



RAISE: Rasing environmental knowledge & awareness through an innovative virtual environment



Implementation Report

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Executive Summary

This Implementation report outlines the strategic deployment of RAISE Virtual World Learning Environment, executed in three phases: Alpha, Beta and Final versions. The Alpha phase focuses on foundational testing and formative usability evaluation by UPatras using the “Software Quality and Human-Computer Interaction” Laboratory. Built on the insights gained from the Alpha phase, the Beta version will expand the testing environment to include the three partnering schools (Arsakeio, Manin, AEDAS) engaging over 100 students. In this context, initially, the questionnaire filled out by the students before entering the 3D world platform is presented, which responds to the students’ prior knowledge. Subsequently, each school describes the process followed for the entry and application of students in the 3D world, followed by a re-completion of the same questionnaire by the students for assessing the acquisition of new knowledge based on the scenarios proposed in the virtual world of RAISE. Finally, the final implementation included the enhancements derived from the previous phases. This stage is set for large-scale implementation with at least 400 users, aiming to validate the platform’s readiness for widespread adoption. The focus will be on ensuring a seamless user experience, robust technical performance, and demonstrable educational benefits.





List of abbreviations

Abbreviation	Definition
3D	3-dimentional
Arsakeio	Arsakeio Lyceum of Patra (Greece)
IR	Internal Report
LE	Learning Environment
Manin	Liceo Manin (Italy)
MoM	Minutes of the Meeting
PC	Project Coordinator
PMT	Project Management Tool
PQP	Project Quality Plan
PR	Project Result
AEDAS	Agrupamento de Escolas D. Afonso Sanches (Portugal)
TPM	Transnational Project Meetings
ISMAI	University of Maia (Portugal)
UPatras	University of Patras
VW	Virtual World





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1. Alpha version Implementation

1.1 Introduction

The development of the 3D Virtual World Learning Environment (VWLE) marks a significant advancement in educational technology aimed at promoting environmental awareness and sustainability education. The alpha version implementation involved a meticulous process to ensure the project's success and impact, starting with the creation of the basic interactions of a multi-user 3D immersive environment. This phase required strict adherence to specific guidelines and the development of scenarios that align with the project's pedagogical framework. Critical feedback was gathered from three game experts who assessed the alpha version's mechanics, visual appeal, and educational effectiveness. Following this, hands-on testing sessions were conducted with students at Arsakeio School to obtain direct user feedback. These sessions included semi-structured interviews and eye-tracking analysis, providing valuable insights that informed iterative improvements to the virtual world. The combination of expert and user feedback has been instrumental in refining the VWLE, ensuring it is engaging, educationally effective, and ready for the subsequent beta phase. Future additions will include detailed chapters on the school visits with accompanying photos, as well as a comprehensive analysis of the students' interview responses to further enhance the project's outcomes.

1.2 Alpha version feedback

The alpha version implementation process for the 3D Virtual World Learning Environment (VWLE) included several critical steps to ensure the project's success and impact. Initially, the development team, led by UPatras, created a multi-user 3D immersive virtual world learning environment aimed at raising environmental awareness and educating students about sustainability. This phase requires close adherence to the specifications from WP2 and involves creating scenarios that align with the project's pedagogical framework.

During the alpha version development phase of the 3D Virtual World Learning Environment (VWLE) we involved three game experts to interact with our virtual world and provide their insights on the basic mechanics and visual of the alpha version of the virtual world. These experts, chosen for their extensive experience in educational games and virtual environments, played through the scenarios and gave detailed feedback on various aspects, including user interface intuitiveness, the effectiveness of the gamified learning activities, and any technical issues encountered. Their evaluations focused on ensuring that the virtual world was not only engaging but also met its educational goals effectively.





After gathering feedback from these game experts, the development team of University of Patras decided to conduct hands-on alpha testing sessions with actual users. The above was not proposed initially at the proposal of the project, but the development team decided that it was essential to conduct these testing sessions to enhance the development process of the virtual world. To achieve this, the RAISE development team organised two visits to Arsakeio School. The first visit took place in December 2023, involving 15 students, and the second in February 2024, involving 25 students. The purpose of these visits was to obtain direct feedback from the students as they interacted with the Virtual World Learning Environment. During these sessions, after the students interacted with the virtual world, semi-structured interviews were conducted to gain deeper insights into the students' experiences. The questions asked during these interviews included:

- How easy was it to navigate through the virtual world?
- Were the instructions and objectives clear and understandable?
- Which aspects of the virtual world did you find most engaging?
- Were there any parts of the virtual world that you found confusing or frustrating?
- How did the virtual world help you understand the environmental concepts being taught?
- Do you have any suggestion for improving the virtual world?

The second visit in February was particularly significant as the RAISE development team brought along equipment from the Software Quality and Human-Computer Interaction lab, including a complete PC with a desktop eye tracker system. This tool allowed the RAISE development team to monitor where the students focused their attention during gameplay. By analysing the eye-tracking data, the RAISE development team observed that users frequently shift their gaze back and forth between the questions and answers in the canvas quizzes. This insight led to increase the space between the questions and the answers, making it easier for students to read and respond without excessive eye movement.

The eye-tracking analysis revealed that students tended to focus more on the top of the quiz interface. By adjusting the spacing, the aim was to provide a clearer and more comfortable viewing experience, reducing cognitive load and improving overall usability. These changes were implemented to ensure that the Virtual World Learning Environment was not only engaging but also educationally effective, facilitating better learning outcomes.





Overall, the feedback from both the game experts and the students played a crucial role in refining the 3D Virtual World Learning Environment. By combining expert insights with direct user feedback, we were able to make targeted improvements that enhanced the user experience and educational value of the virtual world. The iterative process of testing, feedback, and refinement ensured that the Virtual World Learning Environment will be well-prepared for the subsequent beta phase, aligning with the project's goals of raising environmental awareness and knowledge among students.





1.3 Expert Feedback on the Alpha version

The RAISE development team sought critical feedback from three game experts to ensure that the 3D Virtual World Learning Environment (VWLE) was on the right track. These experts were selected for their extensive experience in educational games and virtual environments, bringing valuable insights into the project's mechanics, visual appeal, and educational effectiveness.

In November, the RAISE team invited the three game experts in Software Quality & Human-Computer Interaction to evaluate the VWLE independently. Each expert visited on a different day to ensure an unbiased and thorough assessment of the virtual world. During these visits, the experts interacted with the alpha version, playing through all RAISE virtual world scenarios designed to raise environmental awareness and educate students about sustainability.

After their hands-on experience with the VWLE, the RAISE team conducted structured interviews with each game expert. The purpose of these interviews was to pinpoint any deficiencies and gather detailed feedback on specific aspects of the virtual world. The interviews were semi-structured, fostering active and technical conversations. The following are the key questions used during these interviews, tailored to elicit comprehensive and actionable feedback:

- How intuitive did you find the user interface and navigation within the virtual world?
- Were there any specific areas or features that you found particularly engaging or problematic?
- How effective do you think the virtual world is in conveying educational content, particularly environmental concepts?
- Did you encounter any technical issues or bugs during your interaction? If so, could you describe them?
- How do you think the feedback mechanisms in the gamified learning activities could be improved?
- Were the instructional elements clear and easy to follow? Do you have suggestions for enhancing them?
- Can you suggest any additional features or improvements that would enhance the user experience and educational value?





The feedback from these interviews was instrumental in refining the VWLE. The experts' responses not only highlighted the strengths of the virtual world but also provided constructive criticism on areas needing improvement.

Expert 1 remarked, "The virtual world is visually appealing and has strong potential to engage students. The graphics and the overall design are impressive, making the learning experience enjoyable. However, the loading times between different scenarios are quite long, which might cause students to lose interest." The RAISE team responded, "Could you elaborate on the specific loading issues? How would you suggest we improve them?" Expert 1 explained, "For instance, transitioning from the main menu to a scenario takes a noticeable amount of time. Optimizing the load times or adding engaging animations during the load could keep students engaged."

Expert 2 focused on the instructional elements, stating, "The educational content is well-integrated into the game mechanics, but the text size for instructions and quiz questions is quite small, making it difficult for some students to read comfortably. Increasing the text size or offering text size adjustments could improve readability." The RAISE team inquired, "Which specific parts of the text did you find too small, and how can we better address this issue?" Expert 2 replied, "The initial setup instructions and some quiz questions were particularly hard to read. Offering a text size adjustment feature would be helpful for students with different visual preferences."

Based on this expert feedback, the RAISE development team implemented several key changes to the VWLE. Navigation aids were enhanced, text size adjustments were added, and the difficulty levels of quizzes were adjusted. These modifications aimed to create a more user-friendly and educationally effective virtual environment, ensuring it would be well-received by students during the upcoming testing sessions at Arsakeio School. The insights provided by the game experts were invaluable in shaping the development of the virtual world. Their feedback set a strong foundation for the VWLE, aligning it more closely with its educational objectives and overall success.





1.4 First Visit to Arsakeio School

On December 19, 2023, the RAISE development team conducted the first hands-on alpha testing session of the 3D Virtual World Learning Environment (VWLE) at Arsakeio School. This initial visit involved 15 junior high school students, offering a diverse range of feedback across different age groups between 10-15 years old. The purpose of this visit was to gather direct user feedback, which would be instrumental in refining the virtual world to better meet the educational objectives, enhance user engagement and impact students' environmental awareness.

The session began with an introduction of the Virtual World Learning Environment to the students, followed by a guided walkthrough of its features and functionalities. Students were then given the opportunity to explore the virtual world independently, allowing them to navigate through the various developed scenarios to raise environmental awareness and promote sustainability education. The RAISE development team closely monitored the students' interactions, noting their engagement levels and any difficulties they encountered.

After the exploration session, semi-structured interviews were conducted to gain deeper insights into the students' experiences. The interviews revealed a range of feedback that was critical for the iterative development process. For instance, when asked how easy it was to navigate through the virtual world, many high school students found the interface intuitive and user-friendly. However, a few junior high school students mentioned that certain navigation elements were slightly confusing, suggesting the need for clearer instructions or additional guidance within the virtual environment. One student commented: *"The graphics were good, but I had a bit of trouble finding my way to the main scenario selection room"*.

Regarding the clarity of instructions and objectives, feedback was generally positive, but there were some suggestions for improvement. Students appreciated the detailed instructions provided at the beginning of each scenario, but a few suggested that incorporating visual cues or interactive tutorials could further enhance understanding. One student mentioned: *"It would be helpful to have pop-up tips or arrows pointing to where we need to go next"*.

After this visit, the RAISE development team embarked on enhancing the Virtual World Learning Environment, leading to the development of an early beta version. This iteration incorporated the students' suggestions, aiming to create a more engaging and educationally effective virtual environment. By addressing the identified needs and





preferences, the team moved closer to realizing their goal of raising environmental awareness and fostering sustainability education through an immersive learning experience.



Figure 1: Photos from Alpha Version Implementation



Figure 2: Photos from Alpha Version Implementation



Figure 3: Photos from Alpha Version Implementation



1.5 Second Visit to Arsakeio School

The second visit to Arsakeio School on February 6, 2024, served as a crucial follow-up to the initial testing session conducted in December. This time, the RAISE development team focused on engaging a younger cohort, consisting of 25 junior high school students. The objective was to validate the improvements made based on feedback from the first visit and to gather additional insights from a different age group. Building on feedback from the high school and junior high school students in December, the RAISE team implemented several key changes to the 3D Virtual World Learning Environment (VWLE). These included enhanced navigation aids, more visual cues, and improved spacing in the interactive quizzes to reduce cognitive load. During this visit, the team was eager to see how these modifications would resonate with the younger students and to identify any further refinements needed.

