humanize digital education and promote student wellbeing at scale.

In conclusion, the LED framework aligns with contemporary educational priorities: it harnesses technology's potential while firmly keeping student wellbeing and development at the centre. This echoes the call in European education policy for inclusive, innovative practices that equip learners with both cognitive and social-emotional skills for the future. As schools across Europe grapple with post-pandemic transformations and the ongoing digital revolution, the LED framework offers a viable model for blending the best of online and offline learning. It underscores that education for the 21st century must be as concerned with heart and health as it is with mind. By documenting and disseminating the framework, assessment tools, EI modules, and training resources, the project will enable broader adoption and adaptation. Ultimately, the LED Digital Education Framework aspires to contribute to a new normal in which digital learning is not a detriment to be managed, but a powerful component of a holistic, well-rounded education that allows children to flourish academically, socially, and emotionally.

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Annex 1. LED Framework Pilot Implementation Guidelines

Overview of the LED Model

The LED model is a holistic educational framework integrating three pillars to foster students' overall growth: a Hybrid-Biophilic Learning Environment, Emotional Intelligence development (SEL), and Digital Wellbeing practices. It is designed as a pilot program that blends smart use of technology with naturalistic learning spaces and social-emotional learning. The goal is to create a nurturing ecosystem where physical environment, student wellbeing, and technology use all support each other:

- *Hybrid-Biophilic Learning Environment:* Classrooms are enriched with biophilic design (natural light, plants, nature views) alongside advanced digital infrastructure for hybrid learning. This means students benefit from nature-inspired calm and focus (since biophilic design has been shown to reduce stress and improve mood and test scores) while also accessing high-speed internet, interactive devices, or even telepresence robots for remote participation. The environment is flexible and hybrid and is designed to "bring the outside in" for a close connection to nature. Research indicates that such biophilic learning spaces not only improve student calmness and cognitive function, but also boost academic performance (e.g., higher test scores and fewer behaviour issues were observed in biophilic classroom pilots). By integrating natural elements (light, greenery, fresh air) with smart classroom tech, the LED model creates a sustainable, wellness-oriented learning environment that enhances engagement and productivity.

- *Emotional Intelligence and SEL Integration:* The LED framework embeds social-emotional learning (SEL) into the curriculum via dedicated Emotional Intelligence training. Educators explicitly teach skills like self-awareness, emotion regulation, empathy, relationship-building, and responsible decision-making, aligned with the well-known CASEL competencies. For example, students practice mindfulness and reflection to manage stress, engage in group activities to build empathy, and learn conflict resolution strategies. Emphasising emotional intelligence ensures holistic student wellbeing: children learn to recognise and manage their feelings, set positive goals, show empathy to others, and make thoughtful choices. Decades of research show that SEL programs have consistent, significant benefits like improving students' social skills, behaviour, mental health, and even academic achievement. By integrating these practices, the LED model supports each learner's emotional growth alongside academic learning. Regular check-ins, mindfulness exercises, and emotional skills lessons are woven into the school week to cultivate a supportive, emotionally safe school climate.

- *Digital Wellbeing Practices:* In modern education students' use of technology strongly impacts their health and learning. The LED model promotes healthy digital habits and literacy so that technology is a positive force, not a source of stress. Digital wellbeing is defined as maintaining an optimal balance between the benefits of digital tools and the potential risks or harms of excessive or improper use. In practice, this involves teaching students how to manage screen time, stay safe online, protect their privacy, and use digital resources mindfully. The framework includes guidelines for "tech-life balance" (e.g., tech-free breaks, outdoor activities), education on cyber-safety and digital citizenship, and use of tools to monitor and reflect on one's

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digital habits. This pillar is crucial because digital engagement affects students' physical, mental, and social health. High digital wellbeing is associated with lower anxiety and better self-regulation when using tech, whereas unchecked device use can lead to distraction, stress ("technostress"), and sleep or mood problems. Thus, the LED pilot teaches students and tutors strategies for mindful, positive technology use. By doing so, it harnesses EdTech for learning while safeguarding students' wellbeing – a balance increasingly emphasised in modern education policy.

Together, these three components form the LED model's foundation. The hybrid-biophilic environment provides a calming, inclusive space that improves focus and creativity, the SEL curriculum builds students' emotional resilience and empathy, and the digital wellbeing practices ensure technology empowers rather than harms students. This integrated approach aligns with emerging best practices for "smart" schools: it addresses academic skills and the whole child. The LED pilot is meant to be flexible and adaptable, so other schools or regions can adopt it as a blueprint for fostering innovation, wellness, and 21st-century skills in unison.

