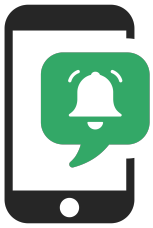

DIGI-Teens

WP1 Participatory Design

D1.2.1 Paradigms for a Gamified Learning Path

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DISCLAIMER

Contents

1 Introduction and Objectives

This deliverable presents the structure and pedagogical rationale of a *digital wellbeing learning path* designed for educational settings. The learning path addresses the growing tension between the benefits of contemporary digital services and the risks emerging from their attention-optimized design, including overuse, compulsive engagement, and reduced autonomy [2, 13]. In particular, it builds on the idea that Digital Wellbeing concerns how digital technologies shape the possibility of living a good life in an information society [2], and on evidence showing that frequent and excessive technology use can interfere with everyday activities and psychological health [13].

The deliverable organizes the learning path into **topics, modules, and operational activities** that can be adopted, combined, and adapted by educators. The topics progressively guide students from foundational concepts (e.g., Digital Wellbeing and persuasive technology) to critical understanding of the attention economy and interface patterns designed to maximize engagement, and finally toward practical strategies (self-monitoring, self-control tools, habit change) and constructive skills (imagining alternative designs and policy/regulatory responses). Alongside the educational content, the deliverable also describes a **gamification framework** intended to support engagement and progression, and an **End-User Development (EUD) approach** enabling teachers to configure activities and motivational settings according to classroom needs.

The objectives of this deliverable are to:

- Define and document a coherent educational learning path on Digital Wellbeing, grounded in the literature and structured into topics, modules, and classroom-ready activities [2, 14, 17].
- Support learners in developing **awareness, critical understanding, and practical skills** for navigating technology in the attention economy, including recognizing persuasive strategies and attention-capture patterns [7, 5, 18].
- Provide educators with a set of **operationalizable activities** (e.g., quizzes, reflections, simulations, self-assessments, and games) that can be selected and combined to match different age groups, schedules, and curricular constraints.
- Describe a gamification framework that aligns motivational mechanisms (e.g., currency, profiles, badges, competitive/collaborative modes) with pedagogical goals, while acknowledging the mixed effects reported in the literature when gamification is misaligned with learning objectives [9, 8].
- Introduce an EUD-oriented configuration model that empowers teachers to tailor the learning path (activity selection, timing, and motivational configuration) without requiring programming skills, thus supporting adaptability across educational contexts.

2 Topics, Modules, and Activities

2.1 Topic 1: Understanting Digital Wellbeing

Digital Wellbeing is generally defined as the impact of digital technologies on what it means to live a good life for a human being in an information society [2].

Although the concept of Digital Wellbeing can be approached from different perspectives, it is often linked to the need for technology that promotes mindful and meaningful experiences while preserving users' time and attention. Nowadays, there is growing attention toward the negative consequences associated with excessive use of technology [13].

Researchers have shown that excessive and frequent use of devices such as smartphones can negatively interfere with daily activities such as driving, studying, and working [13]. Furthermore, tools such as social networks can foster the development of compulsive behaviors that undermine people's autonomy, potentially leading to mental health problems and issues in social interaction [13].

These are the main objectives for Topic 1:

- Understand what Digital Wellbeing is and its importance.
- Recognize the impact of digital technology on daily life.
- Recognize the signs of excessive digital use and its potential consequences (with particular attention to physical and psychological health).

2.1.1 Module 1.1: Definition of "Digital Wellbeing"

Digital Wellbeing refers to the influence of digital technologies on the concept of a satisfying life for individuals within an information-based society. Digital Wellbeing should balance the costs and benefits of digital technology use, taking into account the context of use, the many digital devices we have access to today, and individual differences [14].

The first module of Topic 1:

- introduces existing definitions of Digital Wellbeing;
- "constructs" a definition of Digital Wellbeing starting from students' ideas.

Table 2.1.1 reports some example activities that can be used to operationalize Module 1.1.

2.1.2 Module 1.2: Persuasive Technology

Persuasive technology is defined as technology designed to change users' attitudes or behaviors through persuasion and social influence [7]. Defined by Brian Jeffrey Fogg, a behavioral scientist at Stanford University, it was intended to influence user behavior without explicit deception or coercion. However, the creation and amplification of such technology underlies many of the problems affecting our Digital Wellbeing.

