

TRANSNATIONAL REPORT OF THE PILOTS IMPLEMENTATION IN SCHOOLS



CLIMATOPIA



Co-funded by
the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein

CONTENTS

Report of the pilot application in Greece	18
Report of the pilot application in LATVIA	45
Report of the pilot application in AUSTRIA	57
Report of the pilot application in SPAIN	63
Pilots results descriptive qualitative analysis and conclusions	68
Methodology	68
Descriptive Analysis	69
Limitations	70
Conslusions	72
References	73
Annex	75

REPORT OF THE PILOT APPLICATION IN GREECE

Introduction and usage of Climatopia project materials

The European Union has supported innovative educational efforts to bring awareness of climate change to K-12 students in the hope of slowing or preventing the devastation of our world environment due to irresponsible use of fossil fuels. In Greece, as in the other project partner countries, Result 1, "Climatopia: Theoretical and Psychological Framework," discusses how both content and learning activities can encourage pupils to actively engage with the subject of climate change and consider possible solutions.

For Results 2 and 3, three novel educational materials about climate change were introduced to four grades in three schools during a two-year period. The materials include:

1. Result 2: Comic Book
2. Result 2: Self-Training Handbook
3. Result 3: Decision-making Game

The Comic Book (Result 2) narrates the journey of three school age children on the planet Climatopia as they are guided by "the four elements of the planet": Earth, Air, Water, and Fire. These four beings transport the children to a poor village, a wealthy villa, an old warehouse-turned classroom, and a high-tech school, with clear inequities between the two communities, the two schools, and their approaches to protecting the environment. Next, they all visit a farm owned by the uncle of one of the children, where flooding caused by climate change has damaged crops. The next stop is a return to their own community, where they witness the mayor addressing a skeptical group of climate change deniers who doubt that forest fires can threaten their town. Then, they travel to a meeting of the heads of state of the Union of Middle Continent Countries, where the children grow frustrated as the delegates debate the costs and benefits of engaging in environmentally-conscious policies. Next, they travel into the future to a summit of world leaders, met first by protesters that decry the hunger and lack of drinking water in Climatopia that have resulted from a disregard of sustainable practices. The world leaders also debate "in two opposing camps," one camp arguing for zero carbon dioxide emissions and the other arguing that fossil fuels are needed for economic development. The children recognize that the leaders "blame each other instead of working together." The comic book closes with the children encouraging the

reader to recognize the climate change is real but that there are solutions by respecting science and nature and reducing energy needs.

The Self-Training Handbook (Result 2) for teachers included three chapters:

1. Chapter 1: Basic scientific concepts related to climate change (to help prepare the teachers to communicate critical concepts to their students)
2. Chapter 2: Instruction on how to continue the comic (to use comic creation as an interactive tool to further engage students on this subject)
3. Chapter 3: Open Educational Resources for comics creation (to provide free, robust materials for use by students)

The Decision-making Game (Result 3) provides an independent and very interactive means for learners to engage with authentic decision-making with respect to climate change policies that could affect the future of the Climatopia planet. Students can navigate through the game and select different options with respect to climate-related behaviors, which will open up a new set of decisions that can ultimately result in an ideal or a devastated Climatopia. It was designed to be played at multiple levels (basic, medium, advanced).

In addition, all students participating in the project were encouraged to create their own comics to continue the story of Climatopia.

Methodology

As the Decision-making Game was not completed in time for the first year of the study in any country, it was implemented only in Year 2. Therefore, some schools in Greece introduced the materials over two years but one school introduced all materials in the second year. Table 1 summarizes actual implementation of the three types of educational materials across the target schools in Greece over the two years of the project.

Table 1
Implementation of Climatopia Project in Greece: Three Schools

School in Greece	Year	Pupils	Result 1: Comic Book	Result 2: Self-Training Handbook	Result 3: Decision-making Game	N Pre-test	N Post-test
Agia Marina Primary School Nea Makri (Sch-AA)	Year 1 2nd grade	Sch-AA Grp 1	pilot	pilot	n/a	37	
	Year 2 3rd grade	Sch-AA Grp 1	n/a	n/a	pilot		37
Primary School of Kilkis 3rd grade (Sch-3K)	Year 1 3rd grade	Sch-3K Grp 1	pilot	pilot	n/a	12	12
Primary School of Kilkis 6th grade (Sch-6K)	Year 1 5th & 6th grades	Sch-6K Grp 1	pilot	pilot	n/a	21	37
	Year 2 5th & 6th grades	Sch-6K Grp 2	pilot	pilot	pilot	72	68
	Combined Year 1 and Year 2	Sch-6K Grps 1 & 2	pilot	pilot	pilot	93	105
Third Laboratory Center of E. Attica (Vocational Technical School, VET) (EPALRAF)	Year 2 2nd grade of VET (upper secondary)	EPALRAF Grp 1	pilot	pilot	pilot	17	17

Most but not all of the participants completed the pre- and post-test. Some may have not due to absence or because their parents did not sign the required permission form.

The pilot teachers were self-trained with the materials produced for Result 1, Result 2.1 (Comic Book), and Result 2.2 (Self-Training Handbook).

The materials were piloted with students at three different school levels. Two schools piloted the materials with students in lower elementary grades (Agia Marina Primary School in Nea Makri, 2nd and 3rd grade; Primary School of Kilkis, 3rd grade). One school piloted the materials with students in an upper elementary grade (6th Primary School of Kilkis, 5th & 6th grades). Finally, one school piloted the materials with students in the last few years of high school (Third Laboratory Center of E. Attica, 2nd grade of a vocational Tech School (upper secondary). A pre- and post-test were administered in Greek to students from the three schools:

1. Agia Marina Primary School in Nea Makri: 37 2nd and 3rd grade students. They received the Comic Book and the teachers received the Self-Training Handbook in Year 1 of the study and the same students received the Decision-Making Game in Year 2 of the study. They completed the pre-test in Year 1 and the post-test in year 2.
2. Primary school of Kilgis: 12 3rd grade students in Year 1. They received the Comic Book and the teachers received the Self-training Handbook materials in Year 1 of the study. Due to the movement of teachers at the end of the school year, these students did not participate during Year 2 of the study.
3. Primary school of Kilgis: 105 combined 5th & 6th grade students in Year 2. Group 1 of combined 5th and 6th graders had received the Comic Book in Year of the study, and their teachers received the Self-training Handbook the same year. Group 2 of combined 5th & 6th grade students received the Decision-making Game in Year 2. Each group completed pre- and post-tests and the results were combined.
4. Third Laboratory Center of E. Attica (Vocational Technical School, VET): 17 2nd year upper secondary students received the Comic Book and the Decision-Making Game and their teachers received the Self-Training Handbook in Year 2 (when they were 16-17 year olds). They completed pre- and post-tests in that year.

Each teacher wrote an individualized report on the administration of the project at their own school. These are included as Annexes A, B, and C.

Pre-test and Post-test

The pilot teachers the pre-test to their students, and then introduced the learning materials. After this, the pilot teachers administered the post-test to their own students.

Results

Presentation of results includes an analysis by school, grade, and question, as well as a combined analysis of all schools on several multiple choice questions.

Analysis by School and Grade

A comparison of pre-test with post-test results was compiled for each of the schools as well as for the two levels in the Primary School of Kilgis (3rd grade and 6th grade), for four sets of data. As two different 6th grade groups (Groups 1 and 2) completed the treatment in different years at the Primary School of Kilgis, the results for those groups are combined. Individual students were not identified while taking these tests, and therefore results are reported in the aggregate. These results are

presented in ascending order of grade level. The results presented in chart as well as graphic form is included as Appendix E.

Second > third graders (one group over two years): Agia Marina Primary School

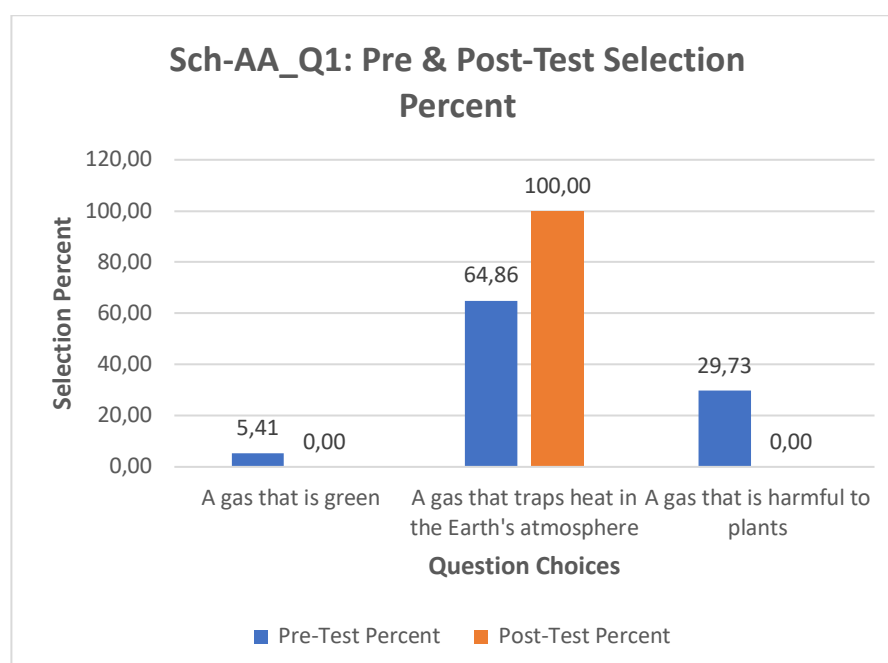
At Agia Marina Primary School, the pre-test was administered to 37 2nd graders, before they were introduced to the Comic Book. They completed training with the Decision-making Game the next year as 3rd graders and then took the post-test.

Question 1 (multiple choice): What is a greenhouse gas?

Almost 2/3 answered the multiple choice question “What is a greenhouse gas?” (64.86%) correctly during the pre-test by selecting “A gas that traps heat in the earth’s atmosphere”, meaning a combined 35.14% did not. However, all students answered correctly on the post-test. Results are shared in percentages in Figure 1.

Figure 1

*Agia Marina Primary School, 2nd & 3rd graders,
“What is a greenhouse gas?”*

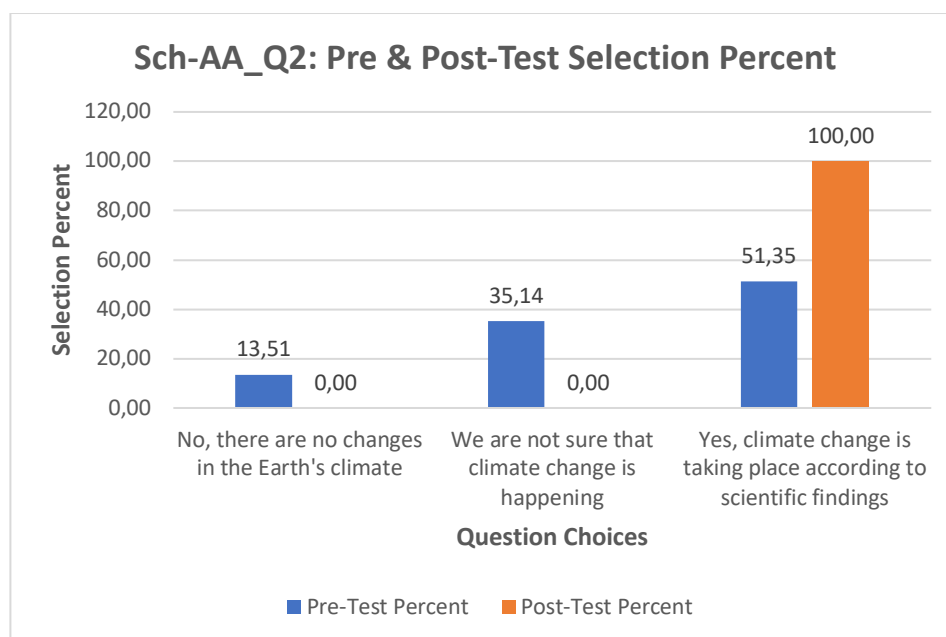


Question 2 (multiple choice): Is climate change real?

The second question also reveals the effect of the treatment. In the pre-test, just over half of the students (51.35%) believed climate change is real, while in the post-test, 100% believed it, as can be seen in Figure 2.

Figure 2

Agia Marina Primary School, 2nd & 3rd graders, "Is climate change real?"



The difference between pre-test and post-test is statistically significant ($\chi^2 = 23.786$, $p < .001$). This is the only school and grade for which there was a significant difference between pre- and post-tests on this question.

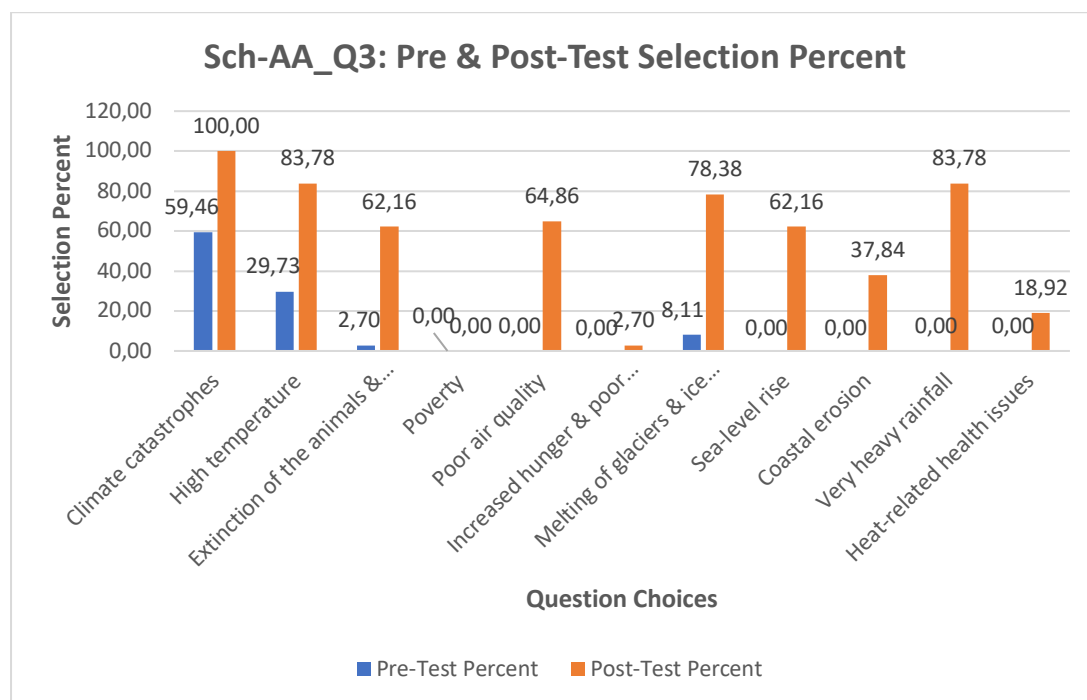
Question 3 (multiple option): What are the negative effects of climate change?

Question 3 allows for 11 different answer options for the question “What are the negative effects of climate change?”, all of which are correct. The option “All of the above” was not chosen by any student at this school for either the pre-test or the post-test. As can be seen in Figure 3, students selected only four answer options on the pre-test, including “Climate catastrophes”, “High temperature”, “Extinction of the animals and plants”, and “Melting of glaciers and ice sheets”. All of these relate to the environment.

In the post-test, ten of the selections were chosen, all except for “Poverty”. The most popular choice in the pre-test, “Climate catastrophes” at 59.46%, rose to 100% in the post-test, and the second most popular choice in the pre-test, “High temperature” at 29.73%, rose to 83.78% in the post-test. Other choices on the post-test ranged from a low of 2.70% (Increased hunger and poor nutrition) to a high of 83.78%, “Very heavy rainfall”. The effects related to people were those least often chosen on the post-test (“poverty” 0%; “Increased hunger and poor nutrition” 2.70%).

Figure 3

Agia Marina Primary School, 2nd & 3rd graders, “What are the negative effects of climate change?”



Question 4

Question 4 was an open-ended question asking students what they believed caused CO₂ emissions. At all the schools, the results ranged widely—they mention mainly transportation, cooling and heating, and consumption of energy for devices). The results are not further analyzed in this report.

