HANDBOOK

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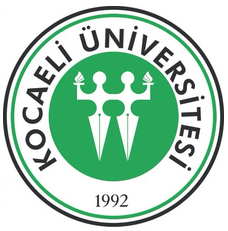
This handbook has been developed by **Sineglossa**

with the contribution of **Green Gaming partners**



THE GREEN GAMING PROJECT

Green Gaming is an educational project supported by the European Union (EU) through the European Education and Culture Executive Agency (EACEA), Erasmus program (Virtual Exchanges in Higher Education and Youth). Green Gaming aims to develop a methodology that uses a game-based approach to achieve the objectives of equipping ICT students and vulnerable young people with soft, digital, and green skills. Literature provides evidence on the appropriateness of game-based approaches for enhancing those skills. Gaming is also appropriate to attract young people – also those not included in traditional education – and engage them in intercultural settings on 21st challenges like climate change. It can also foster behavioral change: through empathy and identification, game designers and gamers learn how to act in real-life situations. This approach is implemented in all the activities of the project: Interactive Open Online Courses (iOOCs) targeting gamified interaction mechanisms embedded in online contents and texts); Online Facilitated Dialogues (OFDs) which focused on discussions facilitated using game-based tools; Green GAME JAM, which focused on an innovative and creative approach, where participants will design a game that addresses the challenge of climate change.

The project involves over 3,400 participants from 6 countries: Sweden, Italy, Turkey, Ethiopia, Nigeria, and Tanzania. The Consortium is composed of both higher education institutions and NGOs working with young people. This enables the creation of diverse intercultural groups involving ICT students and young people, notably vulnerable groups like the unemployed, migrants, and girls living in politically unstable regions.

The activities are expected to provide participants with knowledge of climate change, and game design and enhance their soft skills (communication; teamwork; problem-solving; creativity; leadership), digital skills (capacity to interact and collaborate in digital settings), and global skills (interest in global impacts and solutions for climate change; improved feelings towards people with different ethnic backgrounds). The implementation of the virtual exchange is followed up by in-progress and final evaluation to improve the methodology and formalize it in a final handbook to foster its replication, transferability, and upscaling.

PROJECT PARTNERS

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INTRODUCTION: THE GREEN GAMING HANDBOOK

WHAT IS THIS HANDBOOK FOR?

The purpose of this handbook is to provide guidance and practical tools to promote and support the teaching of digital, soft, and green skills through gaming and gamification.

WHO IS THIS HANDBOOK FOR?

For teachers, trainers, and facilitators working in both formal and informal education who deal with sustainability education and/or digital skills education, and who wish to enrich their training activities with soft skills education and with tools capable of engaging and motivating learners.

HOW DOES THIS HANDBOOK WORK?

This handbook is divided into **two parts**.
The first provides **an overview of the effectiveness of gamification in education and highlights the importance of equipping young people with Green Skills, Digital Skills, and Soft Skills** to prepare them to navigate the world of work effectively.
The second section is the actual handbook, divided into four sections:

- The first section offers **a guideline to approach Green Skills, Digital Skills and Soft Skills in education**.
- The second provides tools and guidance for **developing the learning objectives** that underpin any educational activity.
- The third offers tools and advice for **applying games (gamification and serious games) to educational content**.
- The fourth presents practical case studies of how to apply the Green Gaming methodological approach through the three types of **activities developed in the project: OFDs, IOCCs, and Game Jams**.

HOW WAS THIS HANDBOOK DEVELOPED?

The Green Gaming methodology was developed during the first phase of the project and shared with all partners through a training activity for the 12 facilitators who would later implement the educational activities. Throughout the project, the proposed methodology and teaching tools were monitored and validated using qualitative questionnaires administered both to the teachers and facilitators involved in the different educational formats and to the participants in the learning activities (the project involved a total of 3,401 people in learning activities: 1,333 participants in OFDs, 1,636 in iOOCs and 438 in Green Game Jam). The evaluation process highlighted improvements and tips that were then integrated into the final development of the tools collected in this handbook.

1: GAMIFICATION IN IMPROVING GREEN SKILLS, DIGITAL SKILLS, SOFT SKILLS

1.1 UNDERSTANDING GAMIFICATION IN EDUCATION

Gamification is the strategic integration of game elements and design techniques in non-game contexts. It aims to tap into the **intrinsic and extrinsic motivations** of individuals -- whether they are learners, customers, or employees -- by crafting experiences that are engaging and aesthetically compelling. The essence of gamification lies in its **game-based foundation**, which includes abstract challenges defined by rules and **interactivity**, yielding measurable outcomes and emotional engagement.

Gamification in the educational context represents a strategic blend of **game-based mechanics**, **aesthetics**, and **thinking** applied to learning environments. This innovative approach is not merely about adding points and rewards to learning activities; it delves deeper into creating **immersive** and **engaging experiences**. Gamification caters to the evolving needs of **digital natives**, who bring a different set of expectations to the learning environment, shaped by their familiarity with digital technologies.

At its core, gamification in education is about **transforming the learning experience**. It makes the process more dynamic and interactive, thus significantly enhancing **student engagement** and **motivation**. This transformation is particularly crucial for areas that are traditionally seen as challenging, such as the **development of new skill sets**. By incorporating game-like elements, educators can encourage **student activity** and **participation**, creating a learning atmosphere that is both supportive and rewarding.

METHODOLOGICAL APPROACHES IN GAMIFICATION

The methodology behind gamification in education focuses on "learning by doing". Benefits of this approach include:

- **Trial and error in a safe environment**: students engage in trial and error, allowing them to learn from mistakes in a safe and supportive setting, thus enhancing their overall learning experience.
- **Immediate feedback and iteration**: this method incorporates instant feedback and iterative processes, enabling continuous refinement and improvement of skills and knowledge
- **Community and collaboration**: the approach fosters essential soft skills like teamwork and communication, as community involvement and collaborative efforts are integral to the learning process.
- **Practical application of skills**: gamification facilitates the practical application of skills in real-world scenarios, which is crucial for developing competencies like communication and environmental stewardship.

