Green-themed serious game project assignments

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GREEN-THEMED

SERIOUS GAME PROJECT ASSIGNMENTS

Prepared by

PLAY2GREEN

Serious Gaming for Universal Access to Green Education

Co-funded by the Erasmus+ Programme of the European Union

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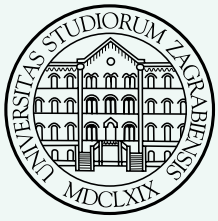

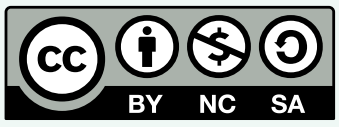

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GREEN-THEMED SERIOUS GAME PROJECT ASSIGNMENTS

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Introduction

This document contains **9 green-themed serious game project assignments** that can be used by anyone who would like to create a digital game which serves as the green educational resource and thus contributes to the **„environment and fight against climate change" Erasmus+ prioririty**. Each of such product visions contains: green challenge, game plot, learning outcomes, evaluation strategy, emerging technology features, game inspirations and starting literature.

- Charging City Simulator
- Ubran Garden
- BuildEco
- Ocean Rescue
- Ocean Sweeper
- EcoSonic Adventures: Journey to Soundville
- GreenCity
- Inclusive eco-fighter
- HoloZoo

Pick one of the projects and design your own version of the green-themed serious game. At the end of this document you will find the tasks that will guide your work. Good luck, have fun!

Charging City Simulator

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Game genre

city building

Green topics

electric vehicles

charging stations

range anxiety

European green deal

sustainable and smart mobility

Green challenge

For many years, the transportation sector has been considered one of the major contributors to global greenhouse gas emissions and an obstacle to a sustainable energy future. Regardless of how people commute to their homes (e.g., by car or by public transportation such as rail), the use of basic clean technologies, specifically **electric vehicles** (EVs), appears to be an important step in promoting sustainable development.

Owners of electric vehicles enjoy many **positive aspects** of driving their vehicles, including low operating costs and no tailpipe emissions, making electric vehicles a clean technology, provided they are powered by renewable energy sources such as biomass, solar energy, or wind energy. The recent introduction of electric vehicles (EVs) marks the beginning of a new positive era in transportation. However, there are **several barriers to widespread adoption** of EVs, including high cost, lack of charging infrastructure, slow charging, and range anxiety (i.e., fear of running out of battery while driving).

The public is not yet familiar with the peculiarities of electric vehicles, which is why they are **not ready to invest** in a new electrified vehicle, which makes the goal of sustainable transport difficult. One of the most relevant factors influencing the purchase of electric vehicles is **range anxiety**, or fear of running out of electricity while driving an EV due to low battery.

The main problem is therefore the **insufficient infrastructure of charging stations**, which is noticeable in the world nowadays. The solution to that problem is a **carefully planned network of charging stations** (like the network of gas stations available for internal combustion engine cars) that allows the driver to choose a charging station without worry. Depending on the needs of a location, filling stations can be fast or slow, which has repercussions on key resources such as time and money.

Game plot

You are a major of the city who is losing a battle with the CO2 emissions. People are complaining about the air pollution... not the news you want to hear right before the incoming election, is it?

However, your trusted associate said that there are new types of clean vehicles called **electric vehicles** that could solve the air pollution problem in your city.

Well, the „little problem“ is that your city is **not at all prepared** for the electric vehicles. For starters, those cars cannot use the gas stations but instead **require charging stations** all over the city!

Hm... install chargers in the existing gas stations, add new chargers on the light post or demolish an old building to create super cool charging stations? A lot of options that consumes money, time and other **resources**. Oh well, you want to make sure that there are enough chargers, otherwise your voters will constantly fear that they will run out of battery!

Oh yeah, those EVs are **super expensive** to buy. In other words, your citizens will suffocate in CO2, unless you as the major step in. Maybe you can reduce a **city tax a bit** for the buyers of EVs? Or, maybe you can consider to introduce low-emission zones in your cities to promote EVs?

I am sure you are the major with the **best strategy** who will make the city **rich** and **green**, and citizens **happy** and **healthy**!

Learning outcomes

- describe the pros and cons of electric vehicles
- critically analyze the charging station options
- plan a charging station infrastructure in a simulation setting
- critically analyze the impact of city policies for EV adoption
- describe the impact of EVs on the transportation sector

Evaluation strategy

Upon reaching the certain milestones in the game, the major needs to have an interview with the press. The press poses a hard hitting questions which relates to the learning outcomes. The answers will affect the popularity of the major and can be used as the proxy of whether the player achieved the learning outcomes and to what degree.

The game tracks the success of the major with various progress bars, e.g. CO2 emissions, money, number of EVs, number of chargers, etc. This can be used as proxy for evaluation of the learning outcomes.