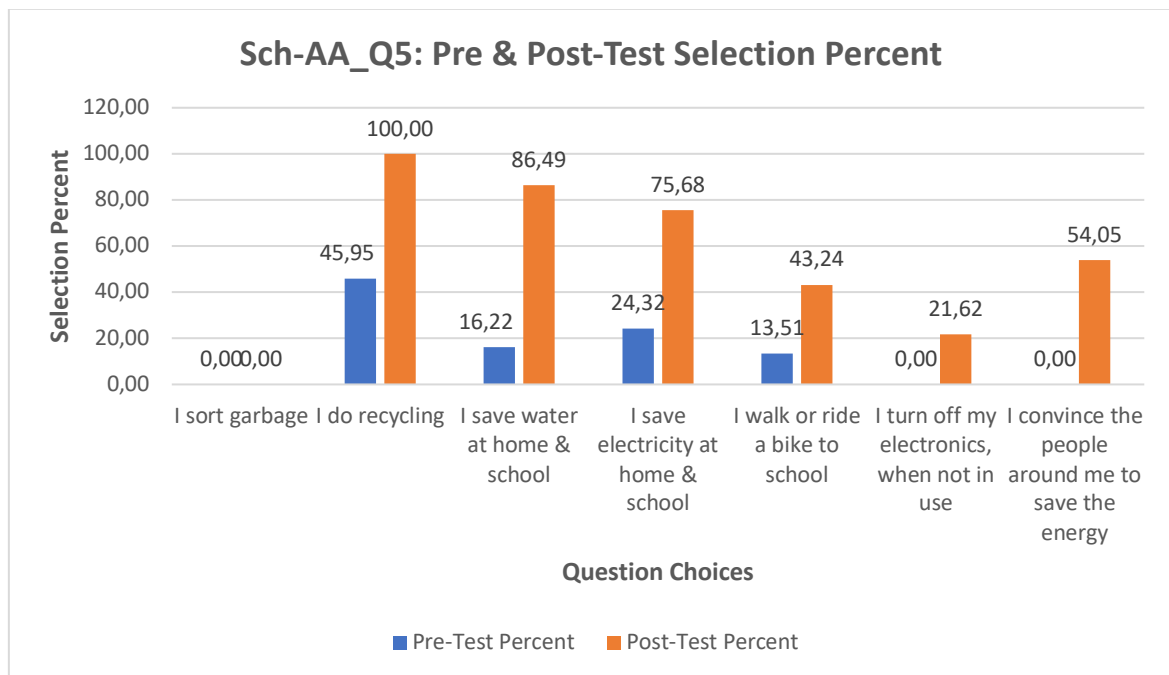
Question 5 (multiple option): What do you do to prevent climate change?

The fifth question involved seven answer options that encouraged students to consider what they did personally to combat climate change. As can be seen in Figure 4, four options were selected in the pre-test, the

highest being “I do recycling” at 45.95%. No student selected “I convince people around me to save the energy” in the pre-test. In contrast, six options were chosen in the post-test, with 100% of the students selecting “I do recycling”, 86.49% selecting “I save water at home and school”, and 54.05% selecting “I convince the people around me to save the energy”.

Figure 4

Agia Marina Primary School, 2nd & 3rd graders, “What do you do to prevent climate change?”



3rd graders: Primary School of Kilkis

At the Primary School of Kilkis, the pre-test and post-test were administered to 12 3rd graders, all in the same year. The students experienced the Comic Book and the teachers worked through the Handbook, but as the Decision-making Game was not ready this group took the post-test without the experience of the game. Their teacher/s were transferred the next year so training did not continue.

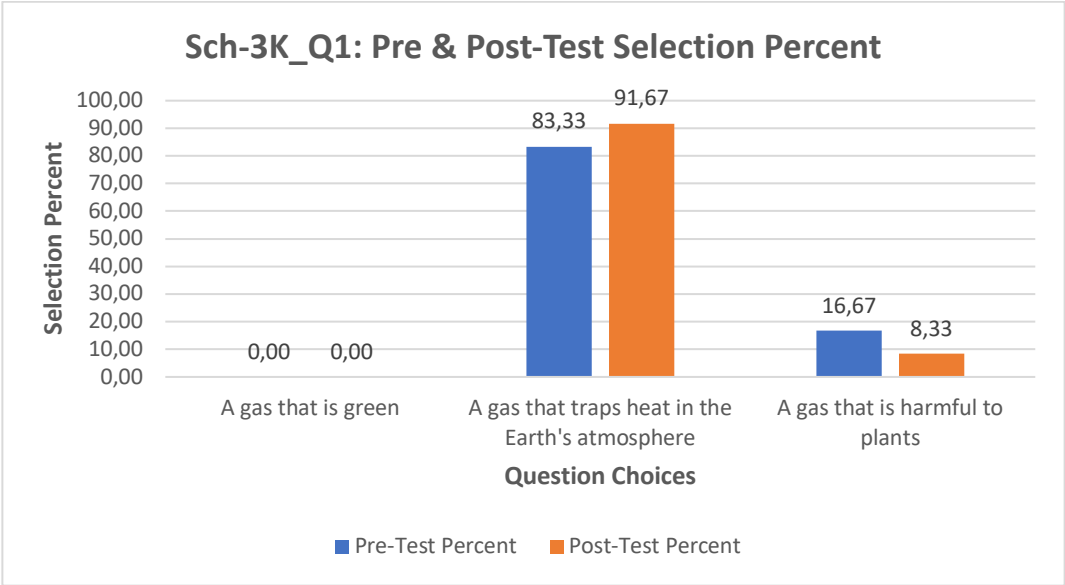
Question 1 (multiple choice): What is a greenhouse gas?

Just over 83% of the 3rd graders from the Primary School of Kilkis correctly identified the meaning of “greenhouse gas” in the pre-test as “A gas that traps heat in the Earth’s atmosphere” (83.33%), and improved in the post-test to 91.67% (see Figure 5). They also decreased by half their choice of

the incorrect answer option “A gas that is harmful to plants”, from 16.67% to 8.33%.

Figure 5

Primary School of Kilgis 3rd graders: “What is a greenhouse gas?”

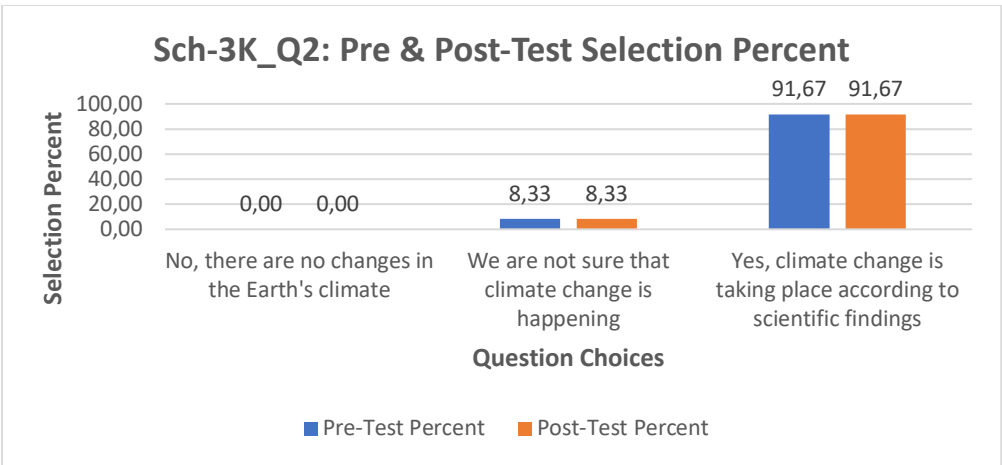


Question 2 (multiple choice): Is climate change real?

The Primary School of Kilgis 3rd graders did not change their responses as a group to the 2nd question, “Is climate change real?”: in both pre-test and post-test, 91.67% indicated “Yes, climate change is taking place according to scientific findings”, while just 8.33% indicated “We are not sure...” The results are summarized in Figure 6.

Figure 6

Primary School of Kilgis 3rd graders: “Is climate change real?”



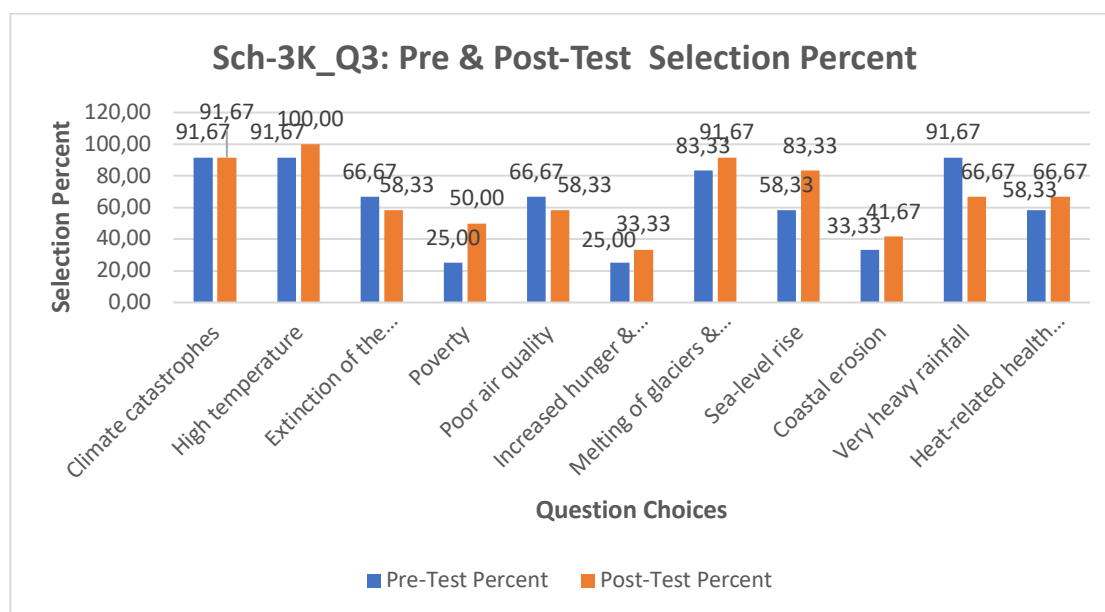
Question 3 (multiple option): What are the negative effects of climate change?

For the question “What are the negative effects of climate change?”, all options were chosen on both the pre-test and post-test. However, the percentages differ. The most frequently chosen options on the pre-test were “Climate catastrophes”, “High temperature”, and “Very heavy rainfall” at 91.67%. The least chosen options on the pre-test related to people: “Poverty” and “Increased hunger and poor nutrition”, both at 25%.

The most frequently chosen options on the post-test were “High temperature” at 100%, “Climate catastrophes” at 91.67%, and “Melting of glaciers and ice sheets”, also at 91.67%. The options related to people, which were lowest on the pre-test, rose to 50% (“Poverty”) and 33.33% (“Increased hunger and poor nutrition”) on the post-test. Results are summarized in Figure 7. The option “All of the above”, which was chosen only on the post-test, was re-coded as a selection of each of the other options.

Figure 7

Primary School of Kilkis 3rd graders: “What are the negative effects of climate change?”



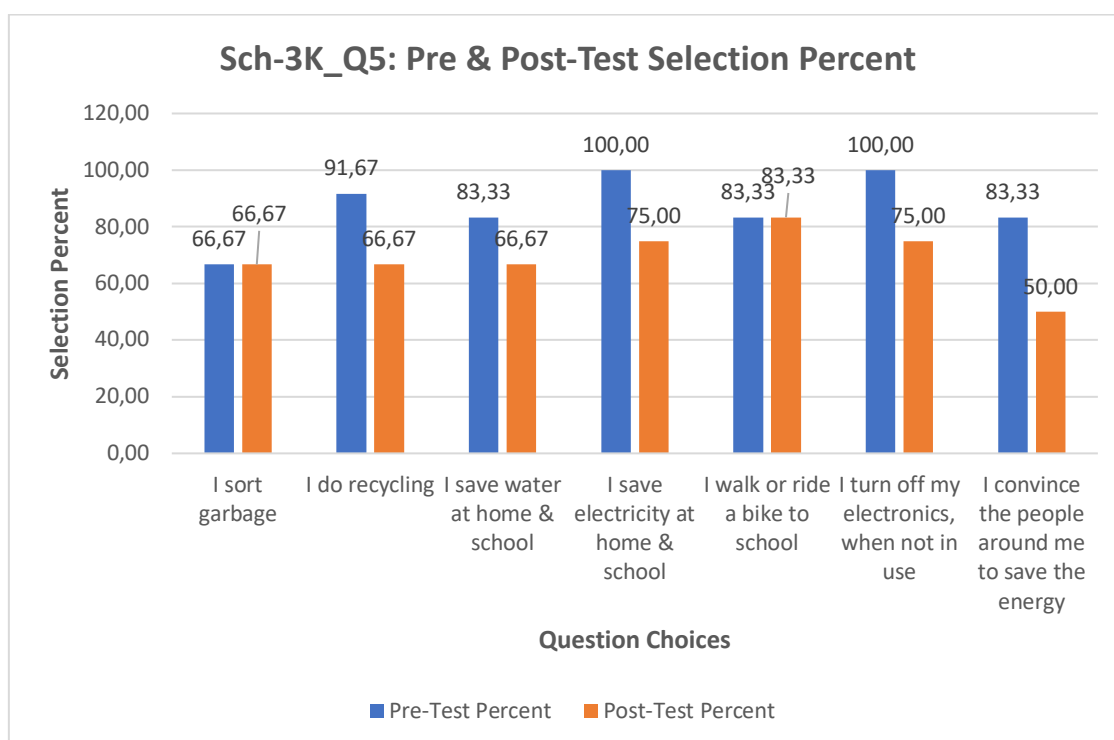
Question 5 (multiple option). What do you do to prevent climate change?

Question 5, like Question 3, is a multiple option question where students could choose as many options as they wished, answering the question “What do you do to prevent climate change” . Results are summarized in Figure 8. Pre-test scores ranged from 66.67% to a high of 100% (“I save electricity at home and school”) for behaviors the students self-reported.

At the time of the post-test, responses were equal or lower than pre-test results for each of the options, ranging from a low of 50% (“I convince people around me to save the energy”) to a high of 83.33% (I walk or ride a bike to school”). It is not clear why some of these results would go in an unintended direction, namely, students self-reporting less personal action to prevent climate change than previously.

Figure 8

Primary School of Kilkis 3rd graders: “What do you do to prevent climate change ?”



6th Graders: Primary School of Kilkis

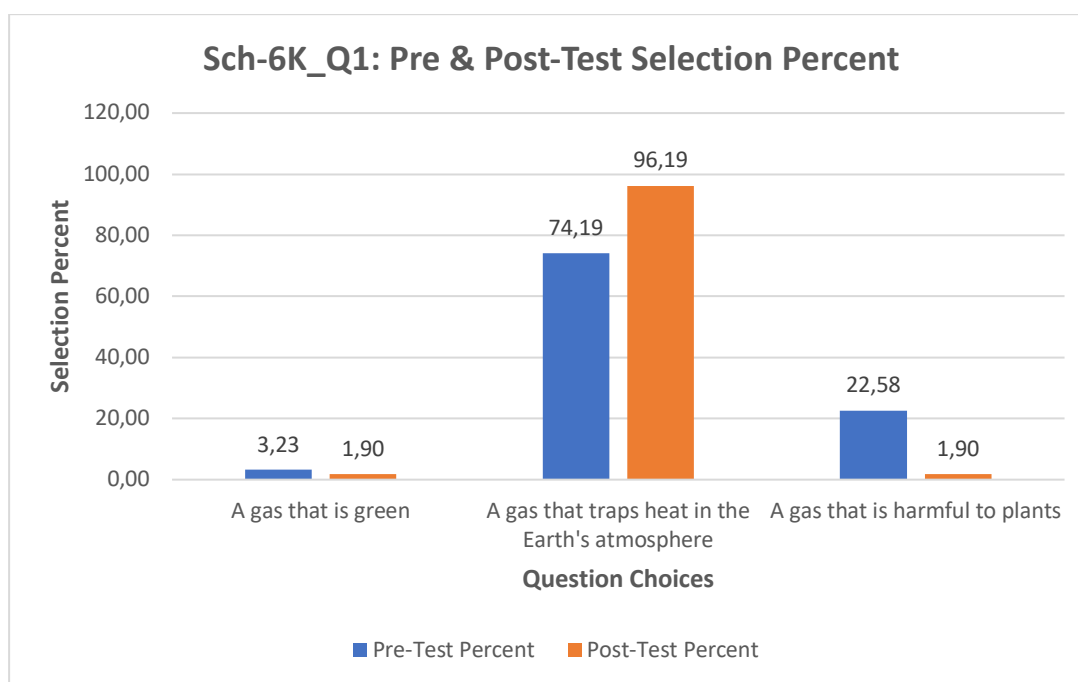
There were two groups of 5th and 6th graders at the Primary School of Kilkis over two consecutive years, each of which completed the pre-test and post-test. Only the second group participated in the Decision-making Game, as it was not completed at the time the first group was participating. The pre-test and post-test results of the two groups have been combined into a single analysis, with 93 completing the pre-test and 105 completing the post-test.