The session began with a brief introduction, followed by a hands-on exploration of the updated virtual world. The junior high students navigated through the immersive scenarios with noticeable ease compared to the previous group, indicating that the navigation improvements were effective. Students were actively engaged, and their interactions were closely monitored by the RAISE team, who were particularly interested in the students' responses to the revised quizzes and instructional elements.

Post-exploration, semi-structured interviews were conducted to gather detailed feedback. The younger students provided valuable insights into the usability and educational impact of VWLE. When asked about the ease of navigation, many students responded positively, reflecting the success of the implemented changes. Some students still suggested minor tweaks, like adding more interactive elements to guide them through complex tasks. The interactive quizzes continued to be a highlight, with students finding them both fun and informative. The eye-tracking analysis conducted during this session provided deeper insights into how students engaged with the quizzes. The data revealed that students were now able to focus more efficiently on the questions and answers, thanks to the increased spacing and improved interface design. This reduced cognitive load and enhanced their overall learning experience. One student remarked, "The quizzes were easier to follow, and I felt like I learned a lot."

The second visit to Arsakeio School not only confirmed the effectiveness of the initial improvements but also offered new perspectives on how to further refine the VWLE for younger audiences. The iterative process of testing and feedback proved invaluable, as each session brought the team closer to creating a more user-friendly and educationally





impactful virtual world. This follow-up visit underscored the importance of continuous user engagement and feedback in the development process, ensuring that the VWLE would be well-equipped to meet its educational goals for students of all ages.



Figure 4: Photos from Alpha Version Implementation Second Visit





Figure 5: Photos from Alpha Version Implementation Second Visit



2. Beta Version Implementation

2.1 Introduction

During the beta version, we enhanced the virtual world with the feedback gathered from the students and the experts during the alpha version. RAISE project team followed a structured procedure for the evaluation and execution of the beta version of the 3D virtual platform for RAISE at the three collaborating schools (Arsakeio, Manin, AEDAS). In this context, initially, the questionnaire was filled out by the students before entering the 3D world platform, to assess the students' prior knowledge. Subsequently, each school describes the process followed for the entry and application of students in RAISE 3D virtual world, followed by a re-completion of the same questionnaire by the students for assessing the acquisition of new knowledge based on the scenarios proposed in the virtual world of RAISE. Finally, an analysis of the students' responses is carried out, and the results are presented.

2.2 Questionnaire

The questionnaire is designed to evaluate the virtual world created by the RAISE team, specifically focusing on environmental education. The purpose of this questionnaire is to gather insights from students regarding their knowledge and attitudes about environmental issues and to assess the effectiveness of the virtual learning environment in enhancing their understanding. Participants are asked to provide basic demographic information such as their student code, country of origin, age, and gender. The questionnaire is divided into various scenarios, each addressing different environmental topics, including wind energy, eco-friendly household practices, water conservation, carbon footprint, waste management, and more. Through multiple-choice and Likert scale questions, students' knowledge and opinions on topics like wind turbine functionality, the benefits of LED bulbs, recycling practices, and the impact of carbon dioxide on climate change are assessed. Additionally, the survey seeks to gauge students' satisfaction with the 3D virtual game environment. This feedback is crucial for the RAISE team to understand the current level of students' environmental awareness and to refine the virtual world to better meet educational goals. The questionnaire is located at appendix 1.





2.3 Beta Version Implementation

As part of the RAISE project, we aimed to ensure thorough testing and dissemination of the beta version of our 3D Virtual Learning Environment. To achieve this, we organised several key events to gather feedback and promote the project among various stakeholders.

One of the highlights was our participation in the Athens Science Festival on April 21, 2024. During this event, we showcased the beta version of the 3D platform to an audience comprising 35 students, parents, and education experts. This interaction provided invaluable feedback as participants actively tested the beta version, shared their experiences, and inquired about the project's objectives and future developments. The event served as an excellent opportunity to gain insights from a diverse group, allowing us to refine the platform further based on their suggestions. The list of participants that interacted with the virtual world can be located at Appendix 5

In addition to the Science Festival, we organised a dedicated workshop on April 10, 2024, during the Erasmus Exchange Day at Arsakeio Lyceum of Patras. This workshop was tailored for education experts, teachers, and other professionals in the education sector. Our primary goal was to disseminate and implement the early results of the project and gather targeted feedback from these stakeholders. Through hands-on demonstrations and guided walkthroughs, participants explored the educational potential of the 3D world and engaged in discussions about its application in real-world classrooms. This event not only provided critical feedback but also strengthened the project's visibility within the academic and educational communities. The list of teachers that participated to the workshop can be located at Appendix

Both events underscored the importance of early stakeholder involvement in the development process. They enabled us to:

- Identify and address usability issues.
- Gather diverse perspectives on the platform's educational impact.
- Build a network of educators and experts interested in integrating the 3D world into their teaching practices.

The collective feedback from these events has been instrumental in shaping the final version of the platform, ensuring that it meets the needs of both students and educators.





Figure 6: RAISE team at Athens Science Festival

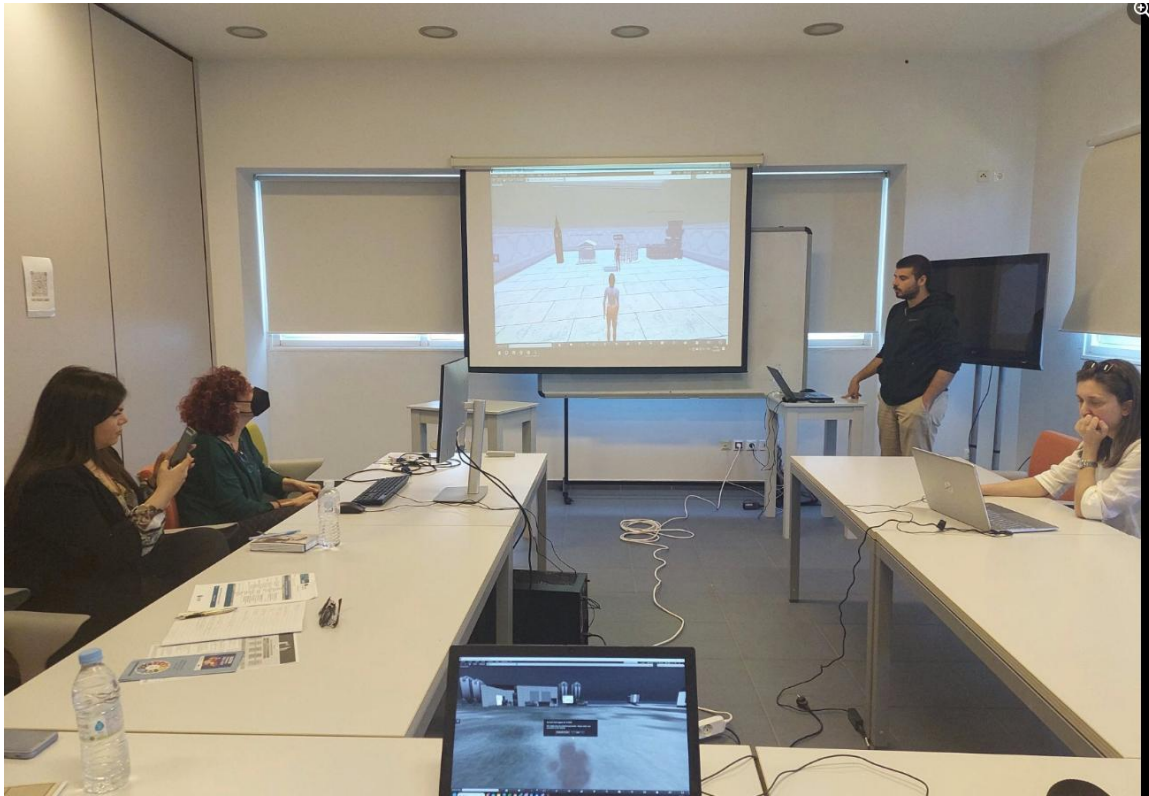


Figure 7:RAISE workshop at Erasmus Exchange event

2.3.1 Description of the procedure (Arsakeio)

Following the instructions of the coordinator, the Arsakeio Lyceum of Patras implemented the 3D world from April 20, 2024, until May 28, 2024, where the completion of the questionnaire for the second time by the students was conducted. **Five** teachers and **seventy-five** students participated in the process, out of which 71 completed the questionnaire before and after the implementation using their personal code, which was created exclusively for the needs of RAISE. The list of students was filled out online by the schoolteacher, to keep the entire educational team informed.

The next step took place in the school's computer lab where, with the help of computer science teachers, students worked individually or in groups on the scenarios of the 3D world as follows. Initially, the students (7th and 8th grade) entered the RAISE 3D virtual world using the code provided to them, and a brief introduction to the scenarios was given to students with the platform. Students were asked to create their own avatar and interact with the platform by answering the questions in each scenario. This educational intervention lasted for two consecutive teaching hours. In the following teaching hours, students entered the platform on their own or with guidance from their peers (in case



someone was absent) and were implemented to the scenarios. Students worked freely with enough time and were thus given the opportunity to actively engage in the suggested environmental issues highlighted in each scenario.

Through this educational activity, students had the opportunity to familiarize themselves with the use of technology and virtual worlds, to develop their creativity, and to tackle problems with their critical thinking. Furthermore, through collaboration and interaction with their classmates, students developed their social skills and learned to work effectively as team members. Overall, this educational intervention provided students with an interactive and engaging educational experience, enhancing their learning and encouraging them to think outside the box.

2.3.2 Description of the procedure (Manin)

The implementation of the 3D Virtual World Learning Environment took place in the school's computer lab, with the support of computer science teachers. Students from the 9th and 10th grades worked individually or in groups on various scenarios within the 3D world. Initially, students entered the RAISE 3D world using the provided code and received a brief introduction to the scenarios to familiarize them with the platform. They created their own avatars and began interacting with the platform by answering the questions presented in each scenario.

The educational intervention phase lasted for two consecutive teaching hours, during which students engaged with the platform either independently or with guidance from their peers, especially if someone was absent. In total, **eighty** students participated in the beta version implementation process, making the most of this immersive learning experience. In the subsequent teaching hours, students continued to enter the platform on their own or with peer support, implementing as many scenarios as possible and interacting with the virtual environment.

Active engagement was a key component, as students were given ample time to work freely and delve deeply into the environmental issues highlighted in each scenario. This hands-on approach allowed students to explore and understand various environmental topics, enhancing their knowledge and attitudes towards these crucial issues. The questionnaire designed to evaluate this experience aimed to gather insights on students' knowledge and attitudes about environmental issues, as well as assess the effectiveness of the virtual learning environment. This feedback is crucial for refining the platform to better achieve educational goals and enhance students' understanding of environmental sustainability.





2.3.3 Description of the procedure (AEDAS)

With the help of computer science teachers, students worked individually or in groups on the scenarios of the 3D world. Initially, the 9th grade students entered the RAISE 3D world using the provided code. A brief introduction to the scenarios was given to familiarize them with the platform. Students then created their own avatars and interacted with the platform by answering the questions in each scenario. This educational intervention lasted for two consecutive teaching hours. During the beta version implementation, **seventy-two** students participated.

In the following teaching hours, students entered the platform on their own or with guidance from their peers if someone was absent. They implemented as many scenarios as possible, interacting with the platform. Working freely with ample time, students were given the opportunity to actively engage with the environmental issues highlighted in each scenario.

2.3.4 Accounts

In preparation for the beta version implementation, we created 100 accounts for each school involved in the project. This was done to ensure that all the students could participate and have a unique identity within the virtual world. Since the project is a school project, we implemented a controlled mechanism for account creation. When a user wants to create an account, they must submit a request. Upon review from the administrators of the RAISE server platform, they are informed via the provided email whether their request has been accepted or not. This controlled process is vital to ensure who enters the virtual, maintaining a secure and monitored environment for the students. The list of accounts used during the beta version can be found in Appendix 3.