Implementation Guidelines for the LED Framework

This section provides a step-by-step implementation blueprint. The process is evidence-based and draws on lessons from existing literature, ensuring that each component of LED is effectively integrated. Key implementation guidelines include:

- *Preparation and Baseline Assessment:* Begin with a needs assessment of the current environment and student wellbeing. Conduct baseline surveys or evaluations of students' wellness (emotional, social, digital habits) and skills (academic performance, digital literacy). This might involve student questionnaires on wellbeing and digital use, teacher observations, and even cognitive measures. Understanding the starting point helps tailor the implementation. Additionally, assess the physical classroom environment and technology infrastructure – noting what improvements toward a biophilic, hybrid setting, are needed (e.g., more natural light, plants, flexible furniture, better Wi-Fi).
- *Stakeholder Engagement and Co-Design:* Involve the school community in planning the LED implementation. A Quadruple Helix approach (co-design workshops with students, teachers, parents, and community or industry partner) is recommended. This participatory design ensures buy-in and surfaces local ideas. For instance, hold brainstorming sessions with students about making classrooms more nature-friendly and with parents about managing children's screen time. Engaging stakeholders early creates a shared vision and adapts the framework to the local culture. Iterative feedback loops (surveys, focus groups) should continue throughout the pilot to refine practices.
- *Professional Development for Educators:* Prioritise training tutors and staff in the LED model's practices before and during implementation. Educators attend workshops on hybrid-biophilic classroom design, learning to utilise flexible layouts and outdoor spaces, and on digital wellbeing and SEL pedagogies, learning how to teach mindfulness, manage classroom tech use, and facilitate emotional learning activities. Training should be hands-on, e.g., tutors practice using generative AI tools for personalised learning, experiment with mindfulness exercises, and discuss case studies on handling cyberbullying or student stress. Research emphasises that ongoing coaching and support for teachers is key to

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success, since confident, well-trained teachers can effectively integrate digital innovations and SEL into daily practice.

- *Upgrade Learning Environments (Biophilic & Hybrid):* Transform the physical and digital learning spaces according to biophilic and hybrid principles. This may involve simple classroom modifications: maximising daylight by opening blinds or adding skylights, improving air quality and ventilation, introducing indoor plants or natural decor, creating quiet "nook" areas (refuge spaces), and displaying nature imagery. If possible, designate outdoor learning areas or gardens and incorporate nature into lesson plans (outdoor classes, gardening projects). Concurrently, bolster the digital infrastructure: ensure high-speed internet, interactive whiteboards or tablets, and devices for students as needed. Consider deploying telepresence robots or video conferencing setups to enable hybrid participation for remote students. This promotes inclusion (e.g., a homebound or hospitalised student can join class virtually via a robot). All technology should be seamlessly integrated so it "blends into the environment" instead of disrupting it. Teachers arrange the classroom flexibly to support both individual focus and collaborative work, reconfiguring seating easily. The result should be a modern classroom that feels safe, airy, and calming like a natural space, yet is tech-enhanced for interactive, personalised learning. (Notably, case studies have shown that thoughtfully integrating nature and aligning furniture for outdoor views can yield measurable gains in student performance and mood.)
- *Curriculum Integration:* Implement the LED-aligned curriculum and activities. Teachers start embedding SEL activities into regular classes (for example, a short mindfulness or breathing exercise at the start of class, or circles to discuss emotions during homeroom). A structured Emotional Intelligence module (outlined in the next section) is delivered, possibly as weekly lessons. At the same time, incorporate digital wellbeing lessons and tips: teach students about cyber-safety, have them reflect on their tech use, perhaps use a "digital wellbeing journal" where students log and reflect on screen time or feelings after social media use. Academic subjects can utilise AI and digital tools in a balanced way, e.g. using generative AI for creative projects or personalised tutoring, but also having "unplugged" activities that engage senses and nature (like science observations in the garden). Project-based learning is encouraged, leveraging digital collaboration tools for group work while also engaging with real-world problems (sustainability projects, etc.). Throughout, maintain an inclusive approach: adapt materials for students with special needs (using accessible tech) and incorporate diverse perspectives so every student feels represented.
- *Support and Inclusion Measures:* Ensure equity and inclusion are built into the pilot. Provide assistive technologies and adaptive tools for students with disabilities (text-to-speech, screen readers, etc.), and use universal design for learning principles in lesson planning. The hybrid format can especially help marginalised learners. For instance, allow students who cannot be physically present to join virtually, or record lessons for those who need to review. Pay attention to intersectional factors: monitor whether all genders and socio-economic groups are participating equally in tech activities and nature outings. Train teachers in culturally responsive SEL (recognising how students' cultural backgrounds may

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influence emotional expression and digital access). The LED framework's flexibility should be used to tailor support for each learner, from quiet spaces for anxious students to mentorship for those lacking support at home. An inclusive LED pilot will yield more valid results and show the model's applicability in diverse contexts.