Emerging technology features

Artificial intelligence

- traffic logic model
- citizen behaviour model

Augmented reality

unlockable feature, showcasing the charging stations in real world to get a sense of spacing required

Virtual reality

non applicable

3D printing

unlockable feature, exporting 3D model of an EV for 3D printing

Holograms

unlockable feature, showing a city with holograms

Game inspirations

- SimCity
- Tropico 6
- Cities: Skylines
- OpenTTD

Starting literature

- Babić, Jurica: “Multi-agent system for managing energy storage using electric vehicles”, 2018, doctoral dissertation, Faculty of Electrical Engineering and Computing, Zagreb
- Pevec, Dario: “Real-world data-driven decision support system for electric vehicle charging infrastructure development”, 2020, doctoral dissertation, Faculty of Electrical Engineering and Computing, Zagreb
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Urban Garden

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Game genre

role-playing

strategy

Green topics

sustainable agriculture

green agriculture

European green deal

Fair, healthy, and environmentally friendly food system

Preserving and restoring ecosystems and biodiversity

Green challenge

In today's world, we are increasingly witnessing the withdrawal of products from the shelves due to unacceptable levels of pesticides. Almost every day we witness that some food product is withdrawn from the shelves of retail chains.

Some of the reasons for withdrawal are non-conformities related to chemical contaminants (such as pesticides, additives, heavy metals, mycotoxins, etc.), or due to some microbiological hazard.

For instance, one factor contributing to the withdrawal was the presence of ethylene oxide, a gas utilized as an insecticide and food sterilizer in several non-EU countries to safeguard plants against fungi, bacteria, and pests. However, its usage is prohibited in the EU for food production due to its detrimental effects. Ethylene oxide can lead to respiratory irritation, drowsiness, dizziness, skin corrosion, and severe eye damage.

Consequently, people's trust in store-bought food is dwindling, prompting them to opt for locally sourced products directly from trusted producers. Moreover, an increasing number of individuals are embracing home gardening to cultivate their own vegetables.

Game plot

Want to escape the unhealthy corporate city life impacting your well-being? Air pollution, respiratory issues, supermarket grocery shopping, and the disappointment of withdrawn products have taken their toll. You yearn for a simpler existence, growing your own food to ensure transparency and relaxation.

An enticing opportunity arises: an ad seeking farmers for a sustainable agriculture program. Enjoy exceptional conditions, including your own upgradeable farm, on-site accommodation, startup funds, and a guaranteed market hungry for fresh, wholesome produce.

Through the game, players learn diverse farming techniques, optimizing space and water without resorting to pesticides. A magical helper, the **Gardening Fairy**, imparts vital lessons on environmental conservation and agricultural sustainability. In this enjoyable experience, players gain knowledge about sustainable farming and its environmental benefits.

The game's objective? Cultivate and sell organic goods, employing sustainable farming practices evaluated by market NPCs. Consider an online multiplayer mode for exciting market competitions among players.

Learning outcomes

- describe principles of sustainable plant cultivation and its importance
- use sustainable methods in agriculture
- sow/plant and grow their own vegetables
- recognize different pesticide types and their impact
- recognize and use environmentally friendly alternative products
- use different cultivation techniques, e.g. vertical cultivation, in order to maximize the use of available space and water and avoid the use of pesticides and other chemicals

Evaluation strategy

After a certain time, the user goes to the market where he sells his products, i.e. the buyers (NPCs) evaluate his success based on the quality and quantity of the products. If the player used pesticides in an illegal and irregular manner, the customers will riot and kick him out of the market and he will lose the monetary incentives he received at the beginning of the game to start his sustainable green farm.

Sustainability in the use of pesticides and water consumption is evaluated, i.e. the overall efficiency in production and the extent to which they followed the principles of sustainable and green cultivation. This is evaluated by the Gardening Fairy.

Emerging technology features

Artificial intelligence

intelligent sidekick (Gardening fairy)

Augmented reality

preview of plants in a real-world scene

Virtual reality

practical gardening tasks realized with VR headset and controllers

3D printing

3D printing of agricultural tools

Players would be able to design and print their own tools, such as irrigation systems, cages for growing plants, and other useful items. This would encourage players to be creative and focus on the idea that 3D printing can be used to create tools and equipment that can help grow plants sustainably.

Holograms

observing the plant growing through immersive hologram experience

Game inspirations

- Stardew Valley
- Garden story
- Harvest Town

Starting literature

- D. Kreković and I. P. Žarko, "Prediction of Microclimate Parameters for Application in Precision Agriculture," 2022 International Conference on Smart Systems and Technologies (SST), Osijek, Croatia, 2022, pp. 361-366, doi: 10.1109/SST55530.2022.9954659.
- Daniela Guitart, Catherine Pickering, Jason Byrne, Past results and future directions in urban community gardens research, Urban Forestry & Urban Greening, Volume 11, Issue 4, 2012, Pages 364-373, ISSN 1618-8667, https://doi.org/10.1016/j.ufug.2012.06.007.
- Marion Ernwein, Framing urban gardening and agriculture: On space, scale and the public, Geoforum, Volume 56, 2014, Pages 77-86, ISSN 0016-7185, https://doi.org/10.1016/j.geoforum.2014.06.016.