2.4 Pre-Post Questionnaire statistical analysis

2.4.1 Qualitative characteristics

Technology has emerged as one of the key factors influencing our daily lives. From communication through social networks to the automation of our tasks, technology has transformed the way we live and work. The consequences of this revolution are many and often controversial. From the increase in isolation due to excessive use of technology to the creation of new job opportunities in the technology sector, the impact of technology is evident in every aspect of our lives.

Especially in the field of 3D virtual world platforms the use of such technology in education can significantly contribute to increasing students' environmental knowledge. By immersing themselves in virtual environments, students can explore natural ecosystems, observe the impact of humans on the environment, and develop sensitivity to environmental issues. Through interaction with virtual objects and environments, students gain practical knowledge and cultivate their willingness to protect the environment. Thus, the use of 3D virtual worlds can be an effective way to enhance environmental awareness and education among students.

While technology offers many advantages in our daily lives, it is equally important to recognize the potential risks and side effects that may accompany its use. It is important to use technology with wisdom and balance, to avoid any negative consequences. Gradual familiarization and continuous education about new technologies can help us leverage their benefits while also protecting ourselves from potential risks.

2.4.2 Quantitative characteristics

Instrument

The data was collected via an online survey. The questionnaire has a first question which asks the student for a code (Student's code), then it has a first part of sociodemographic characterisation (country, gender, age), followed by a set of questions related to the scenarios. The questionnaire was drawn up by the UMAIA team, with input from the other partners. The questionnaire consists of 31 questions, 25 with a single correct answer, 3 multiple choice questions and 3 Likert scale questions.

The questionnaire was created using LimeSurvey software and can be found in Appendix A, in English, Greek, Portuguese and Italian versions.

Procedure

The sampling process and subsequent data collection took place in a school environment in the three schools mentioned: Arsakeio Lyceum of Patras (Greece), Agrupamento de Escolas D. Afonso Sanches (Portugal), and Liceo Manin (Italy) . Informed consent was given to the parents and guardians of the students who voluntarily agreed to take part in the study. Data collection was carried out in collaboration with the project partners, who





were responsible for the sampling and data collection process in the different schools (Figure 6, 7 and 8)

To identify the answers to the questionnaires before and after the 3D VWLE from the same students, school partners were asked to use the same “Student’s code” before and after the 3D VWLE.



Figure 8: Beta Version Implementation at Arsakeio





Figure 9: Beta Version Implementation at AEDAS



Figure 10: Beta Version Implementation at Manin



Statistical Analysis Methodology

Data was processed using version 28.0 of the Statistical Program for Social Sciences, IBM SPSS. Descriptive statistics (e.g., frequency/percentage) were used for the socio-demographic characterization of the sample.

To analyse the responses of pre and post questionnaire, initially descriptive statistics (frequency/percentages, means) were used. To test whether the proportion of correct answers after the 3DVWLE increased compared to the answers obtained before, the non-parametric McNemar test was used. The Paired sample T-test was also used to analyse the answers on a Likert scale, after checking for adherence to Normality.

Results with a significance level below .05 ($p < 0.05$) were considered statistically significant.

2.4.3 Statistical analysis results

Sociodemographic Characterization

There were obtained 308 answers to the questionnaire. Student responses to the VWLE 3d pre-post evaluation questionnaire distributed by country, gender and age are presented in Tables 1 a 3.

Table 1: Distribution of answers by country

Country	Frequency	Percent
Greece	63	20,5
Portugal	113	36,7
Italy	132	42,9
Total	308	100,0

Table 2: Distribution of answers by gender

Gender	Frequency	Percent
Female	173	56,2
male	129	41,9
Other	6	1,9
Total	308	100,0





Table 3: Distribution of answers by age

Age	Frequency	Percent
10	1	,3
11	1	,3
13	27	8,8
14	78	25,3
15	64	20,8
16	79	25,6
17	33	10,7
18	8	2,6
19	7	2,3
Missing	10	3,2
Total	308	100,0

An analysis of the distribution of answers shows that not all the students answered the questionnaire twice (before and after the 3d VWLE) as there should have been an even number of answers (for each country, each age and each gender).

As mentioned above, to identify the answers to the questionnaire before and after the 3d VWLE from the same student, students were asked to use the same “Student’s code” to identify themselves. However, it turned out that most of the students did not comply with this recommendation.

It was therefore only possible to use 94 answers (2 x 47 student answers) out of a total of 308 answers. This could be due to various reasons such as the questionnaire before and after were answered on different days and some students were not present or some students omitted data or even didn’t answer. Thus, each school will provide a certification (see appendix list) indicating the number of children who participated, the exact dates, and the sections. Additionally, find an appendix with the names of the children. To summarise, it was optional for the children to complete the questionnaire, as our main concern was for them to engage with the content. As a result, we only collected 47 complete responses.

The distribution of participants by country, gender and age is shown in tables 4 to 6.

Table 4: Distribution of participants by country

Country	Frequency	Percent
Greece	6	12,8
Portugal	23	48,9
Italy	18	38,3
Total	47	100,0



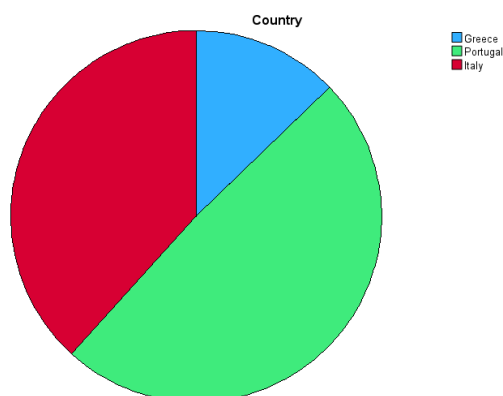


Figure 11: Distribution of participants by country

Table 5: Distribution of participants by gender

Gender	Frequency	Percent
Female	21	44,7
male	25	53,2
Other	1	2,1
Total	47	100,0

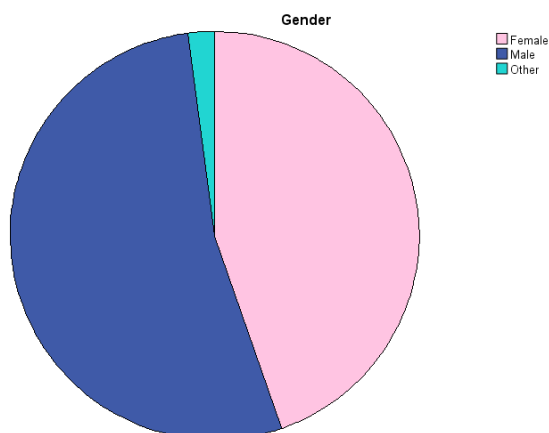


Figure 12: Distribution of participants by gender

Table 6: Distribution of participants by age

Age	Frequency	Percent
10	1	2,1
13	3	6,4
14	15	31,9

15	4	8,5
16	14	29,8
17	6	12,8
18	3	6,4
19	1	2,1
Total	47	100,0

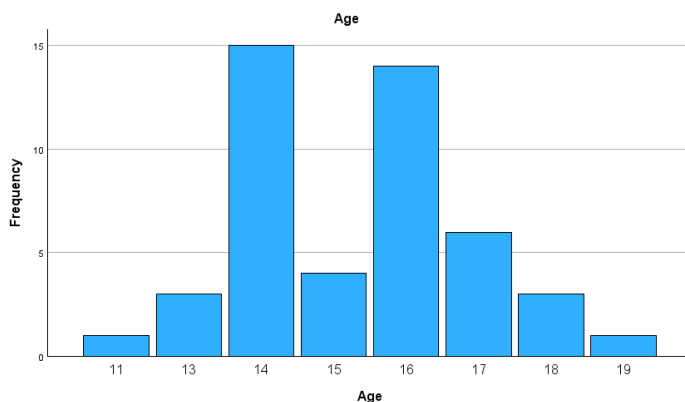


Figure 13: Distribution of participants by age

Inferential analysis

In questions with several options and only one correct, as well as in multiple-choice questions, McNemar's non-parametric test (a statistical test used on paired nominal data) was used to test whether the proportion of correct answers increased after the 3D VWLE. For Likert scale questions, the Paired sample T-test was used, after checking for adherence to Normality.

Table 7 shows the proportion of correct answers before and after the 3D VWLE and the respective p-value of the Mc Nemar test for questions Q1 to Q9.

Table 7: Results of McNemar Test

Question	Proportion of correct answers		Sig
	Before	After	
Q1	0,723	0,766	0,387
Q2	0,617	0,829	0,016
Q3	0,489	0,489	0,500
Q4	0,574	0,595	0,500



Q5	0,213	0,255	0,387
Q61	0,787	0,809	0,500
Q62	0,744	0,787	0,364
Q64	0,660	0,809	0,083
Q66	0,723	0,595	0,131
Q7	0,489	0,617	0,062
Q81	0,511	0,532	0,500
Q82	0,532	0,596	0,290
Q91	0,191	0,319	0,090
Q92	0,404	0,362	0,396
Q93	0,723	0,808	0,227
Q94	0,745	0,915	0,029

Of the 16 questions, 13 showed a higher proportion of correct answers after the 3d VWLE, 1 remained the same and 2 decreased slightly. However, in two questions the increase was statistically significant (p-value < 0.05; at bold). It can be said that there is an improvement in knowledge after the 3d VWLE.

Table 8 shows the mean answers to question 10 (on a Likert scale, from 1 to 5) before and after the 3D VWLE and the respective p-value, using the t-test – 2 paired samples. A higher mean value corresponds to more environmentally friendly behavior.

Table 8: Results of paired t-test

Questions	Mean		t	p
	Before	After		
Q10_A	2,83	3.09	1,097	0,139
Q10_B	3,26	3,67	1,850	0,036
Q10_C	3,98	4,42	2,235	0,015
Q10_D	2,02	2,30	1,289	0,102
Q10_E	3,72	3,93	,728	0,235





Similarly, in 5 questions, the mean after the 3d VWLE increased. In two questions, this increase was statistically significant (p-value <0.05; at bold)

Table 9 shows the proportion of correct answers before and after the 3D VWLE and the respective p-value of the Mc Nemar test for questions Q11 to Q19.

Table 9: Results for McNemar test

	Proportion of correct answers		
	Before	After	Sig
Q11	0,511	0,638	0,132
Q12	0,723	0,745	0,500
Q13	0,660	0,682	0,500
Q14	0,574	0,638	0,290
Q15	0,426	0,617	0,018
Q16	0,553	0,702	0,094
Q17	0,574	0,702	0,105
Q18	0,021	0,149	0,016
Q19	0,383	0,574	0,032

The 9 questions showed a higher proportion of correct answers after 3D VWLE, 3 of which showed a statistically significant improvement (p-value < 0.05, at bold).

As with question 10, the two-sample paired t-test was used to test whether there were statistically significant differences in the answers before and after the 3D VWLE.

Since question Q20A was inverted (i.e. a higher value of the variable corresponds to a less pro-environmentalist attitude), its inverted variable Q20A_Inv was calculated ($Q20A_Inv = 6 - Q20A$), so that in all questions a higher value corresponds to a more environmentally friendly attitude





Table 10 shows the average answers to question 20 (on a Likert scale, from 1 to 5) before and after the 3D VWLE and the respective p-value, t and p-value.

Table 10: Results for paired t-test

Questions	Mean		t	p
	Before	After		
Q20A_Inv	3,55	3,81	1,379	,088
Q20B	3,58	3,79	1,244	,110
Q20C	3,91	4,07	0,894	,188

In all three questions, the mean after the 3D VWLE increased, although without statistical significance.

Table 11 shows the proportion of correct answers before and after the 3D VWLE and the respective p-value of the Mc Nemar test for questions Q21 to Q30.