This module:

- introduces persuasive technology, its characteristics and uses;

Table 1: Example activities for Module 1.1

ACTIVITY	REFERENCE	CATEGORY
Ask students to provide their own definition of Digital Wellbeing, or to describe Digital Wellbeing in one word. Collection of results and class discussion, using platforms like Wooclap or Padlet.	Digital Wellbeing Course - Polytechnic University of Turin [17]	Questionnaire
Introductory quiz on Digital Wellbeing to measure students' understanding of digital wellbeing. The questions, with closed answers, include: • How would you define Digital Wellbeing? • What can lead to poor Digital Wellbeing? • Why is it important to take care of your Digital Wellbeing? • What habits can negatively affect Digital Wellbeing?	Habit Hero - mobile application developed in a thesis at the Polytechnic University of Turin [26]	Quiz
Take a look at the United Nations Sustainable Development Goals. • Which of these goals are most important to you? • What challenges represented by these goals have you experienced personally (directly or indirectly)? • From which challenges have you been spared? • Which challenges have affected your loved ones or the communities you care about? • What role should technology play in achieving the goals you care most about?	Center for Humane Technology: Foundations of Humane Technology [3]	Questionnaire

- introduces its problems, from long-term consequences on child development to loss of crucial skills such as memory and concentration;
- stimulates discussion on how persuasive technology affects students' Digital Wellbeing.

Table 2.1.2 reports some example activities that can be used to operationalize Module 1.2.

Table 2: Example activities for Module 1.2

ACTIVITY	REFERENCE	CATEGORY
Find a partner and open the same social media application together. Scroll through the main feed (avoiding looking at notifications, messages, etc.). • What do you find similar in your feeds? • And what do you find different?	Center for Humane Technology: The Attention Economy [3]	Questionnaire, Simulation, Social, Self-assessment, Frequency
Keep track of all the places online where you notice persuasion techniques. You can track them over the next 24 hours or throughout the week. Regardless of time, pay close attention to the role persuasive technology plays in your life.	Center for Humane Technology - Youth Toolkit: Persuasive Technology [3]	Activity frequency
The Ledger of Harms is a project of the Center for Humane Technology in collaboration with researchers and industry advocates. It synthesizes the latest knowledge on the negative impact of technology on individuals, communities, and society. Take a few minutes to review the categories and evidence contained in the Ledger of Harms. • Which of these harms are important to you? • Which deserve deeper reflection?	Center for Humane Technology: Foundations of Humane Technology [3]	Questionnaire

2.1.3 Module 1.3: Digital Wellbeing and Technology Addiction

Digital Wellbeing is often associated with the need for technologies that promote meaningful and mindful experiences while safeguarding time and attention. It is desirable to have digital ecosystems that foster positive interaction, personalization, and autonomy.

This module:

- focuses on overuse and technology addiction;
- introduces tools such as screen time and validated questionnaires;
- allows individual and/or class self-assessment.

Table 3 reports some example activities that can be used to operationalize Module 1.3.

Table 3: Example activities for Module 1.3

ACTIVITY	REFERENCE	CATEGORY
Individual compilation of one or more validated questionnaires to allow students to understand their relationship with Digital Wellbeing. Examples include: The Smartphone Addiction Scale, The Internet Addiction Scale, The General Self-Efficacy Scale.	Digital Wellbeing Course - Polytechnic University of Turin [17]	Questionnaire
Scenario-based game offering an engaging narrative where students shape their story based on their choices regarding digital distractions, overuse consequences, time management, etc.	Habit Hero - mobile application [26]	Game, Storytelling, Simulation

2.2 Topic 2: Attention as a Currency

Seemingly free tools like the social media we use every day help us stay in touch with our friends, easily find information, and learn new things. However, they analyze our actions and the data we share, using what they learn about us to induce us to pay them more attention than we would like. In particular, these tools can "sell" our attention to advertisers, and are involved in a race to capture our attention: we "pay" for their use with the time we spend on these platforms, a business model called the Attention Economy [5].

These are the main objectives for Topic 2:

- Understand the foundations of the Attention Economy.
- Understand the strategies adopted to capture our attention, and how these strategies can impact digital wellbeing.
- Recognize the "dark patterns" used by technology to capture our attention.