- **Adaptability to cultural nuances**: a key aspect of gamification in education is its flexibility to adapt to different cultural contexts. This adaptability ensures that learning is relevant and resonates with the students' own social and cultural backgrounds.
- **Influencing behavioral and perspective shifts:** gamification aims to create significant changes in behavior and perspectives, especially in response to environmental challenges, by effectively linking theoretical knowledge to actionable, real-world practices.

GAMIFICATION'S ROLE AS A TRANSFORMATIVE EDUCATIONAL TOOL

The gamified approach should focus on creating interactive, engaging, and practical learning experiences that are culturally sensitive and aligned with **real-world scenarios**. By doing so, gamification can effectively educate and motivate students in the areas of soft, digital, and green skills, ensuring a comprehensive and impactful learning journey.

1.2 GREEN SKILLS

Green skills represent a crucial component in our education and training systems, primarily due to their role in safeguarding the **health of our planet and public health**. These skills are not just about environmental knowledge; they encompass a comprehensive set of competencies, **attitudes**, and **values** that encourage individuals to live, work, and act in harmony with the environment. The essence of green skills lies in fostering a **sustainability mindset**, enabling learners to develop as systemic and critical thinkers, equipped with the ability to make informed decisions for the betterment of our planet.

GREEN SKILLS IN THE JOB MARKET

The global job market is progressively recognizing the value of green skills. These skills are essential for a wide range of careers, from traditional environmental roles to emerging green technologies and **sustainable business practices**. As industries adapt to a **greener economy**, the demand for professionals equipped with green skills is growing, making these competencies a significant asset for young learners entering the workforce.

MEETING ECOLOGICAL CHALLENGES THROUGH EDUCATION

Our ecological challenges highlight the need to integrate sustainability into all facets of education. Achieving a sustainable future requires more than just technological innovations or political commitments; it calls for a fundamental shift in values and practices towards **environmental stewardship**. This shift is not only crucial for ecological reasons but also for creating fair and **sustainable livelihoods** for all.

THE TRANSFORMATIVE POWER OF SUSTAINABILITY EDUCATION

Sustainability education aims to transform perspectives, beliefs, and behaviors concerning the environment. It's about cultivating a deep understanding of our **interconnectedness with nature** and our role as **agents of change**. This educational approach prepares learners to face current challenges and shape future trajectories, thereby contributing to a more sustainable society and job market.

PREPARING LEARNERS FOR FUTURE OPPORTUNITIES

Educational activities in green skills prepare learners not just for immediate environmental challenges but also for future career opportunities in a **green economy**. By providing high quality and inclusive education in this field, we can break the cycle of socio-ecological problems and open up new pathways for education and employment.

In summary, the development of green skills in education is a strategic response to environmental challenges and a proactive approach to equipping young learners with the competencies needed for success in a sustainable, green economy. This approach aligns with the **evolving demands of the workforce**, ensuring that learners are not only environmentally aware but also competitively employable.

THE ROLE OF GAMIFICATION IN GREEN SKILLS DEVELOPMENT

Another crucial aspect in the development of green skills is the use of innovative teaching methods, such as gamification. In the context of green skills, gamification offers an innovative way to integrate **environmental behaviors** and **sustainability concepts** into the learning experience. By using game mechanics and interactive elements, gamification in sustainability, education not only imparts knowledge but also cultivates a sense of environmental **morality**.

Gamification, thus, becomes a powerful tool to stimulate a change in mindset, which is essential for transitioning to **sustainable production and consumption patterns**. The role of gamification in this context is to make the acquisition of these skills more engaging, relevant, and impactful, aligning with the goals of **lifelong learning** and sustainable development.

1.3 DIGITAL SKILLS

Digital competence, recognized as one of the *Key Competencies for Lifelong Learning*, encompasses a broad range of skills and knowledge. As defined in the 2018 Council Recommendation, it involves the confident, critical, and responsible use of digital technologies for learning, work, and societal participation. This includes **information** and **data literacy, communication** and **collaboration, media literacy, digital content creation** (including programming)**, safety** (including digital well-being and competencies related to cybersecurity)**, problem-solving,** and **critical thinking**. These competencies represent a blend of knowledge, skills, and attitudes, essential for navigating the digital aspects of modern life.

DIGITAL SKILLS IN THE JOB MARKET

In the rapidly evolving job market, digital competence has become a critical factor for employability. The ability to adeptly use digital tools and platforms is now a prerequisite in many professions. As industries increasingly integrate digital technologies, proficiency in these areas is not just advantageous but essential for young learners aspiring to succeed in the modern workforce.

CHALLENGES OF THE DIGITAL LANDSCAPE

Today's digital landscape presents unique **challenges** such as misinformation and disinformation, especially prevalent in social media and news sites. **Online risks** like cyber threats and unethical online behaviors are constantly evolving, making digital competence vital for personal safety and privacy. This skill set enables students to address issues such as copyright infringement, cyberbullying, and **responsible online interaction**. As social interactions and professional activities move increasingly online, digital competence is critical for safe, responsible, and effective engagement in these spaces.

THE IMPACT OF COVID-19 ON DIGITAL LEARNING

The COVID-19 pandemic has highlighted the importance of digital skills, particularly for students. With a significant shift to online education, digital competence has become indispensable for **continued learning and adaptation to digital platforms**. Beyond career readiness, digital competence is emerging as a fundamental life skill for educational and social success.

MANAGING DIGITAL IDENTITIES AND COMMUNICATION

Digital competence involves more than just technical know-how; it's about understanding how to create and manage digital identities, communicate appropriately in various digital settings, and be aware of behavioral norms in these environments. It includes **navigating the complexity of data** produced through digital tools and appreciating cultural and generational diversity in digital spaces.