Question 1 (multiple choice): What is a greenhouse gas?

Just over 74% of the 6th graders correctly answered the question “What is a greenhouse gas?” on the pre-test by selecting the answer “A gas that traps heat in the Earth’s atmosphere” (74.19%). However, 22.58% still got the answer wrong (see Figure 9), selecting “A gas that is harmful to plants”. The percentage of correct responses rose to 96.19% on the post-test, indicating that even these older elementary school students benefited from the training.

Figure 9

Primary School of Kilkis 6th graders: “What is a greenhouse gas?”

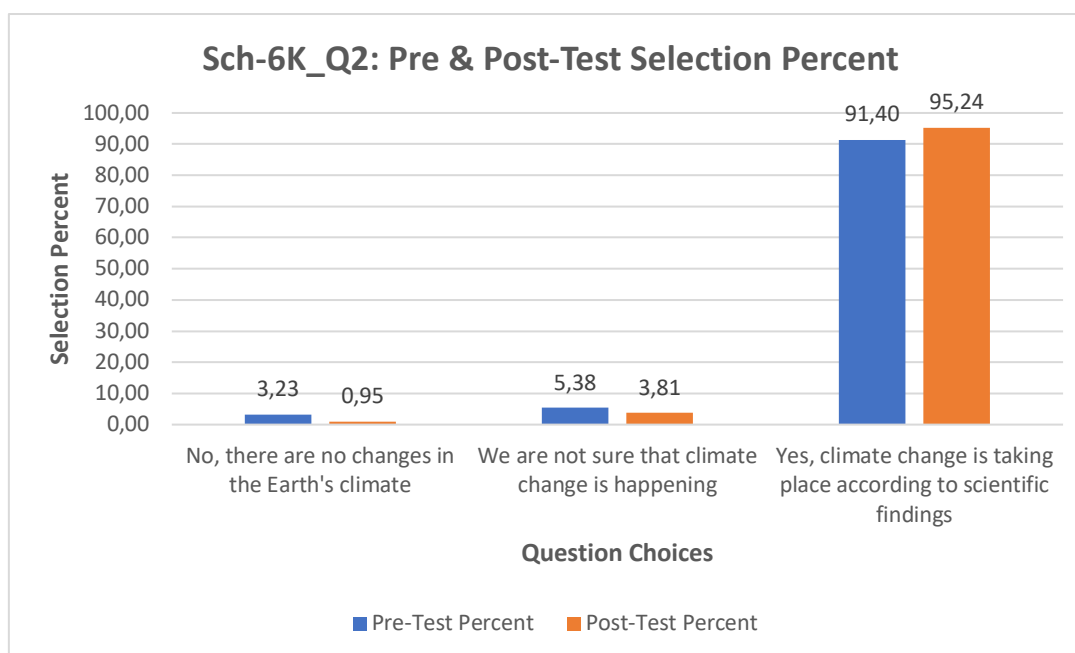


Question 2 (multiple choice): Is climate change real?

Again, as might be expected with this older elementary school group, a majority (91.40%) answered the question “Is climate change real?” correctly before the activities. This increased to 95.24% after the activities (see Figure 10).

Figure 10

Primary School of Kilkis 6th graders: “Is climate change real?”



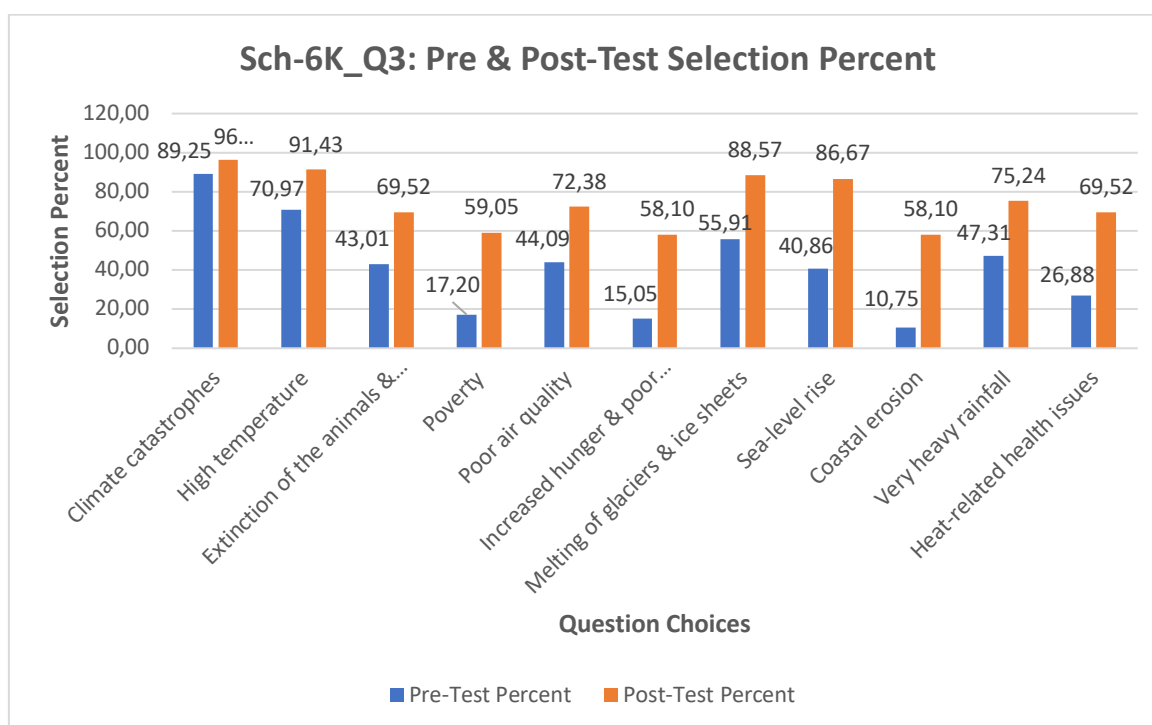
Question 3 (multiple option): What are the negative effects of climate change?

In response to the question “What are the negative effects of climate change?”, the 5th and 6th graders selected each option on both the pre-and post-test. The most frequently occurring option on the pre-test was “Climate catastrophes” at 89.25%, with the second most frequent option being “High temperatures” at 70.97%. The lowest options related to people: 17.20% selected “Poverty” and 15.05% selected “Increased hunger and poor nutrition”.

On the post-test, the highest options remained the same, with “Climate catastrophes” rising to 96.19% and “High temperature” rising to 91.43%. Options relating to people rose greatly, with “Poverty” now scoring 59.05% and “Increased hunger and poor nutrition” now scoring 58.10%. The option “All of the above”, which was chosen only on the post-test, was re-coded as a selection of each of the other options.

Figure 11

Primary School of Kilkis 6th graders: "What are the negative effects of climate change?"



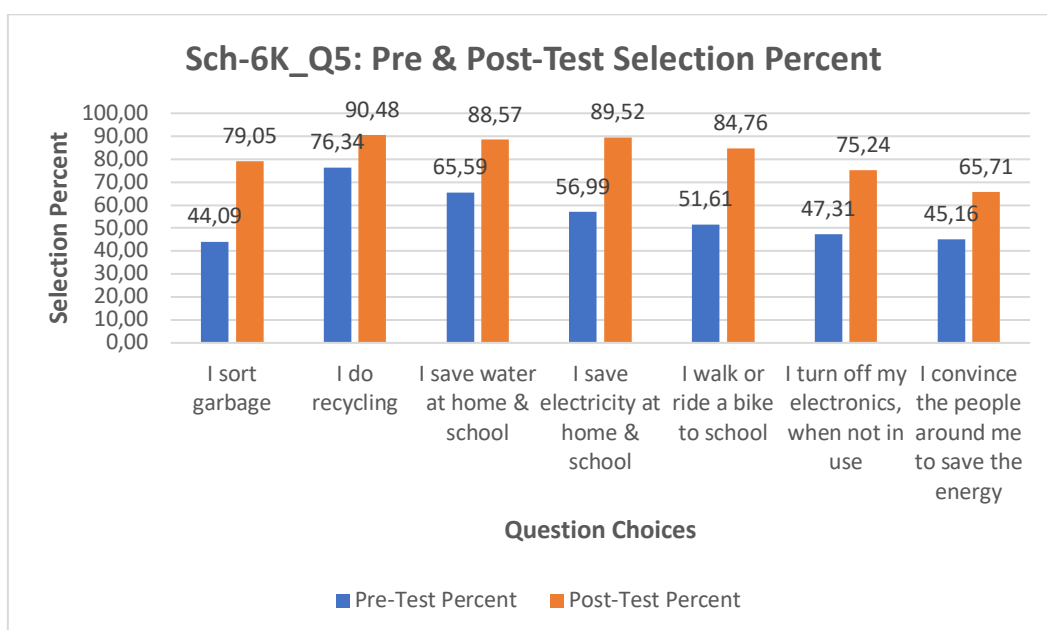
Question 5 (multiple option): What do you do to prevent climate change?

At the time of the pre-test, the 6th graders already seemed to be engaged in helping prevent climate change. They selected every option on the question "What do you do to prevent climate change", with the highest response rate to the option "I do recycling" (76.34%) followed by "I save water at home and school" (65.59%).

On the post-test, the frequency of each response rose. The highest response rate was still for "I do recycling", now having risen to 90.48%, while "I save water at home and school" rose to 88.57%. The lowest response was 'I convince the people around me to save the energy', which still rose to 65.71% on the post-test from a pre-test score of 45.16%.

Figure 12

Primary School of Kilkis 6th graders: "What do you do to prevent climate change?"



Upper Secondary Students: Third Laboratory Center of E. Attica

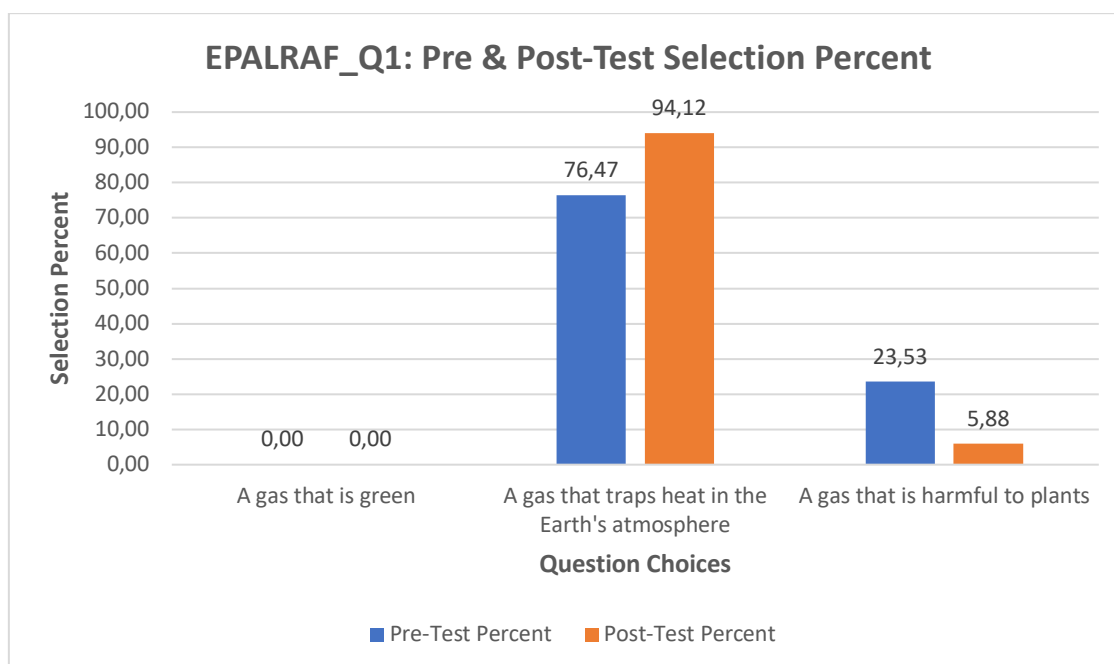
Seventeen upper secondary students from the Third Laboratory Center of E. Attica completed all activities in year 2 of the program along with their teacher.

Question 1 (multiple choice): What is a greenhouse gas?

Results of the upper secondary students were similar to those of the 6th graders for the question “What is a greenhouse gas?”. A large majority (76.47%) were correct on the pre-test, while 94.12% were correct on the post-test, choosing “A gas that traps heat in the Earth’s atmosphere”. The other answer chosen was “A gas that is harmful to plants”, with 23.53% choosing this on the pre-test and 5.88% choosing this on the post-test (See Figure 13).

Figure 13

Third Laboratory Center of E. Attica upper secondary students: “What is a greenhouse gas?”

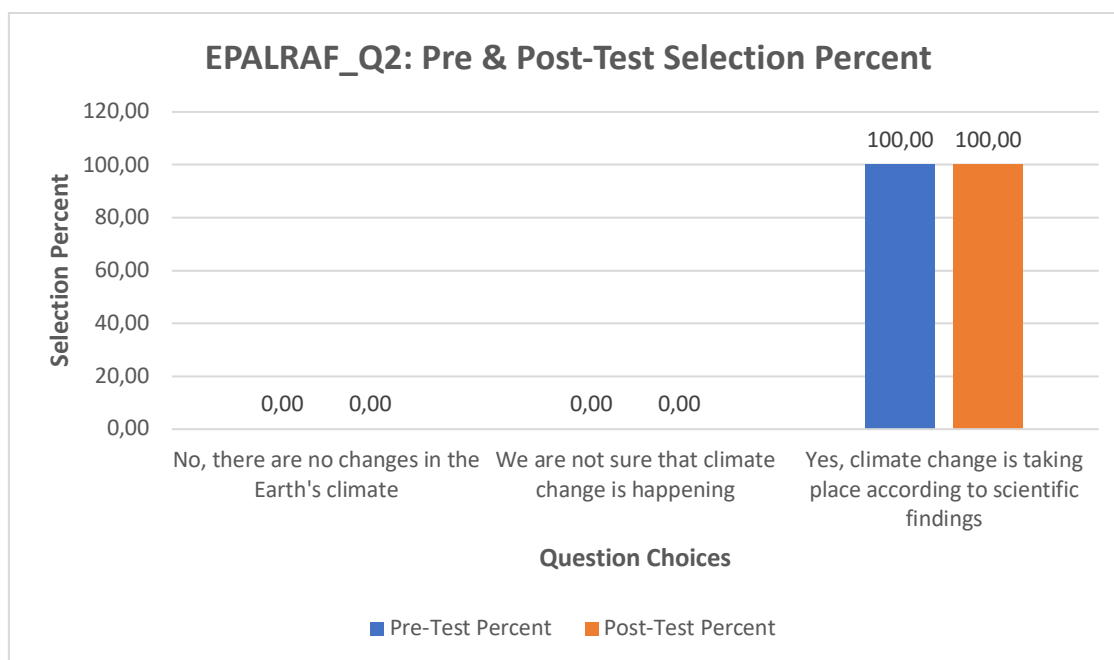


Question 2 (multiple choice): Is climate change real?

The upper secondary students responded to the question “Is climate change real?” identically in both pre- and post-test, each time unanimously selecting the answer “Yes, climate change is taking place according to scientific findings” (see Figure 14).

Figure 14

Third Laboratory Center of E. Attica upper secondary students: “Is climate change real?”