2.2.1 Module 2.1: The Attention Economy

In the attention economy, persuasive technology is often exploited to capture users' attention, a goal that is often not aligned with people's digital wellbeing [18]. In general, today's technology is designed to keep us "engaged," exploiting psychological vulnerabilities and people's cognitive biases.

The first module of Topic 2:

- introduces the attention economy, showing how and why this business model is convenient for tech companies;
- introduces cognitive biases and main psychological techniques, from variable rewards to social influence, used by contemporary technology to capture users' attention.

Table 4 reports an example activity that can be used to operationalize Module 2.1.

Table 4: Example activity for Module 2.1

ACTIVITY	REFERENCE	CATEGORY
In this simple five-minute activity, we will practice directing and exploring our attention. First, listen to this guided audio exercise. Now reflect on the questions: What was the exercise like? What did you notice about the nature of attention?	Center for Humane Technology: Foundations of Humane Technology [3]	Self-assessment, Game

2.2.2 Module 2.2: Capturing Attention Through Technology

To capture users' attention, technology uses Attention-Capture Damaging Patterns [18]. These are recurring patterns in (graphical) interfaces that a designer uses to exploit psychological vulnerabilities and capture the user's attention, often leading the user to lose track of their goals, lose the sense of time and control, and later feel regret. The goal is to maximize continuous use, daily visits, and interactions (e.g., clicks, shares, likes, etc.).

The second module of Topic 2:

- introduces and exemplifies attention-capture patterns, from infinite scrolling to the use of viral recommendations;
- introduces the effects - positive and especially negative - that these patterns cause to Digital Wellbeing;
- provides tools to allow students to recognize attention-capture patterns within a digital service.

Table 5 reports an example activity that can be used to operationalize Module 2.2.

Table 5: Example activity for Module 2.2

ACTIVITY	REFERENCE	CATEGORY
Take your smartphone or PC and open one of the applications/websites you use most often. How many/which attention-capture damaging patterns can you identify?	Digital Wellbeing Course - Polytechnic University of Turin [17]	Questionnaire, Self-assessment

2.3 Topic 3: Time Management and Self-Control

Achieving Digital Wellbeing in the Attention Economy is traditionally considered an end-user responsibility [6]. According to this view, users must take personal responsibility for their digital health, self-controlling their use of technology. To help users in this process, today there are Digital Self-Control Tools (DSCT) [11, 16], namely smartphone applications or

browser extensions whose main objective is precisely to support users in self-regulating the use of other applications and websites.

These are the main objectives for Topic 3:

- Implement self-control and self-monitoring strategies to balance digital use and offline activities.
- Know the potential and weaknesses of Digital Self-Control Tools (DSCTs).

2.3.1 Module 3.1: Self Monitoring and Self Regulation

Self-control and self-monitoring are key concepts in the responsible use of technology. Self-control refers to the ability to regulate one's actions, emotions, and thoughts in order to pursue long-term goals, even when faced with immediate temptations or distractions. In the context of technology, self-control involves the ability to manage the time spent online, limit access to harmful or unproductive content, and maintain a healthy balance between digital use and offline activities [16].

On the other hand, self-monitoring concerns awareness and careful observation of one's own behavior, habits, and the effects resulting from technology use [16]. This includes tracking app usage, visited websites, and online interactions to assess whether they align with personal goals and overall well-being. Self-monitoring helps identify potential issues related to excessive technology use or undesirable behaviors, thereby enabling adjustments or changes to improve one's digital experience.

The first module of Topic 3:

- introduces the concepts of self-control and self-monitoring for responsible technology use;
- allows students to practice self-control and self-monitoring in relation to their own technology use.

Table 6 reports example activities that can be used to operationalize Module 3.1.

Table 6: Example activities for Module 3.1

ACTIVITY	REFERENCE	CATEGORY
The Great Data Hunt, a weekly challenge providing students with a daily report on device use in various contexts, actively involving them in a guided self-analysis process.	Habit Hero - mobile application [26]	Self-assessment, Game, Time Management
In a notebook, create a simple table to track your time, observations, and how you felt using certain apps (e.g., Snapchat, TikTok). Reflect on what surprised you and if tech is helping you become who you want to be.	Center for Humane Technology: Social Media and the Brain [3]	Self-assessment, Activity Frequency, Social

2.3.2 Module 3.2: Digital Self-Control Tools

Digital Self-Control Tools (DSCTs) are tools designed to help people manage their use of technology in a more conscious and responsible way [11, 16]. These tools are intended to support self-control and self-monitoring in the digital environment, helping users maintain a healthy balance between technology use and other important activities in daily life. They can be used alongside good time-management practices and personal self-discipline to improve the digital experience and maintain a healthy balance between online and offline life.