PREPARING LEARNERS FOR A DIGITAL FUTURE

Digital skills are critical for equipping students and lifelong learners to effectively navigate complex digital landscapes. By fostering these skills, educational systems prepare individuals not only for current digital challenges but also for **future technological advancements** and **career opportunities**. In summary, digital skills are integral to the employability and comprehensive education of young learners, equipping them with the necessary tools to thrive in an increasingly digital world.

THE ROLE OF GAMIFICATION IN DIGITAL SKILLS DEVELOPMENT

In the domain of digital skills, gamification emerges as an essential educational tool. By leveraging interactive game environments, gamification enhances the learning experience, making it more engaging and effective.

This approach is especially **beneficial for teaching complex digital skills**, such as navigating digital interfaces and understanding software workflows. Gamification transforms the learning process into a more **interactive** and **engaging** experience, fostering the acquisition and retention of crucial digital competencies needed for navigating the complexity of the digital era.

1.4 SOFT SKILLS

Soft skills refer to a diverse range of personal attributes, interpersonal abilities, and social skills that **enable individuals** to navigate their environment, work well with others, perform effectively, and achieve their goals with complementing hard skills. These include, but are not limited to, **emotional intelligence, empathy, effective communication, teamwork,** adaptability**, problem-solving, critical thinking,** and **leadership**. Unlike technical or "hard" skills, which are often tied to specific tasks, technologies, or domains, soft skills are transferable across various jobs and industries. They represent the human elements of work, crucial for personal development, successful professional interactions, and the capacity to **cope with change** in an increasingly dynamic world.

NAVIGATING THE CHANGING WORLD: THE RISING IMPORTANCE OF SOFT SKILLS

In our rapidly evolving societies, where technological advancements dictate the pace of change, the significance of soft skills in the realm of education and employment cannot be overstated. The landscape of the **labor market is undergoing a transformative shift**, primarily influenced by the advent of automation. This shift has resulted in routine and low skill tasks being increasingly executed by machines, making certain skills redundant while simultaneously elevating the importance of others.

The demand for soft skills in this new environment is more pronounced than ever. Employers are not just looking for technical competence; they are seeking individuals who demonstrate flexibility, adaptability, and a lifelong commitment to learning. These are the attributes that enable professionals to navigate the complexities of a rapidly changing job market.

Moreover, the value of soft skills extends beyond the professional realm. In a world characterized by constant transitions, whether in work, personal spheres, or society at large, individuals are faced with the challenge of **managing these changes effectively**.

SOFT SKILLS FOR LIFELONG EMPLOYABILITY AND ADAPTATION

The integration of soft skills into education is particularly vital for the **employability** of young learners. In the current job market, where the only constant is change, the ability to adapt, communicate effectively, work collaboratively, and think critically are what set candidates apart. These skills are transferable across different industries and roles, making them invaluable in a landscape where **career paths are no longer linear** but dynamic and multifaceted.

Furthermore, the development of soft skills is an **ongoing process**. It is not limited to the early years of education but extends throughout an individual's life. Lifelong learning is a critical component of personal and professional development, and soft skills are at the heart of this concept. They enable individuals to continue **growing, learning**, and **adapting**, regardless of their age or stage in their career. By focusing on these skills, we are preparing learners not just for the jobs of today but for the **challenges and opportunities of tomorrow**.

THE ROLE OF GAMIFICATION IN SOFT SKILLS DEVELOPMENT

Gamification is particularly effective in the realm of soft skills education. These skills, such as empathy, communication, or collaboration, thrive in interactive environments offered by gamification. Through **role-playing** and **realistic simulations**, gamification provides a conducive space for active learning and **immediate feedback**, which are key components for mastering soft skills. This approach ensures that learners are not only equipped with the knowledge they need but also with the skills to apply that knowledge effectively in a variety of contexts.

2: HOW TO APPLY GAMES TO EDUCATIONAL CONTENT

2.1 GUIDELINES TO APPROACH GREEN SKILLS, DIGITAL SKILLS AND SOFT SKILLS IN EDUCATION

GREEN SKILLS

Green Skills consist of both hard skills, that is, knowledge of what environmental sustainability is and how it can be applied to real-world scenarios, and soft skills, that is, the ability to assess the impact of human actions on the ecosystem and to combine different disciplines and skills to address sustainability-related obstacles.
A training course aimed at stimulating and/or strengthening Green Skills should therefore take into consideration three aspects:

- **Knowledge**: providing learners with the information they need to understand what environmental sustainability is, distinguishing the human-centered approach from the nature-centered approach (for example, through an in-depth look at initiatives such as the Green Deal or the 2030 Agenda for Sustainable Development).
- **Awareness**: fostering learners' need to protect nature, making them aware of the relationship between the well-being of nature and the well-being of humankind and being able to assess the impact of their actions on the future of nature.
- **Advocacy**: making learners capable of articulating and negotiating values, principles and goals marked by sustainability, envisaging alternative futures for sustainability in the face of uncertainty, ambiguity and risk of the present, and considering sustainability challenges and opportunities from different disciplines and views.

DIGITAL SKILLS

Like Green Skills, Digital Skills encompass both hard skills (e.g., creating and editing digital content) and soft skills (among the skills areas listed in the DigComp framework are, for example, Communication and collaboration and Problem solving). A training course aimed at developing Digital Skills must stimulate both learners' "hard" knowledge and soft skills by promoting activities based on challenges faced in the real world (e.g., misinformation and disinformation in social media and news sites, AI ethics, environmental sustainability, etc.).
The focus on real-world tasks in teaching Digital Skills is particularly important because of the level of interconnectedness that characterizes these skills. As the DigComp framework points out, digital competence is closely connected to other key competencies, such as Citizenship competence, Entrepreneurship competence, Cultural awareness, and not least one of the three pillars of the Green Gaming methodology: the Green competence (being aware of the environmental impact of digital technologies and their use is, in fact, one of the descriptors that define the Safety competence area in the DigComp framework).
As with Green Skills, teaching Digital Skills should therefore not be limited to conveying technical content (e.g., creating a digital identity), but should make participants aware of the limitations, dangers and opportunities of digital technologies, helping them to drop them into the real world.