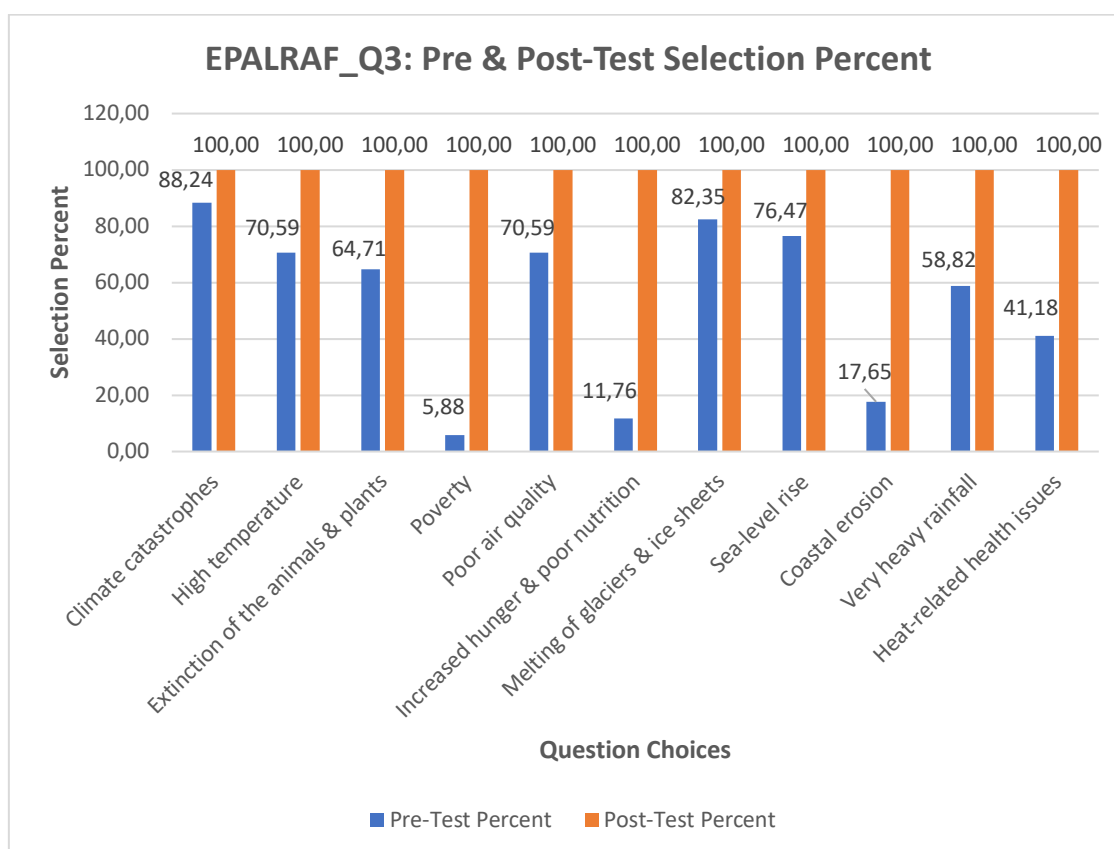


Question 3 (multiple option): What are the negative effects of climate change?

Of 11 options on negative effects of climate change, the upper secondary students selected all of them on the pre-test. The most frequently selected option was “Climate catastrophes” at 88.24%. The least frequently selected options related to people, with the lowest being “Poverty” (5.88%) and “Increased hunger and poor nutrition (11.76%). In contrast, on the post-test, every specific option was selected by every student, so each option scored 100% (see Figure 15). The option “All of the above”, which was chosen only on the post-test, was re-coded as a selection of each of the other options.

Figure 15

Third Laboratory Center of E. Attica upper secondary students: “What are the negative effects of climate change?”

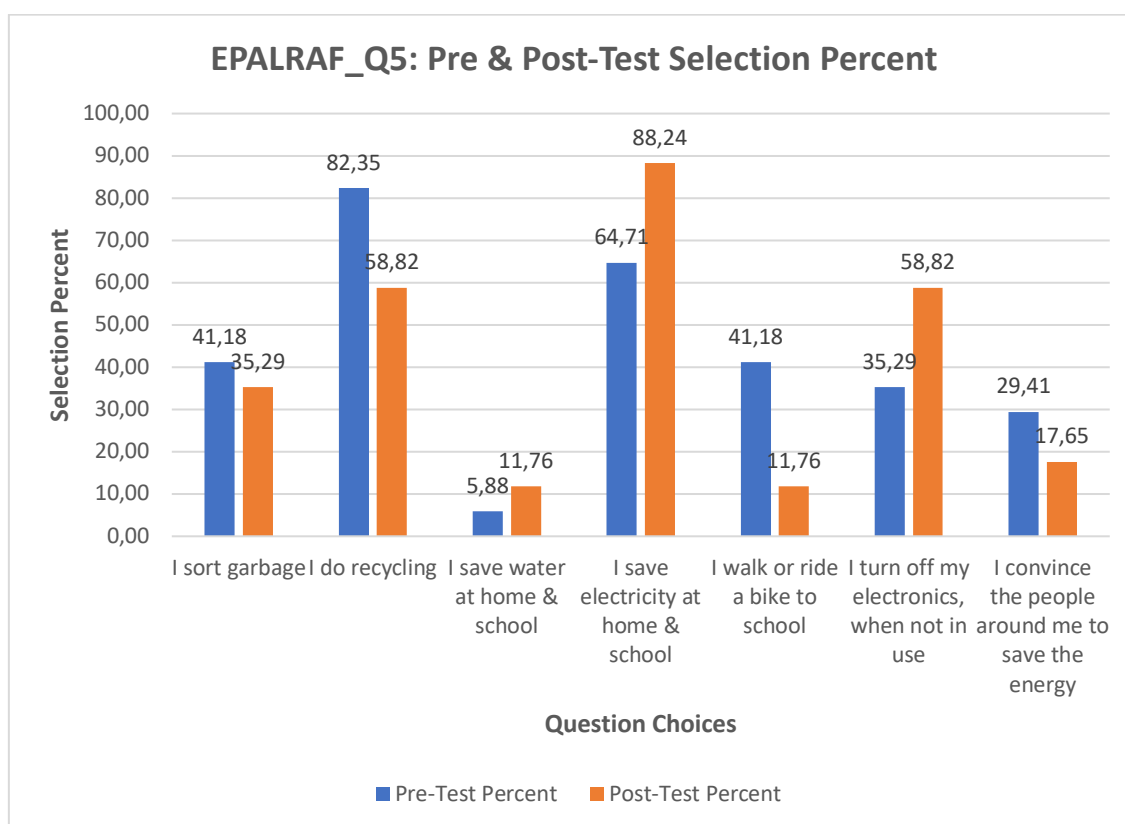


Question 5 (multiple option): What do you do to prevent climate change?

Each of the answer options for “What do you do to prevent climate change” was selected by the upper secondary students on both the pre-test and post-test. On the pre-test, the most common selection was “I do recycling” (82.35%) while the least common was “I save water at home and school” (5.88%). On the post-test, the most frequently occurring option was “I save electricity at home and school” (88.24%) while the least frequently occurring options were “I save water at home and school” and “I walk or ride a bike to school” (both at 11.76%). Surprisingly, several of the options fell in value from the pre-test to the post-test, in particular “I do recycling”, which dropped from 82.35% to 58.82% (see Figure 16).

Figure 16

Third Laboratory Center of E. Attica upper secondary students: "What do you do to prevent climate change?"



Cross-school Analysis

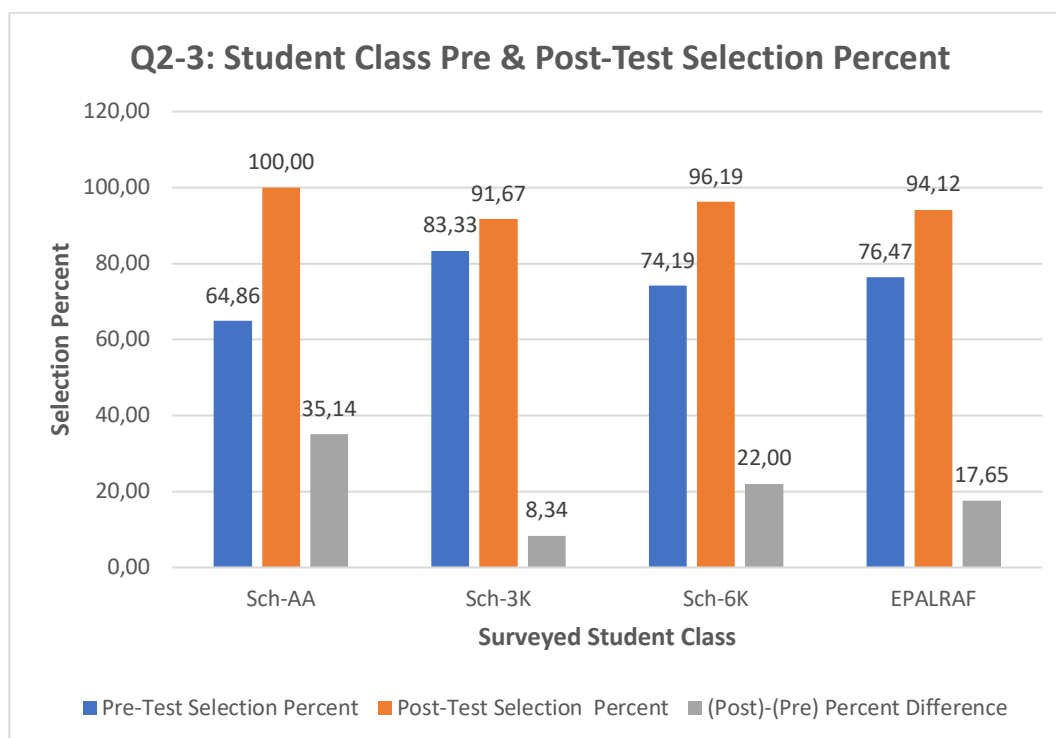
The two multiple choice questions and one of the multiple option questions were reanalyzed by combining data from all the schools together.

Question 1 (multiple choice): What is a Greenhouse Gas?

The combined answers to the question "What is a greenhouse gas?" reveal that the youngest students (2nd graders from Agia Marina [Sch-AA]) made the most progress as a result of the treatment. There was an increase of 35.14% correct answers for this group (see Figure 17). Interestingly, this was the only group that scored 100% on the correct answer to this question (A gas that traps heat in the earth's atmosphere) in the post-test.

Figure 17

All Schools: What is a Greenhouse Gas? (correct answer only)

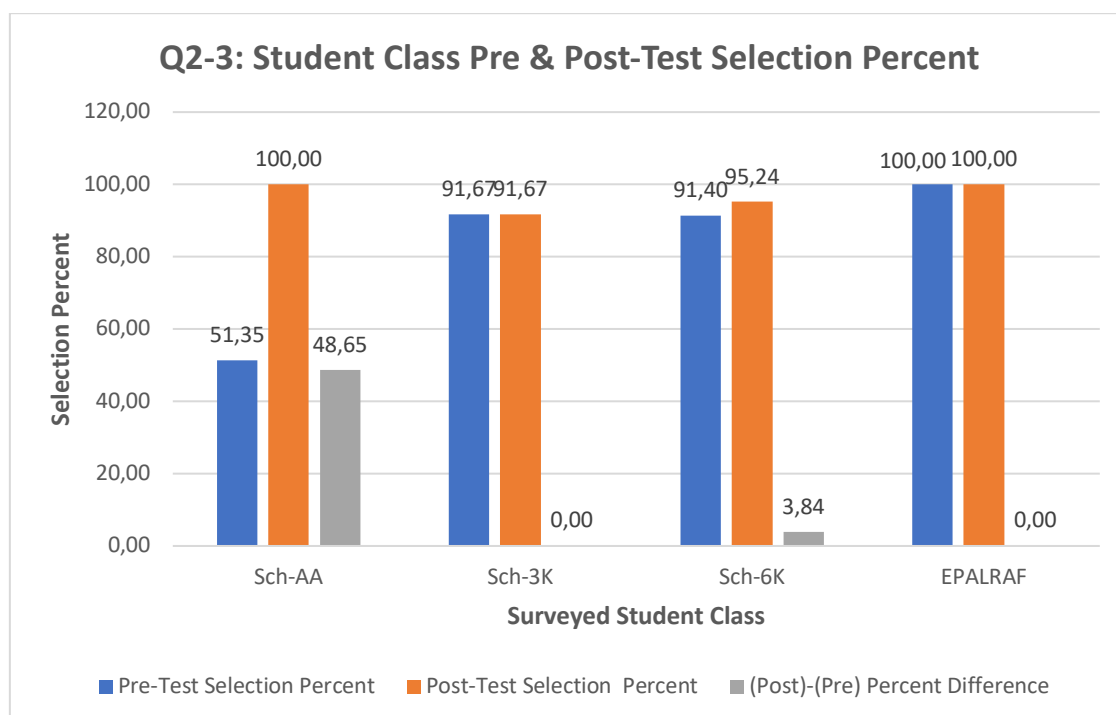


Question 2 (multiple choice): Is climate change real?

The second multiple choice question also revealed that the youngest students demonstrated the biggest increase in correct answers to the question “Is climate change real?” between the pre- and post-tests. Initially, only 51.35% of the 2nd graders selected the correct answer “Yes, climate change is taking place according to scientific findings” in the pre-test, while 100% selected the correct answer in the post-test, for an increase of 48.65%. The results are displayed in Figure 18.

Figure 18

All Schools: Is climate change real? (correct answer only)

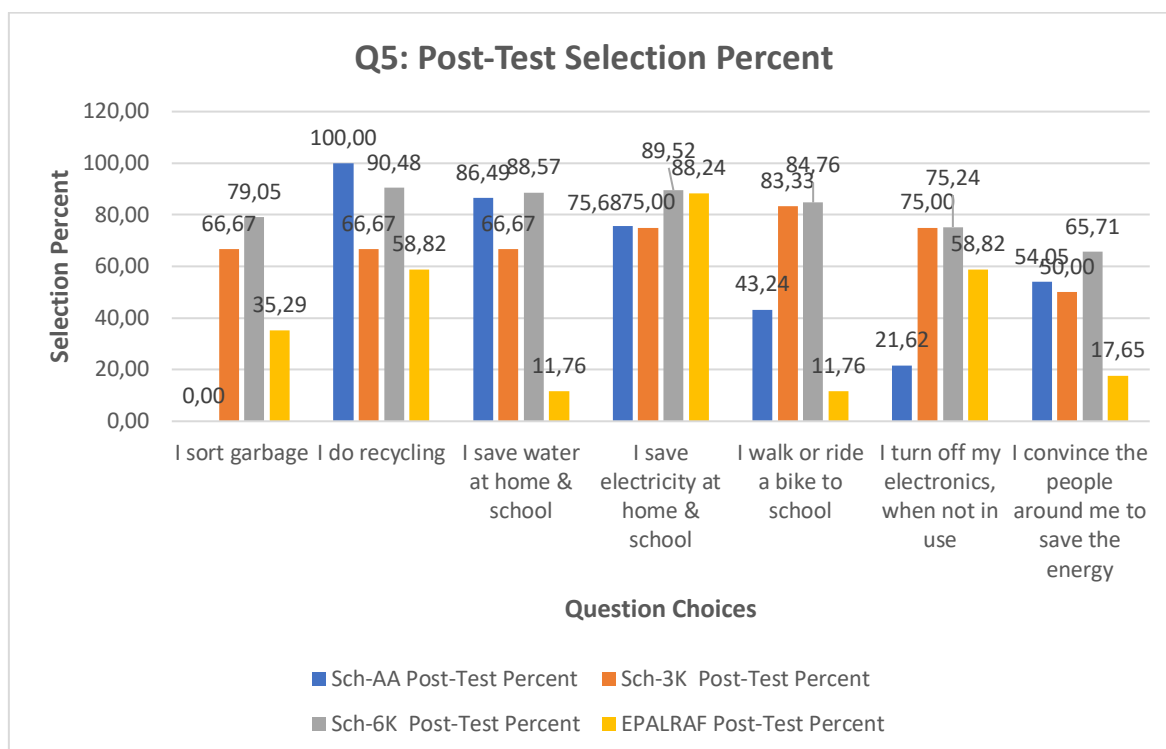


Question 5 (multiple option). What do you do to prevent climate change?