The second module of Topic 3:

- introduces Digital Self-Control Tools, providing concrete examples of commercial tools and research prototypes;
- offers an overview of the main strategies and common features of Digital Self-Control Tools;
- allows students to experiment with the use of Digital Self-Control Tools;
- encourages discussion about the advantages and disadvantages of these tools — from how easy it can be to ignore blocks to their short-term effectiveness.

Table 7 reports an example activity that can be used to operationalize Module 3.2.

Table 7: Example activity for Module 3.2

ACTIVITY	REFERENCE	CATEGORY
Set up your digital devices and services by activating the Digital Wellbeing features provided by today's technology, or follow behaviors that improve self-control. Strategies include: turning off notifications, reducing harmful apps, eliminating clickbait, creating tech-free spaces, doing a digital detox, installing a DSCT.	Center for Humane Technology: Control Your Tech Use [3]	Game, Offline Tasks

2.4 Topic 4: Building Healthy Digital Habits

One of the reasons contributing to the overuse of devices like smartphones, especially in young populations, is their habitual, almost unconscious use [15]. Habit, in particular, makes smartphone use meaningless, especially in certain contexts. Understanding one's digital habits and the contexts in which these habits can be problematic is fundamental to cultivating a conscious and useful use of technology.

These are the main objectives for Topic 4:

- Understand one's own digital habits.
- Develop a conscious use of technology.
- Build a digital environment that promotes Digital Wellbeing.

2.5 Module 4.1: Digital Habits

A habit is an automatic, repetitive, and often unconscious behavior that a person develops over time in response to specific stimuli, situations, or contexts [21]. Habits are an integral part of our daily lives and significantly influence our actions, decisions, and overall well-being.

Habits play a significant role in the field of technology overuse and digital well-being, as they deeply shape our behaviors and interactions with digital tools [21]. For example, frequently checking a smartphone without any real need may be the result of a habit that has developed over time. Dual System Theory, in particular, suggests that human behavior is driven by two systems: one automatic, fast, and emotional, and the other reflective, controlled, and rational. In the context of digital habits, this means that many of our online actions are guided by emotional automatism (the automatic system) [11].

The first module of Topic 4:

- explains what a habit is and its main characteristics — from automaticity to the role of context;
- defines what a digital habit is, with reference to Dual System Theory;
- enables students to discover their own digital habits by identifying the main contextual "triggers" that lead to unconscious technology use.

Table 8 reports example activities that can be used to operationalize Module 4.1.

Table 8: Example activities for Module 4.1

ACTIVITY	REFERENCE	CATEGORY
Multiple-choice survey on digital habits. Questions include: How long before bed do you stop using your phone? Do you check your phone right after waking up?	Habit Hero application [26]	Questionnaire
A structured reflection session focused on a self-assessment of students' current digital habits.	Habit Hero application [26]	Self-assessment

2.5.1 Module 4.2: Changing Digital Habits

Changing a digital habit is a complex process that requires awareness, commitment, and patience [21]. According to Dual System Theory, in particular, changing habits requires conscious and rational engagement (the reflective system) in order to effectively intervene and modify undesirable digital behaviors [11].

After understanding one's own digital habits and the triggers that activate them, it is necessary to set clear and realistic goals, implement gradual changes, and celebrate achievements. To do this, it is important to "build" a digital environment that promotes Digital Well-being. The Habit Alteration Framework describes the process of habit formation and provides intervention strategies targeting habitual behaviors that may potentially lead to the development of healthier new habits.

The second module of Topic 4:

- provides examples of strategies to change existing digital habits, with reference to the Habit Alteration Framework;
- allows students to experiment with these strategies in a practical way.

Table 9 reports example activities that can be used to operationalize Module 4.2.