SOFT SKILLS

Soft Skills can be divided into two macro areas:

- **Social Skills**, i.e., the skills related to how people relate, communicate and cooperate with others (empathy, teamwork, leadership, etc.).
- **Personal Skills**, i.e., the skills related to each individual's way of thinking, understanding and processing information (creative thinking, critical thinking, flexibility, etc.).

A training course aimed at strengthening Soft Skills should take both of these areas into consideration, **stimulating interaction among learners while also enhancing their ability to analyze (info, data, etc.), create (sth new) and reflect (on sth)**.
Gamification is one of the most effective methodologies for training soft skills: "Playful experimentation is about fostering imagination, playing with possibilities, establishing connections and following intuition. Playful experimentation promotes combining ideas in unusual ways. It makes it clear that learning is not the end destination of an education or training programme: in play, means are more valuable than ends, so learners dare to try different non-conventional ways to achieve the goals. Process is more important than outcomes. Safe playful spaces support learning from failure, management of risk-taking, creativity, collaboration and innovation. By giving learners the opportunity to select how to proceed in exploring the problems and experiment with alternative approaches in a safe learning environment, it nurtures their motivation, increasing the enjoyment of learning, and allows them to learn from experience, thus nurturing their autonomy as learners. What matters here is that -- by trial and error -- learners develop perseverance and resilience to setbacks, while learning that by experimenting they develop better solutions (from EntreComp Playbook)."

2.2 HOW TO DEVELOP LEARNING OBJECTIVES

Before starting to design an educational course or activity, it is important to assess the profile of the learners – in terms of their level of competence with respect to the main topics and their predisposition to engage with competitive and collaborative learning activities. It is also important to clearly define the learning objectives.
The goal of this preparation phase is to **ensure that the activities fit the learners' characteristics and are aligned with the learning objectives**, facilitating learners' engagement and avoiding activities that are too complex or out of focus with respect to the main subject.

TIP: Profiling learners
To profile the learners, it may be useful to administer a questionnaire to a sample corresponding to the final recipients of the training, in order to assess their initial level of competence with respect to the topics to be addressed and/or their predisposition for a competitive and collaborative teaching approach.

TOOL 1: HOW TO WRITE LEARNING OBJECTIVES

Learning objectives are statements that describe significant and essential learning that learners are expected to achieve by the end of a course or program. When writing learning objectives, ensure they are:

- **Achievable**: The cognitive level of the learning objectives should be appropriate to the course level and learner level, according to the learners' profile.
- **Specific**: Good learning objectives break down a broad topic into manageable components, and they are explicit about the desired outcomes related to these components.
- **Measurable**: Learning objectives need to deal with changes that can be observed and measured.
- **Result-oriented**: Objectives should focus on the results, rather than the process or activities that learners are going to complete, that is the knowledge, skills, or attitudes that learners should have acquired at the end of the course.

BE INSPIRED: EXAMPLES OF LEARNING OBJECTIVES

Example of learning objective from GreenComp: *[at the end of the course, the student/learner] can synthesize sustainability-related information and data from different disciplines*.
Example of learning objective from DigComp: *[at the end of the course, the student/learner] can plan and develop a sequence of understandable instructions for a computing system to solve a given problem or to perform a specific task*.

TOOL 2: THE GREEN GAMING SKILLS FRAMEWORK

When designing curricula and training courses aimed at the acquisition or consolidation of a cross-cutting skills set – including green, digital and soft skills – teachers and trainers can draw inspiration from **the Green Gaming Framework, the framework of the most relevant competences for the three thematic areas: Green, Digital, and Soft**. The GG Framework was created by selecting the most significant competences from the three skills frameworks already developed and validated at the European level: GreenComp (for green competences), DigComp (for digital competences), EntreComp and LifeComp (for soft competences).

GREEN SKILLS

[REFERENCE: GREENCOMP]

1. VALUING SUSTAINABILITY

To reflect on personal values; identify and explain how values vary among people and over time, while critically evaluating how they align with sustainability values.

2. SUPPORTING FAIRNESS

To support equity and justice for current and future generations and learn from previous generations for sustainability.

3. PROMOTING NATURE

To acknowledge that humans are part of nature; and to respect the needs and rights of other species and of nature itself in order to restore and regenerate healthy and resilient ecosystems.

4. FUTURES LITERACY

To envision alternative sustainable futures by imagining and developing alternative scenarios and identifying the steps needed to achieve a preferred sustainable future.

5. ADAPTABILITY

To manage transitions and challenges in complex sustainability situations and make decisions related to the future in the face of uncertainty, ambiguity and risk.

6. EXPLORATORY THINKING

To adopt a relational way of thinking by exploring and linking different disciplines, using creativity and experimentation with novel ideas or methods.

DIGITAL SKILLS
[REFERENCE: DIGCOMP]

1. MANAGING DATA, INFORMATION AND DIGITAL CONTENT

To organise, store and retrieve data, information, and content in digital environments. To organise and process them in a structured environment.

2. COLLABORATING THROUGH DIGITAL TECHNOLOGIES

To use digital tools and technologies for collaborative processes, and for co-construction and co-creation of data, resources and knowledge.

3. NETIQUETTE

To be aware of behavioral norms and know-how while using digital technologies and interacting in digital environments. To adapt communication strategies to the specific audience and to be aware of cultural and generational diversity in digital environments.

4. DEVELOPING DIGITAL CONTENT

To create and edit digital content in different formats, to express oneself through digital means.

5. PROTECTING PERSONAL DATA AND PRIVACY

To protect personal data and privacy in digital environments. To understand how to use and share personally identifiable information while being able to protect oneself and others from damage. To understand that digital services use a "Privacy policy" to inform how personal data is used.

6. PROTECTING HEALTH AND WELL-BEING

To be able to avoid health risks and threats to physical and psychological well-being while using digital technologies. To be able to protect oneself and others from possible dangers in digital environments (e.g. cyber bullying). To be aware of digital technologies for social well-being and social inclusion.