For the question “What do you do to prevent climate change?”, the responses to each of the seven answer options on the post-test from each school grade were compared (see Figure 19). Overall, the oldest students (upper secondary students from the Third Laboratory Center of E. Attica [EPALRAF] indicated that they did less than all the others. On five questions, they did less than all the other school grades, while on one question (“I turn off my electronics when not in use”) they did less than two other school grades, and on the remaining question “I save electricity at home school”) they did very slightly less than only one school. As demonstrated in Figure 16, these students had scored higher on this question on the pre-test than they did on the post-test.

Figure 19

All Schools: What do you do to prevent climate change?



Discussion

Impact on the Students

The Climatopia project had a positive effect on students at all grade levels, not just in terms of increased knowledge about the climate and associated behaviors, but also in terms of interaction with content, collaboration, and content creation.

In terms of pre- and post-test results, the effects of the project appeared to be greater on students in the earlier grades. It is likely that the older students were already more aware of the reality of climate change and its consequences, and thus there was not as great a difference between their pre- and post-results.

One result that appeared at all grade levels was the increased awareness of the impact of climate change upon people. In the pre-test, for example, few or no students selected the options “poverty” and “Increased hunger and poor nutrition” as consequences of climate change (Question 5), focusing instead on environmental effects. In the post-test, however,

there was a marked increase in the number of students at all levels selecting these options. The Climatopia project, which focuses on people, has driven home to the students involved that climate change has negative effects not just on the environment but on individuals and their communities as well.

However, in addition to increased knowledge about climate change, there were other effects that were noted but not explicitly tested. For example, the report from Agia Marina notes “The Climatopia project contributed to the development of various skills, including critical thinking, decision-making, and creative expression. Students engaged in activities that stimulated their capacity for empathy, group-based decision-making, and crisis management” (p. 3). The section on pupils concludes “Pupils reported a positive psychological impact, expressing a sense of hope and empowerment in their ability to contribute to a sustainable future” (p. 4).

Kilkis Primary School shares a particularly poignant example about student engagement, particularly on the part of one struggling student:

Characteristically, the children said that Climatopia hour was their favourite and that they wished the lesson would happen every day. What was observed by the teachers who implemented the program was that students with low academic achievement actively participated in the lessons, expressing their views orally and in writing on the worksheets. A typical case is that of a student from last year's sixth grade who exhibited very low performance in school subjects, disruptive classroom behaviour and indifference to curriculum lessons. From the first implementation of the programme, this pupil actively participated in discussions and completed the worksheets accurately in terms of structure and content. (p. 5)

Even the older students from the Third Laboratory Center of E. Attica expressed their engagement and concern about how current practices are affecting the environment:

From the beginning of the activity the students showed a lot of interest. We could say that at first they thought it was a bit funny and boring. However, as the plot of the story progressed, this changed. The children began to be anxious about the continuation of the plot, but also to reflect on the consequences of the climate crisis and its impact on their own lives (p. 2).

* * *

Below are some of the students' comments:

- Is it possible for a T-shirt to cause so much pollution to the environment?
- How easy is it in our region for such phenomena to occur?

The fact that made a big impression on them was the amount of water consumed by humans for personal use per 24 hours. (p. 2)

Impact on the Teachers and the School

The teachers had a critical role in this project. Not only did they facilitate the learning of their students, but they engaged in their own professional development related to climate change, the creation of comics as a pedagogical tool, and methods in nonviolent communication. In addition, they could be considered an important bridge from the classroom to the community, helping create a culture of sustainable living and enlightened policies that would promote energy awareness.

The implementation report of the Primary School of Kilkis provides a positive example of teacher engagement with the project.

At the beginning of the year the project was presented to the school teachers in a thirty-minute presentation. The teachers seemed to be enthusiastic about the programme and especially about the way difficult concepts such as global warming were approached by the students through story and comic books. In fact, some suggested that this material should be published so that it is available in book form and can be made available to parents and teachers. (pp 5-6).

In fact, one teacher with experience in teaching Creative Writing read was so impressed with the Comic Book that she suggested “that she contribute to the transformation of the text into a theatrical work to be presented en masse to the students in the context of climate events” (p. 6).

The implementation report of Agia Marina Primary School is similarly positive. The report notes that both their teaching and their opportunities for collaboration improved:

Teachers reported an enhancement in their pedagogical strategies through the incorporation of the Climatopia methodologies. The use of William Glasser’s “Choice Theory” and Marshall Rosenberg's nonviolent communication provided them with innovative tools to engage students effectively.

The teachers expressed a sense of empowerment in guiding students towards self-directed learning. The incorporation of the homonomous (connected) Self concept contributed to fostering a more holistic approach to education.

The collaborative nature of the project, including peer reviews and discussions, created a supportive professional environment. Teachers found value in exchanging ideas and methodologies, contributing to professional development. (p. 3).

The Agia Marina report also discusses impact on the school as a whole: “The school community witnessed the integration of sustainable development values into the learning environment. This permeated not only the content of lessons but also the overall ethos of the school” (p. 4). The report details multiple cross-curricular initiatives that integrated education about climate change into pedagogical practices that supported sustainable education and practices. (pp 4-5).

Impact on Parents and the Community

The project clearly reverberated not only within the school but also extended to families and communities.

The implementation report of Agia Marina Primarch School notes that “The Climatopia project encouraged parental engagement through activities that involved students at home. Parents reported positive discussions with their children about climate change, fostering a sense of shared responsibility” (p. 5).

The implementation report of the Primary School of Kilkis reports that after teachers informed the parents of the students about the project: the interest of the parents in the programme was evident. At this point, it is worth noting that some parents expressed the desire to implement the programme to themselves in the afternoons, so that they would have the opportunity to participate in the same activities with their children, but also to be able to discuss their common experiences at home. (p. 6)

Similarly, the implementation report of the Third Laboratory Center of E. Attica reports that when told of the project, parents “showed interest and agreed that it is a good educational activity outside the curriculum” (p. 2).

The project went beyond classroom and school walls to enhance the relationship between school and community. The Agia Marina report notes:

The positive outcomes of the Climatopia project generated a favorable public perception of the school. The community recognized the school's commitment to providing holistic education that addresses real-world challenges. The same

happened with the Directorate of Primary Education of Eastern Attica, which approved the pilot implementation.

The success of the pilot test phase laid the foundation for our participation in the Erasmus+ MIRACLE project as Associate Partner Pilot School. The school community expressed interest in continuing similar projects and integrating sustainable development issues into the curriculum. (p. 6)

Students in the 5th grade from the Primary School of Kilkis had the special opportunity to educate the community when on 19 December 2023, the fifth grade students and their teacher “participated in an educational activity organised by European School Radio where they presented the programme themselves and broadcast their own message on the climate crisis on the live radio show” (p. 5).

Conclusion

The Climatopia project was successful on many levels. It educated students about climate change and taught specific strategies to help them mitigate it so we can ensure a more healthy, verdant environment in the future. It encouraged collaboration among students, between students and teachers, between teachers and the community, and among community members to work together on this authentic initiative, thus also preparing all stakeholders for a more unified approach to other community problems in the future. It provided opportunities for student content creation that not only helps them engage with a specific topic but also helps them explore creative talents and nurture important skills and develop a positive mindset, where they feel validated because they can contribute to educating others about an urgent issue. The effect of this pilot project in Greece, as well as the partner countries, bodes well for greater dissemination and future collaborations within the European Union, and beyond.

Acknowledgments

The Climatopia project in Greece is indebted to the brave teachers that agreed to pilot this important initiative and then authored a report on the experience at their school. In order of grade level, they are:

- Dimitra Raiou, Primary School of Agia Marina Neas Makris
- Dr Christos Ioannides, 3rd and 6th Primary Schools of Kilkis
- Maria Sofianidou, 6th Primary School of Kilkis
- George Sarrigeorgiou. 3rd Laboratory Center of East Attica

REPORT OF THE PILOT APPLICATION IN LATVIA

Introduction

The primary objective of this pilot implementation within the Climatopia project is to test and evaluate two key outcomes: Result 2 (R2) – the Climatopia Education Kit, which includes the Climatopia Comic Book and the Climatopia Self-Training Handbook, and Result 3 (R3) – the Climatopia Simulation and Decision-Making Game, hosted on the Gennially Platform

The main tasks for implementing these pilot projects are as follows:

1. Recruit two secondary school teachers from two distinct regions in Latvia, each representing a different school.
2. Provide the teachers with comprehensive instructions regarding the implementation goals and detailed guidance on using the developed materials, offering advice as needed.
3. Conduct the pilot testing over approximately one month.
4. In the first phase of the pilot, collect baseline data using a questionnaire before starting the implementation.
5. In the second phase, proceed with the intervention, actively utilizing the developed materials.
6. In the final phase, collect follow-up data from the students after the intervention to assess the impact.
7. Request feedback from the teachers, asking them to provide an overview of their experiences with the materials and to complete a questionnaire aimed at gathering best practices for Result 5 (R5)."

Scope: The target groups included eighth-grade students from Brocēni (Brocēnu Secondary School) and seventh-grade students from Valmiera (Valmiera State Gymnasium) (N53).

Brocēni Secondary School, located in the town of Brocēni in Saldus Municipality, Latvia, is notable for its innovative approaches to education. One of the school's recent initiatives is the introduction of an outdoor green classroom, which was opened in September 2022. This unique learning environment aims to diversify and enrich the educational experience, making learning more engaging and interactive for students. The green classroom project was made possible through the "Strong Community" project competition and received financial support from SCHWENK Latvija, a company involved in cement production in the region. Valmiera State Gymnasium offers a diverse educational program, including basic and secondary education, with a strong focus on extracurricular activities such as sports, arts, and technology. The school is involved in several projects, including Erasmus+ and UNESCO,

indicating a commitment to international education and cultural exchange.

Above mentioned schools are longstanding members of UNESCO Associated School Project Network (ASP) and are stated as one of the most active participants in networks activities.

Methodology

The usage of questionnaire allows for the collection of quantitative and qualitative data, making it versatile for various research needs. In this case, Google Forms was utilized to administer the questionnaire, leveraging its digital platform for ease of distribution and data compilation, enabling efficient analysis of responses from a wide audience.

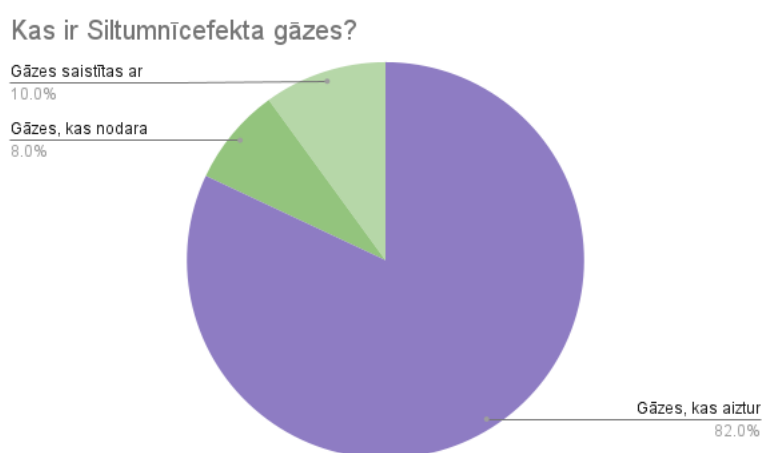
The questionnaire administered to students comprised five different questions: four were designed to require students to select the correct answer, like a test format, and one question was descriptive – students needed to write answers to it by themselves.

Pre-Test results:

Before the tests 51 students (from both schools) were asked to fill in the questionnaire.

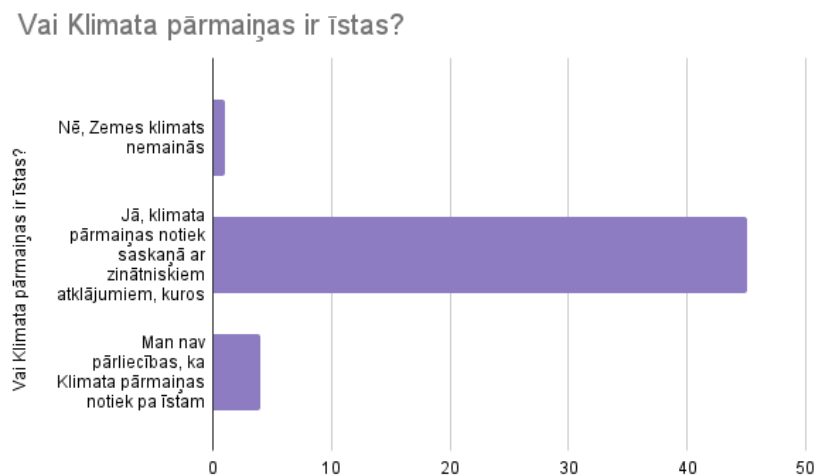
The first question posed to students was: "What are the Greenhouse Gases?" They were provided with three options to select from. According to the responses, 10% of the students believed that these gases are related to greenhouses, 8% thought that they are gases harmful to plant life, and the remaining 82% correctly identified them as gases that trap heat in the Earth's atmosphere (refer to the data chart below).

1. question "What are the greenhouse gasses?"



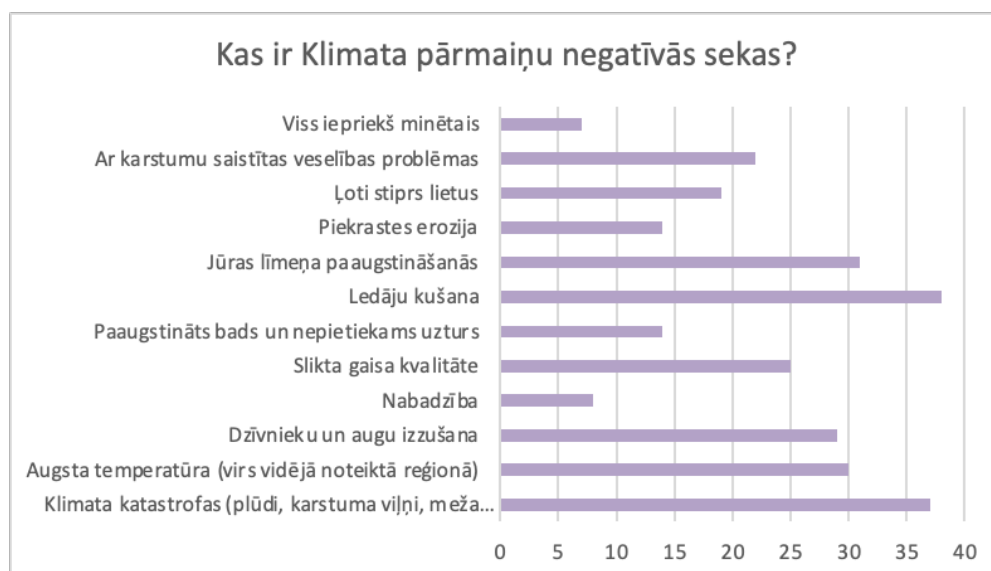
The second question was a closed-ended inquiry about the reality of climate change. According to the data, 43 students acknowledged that climate change is real and scientifically based. Three students expressed uncertainty, one denied any changes in the Earth's climate, and another was unsure.

2. question "Reality of Climate Change"



The third question focused on the negative effects of climate change, requiring students to select the most appropriate answers from several checkboxes (see graphic below).

3.Question "Negative consequences of Climate Change"

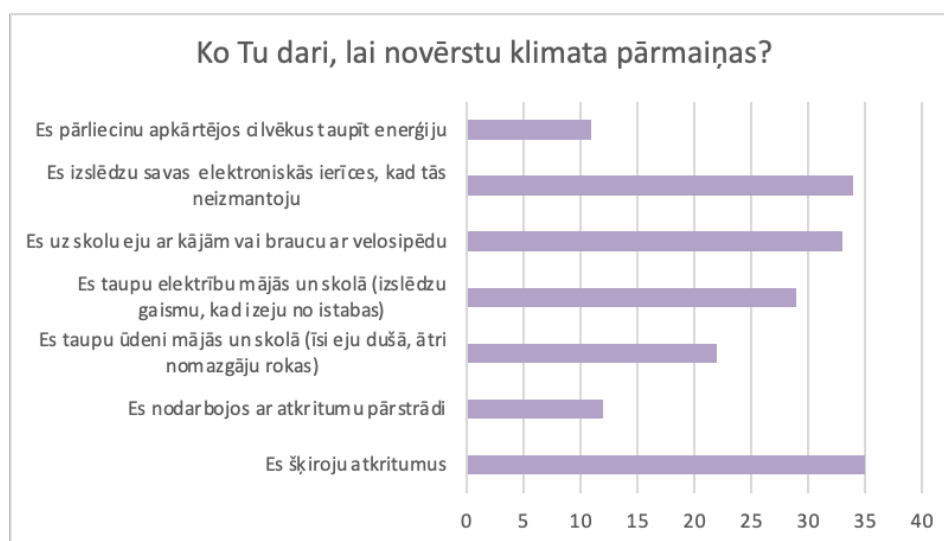


38 students noted that the negative consequences of climate change are more related to the melting of glaciers. Meanwhile, 37 students responded that the negative consequences of climate change are more global and include floods, heatwaves, and so on. Similar factors mentioned in response were "High temperature, Health problems, Drying of animals and plants," among others. The fewest students chose the response "All of the above" (7), possibly because climate change is only associated with the visible effects of climate change.

