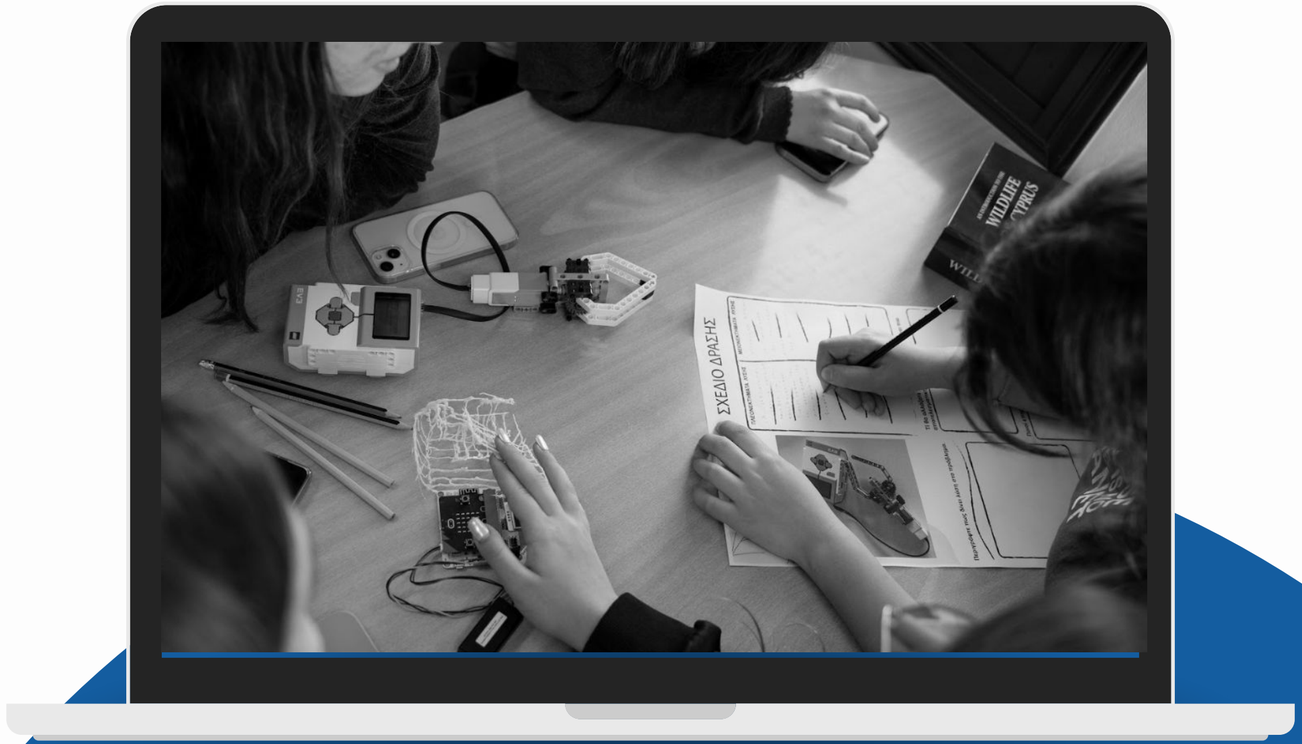
Lionfish

Pilot Implementation & Evaluation



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Introduction

We aimed to present a learning experience design tailored for students from middle to early high school, centered around the pressing issue of the 'Lionfish Invasion'. A set of activities from the manual were selected to be piloted with secondary education students. In our evaluation report we present the outcomes of some pilot tests with students and teachers in Cyprus.

RQs of the Evaluation Study

- *How is the intervention perceived by students and teachers?*
- *What are the pros and cons of the learning design drawing on the use of 360VR, STEAM activities, and visual thinking tools?*

Evaluation

Methodology

We used a mixed method approach for the evaluation study.

01

Questionnaire for students. The context and scales were developed considering previously published relevant articles (Milfront & Duckitt, 2010; Mamaril et al., 2016).

02

Interview guide for class-wide discussion with students (end of the intervention).

03

Interview guide for semi-structured interviews with teachers (end of the intervention).