7. PROTECTING THE ENVIRONMENT

To be aware of the environmental impact of digital technologies and their use.

8. CREATIVELY USING DIGITAL TECHNOLOGY

To use digital tools and technologies to create knowledge and to innovate processes and products. To engage individually and collectively in cognitive processing to understand and resolve conceptual problems and problem situations in digital environments.

SOFT SKILLS

[REFERENCE: ENTRECOMP, LIFECOMP]

1. EMPATHY

To understand another person's emotions, experiences and values, and to respond appropriately.

2. COMMUNICATION

To use relevant communication strategies, domain-specific codes and tools, depending on the context and the content.

3. COLLABORATION

To engage in group activity and teamwork acknowledging and respecting others.

4. CREATIVITY

To develop creative and purposeful ideas.

5. COPING WITH UNCERTAINTY, AMBIGUITY & RISK

To make decisions dealing with uncertainty, ambiguity and risk.

6. CRITICAL THINKING

To assess information and arguments to support reasoned conclusions and develop innovative solutions.

2.3 APPLYING GAMES TO TRAINING

Before providing examples and practical tools for applying games to educational activities, it is useful to pause and clarify the definitions of *Game*, *Gamification*, and *Serious Game*, highlighting both their similarities and differences.

SIMILARITIES

- **ACTIONS:** In all three cases, there is a goal to achieve and one or more actions required to reach that goal.
- **GAIN:** In all three cases, achieving the goal brings some form of benefit – either winning something or receiving a reward or gratification.
- **RULES:** In all three cases, there are constraints – such as time limits or rules about what can or cannot be done – that players must respect.

DIFFERENCES

- **GAME:** A game is **pure entertainment** and is based on freedom and willingness: *"It is an invariable principle of all play that whoever plays, plays freely. Whoever must play, cannot play."* (James P. Carse, *Finite and Infinite Games*, 1986)
- **GAMIFICATION AND SERIOUS GAMES:** They share the same goals: **imparting knowledge and/or changing attitudes and behaviours**. They link tasks to playful and rewarding interactions, capturing and maintaining learners' attention through intrinsic motivators such as competition, cooperation, achievement, and social interaction.

WHAT IS GAMIFICATION?

The incorporation of game elements, mechanics, aesthetics and principles into non-gaming contexts, to enhance motivation, productivity, satisfaction and engagement, or to influence behavior.

It makes the learning experience more dynamic and interactive, thus significantly enhancing student engagement and motivation.

This transformation is particularly crucial for areas that are traditionally seen as challenging, such as the development of new skill sets.

TOOL 1: HOW TO APPLY GAMIFICATION TO A LEARNING CONTEXT

Step 1: Define the Aim
Start from the learning objective of the educational activity (see previous section) to clearly identify its purpose – *for example, Raising awareness about the importance of avoiding resource waste, Teaching appropriate behaviour in digital environments (netiquette), and so on.*
Step 2: Break it Down
Divide the training activity into a sequence of steps (for example: theoretical introduction, group work, assessment quiz, etc.) and decide which step(s) you want to gamify.
Step 3: Gamify
Create enjoyable mechanics and meaningful constraints to transform the selected step(s): movement, challenges, rankings, sensory feedback, storytelling elements, and more.
Step 4: Check the Fit
Consider the target group of the activity (for example ICT students, NEETs, etc.) and evaluate whether the gamification mechanisms you envision are relevant and engaging for that audience. Ask yourself: Am I addressing things they genuinely care about?
Step 5: Evaluate
Set clear indicators to monitor and measure the impact of the gamified activity.

BE INSPIRED: EXAMPLES OF GAMIFICATION

Musical Stairs: The musical stairs at PIER 39 in San Francisco are an example of gamification, designed to encourage physical activity by transforming a mundane task into an interactive, fun experience. This playful intervention uses a core gamification mechanic: immediate and engaging feedback.
Gamified Survey: Survey gamification it's the use of gaming techniques in surveys. This includes things like: Leaderboards, Rewards and badges, Avatars, Virtual currencies, Challenges for the respondents. Giving the respondents a fun experience even while answering some simple questions like "How likely are you to recommend our company?" make them more engaged and less likely to leave the surveys in the middle.
Duolingo: Duolingo uses gamification to make language learning more engaging and habit-forming through elements like points (XP), streaks, levels, achievements, and leaderboards. By applying game-design principles, the app transforms learning into a rewarding experience that encourages consistent practice and long-term commitment.
Waze: Waze uses gamification to encourage user participation by incorporating game-like elements into its navigation service. Key features include a points and scoring system, leaderboards, badges, and customizable avatars that evolve with a user's activity level and contributions, such as reporting accidents or road closures. This approach transforms a mundane task like driving into an engaging, competitive, and social experience.

WHAT IS SERIOUS GAME?

SG are games designed for a primary purpose other than pure entertainment: i.e. for educational, training, or informational purposes that combine the playful experience with learning specific skills and competencies.
The main features of a SG are:

- Immersive experience
- Meaningful engagement
- Learn-by-doing involvement
- Simulation of real-world environmental problems
- Autonomy in game decisions
- Presence of a guiding host

TOOL 2: HOW TO DEVELOP A SERIOUS GAME

PARTS OF A GAME

The basic parts that make up a game are:

- **Goal: What does a player or team have to do to win?**
  A game is defined by an unambiguous goal to be achieved (e.g., crossing the finish line first, overcoming all levels, conquering a secret target, etc.).
- **Challenge: What obstacles might you put in the player's way to make reaching the goal fun and interesting? How are they being kept from doing it?**
  A game should challenge players progressively through increasing levels of difficulty. Players can challenge the game itself or other teams/players.
- **Mechanics: What core actions or moves does the player do to move the game forward? What can and cannot players do in the game? What parts make up the materials of play?**
  Game mechanics include: the actions that players take to power the game; the rules of the game (sequence of play, what is allowed and what is not allowed, what determines defeat or victory, etc.); the components of the game (e.g., tokens, cards, board, etc.).