Table 11: Results for McNemar test

	Proportion of correct answers		Sig
	Before	After	
Q21	0,511	0,660	0,046
Q22	0,277	0,532	0,011
Q23	0,574	0,638	0,227
Q24	0,362	0,447	0,227
Q25	0,638	0,723	0,212
Q26	0,468	0,574	0,166
Q27A	0,170	0,213	0,387
Q27B	0,426	0,511	0,212
Q27C	0,596	0,617	0,500
Q27D	0,468	0,383	0,212
Q28	0,426	0,596	0,076
Q29	0,468	0,553	0,194
Q30A	0,383	0,553	0,058





Q30B	0,447	0,511	0,339
Q30C	0,404	0,638	0,003
Q30d	0,362	0,468	0,134

Of the 16 questions, 15 show a higher proportion of correct answers after the 3d VWLE, with only 1 decreasing slightly. However, there are 3 questions in which the proportion increased with statistical significance (p -value < 0.05, at bold). It can once again be said that there is an improvement in knowledge after the 3d VWLE.

Regarding question Q31 “How satisfied are you with the 3D Virtual game?” the answers are shown in Table 12.

Table 12: Answers to question Q31

How satisfied are you with the 3D Virtual game?	N	Percent
Very dissatisfied	6	12,8
Dissatisfied	0	0
Neither dissatisfied or satisfied	16	34,0
Satisfied	17	36,2
Very satisfied	8	17,0
Total	289	100,0

The majority, 53.2%, say they are satisfied or very satisfied with 3D VWLE.

Conclusion

The Three (3) Digital Virtual World Learning Environment (3D VWLE) significantly increased students’ knowledge, attitude, and behavior regarding environmental conservation. This platform provided an immersive and interactive way for students to learn about various environmental issues. The design of the 3D VWLE incorporated gamified scenarios that engaged students more deeply than traditional learning methods. As a result, students were more motivated to participate and retain information. Out of a total of 48 questions and sub questions, 10 questions showed a statistically significant increase. This demonstrates the effectiveness of the VWLE in enhancing specific aspects of environmental education. The data indicates that students not only learned new facts but also developed a more positive attitude towards conservation efforts. Additionally, their behavior reflected a greater commitment to sustainable practices. This improvement suggests that the 3D VWLE could be a valuable tool for educators aiming to foster environmental awareness. Overall, the integration of technology in education





through the VWLE proved to be a successful strategy in promoting environmental stewardship among students.





3. Final Version Implementation

3.1 Introduction

The implementation of the 3D Virtual World Learning Environment (VWLE) as part of the RAISE project has been a pivotal step in fostering environmental awareness among students across three schools: Arsakeio Lyceum of Patras (Greece), Agrupamento de Escolas D. Afonso Sanches (Portugal), and Liceo Manin (Italy). This report provides a detailed overview of the methodologies, processes, and outcomes associated with integrating this innovative platform into the educational practices of these institutions. It highlights the use of pre- and post-questionnaires to evaluate the effectiveness of the 3D VWLE, capturing both qualitative and quantitative data to measure students' learning progress and engagement. By focusing on practical scenarios and immersive experiences, the platform successfully bridged theoretical knowledge with real-world environmental challenges, offering students an interactive and transformative educational experience.

Through the collaboration of educators and students, VWLE became a dynamic tool for exploring environmental issues, fostering creativity, and encouraging teamwork. Each participating school adapted the platform to their unique contexts, providing valuable insights into its scalability and adaptability. The statistical analysis of students' responses revealed significant improvements in knowledge, attitudes, and behaviors towards environmental sustainability, underscoring the platform's effectiveness. Moreover, the high levels of satisfaction and willingness to recommend and reuse the platform reflect its potential for long-term integration into educational systems. This report not only documents the achievements of the RAISE project but also lays the foundation for its future development and broader application.

3.2 Final Version Implementation

3.2.1 Arsakeio Implementation

Following the instructions of the coordinator, the Arsakeio Lyceum of Patras implemented the 3D world final version from October 20, 2024, until November 28, 2024, where the completion of the questionnaire for the second time by the students was conducted. Five teachers and **seventy-five students** participated in the process, out of which seventy-one completed the questionnaire before and after the implementation using their personal code, which was created exclusively for the needs of the RAISE program. The list of students was filled out online by the schoolteacher, to keep the entire educational team informed.





The next step took place in the school's computer lab where, with the help of computer science teachers, students worked individually or in groups on the scenarios of the 3D world as follows: Initially, the students (9h and 10th grade) entered the RAISE 3D world using the code provided to them. Students were asked to create their own avatar and interact with the platform by answering the questions in each scenario. This educational intervention lasted for two consecutive teaching hours. In the following teaching hours, students entered the platform on their own or with guidance from their peers (in case someone was absent) and implemented as many scenarios as possible, interacting with the platform. Students worked freely with enough time and were thus given the opportunity to actively engage in the suggested environmental issues highlighted in each scenario.

Through this educational activity, students had the opportunity to familiarize themselves with the use of technology and virtual worlds, to develop their creativity, and to tackle problems with their critical thinking. Furthermore, through collaboration and interaction with their classmates, students developed their social skills and learned to work effectively as team members.

Overall, this educational intervention provided students with an interactive and engaging educational experience, enhancing their learning and encouraging them to think outside the box.





Figure 14: Arsakeio Final version implementation

3.2.2 Manin Implementation

At Manin, the implementation of the 3D Virtual World Learning Environment (VWLE) was planned and executed, ensuring an engaging and educational experience for all participants. With the support of computer science teachers, students were introduced to the platform in the school's computer lab, working either individually or in small groups to explore the interactive scenarios. The process was structured into several phases to maximise learning outcomes and student engagement.





During the Introduction and Familiarization phase, 9th, 10th and 11th -grade students (**70 students in total**) were guided through the login process using their unique codes by working in groups in all the scenarios of the virtual world. Teachers provided a brief yet comprehensive introduction to the 3D VWLE and a brief introduction to its scenario learning goal, highlighting the objectives and purpose of the scenarios. Students then created their avatars, which added a personalized and immersive element to their interaction with the platform. By answering scenario-based questions, students were not only engaging with the content but also building a foundational understanding of the environmental challenges addressed in the game.

The Educational Intervention phase spanned 4 teaching hours, during which students explored the platform under the direct guidance of their teachers. In the subsequent Independent and Peer-Guided Engagement phase, students were encouraged to work autonomously, implementing all the scenarios. Peer collaboration played a significant role during this phase, as absent students were assisted by their classmates to ensure they remained on track.

To extend the learning experience and assess the students' knowledge acquisition, Manin incorporated a unique post-implementation activity into the English curriculum. Students were instructed to write essays reflecting on their environmental knowledge and insights gained from the game. This exercise not only reinforced their learning but also provided a creative platform for students to articulate their thoughts on sustainability.

Throughout the process, active engagement was a key focus. Teachers allowed students ample time to freely explore the scenarios, encouraging them to critically analyze the environmental issues presented. This approach enabled students to develop problem-solving skills while fostering a deeper connection with the content. The incorporation of essays as a follow-up activity further enriched the educational intervention, making it a comprehensive and impactful learning experience for the students at Manin High School.

Active engagement was a key component, as students were given ample time to work freely and delve deeply into the environmental issues highlighted in each scenario. This hands-on approach allowed students to explore and understand various environmental topics, enhancing their knowledge and attitudes towards these crucial issues. The questionnaire designed to evaluate this experience aimed to gather insights on students' knowledge and attitudes about environmental issues, as well as assess the effectiveness of the virtual learning environment. The piloting of the final version has turned out to be more effective than the one of the Beta version, as the Manin Team noticed that the





platform was widely improved in order to better achieve the educational goals of the project and enhance students' understanding of environmental sustainability.



Figure 15: Manin Final version implementation



Figure 16: Manin Final version implementation

3.2.3 AEDAS Implementation

With the help of computer science teachers, students worked individually or in groups on the scenarios of the 3D world. Initially, the 9th, 10th and 11th grade students (**93 students in total**) entered the RAISE 3D world using the provided code. A brief introduction to the scenarios was given to familiarize them with the platform. Students then created their own avatars and interacted with the platform by answering the questions in each scenario. This educational intervention lasted for four teaching hours.

In the following teaching hours, students entered the platform on their own or with guidance from their peers if someone was absent. They implemented as many scenarios as possible, interacting with the platform. Working freely with ample time, students were given the opportunity to actively engage with the environmental issues highlighted in each scenario.



Figure 17: AEDAS Final version implementation

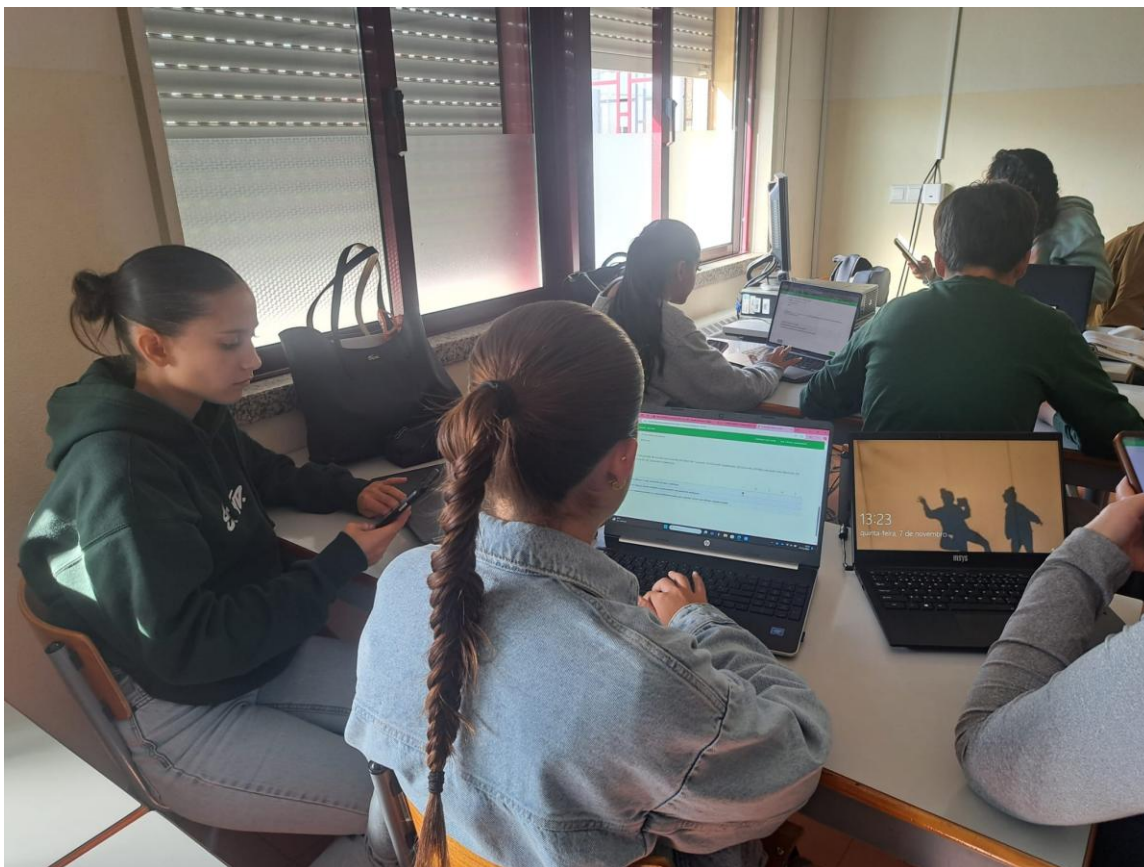


Figure 18:AEDAS Final version implementation



Figure 19: AEDAS Final version implementation



3.3 Pre-Post test Questionnaire

3.4 Statistical Analysis

Statistical Analysis Methodology

Data was processed using version 28.0 of the Statistical Program for Social Sciences, IBM SPSS. To analyse the responses of pre and post questionnaires, initially descriptive statistics (frequency/percentages, means) were used. To test whether the proportion of correct answers after the 3DVWLE increased compared to the answers obtained before, the non-parametric McNemar test was used. The Paired sample T-test was also used to analyse the answers on a Likert scale, after checking for adherence to Normality.