- *Monitoring and Evaluation:* Establish a robust evaluation plan to track outcomes and guide improvements. The pilot should collect both quantitative and qualitative data at regular intervals (e.g. baseline, mid-point, and final). Use multiple measures reflecting the LED goals:
    - Wellbeing Metrics: periodic student surveys on emotional wellbeing, stress levels, and digital habits; possibly physiological.
    - Academic and Skill Metrics: tests of academic progress, creativity, critical thinking; digital literacy assessments to see if tech skills improved.
    - Engagement and Behaviour: records of attendance, disciplinary incidents, and engagement in class (to see if environment/SEL changes affect these).
    - Environmental Data: if possible, gather data on classroom conditions (light, air quality via sensors) and usage of spaces to correlate with outcomes (this was done in some smart classroom pilots using IoT sensors).
    - Stakeholder feedback: interviews or focus groups with students, teachers, and parents to capture perceived changes (e.g., "Students seem calmer and more focused after the classroom redesign" or "I feel more aware of my online habits after the digital wellbeing lessons").

Use this data to continuously refine the implementation. For example, if mid-term surveys show students still feeling high stress, introduce more mindfulness practices; if some digital wellbeing scores are low, adjust those lessons. The evaluation should also document best practices and challenges to inform others. Crucially, evidence from the pilot will feed into final policy recommendations and toolkits, demonstrating the model's impact (e.g., improved wellbeing, academic gains, reduced screen-time anxiety) in a measurable way.

- *Scale-Up and Sustainability:* Towards the end of the pilot, plan for scaling successful elements. Create open-access toolkits and guidelines (based on pilot data) that other schools can use. These might include case studies, checklists for creating biophilic classrooms on a budget, sample SEL lesson plans, and protocols for a digital wellbeing program. Engage with local or regional education authorities to incorporate the LED model into broader strategy (for instance, adding digital wellbeing and SEL to the district's curriculum standards). To sustain the initiative, identify what resources are needed long-term (e.g., maintain a school garden, update devices) and seek partnerships or funding if necessary. It's also recommended to hold a policy workshop or seminar sharing the pilot results with stakeholders and policymakers. This dissemination can build support for wider adoption. The ultimate goal is to ensure the LED model doesn't remain a one-time experiment but becomes an ongoing, scalable approach. By the end of the pilot, the school should have a concrete plan to integrate LED practices into its regular operations and possibly serve as a mentoring site for other schools ("lighthouse" school). Documentation

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from the pilot (evaluation reports, testimonials, before/after data) will be crucial evidence to advocate for broader implementation.

Each of these steps is part of the blueprint to implement the LED model with fidelity. By following these guidelines other schools or regions can replicate the pilot's success. The focus is on creating a supportive environment (physical and psychological) and educating the whole child (skills + wellbeing), using technology and nature as allies rather than adversaries. The next sections provide more detail on specific resources developed in the LED pilot: a Digital Wellbeing Assessment Tool, an SEL curriculum module for Emotional Intelligence, and training materials for educators.

Digital Wellbeing Assessment Tool

As part of the LED framework, we propose a Digital Wellbeing Assessment Tool that schools can use freely to evaluate and guide students' healthy technology use. This tool is essentially a structured self-assessment questionnaire (available online or on paper) accompanied by a manual for administration and interpretation. Its purpose is to help students, educators, and even parents gain insight into how digital habits affect student wellbeing, and to provide actionable feedback or resources.

Key Features of the Digital Wellbeing Tool:

- The assessment covers multiple dimensions of digital wellbeing, reflecting its holistic definition (physical, mental, social, and emotional impacts of digital engagement). It consists of concise, age-appropriate questions or statements where students rate themselves (e.g., on a 5-point agree scale). The survey is designed around five core domains:

1. Screen Time & Balance: Questions about how much time the student spends on devices daily, whether they take breaks, and if device use interferes with sleep or offline activities. (For example: "I often spend more time on social media or gaming than I intend to.") Rationale: This gauges if students maintain a healthy balance or feel screen overuse. Significant since a majority of youth report habitual or excessive social media use.

2. Online Safety & Privacy: Items on knowledge and behaviours related to staying safe online, understanding digital footprints, privacy settings, cyberbullying, etc. (E.g., "I am careful about what personal information I share online.") Rationale: Knowing how to protect one's digital identity is crucial; one survey found over 80% of younger students understood their digital footprint's importance, but many still had privacy concerns.

3. Emotional Impact of Technology: Questions probing how online interactions and content make the student feel. This includes social-emotional effects of social media (comparison, FOMO), stress or anxiety from constant notifications, and mood changes with device use. (E.g., "Seeing posts on social media often affects my self-esteem or mood.") Rationale: Research and health advisories warn that heavy social media use can contribute to teen depression, anxiety, or body image issues. This domain helps identify students who may be negatively affected emotionally by their digital life.