The fourth question was open-ended, asking students to identify activities that produce CO2 emissions. The responses varied widely. Students' responses varied from electricity usage to home heating, with many students mentioning respiratory processes as well as transportation by car and not properly sorting or disposing of waste. Some respondents admitted that they didn't know the correct answer.

In the fifth question students described the actions, they are taking to mitigate climate change.

5. question "Actions to mitigate climate change"



35 students responded that they are fighting climate change by recycling, 33 stated that they go to school by bike or on foot, and 29 students mentioned that they try to save electricity at home and at school. However, only 11 students noted that they also encourage others to protect the climate and engage in the mentioned activities.

Intervention phase:

During the intervention phase, each school teachers had the opportunity to trial various resources, including the Climatopia Education Kit, which comprises the Climatopia Comic Book and the Climatopia Self-Training Handbook, as well as Climatopia Simulation and Decision-Making Game. However, the extent to which these materials were used varied based on the teacher's workload and the specific objectives of each lesson that can't be negotiated.

Post-Test:

The first question. After the implementation phase, there were no significant differences in the answers from the first implementation phase. However, there was a 2% decrease in students' responses stating that greenhouse gases come from a greenhouse, meaning that there was a 2% increase in the number of students who believe that greenhouse gases are harmful to plants.

1. question "What are the Greenhouse Gases?"

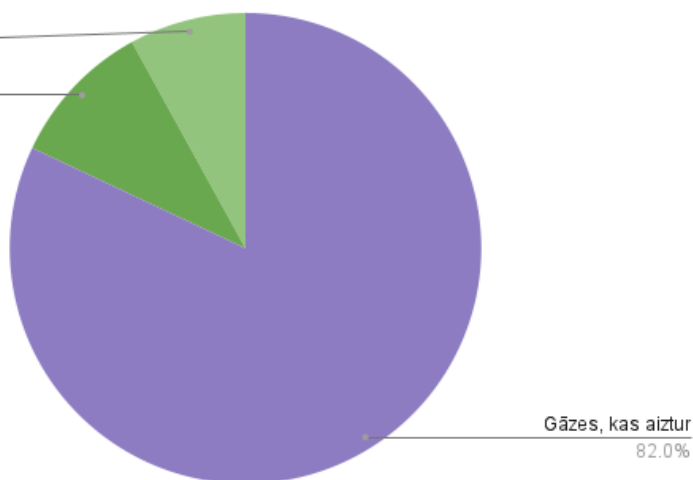
Kas ir Siltumnīcefekta gāzes?

Gāzes saistītas ar

8.0%

Gāzes, kas nodara

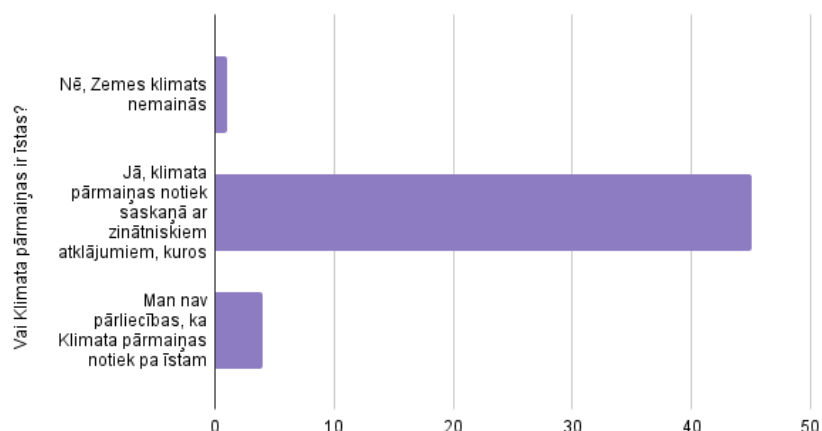
10.0%



The second question, after the implementation, collected responses regarding whether climate change is real. Students' answers remained unchanged and remained the same before and after the implementation phase.

2. question "Reality of Climate Change"

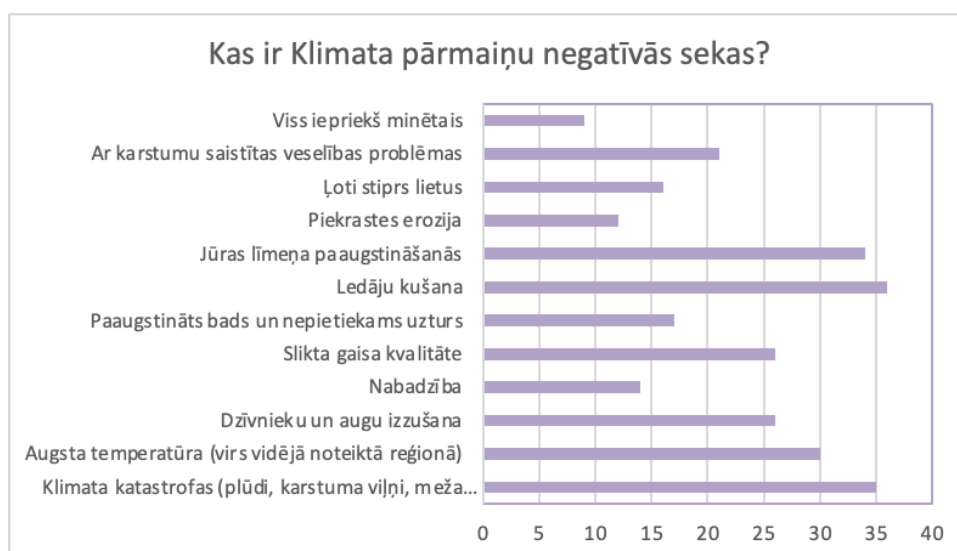
Vai Klimata pārmaiņas ir īstas?



The third question. Regarding the negative consequences of climate change, it was shown that fewer students answered that climate change is associated with climate catastrophes (35 respondents). After the implementation, 30 students responded that climate change is related to high temperatures, while most respondents (36) stated that climate change is associated with glacier melting. Nine respondents chose the option "all of the above," which is two more respondents than before the implementation.

3.Question "Negative consequences of Climate Change"

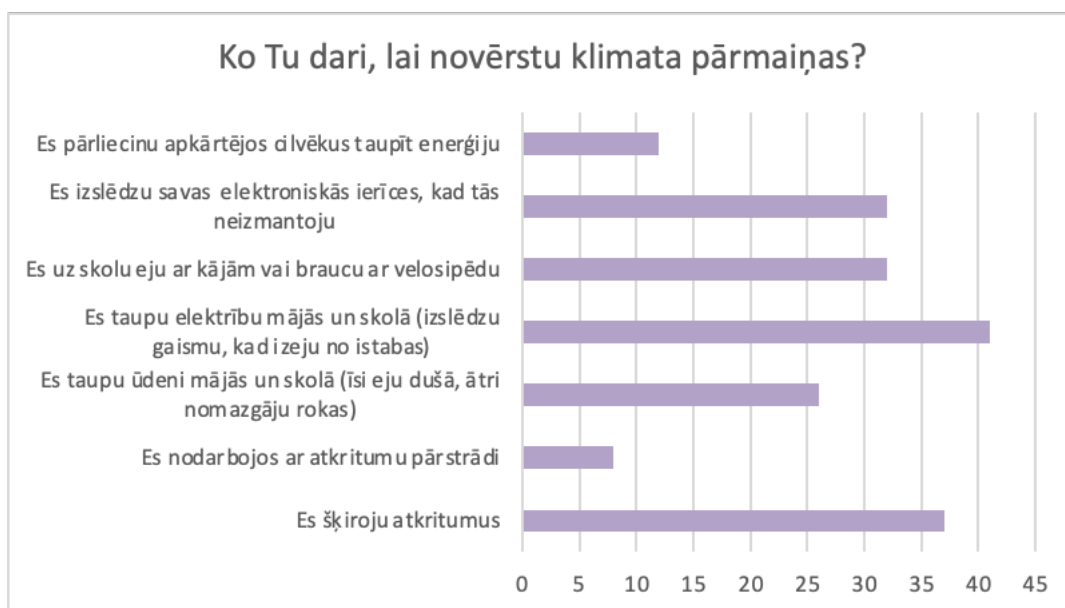
Kas ir Klimata pārmaiņu negatīvās sekas?



The fourth question. The inclusion of open-ended questions showed that after the implementation, students no longer mentioned "breathing" in their responses, and instead, they described their daily activities more, such as driving a car, traveling, and heating their homes. It is possible that travel-related responses were mentioned because they were also part of the Climatopia game.

The fifth question included questions about climate change mitigation measures, and after the implementation.

5. question "Actions to mitigate climate change"



41 students responded that they save electricity at home and at school, 37 students said they recycle waste, while 26 students mentioned conserving water. The fewest students engaged in waste recycling, with only 8 mentioning it. However, 12 respondents stated that they also encourage others to save electricity, which is one more respondent than before the implementation.

Overall, when analyzing the data before and after the pilot implementation, it can be concluded that there are no significant differences in students' responses. Some questions only differ by 1 or 2 units, which is a small margin to indicate any notable impact. Interpreting the results and considering the school context, it can be inferred that these responses are not significantly different because these schools have had successful collaboration with the UNESCO Associated Schools Network, and awareness of climate change was already sufficient beforehand.

However, if the results are interpreted qualitatively and the students' expressions in open-ended questions are analyzed, it can be observed that the word "don't know" appeared less frequently in their responses, and they provided more detailed explanations about climate change mitigation measures. This may indicate an improvement in their expressions about this topic and the topic of climate change was brought to the forefront.

Second pilot implementation: Game reviews

It was reported by teacher at Valmiera State Gymnasium that the game on the Genially platform was tested by students in the sixth grade during a science lesson. It was first tried out by teacher, and it was concluded that it is more suitable for younger students, starting from the fourth grade, as opposed to those in the eighth grade (as the translation of the game advanced levels were not available to that period of time). The idea and problems were discussed with the teacher, and understanding was shown by the sixth graders as they listened.

Insights were provided by a Brocēni Secondary School teacher as follows: A game was played by the class, and it was quite well-received overall. Reviews are accessible here:

<https://docs.google.com/document/d/1yQARpJZg02kb4pVdT2MLslgD4RKGQMJor6gl59gq2Jc/edit>

Teacher insights included:

- Spelling errors were identified, for example, "plant" used instead of "soil," and redundant "is" in "is is."
- The name was used once to address them, whereas "?name?" was used at other times. Occurrences were noted where the text was only in English, and others where it was available in both Latvian and English.
- A punctuation mark at the beginning of a sentence was noted in some places.
- It was found challenging to discern where to press to advance in the game.

Overall, the game was enjoyed by the teacher, despite the destruction of Climatopia. It is stated that the game can be engaged with independently of the comic, given the sufficient amount of additional information provided. A preference for more interactive decision-making was expressed, indicating a desire for more action within the game.

Overall teachers reflections about the materials:

The teacher from Valmiera State Gymnasium stated that:

Upon review of the Valmiera State Gymnasium teacher's support materials, it was concluded that the project demands a significant time investment, specifically a minimum of 20 instructional hours, which could not be accommodated within the span of a month. The support materials stimulate the reading of certain texts followed by the completion of worksheets. The decision was made to base the activities on specific chapters of the comic, namely chapters 4, 5, and 6.

The implementation was conducted over five lessons:

In the first lesson, questionnaires were completed by students, and discussions were held to gauge their understanding of climate change and their environmental actions.

The second lesson involved the collective reading of the comic, projected for all to see, and a discussion of its content. This method was found to be somewhat ineffective in maintaining interest, leading to a shift towards independent engagement with the material.

During the third lesson, the class was divided into five groups, each with a distinct focus: questions from chapter 4 for one group, questions from chapter 5 for another, questions from chapter 6 for the third, envisioning a comic location in ten years for the fourth, and in eighty years for the fifth. A Google document containing the worksheet questions was prepared and shared with the students for online completion. Despite all students having access to the comic, the inability to complete the document on mobile devices due to the absence of the necessary software was encountered by some. Time constraints necessitated that the drawing groups select only one location for their illustrations, which tended to emphasize the physical aspects of the location over changes in attitudes towards climate. The drawings have been included in the appendix.

In the fourth lesson, group work continued with students formulating responses to the questions. Computers were provided to all students, facilitating a smoother workflow, although the comprehensiveness of answers varied.

The final lesson involved a review of all questions and answers, the completion of questionnaires, and a discussion to evaluate what was appreciated and what could be enhanced in the comic. Access to the worksheets and their responses is available through the following link:

https://docs.google.com/document/d/17wmYdh1IMQbZy_2g7mv8UpHbqQeqq2oibdlAnYSfrgc/edit

The experiments suggested for the initial stages of the program were highly anticipated, but unfortunately, they were not conducted. The remainder of the program predominantly involved reading and completing worksheets, which may lack engagement for some students. The comic's illustrations were well-received by the students. However, the narrative's clarity was compromised in places, with rapid transitions between scenes making it challenging to follow. Only a few students expressed a willingness to learn from such materials.

The school curriculum typically introduces climate change topics towards the end of the 7th grade or at the beginning of the 8th grade, presenting an opportunity for integrating the comic.

The Teacher from Brocēni Secondary School highlighted that:

For the effective execution of the learning activities, it is recommended that teachers thoroughly acquaint themselves with all provided materials. The Handbook primarily serves to impart theoretical knowledge about climate change, functioning akin to a textbook or scientific resource for educators. It stands as an excellent scientific resource to enhance teachers' expertise in this area. It is also deemed suitable for use by high school students in advanced geography courses or as theoretical groundwork for their academic projects.

Instructions and resources for crafting a comic are detailed within Chapters 2 and 3 of the Handbook (in English). The translation of Chapter 3 is segmented into Parts A, B, and C. Owing to time and resource constraints, only a selection of the outlined activities was undertaken. The methodological content delineated in Chapters 1 and 2 is of significant value to educators. A lack of engagement with this material might lead to ambiguities regarding the content encapsulated within specific activities and queries, such as the "Change conversation" (page 13) and "My homonymous self" (page 14). These inquiries pertain to five fundamental needs, elucidated in Chapter 1. The absence of a reference to William Glaser's classification in the translated version underscores the critical nature of the explanation in Chapter 1. An initial oversight of this section led to a misunderstanding of the concept of 'fun,' which, upon review, was interpreted as 'joy of life.' However, online classroom management resources suggested 'joy' as an equivalent translation. Chapter 1 may also be regarded as psychological material, aiding teachers in comprehending student behaviors.

To facilitate a SWOT analysis with students during the "Change conversation," an explanation of basic needs is prerequisite. The rationale behind merging the spirals, which depict the students' associative groups, into the Tree of Knowledge (page 16) during drawing exercises, remained unclear. In classroom settings, the guidance provided to students typically results in uniformly drawn spirals with minor variations in interest groups. A more apt designation for this concept might be the 'Spiral of Influence.' The questions on page 15, concerning each group, are insightful but may not be conducive to open classroom discussions, particularly among teenagers who might be reluctant to share personal experiences related to close-knit groups like family, classmates, and friends. These could be more fittingly assigned as written tasks or for personal reflection. For younger students, a simplification of these questions is advisable. These queries could also prove beneficial in the analysis of other subjects or activities. The creation of a collage is particularly effective when tied to climate change themes, its mitigation, and envisioning the future. The task of sourcing images that represent the five basic needs, however, poses a more complex challenge, demanding abstract thought and a broader search for materials (given that students typically do not maintain 'unnecessary' paper waste at home, resources were procured from discarded library magazines).