Results with a significant level below .05 ($p < 0.05$) were considered statistically significant.

3.4.1 Statistical analysis results

Sociodemographic Characterization

There were 396 responses to the questionnaire. The students' responses to the evaluation questionnaires before and after the 3D VWLE game are shown in Table 13 and 2, distributed by country and gender respectively.

As mentioned before, to identify the same student's answers to the questionnaires before and after the VWLE 3D game, students were asked to use the same "student code" to identify themselves. However, some students didn't identify with a code and others didn't use the same code before and after the 3D VWL game. It may even have happened that the questionnaires before and after the 3D VWLE game were answered on different days and some students were not present on one of the days.

This resulted in 320 answers to consider for valuable statistical analysis from questionnaire of 160 students (since each student answered twice, once before and once after the game).

Thus, the distribution of the 160 participating students with two answers to the questionnaire by country, gender and age is shown in tables 13 to 15. Figures 12 to 14 also show the distribution of the participating students by country, gender and age.

Table 13: Distribution of answers by country

Country	Frequency	Percent
Greece	124	29,2





Portugal	154	36,3
Italy	118	27,8
Total	396	100,0

Table 14: Distribution of answers by gender

Gender	Frequency	Percent
Female	271	63,9
male	125	29,5
Total	396	100,0

Table 15: Distribution of participants by country.

Country	Frequency	Percent
Greece	53	33,1
Portugal	57	35,6
Italy	50	31,3
Total	160	100,0



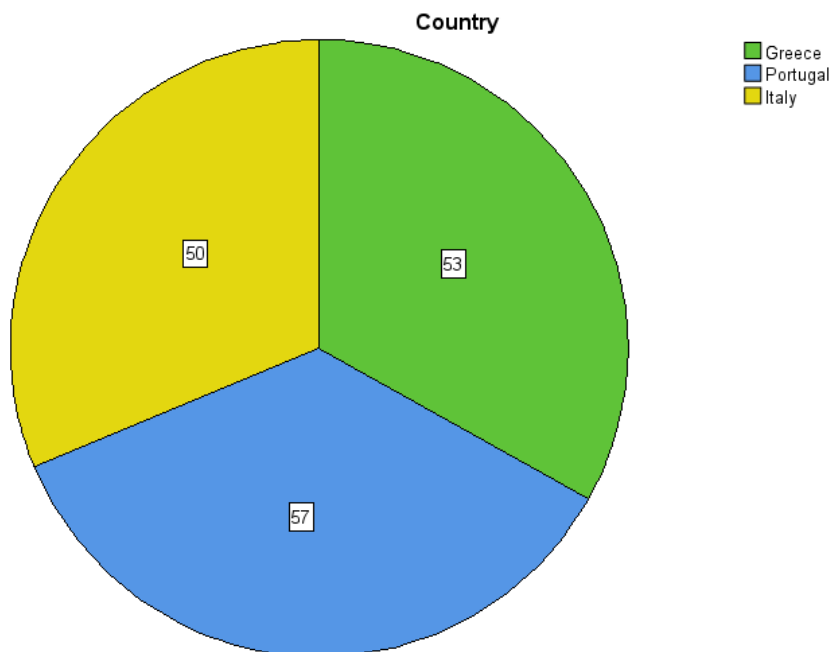


Figure 20: Distribution of participants by country.

Table 16: Distribution of participants by gender.

Gender	Frequency	Percent
Female	111	69,4
male	49	30,6
Total	160	100,0

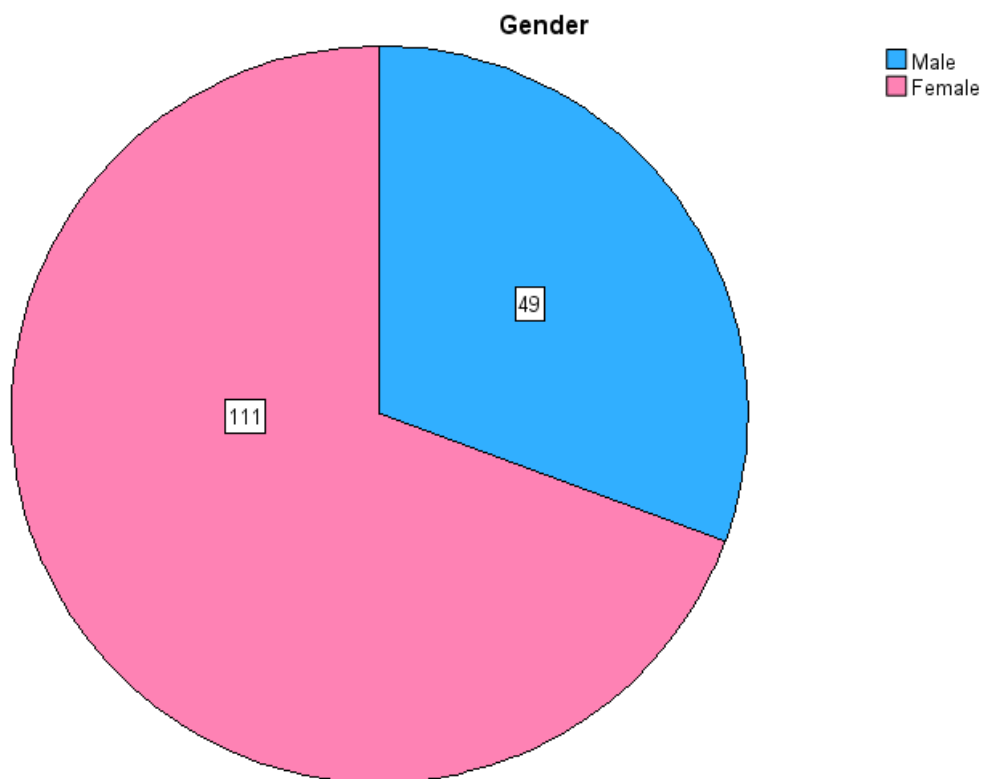


Figure 21: Distribution of participants by gender.

Table 17: Distribution of participants by age

Age	Frequency	Percent
13	4	2,5
14	40	25,0
15	48	30,2
16	61	38,4
17	4	2,5
18	1	0,6
19	1	0,6
Missing	1	0,6
Total	160	100,0



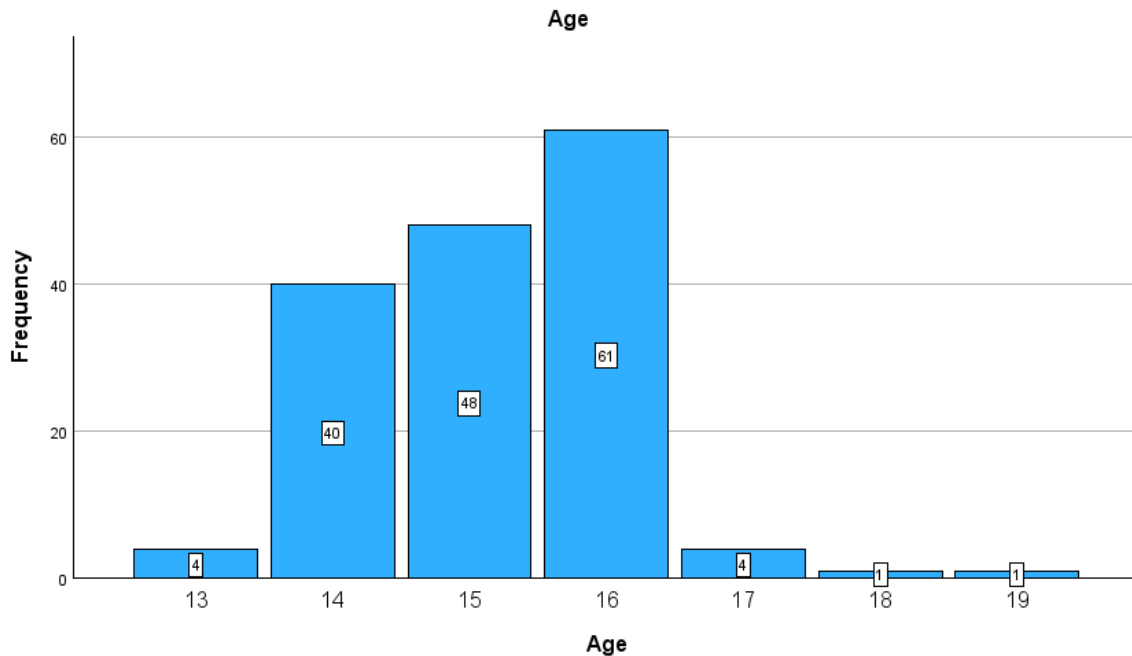


Figure 22: Distribution of participants by age.

3.4.2 Inferential analysis

In questions with several options and only one correct, the answers were recoded so that the answer had only two options, right or wrong (even the answer “I don't know” was considered the wrong answer). This made it possible to use McNemar's non-parametric test. McNemar's tests whether the proportion of correct answers before the game and after the game is identical.

Table 18 shows the proportion of correct answers before and after the 3D VWLE and the respective p-value of the Mc Nemar test.

Of the 20 questions, 19 showed a higher proportion of correct answers after the 3D VWLE, 1 decreased slightly. Furthermore, in 13 questions out of 20, the increase was statistically significant ($p\text{-value} < 0.05$; in bold). It can be said that there is an improvement in environmental awareness (of environmental knowledge, attitudes and behaviors) after the 3D VWLE game.

For the Likert scale questions, the paired samples T-test was used. The results of the test are shown in Table 18. The answers to questions 4D and 9A were inverted so that a higher value on the Likert scale corresponded to a more pro-environmental awareness. Thus, in



all questions a higher mean value corresponds to more environmentally friendly knowledge, attitude or behavior.

Table 18: Results of McNemar Test.

Question	Proportion of correct answers		p-value
	Before	After	
Q1	0,793	0,862	0,071
Q2	0,463	0,631	<0,001
Q3	0,731	0,788	0,233
Q5	0,625	0,781	<0,001
Q6	0,788	0,838	0,243
Q7	0,581	0,694	0,030
Q8	0,769	0,731	0,471
Q10	0,569	0,750	<0,001
Q11	0,388	0,631	<0,001
Q12	0,569	0,675	0,027
Q13	0,719	0,775	0,262
Q14	0,631	0,750	0,014
Q15a	0,175	0,269	0,036
Q15b	0,550	0,731	<0,001
Q15c	0,744	0,844	0,014
Q15d	0,656	0,750	0,053
Q16a	0,400	0,688	<0,001
Q16b	0,544	0,688	0,004
Q16c	0,688	0,813	0,008
Q16d	0,581	0,656	0,141





Table 19 - Mean, standard deviation of the two samples before and after the game, t-value and p-value for paired t-Test.

Questions	Before	After	t	p-value
	Mean (Std.Dv.)	Mean (Std.Dv.)		
Q4_A	2,36 (1,29)	2,74(1,44)	3,155	0,002
Q4_B	3,36(1,31)	3,86(1,29)	5,355	<0,001
Q4_C	4,60(0,95)	4,69(0,77)	1,122	0,264
Q4_D	3,14(1,32)	3,50(1,01)	3,214	0,002
Q4_E	3,88(1,28)	4,14(1,19)	2,228	0,027
Q9_A	2,69(1,08)	2,87(1,16)	1,776	0,078
Q9_B	3,81(1,08)	4,13(1,03)	3,311	0,001
Q9_C	4,01(1,23)	4,33(1,00)	2,682	0,008

In all 8 questions, the mean value increased after the 3D VWLE. In six of the eight questions, this increase was statistically significant (p-value <0.05; at bold)

Appreciation of the game

With regard to the game appreciation questions asked after 3D VWLE, the results are shown in the tables 20 to 26.