Build Eco

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Game genre

adventure

role-playing

strategy

Green topics

building renovation

energy efficiency

renewables

European green deal

sustainable construction

clean, affordable and secure energy

Green challenge

Sustainability carries significant weight in today's world, a concept we should all grasp. However, many feel unable to truly embrace it, thinking their individual actions hold little impact for the environment or themselves in the grand scheme.

The focal point is establishing **sustainability**, or at least enhancing energy efficiency, and understanding its influence on our daily lives. Our society treats everything as disposable, including our **homes**. The more we invest in them, the greater the returns. Unfortunately, not everyone believes they possess the time or funds to address these matters, leading to years of **high bills** and **wasted energy** in inadequately insulated spaces.

By **investing in our own properties**, we not only reduce expenses and improve energy efficiency, benefiting the environment, but also enhance the property's value for future endeavors such as renting or selling.

Another fruitful investment lies in **green energy**, particularly in areas blessed with ample **wind** or **sunlight**. For instance, solar panel installation can be financially supported by European funds, enabling owners to produce and even sell surplus energy.

A significant advancement in modern homes is the integration of **smart technologies** as part of the **Internet of Things** (IoT). While not obligatory for renovations, smart buildings can shoulder some responsibilities, such as **autonomous temperature regulation** through window control based on external conditions (e.g., opening for cooling in summer and closing for heating in winter).

Game plot

You, a **bright student** residing alone in a bustling city flat, face a somewhat dim future devoid of parental support. Acutely aware of the distressing trajectory Earth is on—rampant **CO2 emissions**, **conflicts**, **wasted energy on futile endeavours**—your parents add an ultimatum: they'll cease bill payments in a year. As if the planet's demise wasn't enough to bear.

Nevertheless, you reject despair, embracing resilience and progress as your sole companions. Amidst the initial impulse to seek employment, a thought emerges: **renovating your current block of flats**. But where to start? Is it a worthwhile endeavour? Cue the trusty search engine... and voilà! You discover the **remarkable benefits**—not only for your financial burdens but also for the environment. A resounding triumph!

Yet, the pressing question lingers: who bears the **financial burden**? Time to engage in social interaction, uncovering your neighbours' sentiments towards your ambitious idea. Will they dismiss it as trivial? Deem it too costly? Or, perchance, will they share your enthusiasm? The only path forward lies in discovering their response.

Ponder the possibilities if your block **undergoes renovation**—could it **inspire the neighbouring** one to follow suit? Perhaps your newfound expertise can aid them on this transformative journey. Only time will reveal the unfolding chapters of this communal tale.

Learning outcomes

- Acquire familiarity with the appropriate approach to undertaking such projects within their community
- Identify the relevant contacts to consult for support and guidance
- Evaluate the pros and cons of renovating buildings/homes, taking into account multiple considerations
- Discover available funding options for financing renovation endeavors
- Recognize the environmental benefits and advantages that building renewal offers both the environment and housing owners.

Evaluation strategy

You are getting your monthly bill and seeing if there are any changes in it, and if there is, in which areas (gas, electricity, water) which corresponds to what part of the building have you renovated.

After a while, you will get called to be in an interview as a young representative of your building on a local radio with a local ecology expert and you will both be asked the same questions, you first and depending if your answers match the expert’s, the interview will either be a success or a failure and an embarrassment.

Emerging technology features

Artificial intelligence

- dialogs with NPC's
- weather changing depending on player choices
- NPC movement/schedule

Augmented reality

previewing a new building facade on an existing building

Virtual reality

be able to visit newly renovated buildings and their abilities (if it's a smart building)

3D printing

3D printing solar panels and other elements used in building renovation

Holograms

hologram of a user-designed building along with its sustainability features (e.g. solars and wind turbines)

Game inspirations

- Eco
- Terra Nil

Starting literature

- Fond za zaštitu okoliša i energetsku učinkovitost, Energetska obnova višestambenih zgrada - https://www.fzoeu.hr/hr/energetska-obnova-visestambenih-zgrada/7683 (17.5.2023.)
- European Comission, Renovation wave, https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/renovation-wave_en (17.5.2023.)
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Ocean Rescue

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Game genre

adventure

role-playing

trivia

Green topics

plastic pollution

chemical pollution

climate change

European green deal

preserving and restoring ecosystems and biodiversity

Green challenge

Ocean pollution is a serious environmental problem that has an impact on ecosystems and marine life. It describes the presence or entry of dangerous materials, plastics, and other contaminants into the ocean that cause **water contamination**, **fish population decline**, and **habitat destruction**. Ocean pollution is a concern since it has a negative influence on the environment, the population who rely on it for food, money, and leisure activities, as well as the environment's ecological and economic health.

Because it directly impacts the health of the earth and its inhabitants, ocean pollution is highly relevant to green issues. The demand for resources is rising along with the human population, which has resulted in an increase in waste, pollution, and unsustainable behaviors.

