

Empowering Education in a Changing World: Serious games for water education

Your guide to increasing digital readiness of curriculum

Introduction

As the world faces unprecedented challenges, including the COVID-19 pandemic, our project aimed to enhance digital readiness and resilience in European higher education. SMARTEN explored new horizons in water higher education and topics related to Water-Energy-Food Nexus. This brochure presents insights on how SMARTEN contributed to shaping the future of European water higher education and unlocking new possibilities for students and educators. Together, let's build a stronger, more prepared academic community.



Project Overview

SMARTEN (Serious gaMES for digitAl Readiness of waTer EducationN) was a strategic partnership Erasmus+ project which aimed to support building digital readiness in water-related higher education and lifelong learning as well as mitigate impacts of the COVID-19 crisis on the educational activities. The project focused on innovative practices based on serious games in education, addressing the water subject in line with the European goals on environment and climate. It has also promoted internationalisation as a key priority for building responsiveness, adaptability, and flexibility of education against external disruptors. The project was designed towards the needs and for the benefit of students of water-related programs, young water professionals, water educators in academia and industry, water society and European community at large.

Partners and Collaborators

SMARTEN gathered four partners (Norges Miljo-og Biovitenskaplige Universitet, H2O-People, University of Thessaly, University of Nis) from four different European states (Norway, The Netherlands, Greece and Serbia) having complementary profiles allowing them to have the ideal competence-based mix to design and implement a truly impactful collaborative project. Jointly, they provided six digital gamified workshops on three water-related serious games, guidelines and assistance tools for facilitators, ICT tools for learning path and experience, instruments of augmented collaboration, a compendium of real-life case-studies for project-based learning, supporting teaching and training digital content, tools for the involvement of regional stakeholders in serious games, six universal eLearning modules.

Project Achievements

Four intellectual outputs were produced by SMARTEN and published on its website:

- Digital Gamified Workshops, led by NMBU.
- Augmented Collaboration Toolkit, led by H2OPeople.
- Case studies for research-based learning with serious games, led by UTH.
- Learning modules for serious games, led by UNI.



The integration of serious games in education through digital workshops

Overview

These workshops focused on developing a [comprehensive guideline for implementing digital gamified workshops](#) in the field of water and wastewater management which are presented in Figure (2). The objective was to provide water educators and trainers with a resource that promoted engaging and effective online workshops while addressing the issue of "Zoom fatigue" experienced by students and trainees. The guideline also aimed to foster collaboration and engagement with various stakeholders, including practitioners, experts, decision-makers, and researchers. Figure (3) presents the serious games and collaborative online tools that were used in the workshops. By incorporating serious games and collaborative online workshops, we sought to enhance the teaching and learning experience, engage stakeholders, and tackle real-life challenges in the water sector.



Figure 2 – The topics of the digital gamified workshops.

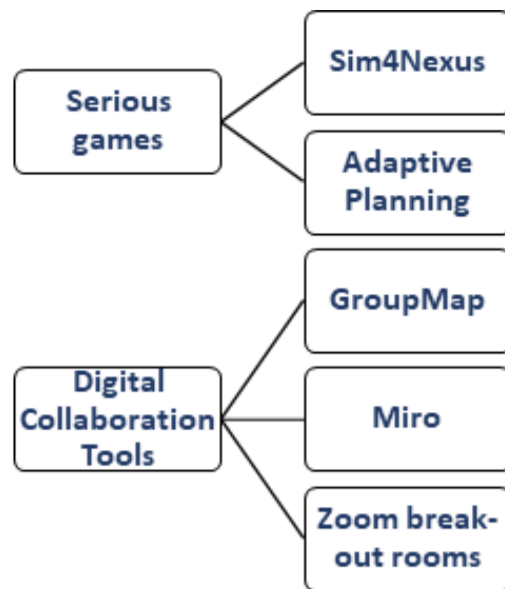


Figure 3 – The tools used in the workshops.

Activities and Workshops

The workshop titled "Digital Gamified Workshops for Water Education" took place on October 11, 2022, as part of the EJWP Training Week in Athens. During the session, participants engaged in the "Adaptive Planning Game" created by TU Delft to test their planning skills. The game involved developing a project for a virtual coastal town and making decisions for long-term planning amidst uncertain conditions. Participants discussed different perspectives and opportunities related to adaptation pathways and evaluated their performance by assessing the strengths and weaknesses of their pathways during the game's implementation.