Table 9: Example activities for Module 4.2

ACTIVITY	REFERENCE	CATEGORY
Digital Wellbeing Bingo, a series of challenges to complete over a week including specific digital wellbeing goals like morning routines without phones, mindful meals, offline hobbies, etc.	Habit Hero application [26]	Self-assessment, Game, Social
Read stories from #MySocialTruth and reflect on why changing social media habits had a positive impact. Set goals and keep track of your new usage for a week. Write in a journal about your progress.	Center for Humane Technology: Take Control of Your Social Media Use [3]	Questionnaire, Social, Storytelling, Activity Frequency

2.6 Topic 5: Imagining New Technology

Tools like Digital Self-Control Tools have recently been criticized due to their “external” nature. There is a need to act on the internal mechanisms - or "dark patterns" - that technology uses to capture our attention, imagining a new technology that can respect digital wellbeing “by design.”

These are the main objectives for Topic 5:

- Know current regulations and policies related to Digital Wellbeing.
- Know the tools that can mitigate internal mechanisms leading to tech overuse.
- Be able to imagine and “design” new technologies and interfaces that consider digital wellbeing a priority.

2.6.1 Module 5.1: Regulating Digital Wellbeing

Public policies and regulations are an essential part of the solution toward technology that respects people’s Digital Well-being. In fact, policies focused on Digital Well-being can encourage technology companies to design and build products that better support our well-being.

Recently, regulatory actions against so-called “dark patterns” have been emerging worldwide, for example from the United States Federal Trade Commission and the European Data Protection Board. California has also recently passed the CA Kids Code, which requires platforms to design their products in ways that ensure children’s privacy and safety. It is important to note that policy both reflects and shapes public will. Policy changes are easier

to achieve when they are integrated with business practices, public awareness, and cultural values.

The first module of Topic 5:

- provides an overview of emerging and/or existing public policies and regulations in the field of Digital Well-being;
- illustrates the impacts that such policies and regulations may have on present and future technology.

Table 10 reports example activities that can be used to operationalize Module 5.1.

Table 10: Example activities for Module 5.1

ACTIVITY	REFERENCE	CATEGORY
Retro-casting exercise: Imagine you are 70 years old looking back at a career as a technologist. What values did you put at the center of your work? What do you need to do today to reach that vision?	Center for Humane Technology: Foundations of Humane Technology [3]	Questionnaire, Simulation, Storytelling
Review the More in Common study on the perception gap in the US. How might the concept of "perception gap" inform the development of technology that creates shared understanding?	Center for Humane Technology [3]	Questionnaire, Mentoring, Textual Info

2.6.2 Module 5.2: Designing for Digital Wellbeing

Researchers emphasize that one of the main limitations of tools such as Digital Self-Control Tools lies in their "external" nature, which prevents them from easily modifying the problematic design patterns and features of an application or website [10]. In other words, there is an inherent contradiction in designing technologies to reduce the use of other technologies, especially within a business model that incentivizes frequent and continuous use.

Digital Well-being, instead, should be considered at every stage of the digital service design process. In particular, the most promising way to (re)align technology with Digital Well-being is to design technology that respects users' attention from the outset [6]. Recently, new guidelines and design patterns for Digital Well-being have begun to emerge. One example is Bright Patterns, benevolent design solutions that prioritize users' goals and well-being over their immediate desires and over the business objectives of technology companies.

The second module of Topic 5:

- challenges students to imagine a new technology;
- introduces design guidelines for Digital Well-being;
- presents alternative design patterns to Attention-Capture Damaging Patterns, such as Bright Patterns.

Table 11 reports example activities that can be used to operationalize Module 5.2.

Table 11: Example activities for Module 5.2

ACTIVITY	REFERENCE	CATEGORY
Download the Humane Tech Design Guide. Try to sketch out an experience you want to create with technology using the Guide.	Center for Humane Technology: Foundations of Humane Technology [3]	Questionnaire, Simulation (?)

3 Gamification Framework

Gamification in education has been widely investigated over the past decade as a strategy to increase student engagement, motivation, and learning outcomes [22]. Integrating game elements into educational contexts can foster participation, persistence, and a stronger sense of progression. However, empirical findings also reveal nuanced and sometimes mixed effects, particularly when gamification mechanisms are not carefully aligned with pedagogical objectives [9].

This section describes the gamification framework designed for the digital wellbeing learning path. Rather than converging on a single rigid model, the investigation deliberately explored multiple alternatives (competitive vs collaborative, static vs dynamic personalization, global vs activity-level gamification). This broad design space allows the system to remain flexible and adaptable across different educational contexts.