Plastic trash, sewage, and other pollutants have been dumped in large quantities, especially in the ocean, harming ecosystems and marine life in ways that cannot be undone. **Climate change**, which is causing ocean acidity, increasing sea levels, and other environmental changes that endanger marine life, is another factor aggravating the issue.

Ocean pollution has serious **economic** and **societal repercussions** in addition to its negative ecological effects. Millions of people who depend on fishing, tourism, and other ocean-related industries are impacted. Moreover, it can result in the buildup of pollutants in seafood and other marine products, which represent a risk to **human health**.

It is imperative to take action to **stop and lessen ocean pollution** given the seriousness and urgency of the issue. This can be done in a number of ways, including **cutting back on plastic use**, introducing **sustainable fishing methods**, promoting **eco-friendly travel**, and **funding research and development** to produce novel solutions. Protecting marine life, preserving public health, and ensuring a sustainable future for the earth and its inhabitants are all possible by addressing the problem of ocean pollution.

Game plot

In a world where your love for animals knows no bounds and your unwavering dedication to combat ocean pollution reigns supreme, you embark on a heart-warming journey. As you leisurely stroll along the sandy shoreline, witnessing the plight of marine life struggling to survive amidst various forms of pollution, your resolve solidifies. Determined to take action and lend a helping hand, you make a resolute decision.

Your ultimate goal is to assist the diverse array of creatures adversely affected by pollution. Engaging in a series of captivating mini-games, you embark on a quest to unravel solutions to the pollution-related challenges faced by each animal. From daring sea turtle rescues to diligently collecting litter strewn across the beach, each mini-game presents a unique opportunity to make a difference.

As you progress through the game, the profound consequences of pollution on the ocean and its inhabitants become apparent. Insights unfold, revealing the detrimental effects on coral reefs, the disruption of the delicate food chain, and the contamination of precious marine life.

By navigating the obstacles presented in each mini-game, your critical thinking and problem-solving skills flourish. Equipped with newfound knowledge and empathy, you emerge from this immersive experience with a profound understanding of the far-reaching impact of pollution on the ocean and its inhabitants. Armed with a resolute sense of purpose, you are empowered to effect real change in the world around you.

Learning outcomes

- understand the effects of various types of ocean pollution, including plastic, chemical, and nutrient pollution
- learn about the causes of ocean pollution, such as human activities and climate change
- get a deeper understanding of marine habitats and species
- acquire problem-solving abilities through taking on numerous tasks and problems associated with ocean conservation, such as cleaning up contaminated areas and saving marine species in need

Evaluation strategy

At the end of the game, other characters will approach the player asking them how to save the ocean. In this way the game will test whether the player has achieved the desired learning outcomes. The game will present the player with a series of multiple-choice questions related to the green topics covered in the game.

For instance, questions can cover topics such as the sources of ocean pollution, the types of pollutants that are commonly found in marine environments, such as plastics, chemicals, and oil spills, and their impacts on marine life and human health. The questions can also focus on the various solutions to reduce ocean pollution, such as reducing plastic use, implementing better waste management practices, and promoting sustainable fishing practices.

Emerging technology features

Artificial intelligence

intelligent sea life (e.g. dolphins)

Augmented reality

unlockable feature, showing characters and their reactions in real world

Virtual reality

virtual swimming using VR glassess and controllers

3D printing

unlockable feature, exporting 3D models of characters for 3D printing

Holograms

unlockable feature, showing the nature with holograms

Game inspirations

- World of Diving
- Beyond Blue

Starting literature

- Landrigan PJ et al. Human Health and Ocean Pollution. Ann Glob Health. 2020 Dec 3;86(1):151. doi: 10.5334/aogh.2831. PMID: 33354517; PMCID: PMC7731724.
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Ocean Sweeper

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Game genre

Point and click

Green topics

Recycling

ocean cleaning

pollution

European green deal

Preserving and restoring ecosystems and biodiversity

Zero pollution for a toxic-free environment

Green challenge

Solving the problem of water pollution is one of the important ecological issues. Water covers approximately 71% of the Earth's surface, with oceans accounting for 96.5% of the total water. Unfortunately, in today's time, a lot of waste ends up in the seas, oceans, and rivers instead of being recycled or disposed of in some other environmentally friendly way. Such pollution causes significant harm to the health of animals and humans.

In bodies of water, oil spills, a lot of plastic and microplastics, various soil contaminants that end up in the water through rain or snowmelt, toxic waste such as mercury, and even large areas of connected garbage floating in the oceans can be found. The largest of them is the Great Pacific Garbage Patch, which is twice the size of Texas. The consequences of such pollution include the endangerment of aquatic ecosystems, lack of oxygen in the water, and a threat to human health.

There are several solutions that could reduce such pollution, including recycling, organized beach and port clean-ups, river clean-ups, reduced use of artificial fertilizers, and more. By properly educating people about all the causes and consequences of water pollution and the solutions, we could incorporate these solutions into our lifestyle.