The answers to question Q17, "How satisfied are you with the 3D Virtual game?", are shown in Table 20.

Table 20: Answers to question Q17

How satisfied are you with the 3D VDLE?	n	Percent
Very dissatisfied	19	11,9
Dissatisfied	11	6,9
Neither dissatisfied or satisfied	18	11,3
Satisfied	58	36,3





Very satisfied	30	18,8
Missing	24	15,0
Total	160	100,0

The majority, 55,1%, are satisfied or very satisfied with 3D VWLE.

The answers to question Q18, “Has this game helped you to change your behaviors so that you are more environmentally friendly and live more sustainably?” are shown in Table 21.

Table 21: Answers to question Q18

Has this game helped you to change your behaviours so that you are more environmentally friendly and live more sustainably?	n	Percent
Yes	108	68,5
No	21	13,1
No answer	31	19,4
Total	160	100,0

The answers to question Q19, “Did this game help you understand the causes of today's environmental problems?” are shown in Table 22.

Table 22: Answers to question Q19

Did this game help you understand the causes of today's environmental problems?	n	Percent
Yes	114	71,3
No	22	13,7
No answer	24	15,0
Total	160	100,0

The answers to question Q20, “Did this game help you find solutions to challenges of today and the future?” are shown in Table 23.



Table 23: Answers to question Q20

Did this game help you find solutions to challenges of today and the future?	n	Percent
Yes	103	64,4
No	29	18,1
No answer	28	17,5
Total	160	100,0

The answers to question Q21, “Would you like to play this game again?” are shown in Table 24.

Table 24: Answers to question Q21

Would you like to play this game again?	n	Percent
Yes	86	53,8
No	46	28,7
No answer	28	17,5
Total	160	100,0

The answers to question Q22, “Would you recommend this game to your friends?” are shown in Table 25.

Table 25: Answers to question Q22

Would you recommend this game to your friends?	n	Percent
Yes	94	58,8
No	37	23,3
No answer	29	18,1
Total	160	100,0

3.4.2 Conclusion

The proportion or average of correct answers increased after the 3D VWLE game. Out of a total of 28 questions, 27 showed improved results. Of these 27 questions with improved results, 19 showed a statistically significant increase. The 3D VWLE raised students' environmental awareness, i.e. increased their knowledge, attitude and behavior regarding environmental preservation.



The majority of students, 55,1%, are satisfied or very satisfied with 3D VWLE. 68.5% of the students felt that the game helped them to change their behavior in order to be more environmentally friendly and live more sustainably. 71.3% of the students felt that the game helped them understand the causes of current environmental problems. More importantly, 64.4% of students felt that the game helped them find solutions to the challenges of today and the future. Given the many demands that young people have these days (with games, social networks, etc.) 53.8% of students would like to play the game again and 58.8% would recommend it to their friends.





4. Discussion and Conclusion about the Implementation Activities

This chapter of the report focuses on the implementation activities outlined in Project Result 3 of the RAISE project, detailing their execution and outcomes as per the project proposal. It encompasses an analysis of the implementation plan's execution, along with the results from phase one (alpha testing), phase two (beta testing) and phase three (final version). Data for this analysis was collected from participant responses via semi-structured interviews conducted during the alpha, beta and final version.

Overall, the execution and results of PR3 were successful, as the consortium achieved all of the proposed objectives. These objectives included the planned implementation activities (including Multiplier Events), the number of participants in RAISE 3D Virtual World Learning Environment, the number of responses to assessment questionnaires across all implementation phases, participation levels, average responses to pre- and post-piloting questionnaire items, overall satisfaction of participants, number of attendees from various interested parties during the multiplier events.

The RAISE team initially aimed to engage game experts for the alpha version, at least 100 students during the beta version and at least 400 users during all versions. RAISE project team achieved to overcome the initial goals by implementing the project to 25 students with the equipment of the "Software Quality and Human-Computer Interaction" Laboratory in addition to the game experts for the alpha version. For the beta version, RAISE project team implemented the project to 228 students in the partner school. Moreover, RAISE project team managed to be accepted at the Athens Science Festival, which is the largest science student event in Greece and showcased the beta version of the virtual world at least 35 participants resulting in overcoming the initial goal of at least 100 students. For the final version, RAISE project team had in total **238 students, 198 participants** from the Multiplier Events and **25 people from the SEED 2024** conference hosted in Valencia as end-users that tested the final version resulting in overachieving the initial goal of having 400 end-users to the final version of the virtual world. (Figure 25)





Figure 23: Best paper award for the publication titled "Development of a 3D virtual world tool for sustainable energy education"



Figure 24: Demonstration of RAISE final version virtual world at the Multiplier Event Hosted in Cremona

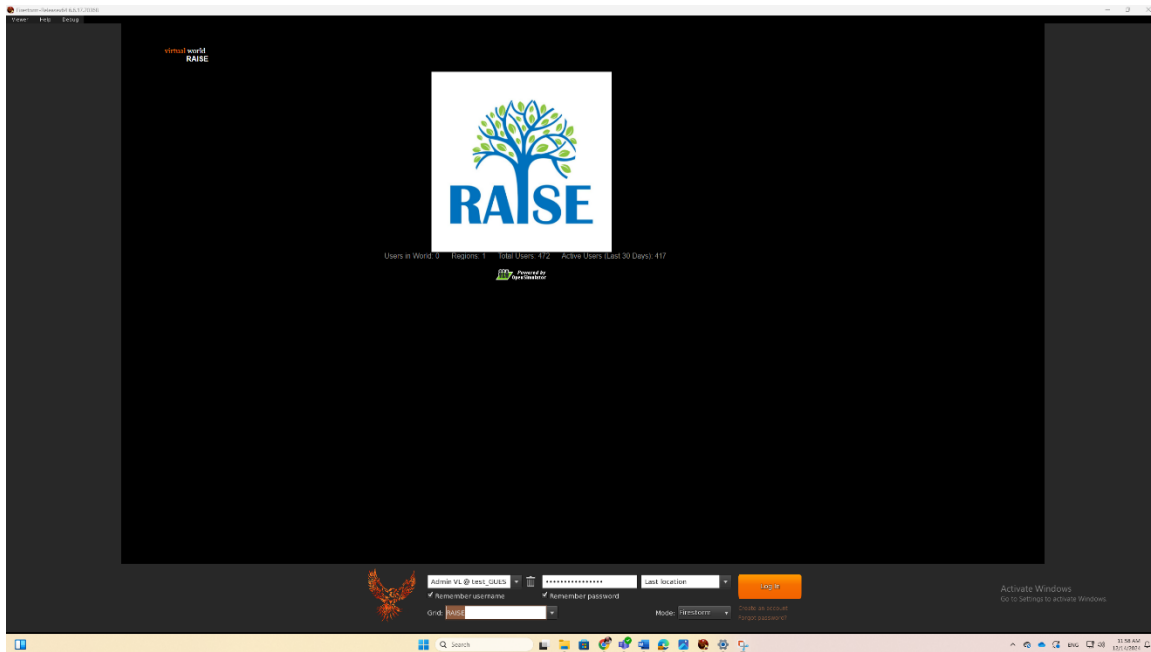


Figure 25: Statistics from Virtual World on 14 December 2024 showcasing the active users and the total users.



Figure 26: Clear screenshot of statistics of the platform on 14 December 2024.

It is essential to emphasise that throughout the entire implementation process, all partners demonstrated excellent teamwork and high levels of communication and cooperation. This collaboration was crucial in ensuring effective coordination between the software development/technical team and the teams responsible for executing activities with the students and counsellors. This task was particularly challenging as the implementation was executed in three different countries in parallel.



Despite these obstacles, the consistent teamwork and coordination were vital for the successful execution of the implementation activities. This close and ongoing collaboration resulted in continuous feedback between the implementation activities and 3DVW development. The development team consistently provided essential resources, including informational materials, video tutorials, and adjustments to the virtual world, significantly enhancing the success of the various implementation activities. All implementation activities were planned and executed with the active involvement of each partner, who contributed to every stage of the process. This includes decision-making, material production (such as questionnaires and manuals), dissemination, and the successful execution of piloting sessions (both alpha and beta phases). Additionally, partners were involved in data collection from the pilot and ME events and successfully hosted various multiplier events. This coordinated effort enabled adherence to the original plan for PR3. These events included a demonstration of the 3D Virtual World, allowing participants to engage with it using the preset equipment at the meeting venue.

The implementation phases and their associated activities, both the alpha and beta phases were executed without significant delays or setbacks. The primary challenge encountered was engaging more students to participate and complete the assessment questionnaires during the final phase piloting events. Despite these challenges, the consortium believes that all partners exceeded expectations to meet the primary objectives within PR3 and successfully collected crucial data for the development of the 3D Virtual World.

In addition to student participation, we faced challenges in motivating students to complete the questionnaires during the beta implementation phase. Despite the efforts of project partners to encourage responses, most participants completed the implementation without fully completing the questionnaires as it was not obligatory during the alpha and beta version implementation, thus becoming obligatory during the final phase of the implementation process. Although team members overseeing implementation activities in their respective countries noted the students' interest and positive feedback during the activities, only a small percentage provided answers to the questionnaires. This low response rate is common among gamers, who typically enjoy playing games but are less inclined to fill out related surveys. Nevertheless, the responses we did collect sufficient data to execute our statistical analysis during the beta implementation and assess if the students indeed had a learning gain after the interaction with the 3D Virtual World Learning Environment.





The data collected from the beta and final phase questionnaires, which reinforced the initial positive feedback from the alpha testing phase, demonstrated that RAISE 3DVW was perceived as a valid, interesting, useful and indeed helped the students to raise their environmental awareness. This conclusion was supported by feedback and the statistical analysis that was executed. Participants in the piloting found the RAISE 3DVW visually appealing, playful, and well-organised, suggesting the development team succeeded in creating a beautiful, secure, and comfortable digital environment for students to learn about challenging environmental problems. Students felt well-oriented in the game, appreciated the visual aesthetics of the virtual world, and enjoyed the sense of playfulness, which enhanced their interaction and immersion. This positive perception reinforced the usefulness of RAISE 3DVW as a tool to help students with environmental issues. However, some fewer positive aspects were also highlighted by students during the implementation activities. The development team made every effort to address these issues, which included improving the 3DVW audio and providing users with more freedom to move around and express themselves within the virtual world. Additionally, refinements and adjustments were made to the content and nature of the response's users could give within the in-game dialogues, based on critical feedback from the piloting sessions. The issues of freedom of movement and dialogue diversity were corrected and expanded in the final version of the 3DVW.

Our data also reveals that many students felt motivated by the virtual environment and scenarios. By interacting and playing in the 3DVW, they experienced feelings of success, achievement, and improvement as they progressed through the challenges designed by the project team, especially during the final version of the virtual world where we implemented a trophy room, where a user can see the trophies he earned for each scenario that he completed. This is a significant positive indicator for the development team and partners involved in creating the scenarios and gathering psychoeducational information. Students reported enjoying the characters and scenarios, finding them engaging and interesting as the gameplay unfolded. These results suggest that the characters and scenarios were relatable and relevant to the target users for whom the 3DVW was developed. On a less positive note, some students mentioned feeling bored at times while playing the game. We believe this was partly due to the limited number of scenarios available during the piloting phase. In response, efforts were made to increase and enhance the number of scenarios in the final version of the 3DVW. Additionally, the development team worked to create more diverse and engaging settings within the virtual world to improve its appeal and enjoyment for students.