Key Learnings

- **Engaging Sustainability:** Design workshops that inspire participants to embrace sustainable water management practices, encouraging them to become catalysts for positive change.
- **Integrated Workshop Approaches:** Foster effective collaboration among workshop participants, emphasizing the importance of integrated approaches in the water sector and promoting cross-disciplinary learning.
- **Data-Driven Workshop Design:** Integrate data-driven decision making into your workshop design, empowering participants to analyze and utilize relevant data to inform their water management strategies.
- **Innovative Workshop Techniques:** Incorporate innovative technologies and interactive exercises into your workshops, providing hands-on experiences that showcase the latest advancements in water management.
- **Resilience and Adaptation Workshops:** Create workshops that highlight the importance of building resilience and adapting to water-related challenges, equipping participants with practical tools to navigate changing circumstances.
- **Policy and Governance Focus:** Integrate discussions on water policy and governance frameworks into your workshops, helping participants understand the regulatory landscape and fostering dialogue on effective governance practices.
- **Holistic Workshop Perspective:** Design workshops that take a holistic approach to water management, encouraging participants to consider the social, economic, and environmental dimensions of their decision-making processes.
- **By incorporating these key learnings into your workshop design, you can effectively educate and empower educators and trainers to deliver engaging and impactful workshops on water management. Together, we can shape a future where sustainable water practices are at the forefront of our collective efforts.**

Impact and Benefits

- Enhanced teaching and learning experience through innovative digital gamified workshops.
- Alleviation of "Zoom fatigue" by providing an engaging online learning format.
- Development of digital and transversal skills, fostering creativity, innovation, and teamwork.
- Interdisciplinary collaboration and stakeholder engagement for comprehensive water management.
- Integration of serious games into curricula, bridging academia and real-life challenges.
- Promotion of inter-institutional cooperation and regional collaboration.
- Transferability and scalability of guidelines and digital tools.
- Synergies between policy and practice, addressing real-life case studies and policy interventions.

The use of SMARTEN augmented collaboration toolkit

Overview

The Augmented Collaboration Toolkit addressed the need for digital readiness and collaboration in the water sector. It provided a range of user-friendly tools to enhance teamwork and facilitate effective collaboration. The Augmented Collaboration Toolkit empowers educators and trainers to actively design and share knowledge in digital and hybrid formats, fostering active engagement and participation. It provides a comprehensive guideline for creating engaging workshops and learning activities. The toolkit offers a range of platforms that facilitate brainstorming, decision-making, and other interactive activities, ensuring a dynamic and enjoyable learning experience. Whether you are organizing your next workshop or learning activity, the Augmented Collaboration Toolkit equips you with the necessary tools to create an engaging and impactful learning environment that promotes collaboration and knowledge sharing. These tools included collaborative skill development resources like InterVision, Deep Democracy, and the Culture Mapping Tool, which supported the development of management and leadership skills through engaging serious games. In addition, the toolkit incorporated digital collaboration tools such as Miro, GroupMap, and Howspace. These tools improved workplace collaboration, communication, and content management during training and workshops, creating a dynamic online environment for participants to easily share ideas and work towards common goals.

Activities and Workshops

The New Waves Festival June 2022 served as a dynamic platform for exploring the future of the water sector, fostering collaboration, and embracing digitalization to drive positive change. The festival provided a unique experience, combining physical and online interactions, allowing participants to collaborate, brainstorm, and engage efficiently. It showcased the role of digitalization in enhancing engagement and knowledge sharing within the water sector. The SMARTEN project presented the concepts of digitalization and serious games as essential elements for a future-proof workplace in the water sector, emphasizing the importance of lifelong learning and adapting to evolving skill requirements.



Key Learnings

- **Power of Collaboration:** Cultivating collaboration skills empowers you to excel in teamwork, problem-solving, and effective communication.
- **Engaging Learning:** Unleash the potential of interactive learning experiences by embracing facilitation techniques and incorporating serious games.
- **Building Blocks of Collaboration:** Explore the vital components of collaboration: active participation, considering different perspectives, and effectively managing collaborative spaces.
- **Unlock Your Skills:** Unleash your collaboration potential with powerful tools like InterVision, Deep Democracy, and the Culture Mapping Tool, designed to enhance teamwork and skill development.
- **Digital Collaboration Made Easy:** Seamlessly collaborate using digital tools such as Miro, GroupMap, and Howspace, facilitating efficient communication and information sharing.
- **Limitless Creativity:** Dive into a world of limitless possibilities with digital canvases, enabling exciting activities like brainstorming and decision-making.
- **Future-Ready Skills:** Choose tools that foster transversal and digital skills, ensuring your readiness for the evolving demands of the water sector and beyond.