Of course, most people are not directly responsible for oil spills in the oceans, but it is still necessary for them to be aware of these dangers. On the other hand, in many ways, they can also participate in preventing water pollution. They can use reusable plastics and recycle the plastics they no longer need. They can be mindful of the cleaning products they use, for example, dishwasher tablets that have a plastic film that dissolves can be replaced with more environmentally friendly gels.

Game plot

The player takes on the role of an old fisherman sailing the ocean. This old man has spent his whole life sailing the ocean and enjoying the beauty of nature. However, he has noticed for some time now that the ocean is becoming increasingly polluted and the animals are becoming sadder. There is no longer enough fish to catch, and the beauties of nature have been transformed into oil and plastic. Now he sails to help the ocean and the living beings in it.

Early in the morning, he sets sail and opens a map to figure out where he will go. He heads to a place where he heard there is a problem. Whether it's a turtle that needs to be freed from plastic, waste that needs to be sorted, or something else, he will find out only when he arrives at that location. Upon reaching the problem area, the task will be solved using some form of point-and-click command. If the fisherman manages to complete all the tasks for the day and clean up the part of the ocean around him, he will be able to enjoy the beauty of the ocean and the sunset.

In addition, the fisherman also engages with local communities and educates them about the importance of preserving the ocean. He organizes beach clean-ups, gives talks about sustainable fishing practices, and encourages others to join in the effort to protect the marine environment. By actively involving others and raising awareness, the fisherman hopes to inspire a positive change and restore the ocean to its former glory. Together, they work towards a cleaner and healthier ocean for future generations to enjoy.

Learning outcomes

- explore and identify different types of waste found in the oceans
- understand the impact of this waste on marine animals' lives and learn how to mitigate the threats they face
- discover potential ways to help and rescue marine animals affected by ocean pollution
- master the skill of sorting and categorizing discarded waste in an interactive and engaging environment
- gain knowledge of general statistics on ocean pollution, increasing awareness of the scale and urgency of the issue

Evaluation strategy

If the user successfully completes all the tasks assigned for the day with accuracy or within a maximum specified number of errors, they will be rewarded with the opportunity to enjoy the beauty of nature and the sunset. However, if they are unable to meet the requirements, they will receive a quiz with several questions. By answering the quiz questions correctly, they can still enjoy the sunset. The quiz content would be integrated into the game through engaging information presented while the fisherman is navigating the boat or after completing or failing to complete a task.

To evaluate the learning outcomes in the game, the user's progress can be measured based on their task completion rate, accuracy in identifying types of waste, effectiveness in assisting marine animals, proficiency in waste sorting, and knowledge retention through quiz performance. Additionally, tracking the player's engagement level, time taken to complete tasks, and overall enjoyment of the game can provide valuable insights into the effectiveness of the learning experience. Regular feedback prompts and assessments within the game can further aid in evaluating the user's understanding and application of the concepts related to ocean pollution.

Emerging technology features

Artificial intelligence

animal behavior model

Augmented reality

virtual preview of ocean pollution through device's camera

Virtual reality

VR (Virtual Reality) will be used in the game to provide users with a view of the ocean and waste around them. They will navigate a virtual boat and engage in solving various challenges.

3D printing

unlockable feature, printing 3D animals as the reward

Holograms

analyzing the biodiversity of the ocean through holograms

Game inspirations

- Sea of thieves
- Touch detective

Starting literature

- LANDRIGAN, Philip J., et al. Human health and ocean pollution. Annals of global health, 2020, 86.1.
- WABNITZ, Colette; NICHOLS, Wallace J. Plastic pollution: An ocean emergency. Marine Turtle Newsletter, 2010, 129: 1.
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EcoSonic Adventures: Journey to Soundville

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Game genre

Interactive game with visual and auditory feedback

Green topics

Environmental awareness

European green deal

Zero pollution for a toxic-free environment

Green challenge

The birth of a deaf child brings significant changes to a family, impacting their dynamics and requiring numerous medical visits for cognitive and language development. Early detection and intervention are crucial for addressing memory, attention, cognition, and higher mental processes. To nurture these affected abilities and support their growth, it is essential to create programs and activities that focus on auditory, phonological, and communicative stimulation. By considering the child's unique stage of development and employing motivating and playful approaches, we can encourage their initiative and interests.

Introducing a **tool** or **application** for early speech therapy rehabilitation of deaf children can foster communicative exchanges, help families establish patterns, enhance attention, and observe communication patterns. By strengthening initial responses and social interactions, facilitating turn-taking, promoting anticipation, and fostering intentional actions, we lay the foundation for effective communication. A notable example is Speech Viewer, a program used in the rehabilitation of individuals with deafness. Through immediate visual feedback, it showcases speech characteristics like pitch, intensity, loudness, sonority, prosody, and phonology. This program utilizes visual and auditory feedback to analyze and enhance the speech skills of individuals with hearing impairments or speech disorders. It includes a range of exercises and clinical management functions for record keeping, such as personal data, exercise scores, statistics, and variations.