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4. Social Connections & Communication: Items about whether devices are enhancing or hindering real-life relationships. (E.g., “I often prefer texting or online chats to talking face-to-face,” or “Using technology helps me stay connected with friends and family in a positive way.”) Rationale: Digital tools can both connect and isolate; this assesses if the student’s social wellbeing is supported by tech or if they feel more lonely/isolated.

5. Digital Habits & Self-Regulation: Questions on mindful use and self-control, like the ability to focus without checking the phone, to unplug at night, and to avoid multitasking overload. (E.g., “I can concentrate on my homework without getting distracted by notifications or apps.”) Rationale: This examines self-regulation skills in the digital context. An area tied to academic performance and stress. High digital wellbeing generally correlates with better self-regulation and lower anxiety around tech.

The tool’s manual provides clear instructions for schools. It suggests that the survey be administered confidentially (e.g. via an online form in class, taking ~15 minutes). It can be used with students roughly upper elementary through high school (questions can be adjusted for age appropriateness). The manual advises giving the assessment at two points: start of the school year (to establish a baseline) and later in the year (to measure change after interventions like the LED program). Teachers or counsellors should introduce the survey emphasising honesty and that there are no “right/wrong” answers. The manual also addresses privacy, ensuring students’ individual responses are not shared without consent, and data is aggregated for class or grade-level insights.

- Scoring and Interpretation: After students complete the questionnaire, the tool provides a profile or score report across the five domains. For instance, it might generate a score or traffic-light rating (green/yellow/red) for each category of digital wellbeing. The accompanying manual helps educators interpret these results. For example, a high score in “Screen Time & Balance” indicates healthy balance, whereas a low score (red flag) might indicate a student spends excessive time online or feels it’s interfering with life. Each section of the manual provides interpretation guidelines: “If a student scores low in Emotional Impact, they may be experiencing negative feelings from online activities, consider discussing their social media experiences or introducing coping strategies.” The manual is careful to stress that the tool is not a clinical diagnosis but a conversation starter and awareness device.

- Feedback and Resources: Crucially, the tool is paired with personalised feedback. After the survey, students can receive a simple summary (e.g., “You indicated that you often feel anxious about messages late at night. Check out these tips for managing notifications and getting better sleep.”). The manual includes a repository of free resources and tips corresponding to each domain of digital wellbeing. For instance:

1. For screen balance issues: tips like using app timers, scheduling device-free time before bed, or engaging in outdoor activities.

2. For online safety: a checklist for privacy settings, advice on what not to share, and links to student-friendly cyber-safety guides.

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3. For emotional health: resources on handling online conflict, understanding that social media can present unrealistic images, and practicing positive self-talk (aligning with SEL practices).

4. For social connection: suggestions to plan in-person meetups, join clubs or groups to complement online interaction, or use tech for collaborative projects rather than passive scrolling.

5. For self-regulation: techniques like turning off non-essential notifications, using "do not disturb" or focus modes during study time, and mindfulness apps that remind users to take breaks.

The idea is that each student can walk away with at least one or two concrete strategies to try, thus immediately using the results to improve their digital habits. Teachers or counsellors reviewing class-wide data can also identify common areas of need (e.g., if many students report poor sleep due to phones, the school might launch a campaign on healthy bedtime routines).

- Free and Open Access: This assessment tool and manual will be offered as a free resource (e.g. under a Creative Commons license) for any school or organisation. It might be hosted as a downloadable PDF and an interactive online survey template. By making it free, the LED project encourages widespread use and adaptation. The manual encourages educators to adapt questions to their context and to share improvements or localised versions. There is also an option to anonymise and aggregate data for school-wide reflections or research purposes, which the manual details ethically (so schools can, for example, measure improvement in digital wellbeing after one year of using the LED model).

The Digital Wellbeing Assessment Tool is informed by current research highlighting the importance of managing students' relationship with technology. Digital wellbeing is increasingly recognised as a teachable competency. For instance, European frameworks include it as part of digital literacy, and programs that educate youth in digital wellbeing have shown reductions in smartphone overuse and stress. By using this tool, schools can proactively address issues like technostress and help students develop healthier digital lifestyles. Ultimately, promoting digital wellbeing supports better mental health and learning outcomes for students, as balanced tech use can reduce anxiety and improve focus. The tool operationalises these insights in a practical way.

In summary, the Digital Wellbeing Assessment Tool is a practical, user-friendly questionnaire with a supportive guide that allows schools to benchmark and improve how students engage with technology. It empowers students with self-awareness about their digital habits – a critical first step in changing behaviour. Offered freely, it serves as a foundational component of the LED model's focus on healthy technology use, and it can be adopted by any interested school as part of their wellbeing initiatives.