The lesson plans within the curriculum are commended for their structured and practical design. Yet, it's observed that each component necessitates at least three hours of instructional time, making comprehensive integration into the existing curriculum challenging. The subject of climate change is incorporated into the 8th-grade geography curriculum with an allotment of seven instructional hours and is also broached in the 6th and 7th grades. The possibility exists for this content to be explored more thoroughly within an environmental club, should such a group be established at the school.

The worksheets associated with the learning component necessitate the reading of the story's text for answering, a requirement also noted in the module activities. The absence of a Latvian translation presented difficulties. The school's budget constraints precluded the printing of extensive materials, leading to the engagement of a company for the printing and binding of the provided materials into individual volumes. Of paramount importance was the story, compiled into six volumes to facilitate group activities within the classroom, where each group was allocated a book. To enhance comprehension, students resorted to using phone translators and listening to audio translations. The lengthy nature of the text proved to be a deterrent to student engagement, particularly as the content was deemed overly simplistic for 8th-grade students,

despite containing essential information on the subject. It was surmised that the material would better suit a younger demographic. Assistance was provided to students in locating specific text passages containing the answers to worksheet questions.

Careful reading of the comic can yield concise, direct answers. The narrative is deemed more crucial, though comics are generally more accessible to children. With teacher facilitation focusing on specific phrases and the overarching narrative, satisfactory outcomes are achievable. Teachers need to pre-plan the extent of comic reading required to address worksheet questions, as screen visibility in a classroom setting is limited and school printing facilities are inadequate.

In the comic creation process, devising plots and dialogues for six different social settings proved challenging, with only a subset of 8th-grade students managing to generate text ideas within a 40-minute timeframe. Group work was not universally embraced, indicating potential for greater creative engagement in a more motivated or younger class setting. Collaboration with the art teacher was sought for hand-drawn contributions, leading to the conclusion that digital creation, possibly in collaboration with the computer science teacher, would be preferable.

Chemistry experiments were conducted by 8th-grade students, with the chemistry teacher modifying the experiments to exclude wax burning due to logistical concerns. Observations were made on limewater transformations, noting the lengthy duration of the filtration process.

Additionally, the "See what three degrees of global warming looks like" YouTube video was utilized for educational purposes, alongside a review of the song "It's only four degrees," which provided insights into the Australian fire tragedy. Despite the activity's title suggesting an uplift in mood through song, the intended excitement was not generated, underscoring the importance of grasping the song's deeper meaning, which leans towards a more serious reflection.

In summary, the concept of climate change and its mitigation could potentially be conveyed to younger students solely through the comic and adding more information and material usage for senior students.

Conclusions

In the conducted study, the Climatopia project was introduced to two schools in Latvia, both of which are members of the UNESCO Associated School Network. This affiliation is noteworthy because it signifies a pre-existing engagement with educational initiatives, particularly those

related to global challenges like climate change. The absence of significant changes in student responses pre- and post-implementation can be attributed to this existing familiarity with climate change topics. The schools' prior involvement with UNESCO's network likely means that students were already well-versed in climate change issues, which could explain why the Climatopia project did not result in marked changes in knowledge or attitudes (based on Questionnaire Data). This context is critical for interpreting the study's outcomes; it suggests that the lack of significant differences in student responses is not necessarily a reflection of the project's effectiveness but rather an indication of the students' initial high level of awareness.

Positive engagement was observed, with an enhanced ability to discuss climate change solutions being demonstrated by students after the intervention. Despite the intervention's short duration and the students' already high level of awareness, the project materials, particularly the simulation game, were found to offer a new approach to climate education. The feedback received underscored the necessity for slight modifications to better accommodate educational environments. These results are viewed as encouraging signs of Climatopia's potential to enrich climate change education, meriting further investigation with a more extensive audience and over extended periods.

REPORT OF THE PILOT APPLICATION IN AUSTRIA

Introduction

This report describes the piloting of the Climatopia Education Kit, and the Climatopia's Game, which have been developed within the CLIMATOPIA project. The first part contains a description of the Education Kit and the Climatopia's Game that have been used during the pilot, its target groups and its expected impact. Subsequently, the method of validation is presented and the process is described. The last part of this report presents the responses and conclusions made.

Description of the Climatopia Education Kit

R2.1 Comic Book

A Comic Book for pupils including the scientific knowledge the children need to acquire combining the benefits of visualization with powerful metaphors and character-driven narratives. Climate change, its causes and consequences as well as attitudes and policies are adopted to stop or even reverse the phenomenon and related concepts such as the

greenhouse effect, greenhouse gases (CO₂ and CH₄), recycling, biodiversity, renewable energy sources and green economy, are approached in the form of questions and problems faced by the characters of the story. The heroes of the comic deal with widespread misconceptions about the above concepts and phenomena in order to find answers and solutions.

The comic book includes stories at different social settings: at home, at school, in the local community (i.e. Municipality Board), at work (i.e. decision-making in a business environment).

The story of the comic does not end. Pupils will familiarize with the general components of comic creation activities (R2.2 Chapter 2): ideation of the end, plot development, script, art production, pencils, inks, colours, letters, editorial, printing, marketing, distribution developing their green skills, to write their own ending. This process addresses multiple intelligences and with the support of an adult, children find the role that best fit their needs, interests, and talents so they can thrive.

R2.2 Handbook for teachers

A Self-Training Handbook for teachers- including three Chapters: Chapter 1: Basic scientific concepts related with climate change.

Chapter 2: Guidelines on the general components of comic creation activities

Chapter 3: Open Educational Resources for comics creation.

Description of the Climatopia's Game

Climatopia's game is an interactive trip in which pupils have to make decisions and answer questions that should determine the future of this planet. The game has numerous interactive slides in which the learner can navigate and click on the interactive elements. Pupils have to follow the storyline in order to save Climatopia from destruction.

Learners start by seeing how Climatopia works and what elements (such as the atmosphere or the biosphere) make life possible on it. After that, they will know more about Climatopia's current situation. This situation is devastating because pollution causes irreversible damage to the planet. So, the 4 elements (Earth, Water, Air and Fire) will appear and guide the pupils through the story.

The final decisions are set in the future and depending on them, pupils will either achieve an ideal or a devastated Climatopia. Whatever the end, pupils shall be able to analyze the main aspects of the ideal Climatopia society, knowing how some sectors such as education, business or institutions would change depending on the decision they make.

Description of the Pilot and the validation methodology

Participants

The Pilot in Austria was conducted at two different schools in the Autumn Semester 2023:

1) Neue Schule, a private school in Lower Austria, secondary level 2
2) Mittelschule Sonnenalle, a public school in Vienna, secondary level 2
The age of the pupils varied between 12 and 16 years.

Two teachers were mainly responsible for organising the pilots in their schools.

Methodology

In a first step, the teachers were instructed in an online-meeting about the materials, their content and goals and how to apply them in their lessons.

To prepare for their lessons, they familiarised themselves with the topics of the project with the help of the teachers' handbook.

Before the pilot started, the participating pupils were given an online questionnaire to evaluate their pre-knowledge and how they approach the topic of climate-change.

After that, the teachers started with their lessons according to the recommendations provided by the project-partners and the handbook.

The materials used in the lessons were the Comic Book and the Climatopia's Game.

After working through the materials, the questionnaire that was used at the beginning was given again to the pupils in order to evaluate the learning progress. Pin codes were used to ensure that the answers could be clearly assigned to the pupils surveyed.

The participating teachers were also asked to complete their own questionnaire.

Responses to the Questionnaires

Pupils' Questionnaire

The pupils' questionnaire was filled in by 52 pupils. In total, we have 89 responses. The pupils' questionnaire was used to compare the attitudes and knowledge levels of the pupils involved before and after the lessons. Therefore, it was presented a first time before the lessons and a second time after the lessons. In this section, the overall results of the questionnaire are presented first, followed by a discussion of the learning outcomes found.

Question 1 – What is a Greenhouses gas?

Was ist ein Treibhausgas?

88 Antworten

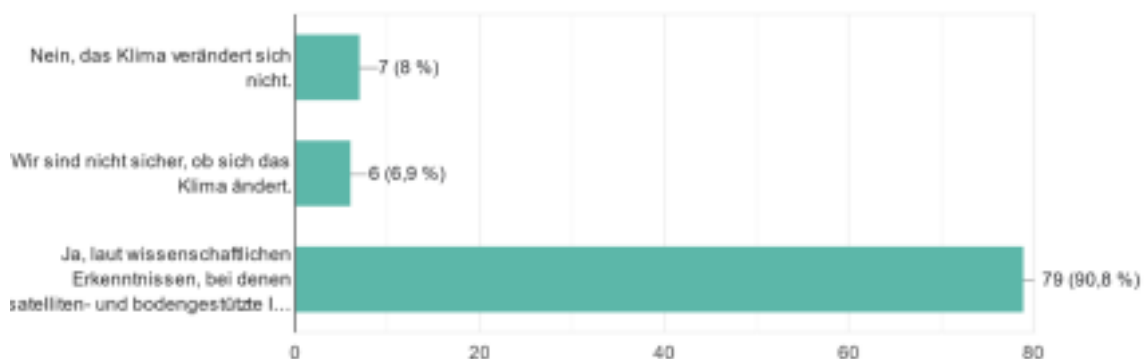


87.5% of the asked pupils clicked the right answer, 8% clicked the answer “A gas that is harmful to plants” and 4.5% answered “A gas that is green”.

Question 2 – Is Climate Change real?

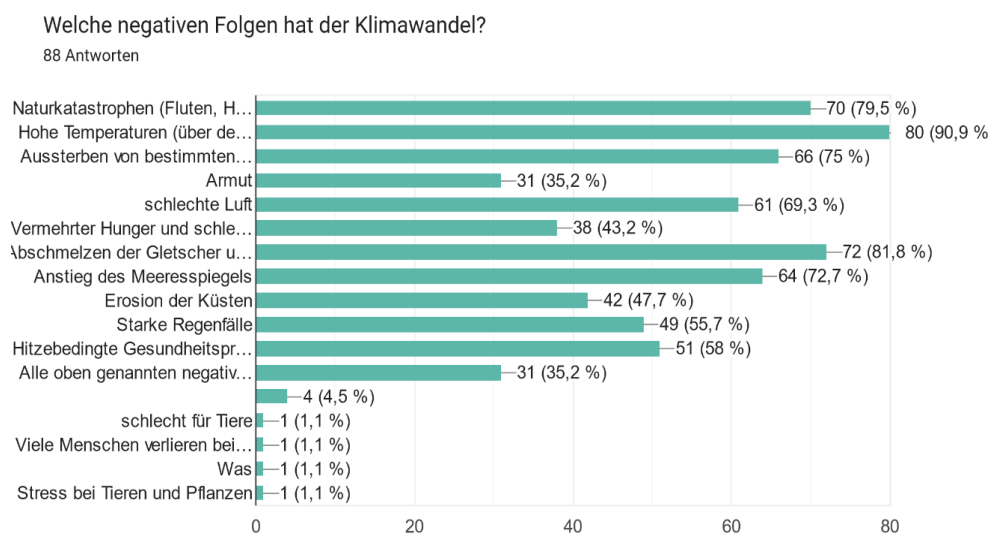
Ist der Klimawandel real?

87 Antworten



90.8% of the asked pupils clicked the right answer, 8% answered “No, there are no changes in the Earth's climate” and 6.9% clicked the answer “We are not sure that climate change is happening”.

Question 3 – What are the negative Effects of Climate Change?

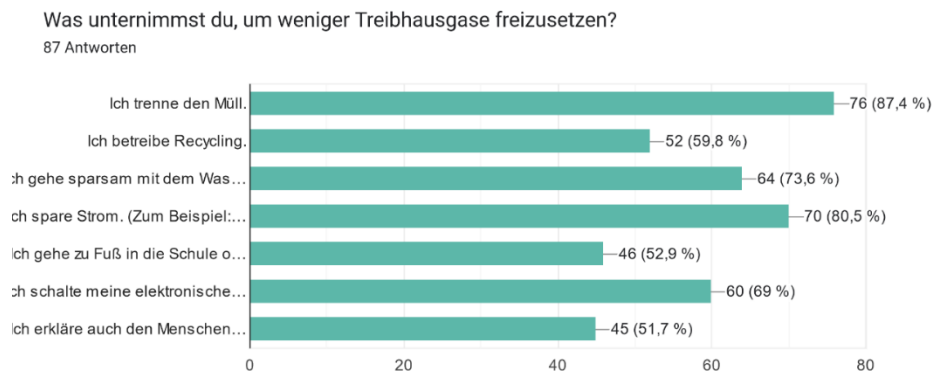


More than a third of the pupils surveyed (35.2%) chose the correct answer “All of the above”, in return, the individual effects listed above this question were clicked on (35.2% - 90.9%). In this context, “Poverty” was recognised as a negative consequence by the fewest pupils (35.2%), while “high temperatures” was clicked on by the most pupils. The individual answers added (each 1.1%) were: “Bad for animals” “Many people loose their homes in case of bad weather conditions” “Distress for animals and plants”

Question 4 – Please, name some of your daily activities that produce carbon dioxide.

This open question was answered by 66 pupils, some of them in great detail. The most frequent answers were: Driving a car – 29.2% ; Driving by public transport (bus, underground) – 29.2% Eating food (some highlighted meat) – 22.5% ; Heating – 13.5% ; Breathing – 12.4% Electricity consumption – 11.2% ; ;Almost all / living – 6.8% ; Rubbish – 3.4%;

Question 5 – What do you do to prevent Climate Change?



The answers to this question, ranked according to frequency, are: I sort garbage. (87.4%)

I save electricity at home and school (turn off the lights, when I leave room). (80.5%). I save water at home and school (take short showers, quickly wash hands). (73.6%). I turn off my electronics, when not in use. (69%). I do recycling. (59.8%) .I walk or ride a bike to school. (52.9%) I convince the people around me to save the energy. (51.7%)

Conclusions

It can generally be said pupils that they started the pilot with good to very good prior knowledge. Also, the attitude of the majority of participants even before working with the Climatopia materials indicates a conscious use of resources and a striving for sustainability.

On the one hand, it can therefore be said that the Climatopia message has certainly been sown on fertile ground, but on the other hand, this fact also makes it clear to us that we need to be rather flexible with the age specifications for the target group and that it definitely makes sense to take previous knowledge into account, especially, when setting the level for the game.

Despite the fact that most of the pupils already had a great amount of prior knowledge, it is still possible to recognise improvements in the answers to questions 4 and 5.

In question 4, 9 pupils listed more daily activities that produce CO₂ in the second questionnaire than in the first questionnaire.

The same applies to question 5: 11 pupils clicked on more activities that they undertake to protect the climate in the second questionnaire than the first time.

To summarise, it can be said that working with the Climatopia materials has had the following positive effects on at least 10.1% of the pupils involved:

- 1) Greater knowledge about daily activities that cause CO₂ (10.1%)
- 2) A greater willingness to take concrete action in everyday life to reduce greenhouse gas emissions. (12.4%)

REPORT OF THE PILOT APPLICATION IN SPAIN

Introduction

The present report is based on the evaluation of the is based on the evaluation of the first three results of the project:

- Project Result 1. Theoretical and Psychological Framework.
- Project Result 2. Climatopia Educational Kit.
- Project Result 3. Climatopia Simulation and Decision-Making Game.

The evaluation involved 89 Spanish participants aged between 3 and 12 years old. In addition, teachers from the school (10 participants) also took part in the pilots. The pilots have been carried out in a rural assembled centre in Segovia called El Pizarral. This centre divides its teaching between three towns in Segovia: Bernardos, Juarros de Voltoya and Santa María la Real de Nieva. In these schools, pupils of different ages are grouped together in the same classes due to the lack of pupils in rural areas.

The pilots have been divided into three days; each day dedicated to a different village:

- The first day in Bernardos involved 18 students from all grades of Primary Education and 12 students of all ages from Preschool.
- On the second day in Juarros de Voltoya, 8 children from both educational stages took part.
- The last day in Santa María la Real de Nieva, 51 children from 3 to 12 years old participated.

Results.

All students of each classroom participated as a group using the whiteboard. In all pilots' sessions, the project staff showed the materials of each result to the teachers and students.