In connection with the suggested green topic of "**Environmental Awareness**" it is important to consider incorporating sustainable practices in the development and use of these tools and applications. This could involve utilizing **eco-friendly materials**, designing **energy-efficient devices**, promoting responsible **e-waste management**, and **integrating accessibility features into natural environments**. Additionally, incorporating environmental education into these programs can raise awareness among deaf children and individuals with disabilities, fostering a more sustainable mindset and encouraging their engagement in environmental stewardship.

Game plot

In the captivating world of Soundville, young eco-heroes embark on a quest to restore harmony between **sound** and **nature**. Joining them is Alex, a brave **deaf protagonist** with a unique connection to the **environment**.

Players guide Alex through **interactive challenges** and **puzzles**, using **visual** and **auditory feedback** to improve speech skills. As they progress, they unlock new levels and encounter **diverse ecosystems**, facing **environmental issues like pollution** and **deforestation**.

Through the game, players learn about the impact of human actions on the environment and discover the power of communication. By earning rewards and witnessing the social impact of their actions, they become aware of the importance of using their voice to make a positive difference.

"EcoSonic Adventures: Journey to Soundville" empowers deaf individuals to develop speech skills and foster **environmental awareness**, creating an immersive and impactful gaming experience.

Learning outcomes

- identify environmental issues and their impact on ecosystems and communities.
- apply sustainable practices such as conservation, recycling, and renewable energy.
- improve speech skills, including tone, intensity, and prosody, for effective communication.
- demonstrate empathy towards the environment and take responsibility for its preservation.

Evaluation strategy

Assessment methods can be implemented at various stages. This includes tracking players' progress and performance within the game through in-game metrics, such as completion rates, accuracy in solving environmental challenges, and speech improvement. Additionally, interactive quizzes, mini-games, or knowledge checks can be integrated to assess players' understanding of environmental concepts and sustainable practices. Player feedback and reflections gathered through surveys or interviews can provide valuable insights into their experiences, perception of speech improvement, and changes in attitudes towards sustainability. By analyzing these evaluation measures, the game's effectiveness in achieving the intended learning outcomes, such as environmental awareness, sustainable practices, speech skills improvement, and empathy towards the environment, can be assessed and refined for continual improvement.

Emerging technology features

Artificial intelligence

pitch, laudness and phoneme recognition

Augmented reality

enabling players to interact with virtual environmental elements in their real-world surroundings for an enhanced and immersive experience

Virtual reality

transporting players into a fully immersive and interactive virtual environment where they can explore and engage with the game world in a realistic and engaging way.

3D printing

print customized eco-friendly objects and structures from the game, promoting hands-on engagement and practical application of sustainable practices in the real world

Holograms

interactive holograms, allowing players to engage with and learn from realistic and dynamic representations of ecosystems and environmental phenomena

Game inspirations

- Fate of the World
- Speechviewer program
- Sedea program

Starting literature

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GreenCity

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Debrecen, Hungary

Game genre

role-playing

strategy

Green topics

selective waste handling

energy saving

recycling

European green deal

clean and circular economy

clean, affordable, and secure energy

Green challenge

During our everyday activities, we all produce different types of waste in many forms. Inhabitants of different settlements may be affected to varying degrees and ways. We usually do not need the wrappings of just-bought goods, we often use temporary containers to carry an object from one place to another, we must get rid of unused or broken devices, old gadgets, household appliances, clothes, shoes, newspapers, magazines, etc.

However, what will happen with these already not valuable objects? Their amount cannot increase without any limit. We must nullify them, but it has a cost and may also have some dangerous side effects. The best method is not producing waste or at least taking steps to decrease the amount. Less waste – greener environment. However, what kind of steps should be taken to achieve a decrease in the waste amount, or what steps can be required from people to support the recycling of the waste? Educating the people is highly important because these issues cannot be solved without their active participation.

Good practices must be introduced and taught, and authorities must ensure support (selective bins, garbage disposal, organizing community garbage collection, operating second—hand shops and charity shops, motivating people to have a garage sale, and cultivate their gardens). People should be aware of how they can decrease their energy consumption (using led bulbs, setting solar panels) and how they can prolong the lifetime of their devices with a broken part (3D printing service).

Game plot

The player assumes the role of a resident in a settlement and takes on the responsibility of implementing and maintaining environmentally-friendly practices.

At the start of the game, the player is provided with various details about the settlement, such as the total population, distribution of age groups, types of housing, and available natural resources. Armed with this information, the player must devise strategies to ensure the sustainability of the settlement. This includes determining the number and placement of recycling bins, providing advice on energy consumption, and offering relevant information to different age groups.

For instance, if there is a high number of young residents, there may be a greater risk of electronic waste, thus prompting the need for initiatives like garage sales or second-hand shops. Similarly, in a small village, residents can be encouraged to engage in activities like vegetable production, installation of solar panels, and composting, whereas in a city, community gardens can be established.

As the player progresses through levels, the complexity of the settlement structure increases, with larger populations and more diverse age distributions and housing types.