Impact and Benefits

- **Digital Readiness:** Promotes digital readiness in water higher education, lifelong learning, and training, equipping participants with essential digital skills.
- **Collaboration and Engagement:** Fosters collaboration and active engagement, creating a conducive environment for collaborative learning and effective teamwork.
- **Seamless Hybrid Learning:** Facilitates a smooth transition to hybrid learning models, combining digital and in-person elements.
- **Empowerment of Educators and Trainers:** Empowers educators and trainers to design impactful workshops and activities, enhancing the overall quality of education and training.
- **Transferable Skills and Knowledge:** Skills and knowledge gained are transferable across disciplines and training areas, expanding career opportunities.
- **Improved Learning Outcomes:** Enhances learning outcomes by promoting active participation, critical thinking, and problem-solving skills.
- **Networking and Collaboration Opportunities:** Creates networking and collaboration opportunities among institutions, fostering knowledge exchange and innovative solutions.

**Examples of real case studies
from research-based learning
with serious games**

Overview

Serious games are a new learning medium that holds a special interest for simulation and can be a powerful tool for universities knowledge transfer arsenal, especially if there is a comprehensive know-how on boosting stakeholders' engagement. More specifically, they have the potential to engage both physical and online attendance, boost intrinsic motivation, and fuel friendly motivation, not to mention, track stakeholders' performance and identify areas for improvement thanks to built-in feedback. Serious games can be used to facilitate mistake-driven learning more discreetly and bolster stakeholders' self-confidence. In short, universities have the rare opportunity to pinpoint performance, skill, and knowledge gaps in a risk-free environment that still mimics real-world problems. This way, they can prepare for real-world challenges such as Nexus-related issues or other complex systems. While serious games benefits are undeniable, launching the right methodological learning approach or strategy is not a trivial procedure and needs a thorough and well-designed framework. A successful serious game methodological learning strategy needs to answer effectively in three basic questions: i) How do you implement serious games in your online training courses to ensure success and educate and inspire your

attendees? ii) Are they really the best approach for talent development? iii) How do you walk that fine line between entertainment and education?

Under these lines, the UTH team has designed [the SMARTEN methodological learning approach](#) for promoting seamless learning through virtual in addition to face-to-face learning delivery based on problem and project-based approaches. Different formats that stimulate the interest and active participation of students, such as slide presentations, videos, interactive attendees' performance formats, and the actual presentation of the SIM4NEXUS serious game, are some of the components that our methodology is structured with. The added value of the SMARTEN methodological approach relies on the special SIM4NEXUS serious game presentation design, in order to incorporate a series of specific cross-regional water-related case studies. Through this approach, real-life paradigms simulated via the serious game, bring to the surface universal and cross-regional water-oriented examples that European countries and beyond face nowadays.

Activities and Workshops

University of Thessaly has conducted a series of activities and workshops, including: i) Training and Multiplier event in Nis: "Digital gamified workshops for water education". The event took place on 14/12/2021 within the EJWP2 training week and participants from SMARTEN consortium (NMBU, H2OPeople, University of Thessaly and University of Nis) and EJWP2 joined the hybrid presentation of the SIM4NEXUS serious game; ii) University of Thessaly: "workshop on SIM4NEXUS serious game". The event took place on 12/01/2022 and the participants were students, professors, and teaching staff. Due to COVID-19 restrictions the workshop was conducted digitally and in the local language with a large turnout. The workshop followed the structure of the SMARTEN methodological approach; iii) SMARTEN multiplier event: "Blended Workshop on SIM4NEXUS Serious Game". This second SMARTEN project multiplier event took place on 30/03/2022 in Brussels during Water Market Europe. Attendees came from different parts of the water sector for practical discussions and testing of this full concept of the gamified digital workshop; iv) Parallel SMARTEN-EJWP3 open workshop in NexusNet COST ACTION project: "What makes a Nexus project impactful". During the 2nd Management Committee meeting and Working Groups meetings Action CA20138 of the NEXUSNET project "Network on water-energy-food Nexus for a low-carbon economy in Europe and beyond", SMARTEN in cooperation with EJWP3 have held a parallel 3-hour open workshop to collect information from the attendees regarding the question "what makes a Nexus project impactful". The session was organised by using the appropriate tools from SMARTEN toolbox in order to facilitate an open dialogue with the participants and trigger their interest.

Key Learnings

- **Effective use of Serious Games in education:** The game should match the learning objectives, the curriculum, and the learners' needs and interests.
- **Clear guidelines for educators and learners:** Prepare the learners and educators by providing clear instructions, expectations, and support.
- **Simplification of complex tasks:** Serious games allow learners to successively practice and develop necessary skills as they progress from one level to the next.
- **Enhancing teachers' readiness:** Mapping learning, game attributes, outcomes, feedback, assessment, and teacher roles as means to scaffold teachers' understanding in classifying learning aspects with game features.
- **Developing soft skills:** Decision making, critical thinking, communication skills, leadership, people management, etc., are only a few paradigms on how effective these new methodologies over traditional approaches are.
- **Common understanding:** Future research should focus on establishing a comprehensive and common vocabulary for describing game-based learning concepts and design features.