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Annex 2. Emotional Intelligence Training Modules

To replicate the SEL (social and emotional learning) component of the LED framework, we propose a set of Emotional Intelligence Training Modules for students. This is essentially a mini-curriculum of four structured sessions that tutors can deliver, aimed at building students' emotional intelligence skills. Each module is designed to be interactive, developmentally appropriate, and hybrid in format, meaning it combines in-person activities with digital resources (to align with the hybrid learning environment). The modules draw on evidence-based SEL practices and are mapped to core competencies like self-awareness, self-management, social awareness, relationship skills, and responsible decision-making. By the end of the four sessions, students should have improved their ability to understand and manage emotions, show empathy, work in teams, and navigate social situations – all foundational for wellbeing and academic success.

Overview of the four Sessions:

- *Session 1: Self-Awareness and Emotional Recognition – "Understanding My Emotions"*

Objectives: Help students identify and name their emotions, and understand how emotions affect their thoughts and behaviour.

Activities: This session starts with an interactive presentation (slides or a short video) introducing the concept of emotional intelligence and why it matters. Students then engage with a "mood meter" or emotions chart or any other tool that lists various emotion words. They practice labelling how they feel in various scenarios. For example, the teacher might use a digital polling app or coloured cards for students to indicate their current mood, sparking discussion. Next, a guided activity has students reflect on triggers: "Think of a time you felt angry or upset – what caused it and how did you react?" They can write in a journal or use an online form (hybrid component) to submit answers anonymously, which the class discusses collectively. The session emphasises that all emotions are normal, and recognising them is the first step to managing them. A short video clip or story may be used (e.g., a short film showing a character going through various feelings) and students identify the emotions observed.

Handouts: An emotion wheel or vocabulary list (so students learn nuanced words beyond just "mad" or "sad"), and a personal reflection worksheet.

Hybrid element: If done in hybrid mode, remote students can join via video conference and participate in polls; an online collaborative board (like Padlet or Jamboard) could be used for everyone to post an "emoji" or image that represents how they feel today, building a shared emotional check-in board.

- *Session 2: Self-Management and Mindfulness – "Managing Stress and Difficult Emotions"*

Objectives: Teach students techniques to regulate their emotions, cope with stress, and build resilience.

Activities: The session opens with a brief discussion on common stressors for students (upcoming exams, peer conflicts, etc.), highlighting that stress and anger can be managed with the right tools. A mindfulness exercise is introduced. For example, a 5-minute guided breathing or meditation

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activity (using a projection of a calming nature scene or an app that rings a bell to focus on breathing). Such mindfulness practices have been incorporated in the LED pilot to improve emotional wellbeing. After this, students learn about specific strategies: deep breathing, counting to ten, taking a break, positive self-talk, journaling feelings, or physical activity. The teacher might demonstrate a quick "desk yoga" or stretching routine to release tension, which students follow. Another interactive component is a role-play or scenario: students are given a hypothetical situation (e.g. someone criticises your work online or you get a low grade) and in small groups they brainstorm healthy ways to respond (rather than, say, yelling or self-criticising). They then share their coping strategies. The class discusses how these techniques make one feel better and in control.

Handouts: A one-page "Coping Skills Toolbox" listing strategies and apps (like a mood-tracking or meditation app recommendation) that students can use at home. There's also a journal page where students list two or three strategies, they will try next time they feel stressed.

Hybrid element: The mindfulness exercise can be done via a shared audio/video even if some students are remote. There could also be a digital relaxation playlist or guided meditation file shared for students to practice after class. Online students can participate in role-plays via breakout rooms.

- *Session 3: Social Awareness and Empathy – "Understanding Others' Feelings"*

Objectives: Develop students' ability to perspective-take, empathise with others, and appreciate differences.

Activities: This module often starts with a short empathy-building game or video. For example, an animated video might show a scenario of a new student feeling left out. Students are asked, "What do you think that person is feeling? How could you tell?" The teacher introduces the concept of empathy and why it's important for a kind community. A classic activity is "Walk in someone else's shoes": students are each given a brief character story or card describing a person (perhaps a classmate with a sick family member, or a teen from another culture). Each student (or pairs) discusses how life might feel for that person and what help or support they might want. Another activity is an emotions charades or face expressions quiz: using slides with photos of people showing various expressions, students try to guess the emotion and scenario, honing their ability to read non-verbal cues. The teacher also facilitates a conversation about respecting others' perspectives e.g., "Not everyone reacts the same way; something that excites you might scare someone else. How can we be understanding?" If time permits, the session could include a collaborative task like empathy mapping: picking a real-world issue (like cyberbullying), and having students map out feelings of each person involved and how empathy could improve the situation.

Handouts: An "empathy checklist" with tips like listen actively, avoid quick judgements, put yourself in their position, etc., and perhaps a story or case study for reflection.

Hybrid element: Use an online platform for part of the activity for example, an interactive quiz on identifying emotions in pictures (many free SEL digital games exist for this). Remote students can participate in discussions; if available, a virtual reality or 360-degree video could even be used to

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simulate someone else's experience (though not required). The idea is to leverage digital content to provide perspective (for example, a short VR scenario of a day in the life of a student from another country to spark empathy).