Learning outcomes

- argue in favor of selective waste handling
- identify steps to decrease the amount of the waste
- implement steps to decrease the ecological footprint of his household
- critically analyze the impact of his city policies

Evaluation strategy

- Upon completing a level the selected poilicies will be assesed and an award can be received if the performance of the player hit a level. The award entitles the player to enter the next level and to try to deal with a bigger settlement. In the case of a failure, than a settlement of the similar characteristics will be offered to try again.
- The collected awards result in a darker shade of green as a frame on the screen.

Emerging technology features

Artificial intelligence

generating an appropriate following settlement depending on the previous performance of the player

Augmented reality

unlockable feature, demonstrating the house types in real world

Virtual reality

non applicable

3D printing

after completing a level, a new 3D model becomes available that can be used to make one step forward to build a tree with leaves.

Holograms

unlockable feature, showing the outline of the current a settlements / a typical building of the settlement with holograms

Game inspirations

- SimCity
- Cities: Skylines
- Eco

Starting literature

- D. Ziouzios and M. Dasygenis, "A Smart Recycling Bin for Waste Classification," 2019 Panhellenic Conference on Electronics & Telecommunications (PACET), Volos, Greece, 2019, pp. 1-4, https://doi.org/10.1109/PACET48583.2019.8956270.
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- Brilhante, O.; Klaas, J. Green City Concept and a Method to Measure Green City Performance over Time Applied to Fifty Cities Globally: Influence of GDP, Population Size and Energy Efficiency. Sustainability 2018, 10, 2031. https://doi.org/10.3390/su10062031

Inclusive eco-fighter

Catherine Sable
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Game genre

role-playing

Green topics

plastic

recycling

European green deal

zero pollution for a toxic-free environment

Green challenge

Plastic production has experienced consistent growth in recent decades, with an increase from 1.5 million tonnes in 1950 to 359 million tonnes in 2018. This upward trend continued even after a temporary decline in the first half of 2020 due to the pandemic.

Within the European Union, approximately 26 million tonnes of plastic waste are generated annually. Unfortunately, less than 30% of this waste is collected for recycling, with some being exported to third countries for processing. The remaining portion either ends up in landfills, is incinerated, or, worse still, is not collected and finds its way into natural environments, rivers, and oceans.

To address these challenges, the Commission introduced an EU plastics strategy earlier this year. The primary objectives of this strategy are to ensure that all plastic packaging can be reused or recycled by 2030 and to reduce the consumption of single-use plastic products and microplastics.

Simultaneously, the gender gap in employment persists, with women experiencing a lower employment rate compared to men. On average, the employment rate for women stands at 62.4%, which is 10.5 percentage points lower than that of men (72.9%). Recognizing the importance of inclusion and diversity, the EU Strategy acknowledges that ignorance and fear are significant barriers to achieving equality.

To overcome these obstacles, intercultural mediation emerges as a viable solution. By fostering intercultural competences, including knowledge and skills, we can facilitate broader collaborations that are more inclusive and overcome the challenges of ignorance and fear. Additionally, intercultural collaboration provides an avenue for addressing plastic pollution by bringing together individuals from diverse backgrounds to work towards sustainable solutions.

Game plot

You are a visionary and enterprising young entrepreneur, driven by innovation. Your ambitious plan is to establish a plastic recycling factory in the quaint town of Egalwaspassiert.

Why this particular town? Well, it happens to have one of the lowest rates of plastic recycling in all of Europe. The evidence of plastic waste is starkly visible as you stroll through its streets. Moreover, Egalwaspassiert has long been a conundrum for policymakers due to its peculiar practices:

In the northern part of town, only men are engaged in the workforce.

In the southern part of town, only women are involved in labour.

In the western part of town, children carry the burden of work.

In the eastern part of town, individuals over the age of 62 are exclusively employed.

People with disabilities face confinement and limited opportunities.

To support your endeavour and ensure the success of your venture, substantial grants are potentially available, subject to certain criteria:

Creation of 70 job opportunities.

Promotion of gender equality in the workplace.

Employment of disabled individuals, amounting to at least 15% of the workforce.

With your exceptional negotiation skills and aptitude for intercultural engagement, you will adeptly persuade the inhabitants of this peculiar town to embrace your vision. Securing ample subsidies, you will construct a thriving company that transforms plastic waste into a wide array of popular objects. Leveraging your technical expertise, you will not only generate new employment opportunities but also bring about positive change for all members of the community.

Learning outcomes

- understand the advantages and benefits of plastic recycling, including its environmental impact, resource conservation, and reduction of waste pollution.
- analyze and evaluate cultural habits prevalent in various regions of the world, considering their impact on society, economy, and sustainability.
- contextualize and compare the habits and practices of different cultural and social groups, identifying similarities, differences, and their underlying factors.
- develop the ability to decenter one's perspective and consider alternative viewpoints and experiences, fostering empathy and understanding for effective collaboration and problem-solving.