EXAMPLE: PARTS OF TIC, TAC, TOE

Goal
Being the first player to get three marks (either "X" or "O") in a continuous horizontal, vertical, or diagonal line on a 3x3 grid.

Challenge
Players do not know where the opponent will place their symbol.

Actions
Blocking the opponent's lines.

Rules
Players take turns writing their symbol in an empty space.

Components
Writing utensils
Board or sheet of paper
3x3 grid

GAME DESIGN PROCESS

STEP 1: BRAINSTORM

Start from your learning objective (e.g., *increasing awareness of the importance of not wasting natural resources*) and think about how the learning process can be turned into a game. What is the game's setting? What is the goal? What is the challenge that makes the goal difficult to achieve?
Tip: Take your time and let ideas flow without judging or discarding them too soon. Remember: brainstorming works best when you're not alone!

STEP 2: PROTOTYPE

Create a playable prototype using whatever materials you have on hand. The act of building the prototype will help you define the rules and mechanics of the game.
Tip: Don't wait until everything is perfectly clear to start prototyping – only by getting hands-on will you notice what needs to be improved, changed, or added.

STEP 3: PLAYTEST

Invite other people to play your game and collect as much feedback as possible – both by observing them while they play and by giving them a short survey at the end.
Tip: Invite people who match your target audience (e.g., ICT students) so the feedback you collect will be truly useful.

STEP 4: RETROSPECT

Use your observations and the feedback you gathered to understand what works and what doesn't, which rules need clarification, and which mechanics can be improved.

STEP 5: ITERATE

Return to brainstorming to solve the issues identified in the previous stages, then update your prototype and invite more people to play again!
Tip: Iteration is the most important part of game development – test your game multiple times to make sure it's clear, engaging, and effectively supports your learning objective.

BE INSPIRED: EXAMPLES OF SERIOUS GAMES

Interlab Simulation, Eurocontrol: The Interpersonal Skill Lab (InterLAB) simulation is a platform used by EUROCONTROL to train non-technical skills (also known as "interpersonal skills") for air traffic management (ATM) professionals. It is designed to foster higher-order cognitive processes like adaptability, logical reasoning, and teamwork, rather than domain-specific operational knowledge. Participants work in teams in a challenging, gamified environment where they develop their own goals, plans, and strategies. Sudden, unforeseen events are introduced during the simulation to force players to react, coordinate, and adapt.
Keep Talking and Nobody Explodes: Keep Talking is a cooperative game aimed at enhancing communication skills. One player, the "defuser," must disarm a virtual bomb while the other players, the "experts," use a manual to guide them. The catch is that the experts cannot see the bomb, so communication is critical as they must quickly and clearly describe the bomb's modules and decipher the information in the manual to provide the correct instructions.

Foldit: Knowing the structure of a protein is key to understanding how it works and to targeting it with drugs. The number of different ways even a small protein can fold is astronomical. Foldit attempts to predict the structure of a protein by taking advantage of humans' puzzle-solving intuitions and having people play competitively and collaboratively to fold the best proteins in 3D puzzle games. The game is developed by the Center for Game Science at University of Washington in collaboration with UW Department of Biochemistry.
Minecraft Education Edition: Minecraft is a popular open world videogame that allows you to explore virtual locations made up of Lego style blocks and interact with other players. In Minecraft, you can search for raw minerals, craft tools and objects, and build structures.
In its educational version, kids can:

- explore the pyramids and ancient Egypt;
- see a cell from the inside and discover the various organelles that make it up;
- visit the International Space Station (ISS);
- understand how a manufacturing plant works;
- visit an ancient city of the past.

TIP: SCENARIO BUILDING METHODOLOGY

One of the most effective methodologies for fostering the acquisition of cross-cutting skills set in a gamified educational context is **scenario building, a form of storytelling in which narratives about different futures are crafted from analysis and understanding of the present condition**.
One of the advantages of the scenario building technique is its flexibility, which allows it to be adapted to different contexts and different levels of complexity.
This kind of activity helps learners understand the close relationship between actions and choices in the present and consequences in the future, as well as their creative abilities, stimulating them to identify strategies through the combination of knowledge and imagination.

EXAMPLE OF SCENARIO BUILDING SERIOUS GAME: SCENARIO EXPLORATION SYSTEM

Scenario Exploration System is a future simulation tool to explore possible paths towards the future, in relation to a certain topic: a serious game to stimulate engagement with stakeholders where participants can play the role of business, policymaker, civil society, the public or the media.

3: CASE STUDIES: THE GREEN GAMING ACTIVITIES

This section presents the activities carried out for the Green Gaming project based on the methodology described in this document, with the aim of suggesting possible frameworks for those who wish to create online courses and educational activities focused on Green, Digital, and Soft Skills training.

3.1 ONLINE FACILITATED DIALOGUES – OFDS

OFDs are a particularly suitable tool for **introducing specific topics in the Green and Digital fields while simultaneously promoting the development of soft skills** such as collaboration, creativity, and critical thinking.
The rationale behind OFDs is to combine a traditional teaching approach with practical activities that help learners understand the proposed topic while also developing transversal skills.

At the end of the experience, most participants in the **Green Gaming OFDs** reported an increased level of awareness about Data Privacy and Green Learning, and identified International Connections and Communication as key takeaways. This confirms the format's ability to introduce new topics while fostering the development of global skills (such as *international connections*) and soft skills (such as *communication*).

TIPS FOR IMPLEMENTING OFDS:

- **Make it hands-on and engaging**

To promote a high level of participation and engagement in an online setting, support the theoretical part with **hands-on examples** to facilitate understanding and help learners relate the topic to their own context. During the practical part, use gamification to boost engagement – for instance, tools like Mentimeter for fun and interactive quizzes – and **encourage group work**, for example, by using breakout rooms where participants collaborate on outputs or share reflections on the proposed topic.
Most participants in the Green Gaming OFDs gave the highest rating (5 out of 5) to the level of engagement, stating that they had the opportunity to contribute to the dialogue. Another positive outcome of highly engaging activities is their **medium- to long-term effect**: most participants expressed an interest level between 4 and 5 out of 5 in follow-up activities.