The data also showed that students found it easy to learn how to navigate the 3DVW, understand the controls, and identify the game's objectives. They indicated that the game effectively explained what they needed to do to play successfully. However, a small number of students mentioned needing to frequently consult the manual, especially in the early stages, to understand what was required of them. They also noted that the manual was not as user-friendly as it could be. This issue, highlighted during alpha testing, became a focus for the RAISE development team. Consequently, the team worked on making in-game information more accessible and easier to use by incorporating instructional videos in the tutorial area of the final version of the 3DVW. This addition aimed to make it easier for students to access necessary information and get set up in the 3DVW, supplementing the previously available text-based guidance with video assistance. Moreover especially during the final version implementation where the guidance of the teachers involved during the implementation was much more focused and specified, students effectively navigated inside the virtual world environment. So, from our experience we concluded that a small and concise introduction to the basic functionalities and core of the virtual world facilitates to fill the learning gain and struggle in the beginning of the interaction of the students with the 3D Virtual World Learning Environment.





5. Multiplier Events

During the project's duration, four Multiplier Events took place. The purpose of the Multiplier Events was to promote the project's goals and actions, disseminate it, and show our results to our stakeholders, which are going to use our 3D virtual world.

5.1 1st Multiplier Event by UPatras in Patras, Greece

The first Multiplier Event of the project was organised by the UPatras partners and held in Patras, Greece on April 24th, 2023. The purpose of the event was to promote and disseminate the project to our stakeholders, and share with them our goals, and future actions. Through this event, we make sure we can maximise our impact as a project and promote our work to our stakeholders. 197 people attended the event in total, 6 of which were project partners, 4 from the Greek Erasmus national agency, while the rest were mainly stakeholders as students or educators. A full list of the participants of the event can be found in Annex 6.4.1.

5.2 2nd Multiplier Event by Arsakeio in Patras, Greece

The second Multiplier Event of the project was organised by the Arsakeio partners and held in Patras, Greece on October 16th, 2024. The purpose of the event was to promote and disseminate the project to our stakeholders, as well as present our final outcomes. Through this event, we make sure we can maximise our impact as a project and promote our work to our stakeholders. 71 people attended the event in total, 19 of which were project partners, while the rest were mainly stakeholders as students or educators. A full list of the participants of the event can be found in Annex 6.4.2.

5.3 3rd Multiplier Event by AEDAS in Porto, Portugal

The third Multiplier Event of the project was organized by the AEDAS partners and held in Porto, Portugal on October 30th, 2024. The purpose of the event was to promote and disseminate the project to our stakeholders, as well as present our final outcomes. Through this event, we make sure we can maximise our impact as a project and promote our work to our stakeholders. 65 people attended the event in total, some of which were project partners, while the rest were mainly educators, interested in implementing our virtual world in their classrooms. A full list of the participants of the event can be found in Annex 6.4.3.

5.4 4th Multiplier Event by Liceo Manin in Cremona, Italy

The fourth Multiplier Event of the project was organized by the MANIN partners and held in Cremona, Italy on December 2nd, 2024. The purpose of the event was to promote and





disseminate the project to our stakeholders, as well as present the final outcomes of the project so we can make sure we can maximise our impact. 62 people attended the event in total, including the MANIN project partners, media representatives, while the rest were mainly educators from nearby schools. A full list of the participants of the event can be found in Annex 6.4.4.





5.1 Annex 1: Pre-Post Questionnaire

Scenario: Wind Turbine Challenge (UPATRAS)

1. Wind turbine blades capture kinetic energy from the wind and turn it into mechanical energy, which is then converted into electricity. (choose the right answer)
☒ a) True
☐ b) False
☐ c) I don't Know
2. A wind turbine is a device that converts the wind's kinetic energy into electrical energy. They can be onshore (on land) or offshore (at sea). (choose the right answer)
☒ a) True
☐ b) False
☐ c) I don't Know
3. Horizontal axis turbines are best used in places with few obstacles where the wind is less turbulent and more constant. (choose the right answer)
☒ a) True
☐ b) False
☐ c) I don't Know
4. Which of the following is a disadvantage of wind energy? (choose the right answer)
☒ a) High initial investment cost
☐ b) Produces harmful emissions
☐ c) Requires constant sunlight
☐ d) Contributes to global warming
☐ e) I don't Know

Scenario: House Eco Explorer (UPATRAS)

5. LED bulbs use less electricity than traditional incandescent bulbs, about: (choose the right answer)
☒ a) 25%
☐ b) 50%





- c) 75%
- d) I don't Know

6. From the list below, choose the environmentally friendly items: (multiple choice)

- a) Reusable water bottles
- b) Cloth shopping bags
- c) Incandescent light bulbs
- d) Solar panels
- e) Products made from endangered species
- f) Rain barrels for collecting rainwater
- g) Chemical pesticides or fertilizers
- h) I don't Know

Scenario: Water treasure (AEDAS)

7. The water footprint measures is: (choose the right answer)

- a) the amount of water used to produce each of the goods and services we use
- b) the mark of your foot when it's raining a lot
- c) the amount of water used only for foot manufacturing
- d) the amount of water used only for food production
- e) I don't Know

8. Used tires can be used in: (multiple choice)

- a) asphalt for roads
- b) paving for playgrounds
- c) food containers
- d) I don't know

9. Used cooking oil can be used for: (multiple choice)

- a) Soaps
- b) Biodiesel
- c) fish food
- d) I don't know

10. Attitudes – Rate the following items according to the 5-point Likert scale:

(1) Strongly disagree; (2) Disagree; (3) Neither agree nor disagree; (4) Agree; (5) Strongly agree)

- a) In kitchen I defrost food in the refrigerator





- b) I wash the vegetables and fruits in a basin and reuse the water to water the plants
- c) I close the faucet when I am not using the water
- d) I keep the tap running while I am brushing my teeth
- e) I opt for a shower instead of an immersion bath

Scenario: Green Championship (AEDAS)

11. From the following items, hazardous waste is: (choose one answer)

- a) An empty wine bottle
- b) A fluorescent light bulbs**
- c) A glass cup
- d) I don't know

12. Toxic substances must be buried and contribute to soil formation (choose one answer)

- a) True
- b) False
- c) I don't Know

13. Smartphones, printers should be placed in the yellow (plastic container). (choose one answer)

- a) True
- b) False**
- c) I don't Know

Scenario: Carbon Champions – carbon footprint (Arsakeio Lyceum)

14. Why does too much carbon dioxide in the atmosphere cause climate change? (choose one answer)

- a) It cools down our planet.
- b) It traps heat and warms up our planet.**
- c) It lets sunlight escape.
- d) I don't Know





15. What is the name used to describe the total set of carbon emissions (or greenhouse gases) caused by an individual? (choose one answer)
- a) Carbon cycle
 - b) Carbon handprint
 - c) Carbon footprint**
 - d) I don't Know
16. What is the main human activity that adds to an individual's carbon footprint? (choose the right answer)
- a) Usage of fossil fuels for energy**
 - b) Usage of alternative energies (solar, wind, etc)
 - c) Photosynthesis by plants
 - d) I don't Know
17. What snack has lower carbon footprint? (choose one answer)
- a) Bacon and eggs
 - b) Chocolate croissant
 - c) Locally produced fresh fruit**
 - d) I don't Know

Scenario: A factory that pollutes (Arsakeio Lyceum)

18. Recycling an aluminum can uses what percentage of the energy used to create it? (choose one answer)
- a) 5%**
 - b) 20%
 - c) 50%
 - d) I don't Know
19. According to NASA, how much is the sea level expected to rise by the year 2050? (choose one answer)
- a) More than 100 centimetres
 - b) Less than 10 centimetres





c) 25 to 30 centimetres

d) I don't Know

20. Rate the following items according to the 5-point Likert scale
(Likert scale: (1) Strongly disagree; (2) Disagree; (3) Neither agree nor disagree; (4) Agree; (5) Strongly agree)

- a) Money is more important than environment.
- b) Factories must work with exclusively eco-friendly partners.
- c) Industries must be held responsible for their toxic emissions that affect biodiversity

Scenario: (various) Manin

21. Evergreens (choose the Right answer)

a) help clean the air by removing toxins and other pollution.

b) lose their foliage completely during the winter or dry season.

c) providing more carbon dioxide than oxygen

d) I don't Know

22. Planting a row of evergreens on the north side of your building can substantially reduce your heating bill: (choose the right answer)

a) True

b) False

c) I don't Know

23. An example of a conifer is: (choose the right answer)

a) Orange tree

b) Pine tree

c) I don't know

24. Electric buses (trolley bus): (choose the right answer)

a) are highly efficient and have lower operating costs than diesel buses

b) have higher operating costs than diesel buses

c) increase noise pollution

d) I don't Know





25. Rainwater can be stored in cisterns and used directly: (choose the right answer)
- a) in toilets, watering gardens and for washing cars
 - b) in household water supply network
 - c) to drink
 - d) I don't Know
26. Which components make up a photovoltaic solar panel installation: (choose the right answer)
- a) battery cell and inverter
 - b) wind blade
 - c) water container
 - d) I don't Know
27. For the following sentences choose the right answer
- a) In biogas plants there is a fermentation process in which waste is digested by microbes to produce methane gas in the presence of oxygen.
- a. True
 - b. False
 - c. I don't Know
- b) Biogas: it is a gaseous renewable energy source produced from raw materials such as agricultural waste.
- a. True
 - b. False
 - c. I don't Know
- c) Honey has anti-bacterial, anti-inflammatory, and probiotic properties.
- a. True
 - b. False
 - c. I don't Know
- d) If stored correctly, honey never goes off.
- a. True
 - b. False
 - c. I don't Know





Scenario: Exploring waste treatment technologies (UMAIA)

28. What is the main benefit of recycling glass? (choose the right answer)

- a) Reducing water consumption
- b) **Saving energy and raw materials**
- c) Producing cleaner air
- d) Supporting local businesses
- e) I don't Know

29. Which of the following items can be made from recycled plastic bottles? Choose the right answer)

- a) **Polar sweatshirts and fleece jackets**
- b) Fertilizer for the plants
- c) Glass bottles
- d) I don't Know

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- a) We cannot add cups, glasses, mirrors to packaging glass for recycling because the melting temperature is different, and the glass produced is not homogeneous.
a. True
 - b. False
 - c. I don't Know
- b) Composting is a process to decompose the organic matter like yard waste, food waste, cardboard, agricultural residues and other organic material, using microorganisms.
a. True
 - b. False
 - c. I don't Know
- c) Ecosystems provide irreplaceable benefits or services for humans and the other species that share planet Earth with us.
a. True
 - b. False
 - c. I don't Know
- d) The forest fires can be aggravated by the type of trees and the low diversity of species.





- a. True
- b. False
- c. I don't Know

After 3D VWLE:

31 How satisfied are you with the 3D Virtual game?

(Likert scale: (1) Very dissatisfied;; (2) Dissatisfied; (3) neither dissatisfied or satisfied; (4) Satisfied; (5) very satisfied)



5.2 Annex 2: Teachers Certificates for Beta version Implementation





CERTIFICATE

Completion of the Beta Version Implementation

This certificate is awarded to the following participant:

Nikolaos Giannakopoulos

for conducting the piloting of the Beta Version of the virtual world titled:

"Beta Version Implementation of the RAISE Project" - 2022-1-EL01-KA220-SCH-000088295,
in which 38 children aged 10-15 participated. The piloting lasted 12 hours and took place on (20
& 21 & 23 & 24 & 27 & 28-05-2024) at Patras-Arsakeia school.



Michael Xenos

Michael Xenos
SCIENTIFIC RESPONSIBLE OF
RAISE PROJECT

Nikolaos Giannakopoulos
SCIENTIFIC RESPONSIBLE
PARTNER OF PROJECT RAISE











CERTIFICATE

Completion of the Beta Version Implementation

This certificate is awarded to the following participant:

Paola Bergamaschi

for conducting the piloting of the Beta Version of the virtual world titled:

"Beta Version Implementation of the RAISE Project" - 2022-1-EL01-KA220-SCH-000088295,
in which 24 children aged 10-15 participated. The piloting lasted 5 hours and took place on (12 &
15 & 22 & 26 -04-2024) at Cremona-Manin school.