Impact and Benefits

- **Learning is fun and engaging:** Serious games create more dynamic classrooms by breaking the traditional rigid teaching structure and provide the fertile ground to embed learning contents into the game itself and; thus, students are motivated to learn.
- **Applicable to the real world:** Exposure to real-life scenarios plays a central role in the learning process, while some situations can't be recreated in the classroom because they're costly, unethical, or simply impossible to simulate.
- **Permanent personal development:** The application of games to learning encourages students to develop their skills continuously and steadily over time, thanks to the gaming environment.
- **Immediate feedback:** Serious games for training incorporate systems that permit constant monitoring and; thus, trainers can study the learning process in depth, as well as its effectiveness on the achievement of objectives.
- **Improves self-esteem:** When playing, it is easier to interact with others, to establish dialogue and to overcome cultural, social and generational barriers.
- **Collaborative learning:** By encouraging cooperation through the game, students increase their job satisfaction; they feel part of the team and are involved in achieving common goals.

Exchanging eLearning resources

Overview

Exchanging knowledge through eLearning is one of the keys to success in today – the digital world. The popularity of the eLearning concept has skyrocketed over the past decade, mainly because it makes it easy for users to learn anytime and anywhere. This concept is especially useful for employee training (for new hires and for improving employee performances), compliance training (informs employees on the laws and regulations), customer training (helps customers to use and understand products and services) and partner training (gives partners the need tools to be successful members of the network). The main goal for using eLearning is to save time, improve productivity and have a lower environmental impact.

eLearning modules applied through this project were divided into six groups. 1st group is PESTLE, covering political, economic, social, technological, legal and environmental factors. 2nd group is SIM4NEXUS, which adopted the Nexus concept – testing pathways for a resource-efficient with low-carbon emissions, that search for new approaches to sustainable and integrated management of resources, such as water, land, energy and food. 3rd group is Adaptive planning, based on identifying all potential options that might be required for proposing adaptive solutions for a sustainable future in water management. 4th group is Water Quality Monitoring. This concept is necessary in order to prevent and protect the water and environment, i.e. it should provide information about the state and improve the quality of water and the environment. 5th group is Digitalization Risks, which combines two approaches: water digitalization (adoption of a smarter approach in order better to solve the more urgent issues in water management) and risks from digitalization (unexpected consequences that arise as a result of digital transformation). 6th group is the Circular Economy, based on the efficient and sustainable use of water resources.

Activities and Workshops

At the University of Nis three different events were organised: workshop “Risks arising from digitalisation in the water sector” to identify and understand risks arising from digitalization in the water sector using GroupMap, multiplier event “Digital gamified workshops for water education” to present the purpose of using serious games in the water education system, training “Projects of the European Junior Water Program” to train young water professionals in the field of project management and personal branding.



Key Learnings

- **Gain attention:** Introduce water-related problems, which are clearly presented through modules.
- **Define objectives:** Concise and precise objectives are the basis of all learning and successful solving of water problems.
- **Recover knowledge:** Much of previous knowledge can be easily forgotten (especially topics such as water), but using good lectures, they can be successfully recovered.
- **Reinforce knowledge:** Knowledge can be reinforced and improved, through a constant eLearning process, about new water problems and solutions.
- **Provide feedback and evaluate:** Quality feedback is a necessary step in understanding teaching problems and how to overcome the problems. Using the eLearning approach this process can be fun and creative. The evaluation process is important because it gives the opportunity to learners to test their knowledge.

Impact and Benefits

- **Everywhere learning:** Learners can learn about water problems and new solutions, without any limitation by place and time
- **Supports different learning styles (self-paced or group work) and fairer learning:** Modules are designed to be easily adjusted to different groups of learners with clearly defined results related to the water sector.
- **Cost effective:** The learners can play different serious water games and gather experiences for real problems, especially related to cost in their companies.
- **Easily adaptable:** Proposed modules can be easily adaptable to any region in the world, and help in solving various water problems.
- **Always developing:** Water management represents the sector that is constantly changing, so enough space is left, in modules, for further development of water solutions with a clear emphasis on potential problems.
- **Sustainable solutions for the environment:** Special care is devoted that proposing solutions that should be sustainable and acceptable for the environment and society.
- **Promoting collaboration:** One of the main aims was to point out the complexity of the water problems and the necessity of joint cooperation and collaboration between various sectors and management levels in order to have successful water management.

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