- **Encourage dialogue diversity**

The decentralized recruitment strategy (i.e., partners managing local registrations) implemented in the Green Gaming project proved effective in attracting a diverse, international audience. **Participants valued the networking aspect – "the possibility to have international connections" – the most**, considering the dialogue component as the most useful and interesting part of the experience. The diversity of participants – including a mix of students and self-employed individuals – was also recognized as one of the most enriching aspects.

- **Set a common framework for all meetings**

When organizing a series of OFDs, it is helpful for all involved educational providers to follow a shared framework. This ensures a consistent educational offering, even across diverse topics, and provides facilitators with guidance for structuring their activities.

This is the **90-minute framework followed in the Green Gaming OFDs**:

- **20 mins – Speech:** the host/facilitator introduces the topic of the day, providing practical examples.
- **50 mins – Workshop:** learners apply the topic introduced in the speech to practical activities, supported by serious games or gamified tools.
- **20 mins – Wrap-up:** final Q&A / retrospective session.

- **Avoid choosing topics that are too broad**

Selecting a specific issue – for example, by contextualizing it to the learner's geographic area or focusing on a particular aspect such as water waste – helps learners retain information and apply it to practical cases. **Participants in the Green Gaming OFDs found the topics "very educational" and "relevant to the tech industry"**, which further supports engagement and interest in exploring the proposed themes.

BE INSPIRED: LIST OF OFDS CARRIED OUT FOR THE GREEN GAMING PROJECT

1. **Green Gaming Economy**: An introduction to the green gaming economy which attempts to teach students about environmental issues like energy management, recycling and their impacts.
2. **Greening Competences**: Developing environmental awareness through nature activities and promoting green solutions for a sustainable future.
3. **Biodiversity Conservation**: Understanding climate adaptation strategies and exploring climate mitigation techniques and identifying AI-driven solutions for local sustainability and scaling AI for a sustainable future.
4. **Employability and Entrepreneurial Skills**: To develop essential soft and digital skills to address 21st-century challenges and excel in future careers.
5. **Water Harvesting**: To show different ways of water harvesting and their benefits by taking advantage of the rain water and use in various ways including planting plants.
6. **Game Building**: How to design and develop a serious game and gamification activity to foster engagement, awareness, and skill development.
7. **Green Gaming**: The potential of games for addressing climate change through games and gamification.
8. **Essential Insights of the Successful Innovation**: A discussion session aimed at equipping students with the technical know-how of making every stage of the innovation fruitful, with presentation of best practices.

3.2 INTERACTIVE OPEN ONLINE COURSES – IOOCS

IOOCs are a particularly suitable tool for conveying **hard skills in specific fields (such as Digital and Green, or at the intersection of the two), while stimulating learning and engagement** through an interactive teaching format.

Self-reported data from the first users completing Green Gaming IOOCs indicate a significant confidence boost in both technical (Game Design) and soft skills (Communication). Specifically, most participants reported feeling "Completely confident" regarding "Applying game design principles" and rated "I was able to express my ideas clearly" between 4 and 5.

NOTE: IOOCs can be developed and hosted on the training institutions' own platforms or on existing platforms (such as Coursera, Khan Academy, Teachable). Before choosing a platform for your course, it is important to evaluate its specific features and characteristics to select the one best suited to your needs and target audience.

TIPS FOR IMPLEMENTING IOOCS:

- **Alternate content types and materials**
  To facilitate learners' understanding, it is important to ensure variety in the content and materials presented.
  In the Green Gaming IOOCs, for example, **more instructional sections (such as text blocks or topic-explainer videos) were alternated with interactive elements (such as quizzes),** using diverse media including texts, videos, and images.
- **Gamification**
  To stimulate engagement and active participation, it is useful to include gamification elements.
  In the Green Gaming IOOCs, **interaction was encouraged through practical exercises such as quizzes, word/definition matching games, and image/definition matching games**. Alternating games with instructional content also helps learners retain what they have just read or heard.
- **Gratification**
  Even in asynchronous training, receiving feedback is important. In the Green Gaming IOOCs, some courses require learners to submit assignments to receive feedback from the training provider, and **all courses include the awarding of badges and a certificate** of participation upon completion.
- **Consistent and inclusive content**
  If the goal is to develop a content package covering multiple topics with a unified approach, as in the Green Gaming project, it is useful to develop a Course Development Framework to ensure consistency across the educational offering. When building the content package, it is important to **include variety not only in subject matter but also in levels of complexity, to be as inclusive as possible for all users**. In the case of Green Gaming, for example, technical courses cater to ICT students, while courses like "Permaculture" and "Wellbeing" are directly relevant to vulnerable or non-technical youth, ensuring broad effectiveness.