- *Session 4: Relationship Skills and Responsible Decision-Making – "Communicating & Resolving Conflicts"*

Objectives: Teach collaborative skills, active listening, communication techniques, and making ethical, responsible choices in social situations (both offline and online).

Activities: This final module ties together the previous skills in real-world interpersonal contexts. It begins with communication basics, perhaps a fun listening exercise where students pair up and take turns speaking and summarising what the other said, illustrating how active listening works. The teacher presents key tips for respectful communication (using "I" statements, maintaining eye contact, acknowledging others' feelings). Next, the focus shifts to conflict resolution. A common interactive activity is a role-play of a conflict: for instance, two students role-play a scenario (prepared script or improvised) like one student accidentally breaking another's device or two friends arguing over something. The class then discusses how they could resolve it using calm communication and empathy ("What would be a win-win solution? What could each person say or do differently?"). The teacher introduces a simple conflict resolution model (e.g., stop, breathe, talk it out, find a compromise). Decision-making is addressed by presenting a few tricky situations, including online dilemmas such as "You see a classmate being mocked in a group chat" or "You're tempted to cheat using your phone in a test" and asking students in groups to decide the best course of action. They must consider consequences and ethical aspects (linking to responsible decision-making). This helps students practice applying values and empathy to choices, including in digital contexts.

Handouts: A "communication and conflict resolution skills" poster or mini-handbook, summarising steps to handle conflicts and reminders like Think before you act/post. Also, a personal plan worksheet: students write one goal (e.g., "I will practice listening without interrupting my siblings" or "I will pause and cool down if I get upset during a game") to carry forward.

Hybrid element: If delivered partially online, students could use a chat or forum to practice written communication skills and see how tone can be misinterpreted in text (learning to write kindly). The scenarios could be presented in an online poll where students vote on the best decision and then discuss.

Module Format and Pedagogy

Each session is about 45-60 minutes long and follows a consistent format: warm-up (engagement activity), introduction of key concept, main interactive exercises, group discussion, and a reflection at the end. The modules leverage active learning rather than lectures, which is shown to be effective in SEL. Because it's hybrid, resources like videos, apps, or online collaboration are woven in, aligning with students' digital interests while still emphasising face-to-face skill practice. The teacher's role is facilitator. Creating a safe, inclusive space for students to share (ground rules for respectful listening are established upfront).

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Adaptability: The content can be adjusted for different age groups. For younger students, stories and puppets might replace some role-plays; for older students, more complex ethical dilemmas or peer mentoring scenarios can be used. The modules can be integrated into a health class, advisory period, or after-school workshop. They could be run on a once-a-week basis over a month, for example.

Evidence and Outcomes

By implementing these four sessions, schools address key SEL competencies that research links to positive outcomes. Meta-analyses have found that such SEL curricula significantly improve students' social-emotional skills, behaviour, and academic performance, with effects observable across all demographics. Students gain a language for their emotions, techniques to handle stress, empathy for others, and better communication/conflict skills. These improvements contribute to a more positive classroom environment and can reduce issues like bullying or classroom disruptions. Moreover, these modules complement the digital wellbeing focus: a student who has learned emotional regulation and empathy is better equipped to handle online challenges like cyberbullying or negative social media comparisons. In essence, the Emotional Intelligence Training Modules give students practical tools to thrive both personally and socially. They are a core component of the LED model's SEL dimension and can be shared as part of the blueprint (including lesson plans, slides, and handouts for each session) for any educator to use.

Educator Training Materials

To ensure successful implementation of the LED model, we also propose comprehensive Educator Training Materials. These resources will equip tutors and school staff with the knowledge and skills to create hybrid-biophilic learning spaces and to foster students' emotional wellbeing. The materials consist of two main parts: an Educator Handbook and a set of Workshop Slides/Modules for professional development sessions. Both are designed to be practical, research-informed, and ready to use or adapt, so that educators anywhere can be trained in the LED approach.

Educator Handbook: This would be a detailed guidebook (digital PDF and/or printed) that serves as a reference for teachers implementing the LED model. Key contents include:

- Introduction to the LED Model: A clear overview of the philosophy and evidence behind learning environment design, SEL, and digital wellbeing. This section summarises why biophilic design improves learning (citing studies of reduced stress and improved test scores in greener classrooms), why SEL is critical (noting that students in SEL programs tend to have better academic and behavioural outcomes), and why focusing on digital wellbeing is essential in modern classrooms (highlighting the impact of tech on student mental health and the benefits of mindful technology use). This gives educators the "why" to motivate their practice change.