3.0.1 Core Gamification Elements in Education

Existing studies identify several recurrent game elements in educational systems. Among the most common are points, badges, leaderboards, levels, and virtual rewards [9]. These elements contribute to a sense of achievement and visible progression, reinforcing short-term engagement. Immediate feedback mechanisms are also central: by providing real-time responses to students' actions, gamified systems help learners understand mistakes and refine their performance [8].

Competition is frequently implemented through leaderboards and challenges with clearly defined objectives. While competitive mechanics can increase motivation, the literature warns that excessive competition may produce demotivation, anxiety, or perceptions of unfairness if not balanced with collaboration. Consequently, many scholars advocate for hybrid approaches that integrate both competitive and cooperative elements [9].

Another major strand in the literature emphasizes personalization. Personalized gamification allows learners to tailor avatars, follow customized learning paths, and experience difficulty levels adapted to their competence. Research suggests that personalization is among the most effective gamification strategies because it strengthens identity and autonomy, two critical components of intrinsic motivation [9].

Progress tracking tools, such as progress bars and mastery indicators, are also recognized as highly effective. They provide continuous visual feedback, help learners set goals, and sustain persistence over time [12].

Virtual currencies represent a further development: unlike abstract points, digital currencies can be spent on in-app purchases, unlocking customization features or additional content. This mechanism fosters ownership and can significantly increase engagement, although it is sometimes linked to freemium business models [23].

Storytelling and narrative integration, although less consistently implemented, have been shown to enhance emotional engagement and contextual meaning in learning activities [8]. Similarly, collaboration-based gamification approaches encourage teamwork and social interaction, reinforcing relatedness and peer support [23].

3.0.2 Educational Platforms as Case Studies

Several widely adopted educational platforms provide practical illustrations of gamification principles.

- **Duolingo** integrates streak systems, XP points, levels, leaderboards, and a virtual currency ("lingots") that can be redeemed for in-app benefits. The system's consistent reward structure has been associated with sustained motivation and has been positively evaluated in empirical studies on language learning effectiveness [19].
- **Kahoot** exemplifies real-time competitive gamification through timed questions, scoring systems, and leaderboards. While research generally reports positive engagement effects, it also identifies potential drawbacks, including stress induced by time pressure, reduced reflection due to speed-based scoring, and technical limitations in classroom environments [25].
- **Quizlet** combines self-paced study modes with progress tracking and badge-based rewards. Its flexibility across subjects and emphasis on mastery make it suitable for individualized learning contexts [24].
- **Classcraft** introduces role-playing elements and team-based collaboration, transforming classroom management into a narrative-driven experience. Studies suggest that while performance improvements may not always be significant, engagement levels increase substantially [20].
- **Gimkit** distinguishes itself through an in-game currency system ("Kits"), power-ups, and upgrade mechanisms. This game-economy approach provides students with a sense of strategic investment and control. Empirical research indicates that, in certain contexts, Gimkit outperforms traditional question-and-answer methods in promoting subject learning [1].

Across these examples, one recurring observation emerges: gamification is most effective when multiple motivational drivers are integrated coherently rather than implemented in isolation.

Figure 1: Mapping of the gamification aspects in the digital wellbeing learning path to the Octalyst framework

3.1 Gamification Elements in the Digital Wellbeing Learning Path

The design of the gamification elements within the digital wellbeing learning path is informed by established research on gamification in education and is structured around the Octalysis framework [4] (Figure 1), which highlights a broad spectrum of motivational drivers extending beyond simple point accumulation. Building upon the empirical evidence and analyses discussed above, as well as the outcomes of the co-design process, the gamification framework for the digital wellbeing learning path in the educational context incorporates the following key dimensions.

3.1.1 Global Reward Logic: The Virtual Currency System

At the center of the gamification framework lies a **global virtual currency system**. Each completed activity grants students coins, establishing a consistent reward layer across the entire learning path. The amount of currency awarded depends on factors such as performance, effort, and task difficulty.

Three core principles govern this reward logic. First, students are always guaranteed a minimum reward upon completion, ensuring that participation is consistently recognized. Second, higher performance leads to proportionally higher gains, encouraging aspiration and mastery. Third, the precise calculation formula remains hidden from students. This opacity prevents over-calculation and excessive instrumentalization of learning behaviors.

This design balances fairness and ambition. Students are not penalized with zero rewards, but excellence remains meaningfully incentivized. The reward system therefore supports both intrinsic and extrinsic motivation: it acknowledges effort while promoting improvement.