The pre-tests for the students could not be carried out because there were not enough technological devices for the students to carry them out. In addition, many of the students were not old enough to be able to complete the questionnaires independently. However, the project staff asked some questions from the pre-test, related to climate change at the beginning and during the pilot sessions to find out what the students' prior knowledge on this subject was.

Students from 3 to 5 years old answered some of the pre-test questions adapted to their age. They had basic knowledge about climate change and the daily actions they take to prevent it. All students indicated that to prevent climate change they recycled at home and at school and did not use the car to go to school. However, none of the students had any knowledge about the greenhouse effect, the carbon emissions impact, or the negative effects of climate change.

Students from 6 to 12 years old also answered the pre-test questions orally. In this case, the students had a higher level of knowledge and skills in relation to climate change and sustainability. Most students had gained this knowledge at school, although many of them also learned about climate change at home. The younger students (6-9 years old) from this group had difficulty answering questions about the greenhouse effect or carbon dioxide emissions. This was not the case with the older students (10-12 years old) as they had extensive knowledge about these concepts and enumerated some activities that produce carbon dioxide such as: deforestation, industry, transportation, or electric power plants. However, all students aged 6-12 years were aware of the existence of climate change and some of its negative effects. When asked about the negative effects of climate change, most of the students chose the answer "all of the above" because they thought that all the options listed were effects caused by this problem. On the other hand, when asked about the prevention of climate change, there was a variety of opinions on the subject. All students selected recycling as the main action to prevent climate change. On the other hand, some students indicated saving water and electricity or walking or cycling to school as actions they take to prevent climate change.

In summary, the students had some knowledge about climate change and its effects, although there are wide differences between the youngest students (3 to 5 years old) and the students of Primary Education (6 to 12 years old).

The pre-tests designed for the teachers were also not carried out in the online questionnaires but were answered orally by the teachers. The questionnaires could not be carried out due to the lack of sufficient

electronic devices to enable each teacher to complete the surveys. Teachers' responses to the questions about climate change and the greenhouse effect showed that they had extensive knowledge and awareness of these issues.

All teachers were able to answer the questions related to climate change and the greenhouse effect. They also named different activities that produce and release carbon dioxide such as: burning fossil fuels, deforestation, transport of goods and people, agriculture and livestock. They had no problems to name some of the ways in which climate change manifests itself and the measures they usually take to prevent this problem.

On the other hand, some teachers did not know what the components of Nonviolent Communication are, so in this case they were not able to answer the question. In relation to William Glasser's choice theory, teachers explained how they incorporate the five basic needs in their classrooms: In relation to survival, all the teachers indicated that basic physiological needs are met in all schools and classrooms without any problems.

- Love and belonging are worked on through good practices and social interactions between teachers and pupils. Some teachers also expressed that they attach great importance to work on emotional management and the development of positive values.
- In this case, some teachers reported that they worked on power and achievement through activities that encourage healthy competition between peers. However, most of them indicated that this need is addressed through investigation and collaborative activities that challenge students.
- On the other hand, in relation to freedom and autonomy, all teachers expressed the need that students should have freedom of thought and expression and that they should carry out activities autonomously to enhance their personal and cognitive development.
- Finally, most teachers indicated that they incorporate fun through gamified activities that allow students to learn by playing.

In general, these needs are incorporated by all teachers through the active methodologies that they try to implement in the classroom to work on the contents of the curriculum.

In conclusion, all teachers in the school have extensive knowledge about climate change and its prevention and have a positive and active attitude towards integrating these important issues in their classrooms.

Result 1.

The staff have explained to the teachers how the Theoretical and Psychological Framework for educational intervention to combat climate change works. The content was attractive to the teachers as they found the chapters thought-provoking and included attractive visual elements that motivate them to read. In addition, the presence of a chapter on learning activities that can be used in the classroom was a point in favour by all teachers. Thus, they considered that the material combines theoretical and practical content in a way that is easy to understand and useful for classroom work.

Teachers made some recommendations for possible improvement of the material. Some of them indicated that interactive elements could be added to increase the motivation of the readers. Other teachers indicated that it would be a great idea to add a part of the framework for pupils to raise awareness of the need to care for the environment and fight climate change. In general, all the recommendations were made because of these arguments, so they found the content suitable and useful.

The evaluation of the story developed for this result was also carried out. After showing this material to the teachers, they expressed different opinions about the story. They all agreed that it was a great material to work on in the classroom with the students as it dealt with current environmental issues in a simple and didactic way. On the other hand, some indicated that there could be different versions of the story depending on its complexity as they felt that younger pupils would not be able to understand it. In addition, most teachers expressed the need to add more visual elements for students to understand the story in a better way.

Result 2.

The project staff showed the participants the Climatopia Comic Book, belonging to result 2. The feedback was positive as the participants were excited to learn about the story of the characters and the plot. However, some teachers have noted the need to adapt this material according to the age of the pupils, as younger pupils may have difficulty in understanding it. The project staff offered the students the possibility to bring the comic book back another time to work on it with their teachers. In response to this, many of the participants asked that the comic book should remain in digital format, because if the mission is to fight climate change, this material should not be printed on paper.

The staff also showed to the teachers the Climatopia Self-Training Handbook material resulting from result 2. In general, the feedback given by the teachers was very positive as they considered it to be a very complete and useful material in the field of fighting climate change. In addition, some teachers indicated that it was easy to understand for any adult with no prior knowledge of the subject. Therefore, they expressed that it was a good material to raise awareness of the importance of combating climate change among adults without knowledge on the subject.

Result 3.

Regarding result 3, it has been assessed the quality and playability of the Climatopia game with the different groups. In all sessions, the game has been guided by the project staff. The pupils had the opportunity to play the basic level of the game, although in one of the Primary Education classrooms, the pupils tried the medium level to see if it was too difficult for their age or not.

The project staff received positive feedback from students and teachers. All groups actively participated in the game and reflected on the environmental issues raised in the game. The game was the most exciting material for the pupils as they were able to actively participate in it and work together to achieve the mission. The participating pupils were highly motivated during the development of the game in all the sessions and the feedback was positive in all the groups.

The feedback received from teachers and pupils showed that the game is high quality and useful for promoting learning and raising awareness about climate change. The project staff noted that the basic level of the game should be played in a guided way especially with pre-school students, as they do not have developed reading comprehension skills and therefore it is not very difficult for them to understand the game individually. At the Primary Education stage, all pupils understood the concepts normally and were able to play the game without any problems. In some classrooms, students even asked for the game to be made more difficult, so the staff shared medium version of the game to try out.

Conclusion

The evaluation carried out in the pilots concludes with the high quality of the materials produced. The pupils and teachers have understood the materials in their entirety and have been able to handle them autonomously in some cases, although in others they have had to adapt

them to facilitate their understanding. The feedback from teachers has been positive as they consider the materials to be useful for students to learn and become aware of climate change and pollution.

PILOTS RESULTS DESCRIPTIVE QUALITATIVE ANALYSIS AND CONCLUSIONS

Overall, the Transnational report encompasses an extensive evaluation of the Climatopia project, designed to enhance climate change education among students. Through innovative educational tools like comics and simulation games, the project aimed to deepen students' understanding of climate change, its causes, effects, and mitigation strategies. The evaluation spanned multiple countries, offering a diverse perspective on the project's impact.

Methodology

The analysis leverages varied data collection methods, including pre- and post-tests, teacher feedback, and direct student observations, to gauge the project's effectiveness. The assessment focuses on changes in students' knowledge, attitudes, and behaviors regarding climate change before and after the Climatopia project material interventions. The raw collected data showcases a rich tapestry of student responses and teacher observations across different educational settings. This includes quantitative improvements in students' correct answers to climate-related questions and qualitative feedback on their engagement and behavioral changes post-intervention.

The following will describe the main findings obtained in each of the countries represented in the pilots implementation:

The Greek context might show variations in student engagement and outcomes based on regional educational priorities and environmental awareness levels. The detailed data on students' pre- and post-intervention responses could indicate shifts in understanding and attitudes towards climate change, reflecting the effectiveness of the Climatopia materials in this setting.

In Latvia, the involvement of UNESCO Associated School Network members meant students were already well-informed about climate change, which may have led to the minimal change in knowledge and attitudes post-intervention. Despite this, there was an observed increase in students' ability to discuss climate solutions, suggesting the materials still had an educational impact.

Austrian students began the pilot with a good understanding of climate change, reflecting a conscious use of resources and a commitment to sustainability. The Climatopia materials further enhanced their knowledge on daily CO₂-producing activities and their willingness to undertake climate-positive actions.

The lack of technological resources limited the ability to conduct pre-tests. Students showed a basic understanding of climate change, with older students (6-12 years) demonstrating more advanced knowledge. Teachers exhibited a high level of awareness and incorporated climate change topics into their teachings effectively.

Across all pilots, there's a consensus that while baseline knowledge of climate change was high, the Climatopia project succeeded in further enriching students' understanding and engagement with the subject. The interactive and multifaceted nature of the materials, including comics, games, and handbooks, catered to diverse learning styles and interests.

Descriptive Analysis

The inductive descriptive analysis resulted in categorizing the data in two ways - based on the content related to climate education and on the pedagogical impact or methods.

Emerging climate education related themes from the data include **increased climate change awareness, enhanced critical thinking and decision-making skills**, and a greater **sense of empowerment among students to contribute to a sustainable future**. Teachers observed positive changes in students' engagement and understanding of complex climate concepts, also in the descriptive questions students answers after implementation were more precise and it can be interpreted as deeper understanding of the climate change concepts.

Considering the pedagogical methods and impact, it was determined that usage of Climatopia project materials **enhanced student engagement** as various pilot countries teachers reported that, students showed increased interest and participation in climate change discussions and activities, particularly through interactive elements like the Climatopia game. There was a notable enhancement in students' understanding of climate change, including its causes, effects, and the importance of mitigation efforts fostering **Knowledge Improvement**. Additionally, the project stimulated positive changes in students' behaviors, such as more frequent recycling and energy-saving practices, indicating a deeper commitment to combating climate change - resulting in defining **Behavioral Change** category.

The Climatopia project's success in engaging students and enhancing their understanding of climate change suggests that innovative educational tools can significantly impact environmental education. The positive feedback from both students and teachers highlights the project's potential to foster a more informed and proactive generation ready to tackle climate challenges.

Limitations

In the project implementation report, it is essential to also mention the limitations, which were divided into five categories:

Technological Constraints
In Spain, the lack of sufficient technological devices posed challenges in conducting pre-tests and fully utilizing the digital aspects of the materials.
Pre-existing Knowledge
In countries like Latvia and Austria, where students already had a high level of awareness about climate change, measuring the incremental impact of the materials was challenging.
Material Integration
Teachers expressed concerns about integrating the materials into existing curriculums due to time constraints and the need for significant time investment.
Diverse Educational Contexts
The varying educational environments and methodologies across countries necessitated flexible adaptation of the Climatopia materials, which could affect comparability.
Duration limitations
The differences in the duration of the pilots per country might impact the results and in some cases may not have been sufficient to foster significant changes in knowledge and attitudes.
Customized Implementations
Each country adapted the Climatopia materials to fit its educational setting, which involved different approaches to integration into the curriculum, varying degrees of digital engagement, and diverse methods of measuring outcomes.
Student Recruitment

The recruitment strategy varied, with some pilots targeting schools known for their environmental initiatives, while others selected a more diverse sample to gauge the materials' broad appeal.

By categorizing feedback according to materials and their usage, the following information was compiled:

Theoretical Framework:

The Theoretical and Psychological Framework was well-received across educators finding it thought-provoking and well-structured for educational intervention.

Some teachers suggested adding interactive elements to increase engagement and extending parts of the framework to students to enhance their awareness and understanding of climate change.

Climatopia Comic Book:

The comic book was praised for its engaging storyline and character-driven narratives that effectively conveyed complex scientific knowledge and climate change issues.

Feedback highlighted the need to adapt the comic book content according to different age groups, particularly for younger pupils who might struggle with the complexity of the material.

Self-Training Handbook:

Teachers found the Self-Training Handbook to be a valuable resource, offering a thorough exploration of climate change topics suitable for both educators and older students.

The handbook was appreciated for its accessibility, making it a good tool for raising awareness among adults with no prior knowledge of climate change.

Simulation and Decision - Making Game:

The simulation game was highly praised for its interactivity and ability to foster active participation among students, making it the most exciting material for pupils.

It was noted that the basic level of the game should be played in a guided manner, especially for younger students, to ensure comprehension and engagement.

Conslusions

In conclusion, while the Climatopia project materials were generally well-received across the four countries, feedback suggests the need for adaptability to different educational contexts, as well as considerations for technological resources and curriculum integration, including also some technical corrections to foster user friendly approach. Further investigation and adaptation will be organized and conducted to maximize the materials' impact and suitability across diverse educational settings.

REFERENCES

1. Bandura, A. (1978) Reflections on self-efficacy. *Advances in behaviour research and therapy*, 1(4), S. 237-269.
2. European Commission. (2019). Communication on The European Green Deal (English). Retrieved from https://commission.europa.eu/publications/communication-european-green-deal_en
3. European Commission. (2022). A European Green Deal Striving to be the first climate-neutral continent. Retrieved from https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en
4. European Commission. (2021). Erasmus+ Programme Guide. Retrieved from https://ec.europa.eu/programmes/erasmus-plus/sites/default/files/2021-erasmusplus-programme-guide_en.pdf
5. Eurydice. (2019). How can education contribute to awareness and action on climate change? Retrieved from <https://eurydice.eacea.ec.europa.eu/news/how-can-education-contribute-awareness-and-action-climate-change>
6. Farinella, M. (2020). How to explain climate change? With comic books. Retrieved from <https://thebulletin.org/2020/04/how-to-explain-climate-change-with-comic-books/>
7. GDPR.eu. (2023). Complete guide to GDPR compliance. Retrieved from <https://gdpr.eu/>
8. Glasser, W. (1999) *Choice theory: A new psychology of personal freedom*. HarperPerennial
9. Maslow, A. H. (1943) A Theory of Human Motivation. In: *Psychological Review*. Vol. 50 #4, S. 370–396
10. Maslow, A. H. (1954): *Motivation and Personality*. New York: Harper & Row Publishers
11. Rosenberg, M. B. (2002). *Nonviolent communication: A language of compassion*. Encinitas, CA: Puddledancer Press

12. Rosenberg, M. B. (2004). The heart of social change: How to make a difference in your world. PuddleDancer Press.
13. Tilbury D., and Galvin C. (2022). Input Paper: A Whole School Approach to Learning for Environmental Sustainability. Retrieved from <https://education.ec.europa.eu/sites/default/files/2022-02/input-paper-whole-school-approach-sustainability.pdf>
14. United Nations Educational, Scientific and Cultural Organization. (2020). Education for Sustainable Development: A roadmap. Retrieved from <https://unesdoc.unesco.org/ark:/48223/pf0000374802>
15. Winnicott, D. W. (1960) Ego distortion in terms of true and false self. The Maturation Process and the Facilitating Environment: Studies in the Theory of Emotional Development. New York: International Universities Press, Inc: 140–57.
16. Winnicott, D.W. (1960) Ego Distortion in Terms of True and False Self. In: Winnicott, D.W., Ed., The Maturation Processes and the Facilitating Environment.

ANNEX

National Report of Greece evidence accessible via this link:

<https://drive.google.com/drive/u/1/folders/14fAjqEJ4Fw2dnf29XVVIVVfaH3VFZKNr>

National Report of Latvia evidence accessible via this link:

<https://drive.google.com/drive/u/1/folders/1ui0lq26s7n7E5vhT9wMM12Y6mLOWIISN>

National report of Spain evidence accessible via this link:

<https://drive.google.com/drive/u/1/folders/1RJ2JEpSgYQajxHhmJw2ffA6uiDbcq8Ke>

National Report of Austria evidence accessible via this link:

<https://drive.google.com/drive/u/1/folders/10FPHVfBRjJLjW0GCY4y4A9fjXGuOuCeG>

Primary data collected via digital surveys accessible via this link:

<https://drive.google.com/drive/u/1/folders/1KXH39d8O5kJH0akndhNuZTWqnQz526ON>



CLIMATOPIA



UNIVERSITY
OF LATVIA

blickpunkt
identität