- Designing Hybrid-Biophilic Learning Spaces: A chapter with practical tips on classroom design and management. It covers how to introduce biophilic elements e.g., using natural light (open blinds, prefer classrooms with windows), adding plants (with a list of easy-maintenance classroom plants), creating nature corners or displays (shells, rocks, artwork of landscapes), and possibly how to take learning outside periodically. It also addresses hybrid classroom setups:

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advice on arranging furniture for both in-person and remote learners (like positioning a camera and screen so virtual students feel included), using sound systems to ensure everyone can hear, and managing devices in class. There are checklists for "biophilic upgrades" (like ensure every student has a view of something natural, incorporate natural materials in decor) and for "tech infrastructure" (e.g., test bandwidth, have an online collaboration platform ready). Photos or diagrams illustrate sample classroom layouts. The handbook also suggests classroom routines such as beginning the day with windows open for fresh air and a short outdoor break between lessons, to reinforce the nature connection. This section draws on design research and pilot experiences to give teachers realistic suggestions even if resources are limited (e.g. "Even if you can't change furniture, you can add a poster of a forest, or play nature sounds during quiet reading time.").

- Integrating SEL into Teaching: This part of the handbook guides teachers on infusing emotional wellbeing practices into their everyday teaching, beyond the dedicated modules. It provides strategies like: holding regular class meetings or "morning circles" to let students share feelings, using emotion check-in boards, incorporating cooperative learning to build social skills, and modelling empathy and kindness. It references known frameworks (like CASEL's SEL strategies) and includes mini-activities teachers can sprinkle in (for example, a "mindful minute" breathing exercise to calm students after lunch, or doing a quick feelings round-robin at the end of the week). The handbook emphasises teacher behaviours that create a supportive climate: active listening, validating student emotions, and building strong relationships. Importantly, it encourages teacher self-care and emotional intelligence as well – acknowledging that teachers set the tone. Tips for teacher wellbeing (managing their own digital stress, creating a calming staff room space, etc.) might be included, as emotionally healthy teachers are better able to support students.

- Promoting Digital Wellbeing in the Classroom: This chapter shows teachers how to educate and guide students in healthy tech use. It aligns with the student assessment tool but is focused on classroom application. Topics include: setting classroom norms for device use (perhaps a "phone parking lot" or agreed tech breaks during class), teaching digital citizenship lessons (respectful online communication, verifying information), and incorporating the use of the Digital Wellbeing Assessment Tool results. For instance, if the tool shows many students are sleep-deprived due to late-night phone use, the teacher might facilitate a discussion or a lesson on sleep hygiene and tech. The handbook provides sample lesson plans or discussion prompts for digital wellbeing, and points to free curricula (such as Common Sense Education's lessons on media balance, which have been developed with SEL in mind). It also advises teachers on how to model good digital habits themselves e.g., not constantly checking their email during class, using tech purposefully. Additionally, it addresses handling digital distractions in a positive way (like rewarding focused periods with short breaks, rather than blanket bans which students might resist). Essentially, this section empowers teachers to become mentors in digital wellness, in line with modern digital competence frameworks that call on educators to foster students' balanced relationship with technology.

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- Lesson and Activity Bank: The handbook appendices include ready-to-use resources – outlines of the 4 SEL training sessions (from the earlier section) with detailed instructions, handouts masters for printing, and links to any multimedia needed. It might also include a few exemplary interdisciplinary lesson ideas that tie together LED elements (e.g., a science lesson where students measure plant growth (science content) in the school garden (biophilic element) and then journal about how taking care of plants made them feel (SEL reflection), possibly using a tablet to record data (tech integration)). These examples help teachers see what the LED model looks like in practice in a lesson plan format.

- Monitoring and Troubleshooting: Since teachers will be on the front lines noticing how students respond, the handbook gives guidance on monitoring student progress in wellbeing and learning. It suggests using journals or exit tickets to gauge SEL impacts, looking at Digital Wellbeing Tool results over time, and recognising signs of improvement or concern (for example, if a student's behaviour improves after mindfulness training, or conversely if a student shows continued anxiety, knowing when to involve a counsellor). It also has an FAQ or troubleshooting tips section addressing potential challenges: "What if students initially mock or resist the mindfulness exercises?" or "How to handle a parent who is sceptical about less 'academic' activities?", offering advice from pilot experience (like sharing research evidence or starting with very simple activities to win students over).

Overall, the Educator Handbook is meant to be a go-to manual that teachers can refer to throughout the year, ensuring they have both the big-picture understanding and the day-to-day strategies for LED implementation. It would be illustrated, example-filled, and grounded in research (with references or links, many drawn from the project's literature review to reinforce credibility).