Importantly, currency is not a symbolic score detached from utility. It can be spent in an in-app shop, transforming achievement into tangible digital assets. This conversion of performance into ownership reinforces a sense of agency and investment in the learning process.

3.1.2 Identity Construction: Customizable Public Profiles

The virtual currency feeds into a customizable profile system that allows students to shape their public digital identity within the classroom environment. Items available in the shop include profile pictures, backgrounds, and decorative borders, with certain assets designated as rarer and more prestigious.

Some customization items are initially locked and become available only after specific milestones have been reached, such as completing a threshold number of activities or unlocking particular badges. This mechanism introduces scarcity and long-term goals into the motivational structure. Rather than providing immediate access to all customization features, the framework embeds aspiration into progression.

Public profiles are visible to teachers and peers. Consequently, customization functions as a social signal rather than a purely aesthetic choice. A student's profile becomes a visible representation of engagement, commitment, and accomplishment. This integration of identity and recognition strengthens the social dimension of motivation, reinforcing participation through visibility and belonging.

3.1.3 Structured Achievement: Badges and Milestones

Complementing the currency system is a structured badge framework that marks significant milestones along the learning path. Badges vary in difficulty and, in some cases, may grant additional currency bonuses. They serve as recognizable symbols of development and achievement.

Beyond foundational badges, the framework includes advanced features such as hidden badges revealed only upon unlocking, highlighted badges that can be displayed prominently on public profiles, competitive ranking-based badges, and collaborative contribution badges.

These variations introduce multiple motivational drivers simultaneously: curiosity, social recognition, mastery, and collective achievement.

Badges are carefully integrated within the overall progression logic. They are not standalone decorations but structured indicators of advancement. Through visible and cumulative achievements, students develop a tangible sense of growth across modules.

3.1.4 Competitive and Collaborative Configurations

A distinctive element of the framework is the possibility of toggling between competitive and collaborative modes at the level of individual activities. This flexibility acknowledges that motivational dynamics vary across classroom contexts and learning objectives.

In competitive mode, individual scores and rankings are emphasized. Leaderboards allow students to compare their performance with peers, stimulating ambition and mastery-oriented engagement. Competition can energize participation and create short-term intensity around specific tasks.

In collaborative mode, the emphasis shifts to collective progress. Class-wide progress bars and shared objectives replace individual rankings. Success becomes a function of aggregated contributions rather than isolated achievement. This structure promotes shared responsibility, reduces performance anxiety, and fosters peer support.

The system does not privilege one paradigm over the other. Instead, teachers can configure the motivational structure according to pedagogical needs. This configurability embodies End-User Development principles (see Section **??**, allowing educators to shape the motivational environment without altering the core technical framework.

3.1.5 Activity-Specific Visualization Strategies

The gamification framework extends beyond reward systems into the design of activity-specific visualization logic. Different types of activities require different visual representations in order to preserve pedagogical alignment.

In activities centered on brainstorming and open-ended reflection, visualization emphasizes aggregation rather than ranking. Responses may be grouped or clustered to highlight shared themes. This approach supports qualitative exploration and collective reflection without imposing competitive pressure.

For structured assessments such as the Smartphone Addiction Scale, visualization highlights numeric distributions and class averages. Students can contextualize their individual results within the broader classroom landscape, fostering awareness through comparison rather than competition.

Quizzes combine personal score visibility with aggregated class data. This dual presentation supports self-assessment while maintaining a social dimension.

Longer-term activities such as Bingo rely on visible progress tracking. In collaborative mode, class completion percentages become central, reinforcing shared responsibility. In competitive mode, individual progress is foregrounded.

Storytelling activities introduce narrative branching. In competitive configurations, students observe individualized narrative outcomes. In collaborative configurations, the class collectively determines the story's trajectory. This integration of narrative and agency deepens emotional engagement.

Reflective activities such as the Daily Reflection diary prioritize clarity and comparability over ornamental gamification. Visualization remains simple to preserve introspective depth.

The Forest activity introduces a symbolic visualization of focus and self-regulation. Healthy, uninterrupted sessions generate visual growth, while interruptions affect the outcome. In competitive mode, students compare personal forests. In collaborative mode, a shared class forest grows collectively, embodying discipline as a shared achievement.