Evaluation strategy

- for each member of the North, South or West convinced, the player gains points
- X points give X% of the grant
- gauges are created to evaluate the negotiation
- players who receive most of the grant win

Emerging technology features

Artificial intelligence

create different ethical elements in the negotiation

Augmented reality

augmented reality experience of non-playable character that talk to you

Virtual reality

creation of Egalwaspassiert town and its inhabitants

3D printing

creation of 3D objects with waste recycled plastic

Holograms

unlockable feature, display the town with holograms

Game inspirations

- Cultures: Discovery of Vinland
- Recycle City

Starting literature

- Parlement Europeen,
  Déchets plastiques et recyclage dans l'UE : faits et chiffres (infographie) ,
  https://www.europarl.europa.eu/news/fr/headlines/society/20181212STO21610/dechets-plastiques-et-recyclage-dans-l-ue-faits-et-chiffres-infographie (18.5.2023.)
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HoloZoo

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Dubrovnik, Croatia

Game genre

trivia

Green topics

conservation of wildlife

habitat preservation

European green deal

preserving and restoring ecosystems and biodiversity

Green challenge

The HoloZoo app aims to address the problem of lack of environmental awareness and education among elementary school children. The app aims to raise awareness of endangered species and their habitats and combat climate change by using hologram technology to create immersive and engaging educational experiences for children.

The issue of environmental education and awareness is significant because it can lead to a lack of understanding and action on environmental issues. Children who do not receive adequate environmental education may grow up without a sense of responsibility for protecting the planet and its resources. This can lead to a lack of interest in sustainability and climate change issues and a lack of motivation to take action to protect the environment.

Biodiversity loss and endangerment of species is also a critical issue that requires attention and action. Many species are at risk of extinction due to habitat destruction, pollution, and climate change. Children who are not aware of this issue may not understand the importance of protecting these species and their habitats.

The HoloZoo app is relevant to green issues because it provides a platform for environmental education and awareness by using innovative hologram technology. By encouraging children to learn about endangered species and their habitats, the app can help inspire the next generation of environmentalists and promote sustainable practices. Furthermore, by using hologram technology, the application promotes the use of environmentally friendly solutions for educational purposes, contributing to the development of more sustainable practices.

Game plot

The HoloZoo application is an educational game designed to raise awareness about the environment and the fight against climate change. The game is aimed at elementary school children and is designed to help them visualize endangered animals and their habitats using hologram technology.

The game consists of two levels: Learning and Quiz. In the learning level, the player can view the animals using a 3D model or list and learn about their habitat, diet, physical characteristics, population and threat status. In the quiz level, the player can test their knowledge by answering questions about the animals they have learned about. The quiz has three difficulty levels, and the player receives points for each correct answer. After each level, the player can unlock new animal models and display them on a globe or list.

The goal of the game is to educate children about the importance of environmental protection and endangered species, while providing them with a fun and interactive learning experience.

Learning outcomes

- identify habitats of specific animals
- classify animals by level of endangerment.
- identify geographic locations where specific animals are at high risk

Evaluation strategy

Quiz scores: The player's score on the quiz level can be used as a measure of their knowledge and understanding of the animals and their habitats. The quiz can have questions related to the animal's physical characteristics, population, and threat status, among other things.

Time taken to complete levels: The game can also track the time taken by the player to complete each level. A faster completion time may indicate a better understanding of the material, while a slower time may suggest that the player needs more practice.

Animal models unlocked: The game can track the number of animal models the player has unlocked, which can be an indication of how much they have learned about the different animals and their habitats.

Repeat plays: If the player repeats the game or specific levels, it may suggest that they are trying to improve their knowledge or score, indicating a desire to learn and retain information.

By analyzing these metrics, the game can provide feedback to the player on their progress and understanding and suggest areas for improvement. The game can also adjust the difficulty of the questions based on the player's performance, providing a personalized learning experience.

Emerging technology features

Artificial intelligence

AI could be added in future iterations and implementation of new functionalities as a new level where, for example, the environment can be managed and the impact on wildlife predicted.

Augmented reality

- Non applicable

Virtual reality

- Non applicable

3D printing

It could be possible to implement possibility of exporting our 3D models of animals for 3D printing.

Holograms

Our application is divided into two levels: learning and quiz. The learning level provides a 3D model of animal habitats and their locations through a holographic globe, as well as a list view that leads to individual animal profiles and 3D views on mobile phones and holograms. By clicking on a marker on the map in globe mode, you get information about the animal, and you can view a 3D model on your mobile phone and a hologram.

Game inspirations

- WildCraft
- World of Zoo

Starting literature

- H. Ghuloum, “3D Hologram Technology in Learning Environment,” Proc. 2010 InSITE Conf., pp. 693–704, 2010.
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Tasks for completing green-themed serious game project assignments

Task	Directions	Deliverable
Game scenario	Define: • green educational content • game design • visuals • emerging technology application • features for implementing universal design for learning	PDF
Visual prototype	Sketch all the screens from your game and connect them to logically to create a visual prototype	Figma prototype
Photo challenge	Share photos that inspire your work on the game (e.g. plastic bottle with „deep message”)	Photos
Investor presentation	Rules: • 10 slides • 20 minutes • 30 font size Provide clear, concise yet informative overview of your game to potential investors	PPTX

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