BE INSPIRED: LIST OF 10OCS CARRIED OUT FOR THE GREEN GAMING PROJECT

1. **Permaculture Practices:** gain practical skills in designing ethical, resilient permaculture systems for gardens, farms, and communities across urban and rural environments.
2. **Farming and Climate Change**: is designed for participants to understand the intricate relationship between farming practices and climate change.
3. **Connecting with Nature through Nature Sports**: offers participants a blend of mindfulness while fostering environmental awareness and sustainable practices.
4. **Environmental Awareness:** is designed to build a clear understanding of key environmental challenges and learn practical, sustainable actions to protect ecosystems and support a healthier planet.
5. **Advanced Digital Skills: use of digital skills for different life activities for ICT students/youths:** designed to equip individuals with in-demand digital skills through hands-on learning in mobile app development, data science, and user interface design for real-world applications.
6. **Employability Skills and Career Development**: designed for individuals to build career-ready skills through gamified learning that strengthens communication, problem-solving, and job-search confidence for success in today's workplace.
7. **Introduction to game development**: designed for individuals to learn the fundamentals of game development by mastering clean, efficient coding practices used to build maintainable and engaging games.
8. **Workplace Wellbeing:** designed for individuals to develop practical strategies to manage stress, build self-esteem, and maintain wellbeing in the workplace or during career transitions.
9. **Advanced Digital Skills - Leveraging coding and algorithmic knowledge to solve problems:** designed for individuals to strengthen digital literacy by using coding and algorithms to solve real-world problems while building critical 21st-century skills like analytical thinking and problem-solving.
10. **Climate Adaptation and Mitigation**: designed for individuals to understand how to respond to climate change by balancing human development with sustainable adaptation and mitigation strategies.
11. **Data Economy and Climate Change (DECC):** Learn to harness data-driven insights to analyze climate challenges and develop practical solutions for mitigating climate impacts.
12. **Artificial Intelligence for Sustainability:** designed for individuals to leverage AI for sustainable development and environmental conservation through practical applications and innovative solutions.

A game jam is a time-boxed creative event in which participants collaborate intensively to design and build a small, playable game from scratch. It is **a particularly suitable tool for bringing together all the elements presented in this methodology – Green Skills, Digital Skills, and Soft Skills – under the umbrella of gaming.**

The goal of developing a digital game to raise awareness or provide information on a sustainability-related topic encourages participants to practice their Digital Skills while simultaneously increasing their awareness and activism regarding Green competencies. At the same time, this type of activity – working in teams to create a new game within a limited time frame – stimulates key Soft Skills: creativity, problem-solving, collaboration, and critical thinking.

At the end of the experience, 70% of participants in the Green Gaming Game Jams reported an improvement in their game design competence, an increased interest in climate change, and personal growth in soft skills – especially communication and conflict management – demonstrating the ability of this format to foster well-rounded development among learners.

TIPS FOR IMPLEMENTING GAME JAMS:

- **Start with a clear challenge**
  Choose one sustainability topic – e.g., waste reduction, renewable energy, biodiversity, circular economy – and give participants a specific challenge to address, **clarifying the purpose of the game** (for instance, raising awareness or providing education on the topic) and the target audience (e.g., adults, teenagers, students in specific fields, etc.).
- **Provide training session**
  If participants are unfamiliar with the challenge topic and/or have never designed a game, it is useful to begin the jam with short training segments on both the sustainability theme and the basic principles of game ideation and development, **supporting the acquisition of additional hard skills**. As mentioned above, 70% of participants in the Green Gaming Game Jams reported "learning new skills" as one of the most significant impacts of the experience.
- **Mix competencies**
  If participants come from different backgrounds, forming heterogeneous teams helps mix skill levels and cultural perspectives. Participants in the Green Gaming Game Jams identified **"intercultural collaboration" and a "wide range of skill levels"** (from beginners – 17 years old – to experienced professionals – 39+ years old) as added values of the experience, highlighting the project's ability to "foster teamwork and collaboration."
- **Provide support by assigning facilitators to the teams**
  While forms of gratification – such as a final award – are important, it is even more crucial to encourage participants to focus on the ideation and development process. Assigning each team a tutor who can **provide periodic and final feedback on strengths and weaknesses**, regardless of the winner, promotes learning and peer-to-peer exchange. Participants in the Green Gaming Game Jams particularly appreciated the presence and support of the facilitators, who offered feedback on the projects under development and helped the teams improve their weak points.

BE INSPIRED: GREEN GAMING GAME JAMS FRAMEWORK

The Green Game Jam is a high-energy, three-day intensive event designed to unite more than one hundred students and young people from various countries to address the urgent challenges of climate change through creative game design. The journey begins promptly via a dedicated Zoom link that remains active for the entire duration of the events. To participate, users must first ensure they understand their local time relative to the Central European zone and then log in to the digital session where they will be integrated into an intercultural and cross-disciplinary learning environment.

Upon the event's commencement, participants are organized into specific group, with each team comprising six to eight members from diverse backgrounds. The primary objective at the start is for team members to establish immediate communication, brainstorm a unique game concept, and assign specific roles based on individual expertise, such as coding, artistic design, sound engineering, or narrative writing. To foster a productive and friendly atmosphere, each group is assigned a trained facilitator who guides the collaborative process and ensures effective teamwork, although the actual technical development remains the sole responsibility of the target participants.

There are two primary pathways for teams to realize their vision during the jam. The first option is to build a functional prototype using standard game development tools to create a simple, playable version of the game that showcases core ideas. Alternatively, teams may choose to focus on a comprehensive Game Design Document, which requires a highly detailed written description of the game's mechanics and narrative rather than a technical build. Regardless of the chosen method, the project must center on a specific climate change theme, such as greenhouse gas emissions, water harvesting, sustainable agriculture, or energy management, ensuring that the final product serves as a tool for environmental awareness.

The event concludes on the afternoon of the third day with a formal presentation before a technical jury of experts in game design and sustainability. Each team is required to deliver a structured presentation covering the game's background story, mechanics, artistic direction, and the technical challenges overcome during the process. Success in the Green Game Jam offers significant rewards, as the winning team receives support for further professional training in the game design sector. Beyond the competition, the event serves as a platform for developing essential green skills, digital skills, and soft skills like leadership and critical thinking, and those who attend at least three-quarters of the event are eligible for a digital badge certifying their newly acquired competencies.

Green Game Jam in 2024 titled Green gaming and sustainability, was hosted from Wednesday, November 20th to Friday November 22nd, 2024. Green Game Jam for 2025 was hosted from Monday October 6th to Wednesday October 8th 2025.

- **Final retrospective**
  This recommendation applies across all the formats described in this section: at the end of the learning activities, it is important to provide participants with a tool for self-assessing the skills and knowledge they have acquired or strengthened. This encourages active reflection and helps them retain what they have learned. In the same context, it is also useful to ask participants for feedback on the content and tools used during the training, in order to monitor the actual impact of the activity and identify possible improvements to enhance its effectiveness.

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