Workshop Slides and Training Modules

In addition to the static handbook, a series of professional development workshops is proposed, complete with slide decks and facilitator notes. These can be delivered in-person or via webinar to train educators in phases of the LED model. We envision a training program that could be done in a two-day workshop or spaced out in smaller sessions. The slide decks (which would be provided as part of the documentation) cover topics such as:

- *Workshop 1:* "Introduction to LED and Biophilic Design" – This session's slides introduce why learning environment matters. Slides showcase research highlights (e.g., images and charts from studies showing improved student outcomes with biophilic design). They include photos of the pilot classroom setup before and after biophilic enhancements, to inspire discussion. The facilitator leads activities like brainstorming "What small changes can you make to bring nature into your classroom?" Teachers might sketch a floor plan or list ideas, then share. The deck also covers hybrid learning tools: slides might demo how to set up a camera for remote students or use an online platform for assignments. It ends with a Q&A and reflection on action steps (each teacher identifies one change to try in their room).

- *Workshop 2:* "SEL in the Classroom" – Slides here focus on emotional intelligence and wellbeing. They would outline the five SEL core competencies and include interactive elements

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like a mock "emotion check-in" (asking teachers to, say, anonymously submit how they feel about technology in their teaching, then showing the aggregate to illustrate an SEL technique). There are slides explaining the 4-session SEL module for students, possibly with short video snippets demonstrating an activity (like a class doing a mindfulness exercise). The facilitator might have teachers practice one of the student activities among themselves (e.g., do a quick mindful breathing together or role-play a conflict scenario) to build familiarity. This workshop also covers teacher SEL: slides encourage teachers to reflect on their own stress triggers and coping methods, reinforcing that cultivating their emotional wellbeing is part of this initiative. By experiencing some activities first-hand, teachers are more comfortable leading them with students.

- *Workshop 3:* "Digital Wellbeing and Pedagogy" – This training module dives into the digital aspect. Slides provide an overview of digital wellbeing concepts and statistics (for instance, a slide might show data on how many teens feel addicted to their phones, or a quote from the Surgeon General about social media risks to underscore urgency). Then, the Digital Wellbeing Assessment Tool is introduced: one slide set walks through the tool's domains and sample questions. Teachers might even take the survey themselves in the workshop to see how it works and reflect on their own digital habits (this can be eye-opening and create empathy for students' challenges). Next, slides present strategies for classroom digital health: e.g., implementing "tech breaks", educating students on healthy use (perhaps referencing available lesson resources from reputable organisations), and how to respond when a student is showing signs of digital burnout. This session might include a collaborative discussion: "What issues do you see with student tech use, and how might we address them proactively?" – teachers share experiences of, say, distracted students, and brainstorm solutions guided by the facilitator. By the end, educators learn how to use the digital wellbeing data to inform their teaching (for example, if many students struggle with focus, a teacher might incorporate shorter chunks of instruction or more offline activities to build attention span).

- *Workshop 4:* "Bringing It All Together – Lesson Planning and Next Steps" – The final set of slides helps teachers integrate LED principles into their lesson planning and school culture. Teachers could be given a template and, working in small groups, outline a lesson or project that uses elements of nature, SEL, and tech. The slides provide a checklist to review their plans (e.g., "Does your plan include a student- centred activity? A reflection component? Use of a tool or an outdoor element?"). This fosters confidence that LED isn't an add-on but can mesh with curriculum standards. Additionally, this workshop covers evaluation methods: slides recap what data will be collected (surveys, etc.) and how teachers contribute (perhaps by observational rubrics or collecting student work). Finally, the training ends with an inspiring call to action – slides might quote student testimonials or show before-and-after outcomes from the pilot (e.g., "School X saw a 20% decrease in stress reports after implementing mindfulness" or an anecdote of a shy student blossoming in a nature activity). It reinforces that, teachers, armed with these new strategies, can lead change in their classrooms and improve student wellbeing and learning.

Each slide deck is visually engaging (with images of nature-rich classrooms, icons for SEL skills, minimal text per slide) and includes facilitator notes so even if a school's own trainer or principal leads the workshop, they can convey the key points. The workshops are interactive, mirroring the

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pedagogy we want in classrooms – for instance, not just lecturing teachers but letting them experience and practice. They also encourage a growth mindset among educators, acknowledging that adopting new practices can be challenging but rewarding, and that they have support through the handbook and the peer community.

In summary, the Educator Training Materials ensure that teachers are prepared and confident in implementing the LED model. The handbook serves as a year-round resource, grounded in research and filled with practical tips, while the workshop slides enable an engaging professional development experience to kick-start the initiative. By investing in educator training, the LED framework acknowledges that teachers are the critical agents of change, when they understand the why and how of hybrid-biophilic design, SEL, and digital wellbeing, they can transform their classrooms. This training component, therefore, is integral to scaling the LED model effectively. As research and our project experience suggest, prioritising professional development in digital and inclusive pedagogies is key to successful innovation in schools. The provided materials make it easy for schools everywhere to adopt and adapt the LED approach, ultimately benefiting students across different contexts.

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