Michael Xenos

Michael Xenos
SCIENTIFIC RESPONSIBLE OF
RAISE PROJECT

Paola Bergamaschi

Paola Bergamaschi
SCIENTIFIC RESPONSIBLE
PARTNER OF PROJECT RAISE



19/23

Posta - Giuzzi Emilio Valentino (emilio.giuzzi) - Outlook

CERTIFICATE

Completion of the Beta Version Implementation

This certificate is awarded to the following participant:

Emilio Giuzzi

for conducting the piloting of the Beta Version of the virtual world titled:

"Beta Version Implementation of the RAISE Project" - 2022-1-EL01-KA220-SCH-000088295,
in which 38 children aged 10-15 participated. The piloting lasted 8 hours and took place on (03-
04-2024 and 3 & 8 & 20 & 22 & 24-05-2024) at Cremona-Manin school.



Michael Xenos

Michael Xenos
SCIENTIFIC RESPONSIBLE OF
RAISE PROJECT

Emilio Giuzzi

Emilio Giuzzi
SCIENTIFIC RESPONSIBLE
PARTNER OF PROJECT RAISE





CERTIFICATE

Completion of the Beta Version Implementation

This certificate is awarded to the following participant:

Simone Manfredini

for conducting the piloting of the Beta Version of the virtual world titled:
"Beta Version Implementation of the RAISE Project" - 2022-1-EL01-KA220-SCH-000088295,
in which 18 children aged 10-15 participated. The piloting lasted 4 hours and took place on (16 &
22 & 29-05-2024) at Cremona-Manin school.

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Michael Xenos
SCIENTIFIC RESPONSIBLE OF
RAISE PROJECT



RAISE

Simone Manfredini

Simone Manfredini
SCIENTIFIC RESPONSIBLE
PARTNER OF PROJECT RAISE















5.3 Annex 3: School Accounts

The list includes all the usernames that were register in the beta version in the 3D virtual world learning environment:

Admin VL

aed 001

aed 002

aed 003

aed 004

aed 005

aed 006

aed 007

aed 008

aed 009

aed 010

aed 011

aed 012

aed 013

aed 014

aed 015

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aed 099

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Andreas Giannak

Angelos Fotopoulos

ars 001

ars 002

ars 003

ars 004

ars 005

ars 006

ars 007

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Cristina Soutinho

Dade Cremona

Dimitris Pap

Dimosthenis Minas

egg ndim

Emi Cremona

FARIA rodrigo

Female Avatar

FemTest FemTest

Francesco Macca







mnn 003

mnn 004

mnn 005

mnn 006

mnn 007

mnn 008

mnn 009

mnn 010

mnn 011

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mn0 099

mn0 100

mumina 0

Nigui Cody

Nikos Giannakopoulos

patricio garrido

RAISE VL

Roberto Carvalho

Rodrigo Sousa

Sr Gabw

Terra Madre

Test Account

Test Account3

Test Dimos

Test Dimos1

Test Dimos2

Test Test

Test user_1

Test user_14

Test user_15

Test user_19

Test user_2

Test user_20

Test user_22





Test User_3

Test user_30

Test user_4

Test user_5

Test user_6

Test user_7

Test user_8

Test user_9

Test Wear

Test_test user_10

To Necas

Tomas Pinto

Tomas Silva

Tone Bits





6.4 Annex 4: Multiplier Event participants' lists

6.4.1 UPatras Multiplier Event





Διημερίδα έργου

RAISE: Raising environmental knowledge & Awareness through an Innovative virtual Environment



Εστία Επιστημών, Αρσάκεια Σχολεία Πατρών, Πάτρα 24-25 Απριλίου 2023
Συνδιοργάνωση Πανεπιστήμιο Πατρών και Αρσάκεια

Λίστα συμμετεχόντων

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RAISE: Raising environmental knowledge & Awareness through an Innovative virtual Environment

2022-1-EL01-KA220-SCH-000088295





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6.4.2 Arsakeio Multiplier Event

MULTIPLIER EVENT					
A/A	ΕΠΩΝΥΜΟ	ΟΝΟΜΑ	ΟΡΓΑΝΙΣΜΟΣ / ΕΠΙΧΕΙΡΗΣΗ	E-MAIL	Υπογραφή
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A/A	ΕΠΩΝΥΜΟ	ΟΝΟΜΑ	ΟΡΓΑΝΙΣΜΟΣ / ΕΠΙΧΕΙΡΗΣΗ	E-MAIL	Υπογραφή
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39	Γιοτσοπούλου	ΔΗΜΗΤΡΑ			
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MULTIPLIER EVENT

A/A	ΕΠΩΝΥΜΟ	ΟΝΟΜΑ	ΟΡΓΑΝΙΣΜΟΣ / ΕΠΙΧΕΙΡΗΣΗ	E-MAIL	Υπογραφή
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6.4.3 AEDAS Multiplier Event



RAISE: Raising environmental knowledge & Awareness through an Innovative virtual Environment



AEDAS Multiplier Event, 30 October 2024

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6.4.4 MANIN Multiplier Event

2022-1-EL01-KA220-SCH-000088295									
Multiplier Event - Università Cattolica - Sede di Cremona									
Meeting Date & Time: 02/12/2024, 17:00-21:00									
Place: Università Cattolica del S. Cuore - Sede di Cremona									
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Multiplier Event - Università Cattolica - Sede di Cremona									
Meeting Date & Time: 02/12/2024, 17:00-21:00									
Place: Università Cattolica del S. Cuore - Sede di Cremona									
no.	First Name	Last Name	Organisation	Country	Arrival time	Departure time	e-mail	Signature	
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2022-1-EL01-KA220-SCH-000088295

Meeting Date & Time: 02/12/2024, 17:00-21:00
Place: Università Cattolica del S. Cuore - Sede di Cremona

UNIVERSITY OF PATRAS
LICEO "MANIN"
RAISE

no.	First Name	Last Name	Organisation	Country	Arrival time	Departure time	e-mail	Signature
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3	GIUSTI	PIERINA	ROTARY CR	ITALIA	17:00	20:00	giusti.pierina@rotary.it	
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5	FABIO	FIRATUCO	RC PIACENZA	ITALIA	17:00	20:00	fabio2554@gmail.com	
6	BERGAMUSCH	MITA	RC PIACENZA	ITALIA	17:00	20:00	mita.bergamusch@gmail.com	
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10	GIUSEPPE	CHIMINI	IAC LONGARINI	ITALIA	17:00	20:00	giuseppe.chimini@gmail.com	
11	GIULIO PIETRO	SEITZ GAGLIARDI	VNMI	ITALIA	17:00	20:00	giulio.pietroseitz@gmail.com	
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13								
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LICEO "MANIN"
RAISE





6.5 Annex 5: List of Participants from RAISE workshop 10 April 2024



Workshop




Erasmus+

Διημερίδα Erasmus Arsakeio

List of educators and professional stakeholders expressing interest to promote the 3D virtual world to their students and trainees

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6	Vasiliki	Varsou	ΓΥΜΝ. ΚΑΤΟΧΗΣ ΑΙΤΩΝΙΑΣ	varsou@yahoo.com	
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15	N. Krikos	PRKIS	ΕΠΙΣΤΗΜΟΝΙΚΟ ΠΑΡΑΡΤΗΜΑ	nkrikis@sch.gr	
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20					

10/4/2024



6.6 Annex 6: List of Participants at Athens Science Festival that interacted with the Virtual World

Athens Science Festival 22/04/2024

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5	Vasilakis	Georgopoulos	BRFAA	v2040000@phionet.gr	
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8	Nikolaos	Andriakou	Παιδί	fig-fermale@kntudil.com	
9	Marina	Γοργας	Γοργας		
10	Kyriak	Kamakar	Γοργας		
11	Aspasia	Λυγερή	Γοργας	sterioti.de@gmail.com	
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17	Evelina	Καλαμά	Γοργας		
18	Artemis	Ευαγγελίου	Γοργας	artrikos@sch.gr	
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20	Marina	Παυλίδης	Ευρωπαϊκός	m.pezoula@gmail.com	
21	Thomas	Χαβιαρίδης	Ευρωπαϊκός	t.chaviaridis@gmail.com	
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26	Nikolaos	Λυγερή	ΕΚΠΑ	GLYRAS@GMAIL.COM	
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Ι Δ Ρ Υ Μ Α
Κ Ρ Α Τ Ι Κ Ω Ν
Υ Π Ο Τ Ρ Ο Φ Ι Ω Ν

IKY

2022-1-EL01-KA220-SCH-000088295

RAISE Athens Science Festival 22/04/2024

[illegible]



6.7 Annex 7: List of Participants at Arsakeio Erasmus Event (not in workshop)

10-11/04/2024. RAISE. (OWN CONTRIBUTION DISSEMINATION)

α.α.	ΕΠΩΝΥΜΟ	ΟΝΟΜΑ	ΙΔΙΟΤΗΤΑ	ΣΧΟΛΕΙΟ	EMAIL	ΤΗΛΕΦΩΝΟ	ΥΠΟΓΡΑΦΗ
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28	ΔΗΜΗΤΡΟΠΟΥΛΟΥ	ΑΝΔΡΙΑΝΑ		Δ.ΣΧ.ΣΤΑΥΡΟΔΡΟΜΙΟΥ	andriana.dimitropoyloy@gmail.com	6977046981	
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32	ΕΥΜΟΡΦΟΠΟΥΛΟΥ	ΔΑΝΑΗ		Ε.Ε.Ε.ΕΚ ΑΙΓΙΟΥ	eudani85@gmail.com	6947605753	
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58	ΛΙΑΚΟΠΟΥΛΟΥ	ΦΩΤΕΙΝΗ	ΝΗΠΙΑΓΩΓΕΙΟ ΝΕΟΧΩΡΙΟΥ ΚΥΛΛΗΝΗΣ	liakopoulou@gmail.com	6945393339	
59	ΜΑΜΑΣΟΥΛΑΣ	ΒΑΣΙΛΕΙΟΣ	Ε.Ε.Ε.ΕΚ ΑΙΓΙΟΥ	bilimamas030883@gmail.com	6948123555	
60	ΜΑΜΩΝΑ	ΧΑΡΙΚΛΕΙΑ	2ο ΔΗΜΟΤΙΚΟ ΣΧΟΛΕΙΟ ΑΚΡΑΤΑΣ	mamoxara@gmail.com	6993194800	
61	Μαντά	Αγγελική	Αρσακείο Δημοτικό Σχολείο Πατρών	Aggeliki3d@gmail.com		
62	ΜΑΝΤΖΑΝΙΔΟΥ	ΓΑΡΥΦΑΛΛΙΑ	ΝΗΠΙΑΓΩΓΕΙΟ ΔΡΕΠΑΝΟΥ	faiyдеми@gmail.com	6945445716	
63	ΜΑΡΑΣ	ΝΕΚΤΑΡΙΟΣ	2ο ΗΜΕΡΗΣΙΟ ΕΠΑΛ ΠΑΤΡΑΣ	nectariosmaras@gmail.com	6979079454	
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66	ΜΕΝΤΣΕΛΟΠΟΥΛΟΣ	ΑΘΑΝΑΣΙΟΣ	2ο ΔΗΜΟΤΙΚΟ ΣΧΟΛΕΙΟ ΑΙΓΙΟΥ	thanosmen@gmail.com	6944202609	
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71	ΜΠΙΛΛΗ	ANNA	ΔΗΜΟΤΙΚΟ ΣΧΟΛΕΙΟ ΚΑΜΙΝΙΩΝ ΠΑΤΡΑΣ	bilaliann@gmail.com	6974027655	
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