4 End User Development for Teachers

A central pillar of the proposed framework is the integration of EUD principles tailored specifically to the role of teachers. Rather than requiring programming-level customization or technical intervention, the system embeds EUD within a set of carefully designed configuration mechanisms. The goal is to empower educators to shape the pedagogical and motivational dynamics of the learning path without increasing technical complexity.

In this design, teachers are not passive users of a predefined system. They act as orchestrators of the learning experience, able to adapt the structure, pacing, and motivational configuration of the platform to the needs of their specific classroom context.

The EUD approach operates primarily through structured configurability. Teachers can select which activities within each module are activated, thereby tailoring the learning path to their pedagogical priorities. This selection process allows for contextual adaptation—for instance, emphasizing reflective activities in one class while prioritizing behavioral engagement tasks in another.

Teachers also control the temporal structure of activities. They can decide whether activities are time-bound or remain open until explicitly closed, shaping the rhythm of participation. This flexibility enables alignment with classroom schedules, student workload, and broader curricular planning.

A particularly significant EUD feature concerns the ability to toggle between competitive and collaborative modes at the activity level. Rather than imposing a fixed motivational paradigm, the system allows teachers to determine whether an activity should emphasize individual performance or collective achievement. This decision can be made dynamically and adjusted over time, reflecting evolving classroom dynamics. Such configurability acknowledges that motivational strategies must be responsive rather than static.

Additionally, teachers can activate or deactivate specific gamification layers. For example, they may choose to emphasize badges and rankings during certain phases of the learning path while prioritizing reflective engagement in others. This selective activation ensures that gamification remains pedagogically aligned rather than dominant.

The activity lifecycle is also managed by teachers. They can open, close, or reset activities

when appropriate, preserving coherence and narrative continuity. By maintaining control over progression, teachers ensure that the motivational architecture reinforces rather than disrupts the learning objectives.

Beyond these foundational capabilities, the framework anticipates future extensions of the EUD component. These potential enhancements would further deepen teacher agency while maintaining usability. For instance, teachers may eventually be able to adjust reward weights according to activity type, emphasizing reflection over speed or collaboration over competition. They could define unlocking thresholds for shop items or badges, shaping long-term motivational goals according to the maturity and profile of their class.

Additional configurability may include the definition of class-level goals in collaborative activities, allowing teachers to calibrate the difficulty of shared challenges. Storytelling narratives could also be selected or adapted, enabling alignment between thematic content and curricular focus.

Importantly, the EUD approach is intentionally designed to avoid technical barriers. Teachers are not required to script behaviors or manipulate code. Instead, they operate within a structured interface that exposes meaningful pedagogical parameters while concealing implementation complexity. This ensures low technical overhead while preserving high pedagogical flexibility.

Through this balance of configurability and usability, the EUD framework achieves three key outcomes. First, it guarantees pedagogical control, ensuring that motivational mechanisms remain subordinate to learning objectives. Second, it enables adaptation to class-specific profiles, accommodating differences in age, engagement level, and group dynamics. Third, it maintains low technical complexity, ensuring accessibility and scalability across educational contexts.

In this way, EUD is not treated as an optional enhancement but as a foundational principle of the platform. Teachers are positioned not merely as facilitators but as co-designers of the motivational environment, capable of shaping how gamification and adaptation manifest within their classroom.

ATTACHMENTS

The following resources complement the content of the deliverable and the work conducted in the WP, and serve as dissemination:

- Ceccarini Chiara, Ballarini Francesco, and Prandi Catia. 2024. Enhancing digital wellbeing through co-design: some preliminary results. Digital Wellbeing for Teens: Designing Educational Systems (DIGI-Teens) Workshop.
- Monge Roffarello Alberto and De Russis Luigi. 2024. Introducing Digital Wellbeing Learning in High School Education. Digital Wellbeing for Teens: Designing Educational Systems (DIGI-Teens) Workshop.
- Scibetta Luca, Ballarini Francesco, Ceccarini Chiara, Monge Roffarello Alberto, Prandi Catia, De Russis Luigi. 2025. Towards Digital Well-being Education in High-School. In Proceedings of the Extended Abstracts of the CHI Conference on Human Factors in Computing Systems (CHI EA '25). Association for Computing Machinery, New York, NY, USA, Article 534, 1–6. DOI: 10.1145/3706599.3720101

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