Description of context

Number of schools/ groups	4
Consenting participants (students)	83
Number of students from each school/group	School 1: 23 students aged 12-13 years old School 2: 21 students aged 14-16 years old School 3: 20 students aged 12-13 years old School 4: 19 students aged 12-13 years old **Total**: 83 students
Participating teachers	6
Pilot setting	Environmental Centre (8:30 - 13:00, regular school day)

Activities

- Before the day (warming up while still at school)
- At a local beachfront
    Station 1: Senses
    Station 2: Understanding
    Station 3: Food Relations

Activities

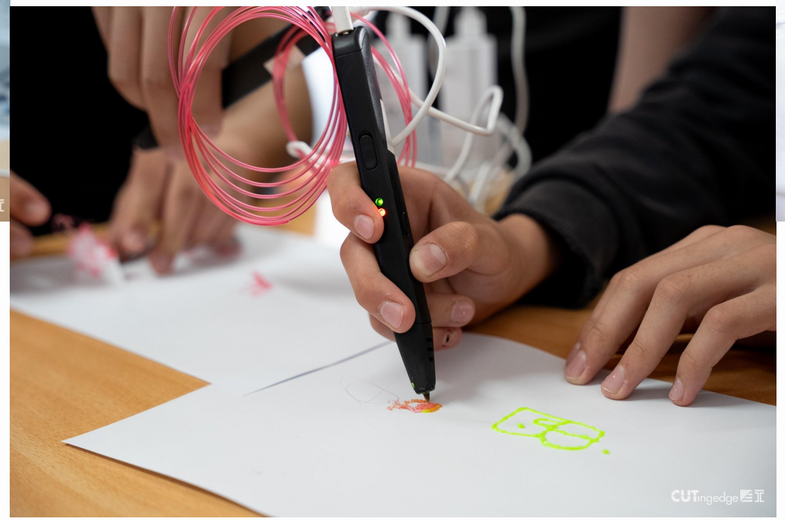
(At the environmental center)

- Station 4: 360VR

Activities

(At the environmental center)

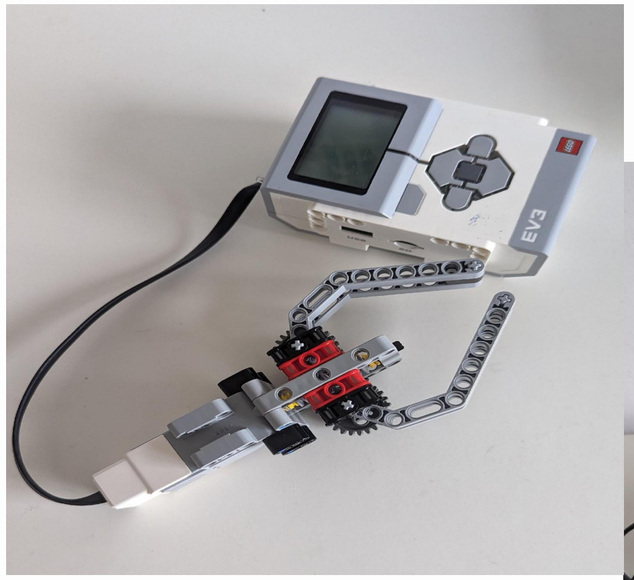
- Station 5: STEM/STEAM and Visual Thinking Canvases

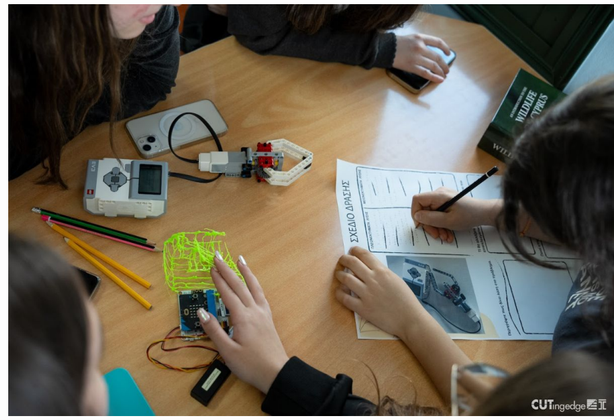


Activities

(At the environmental center)

- Station 6: Reflection of all previous activities





Findings

01 Questionnaire for students.

02 Class-wide discussion with students.

03 Semi-structured interviews with teachers.

Findings

Class-wide discussion (students) & Semi-structured interviews (teachers)

- **Understanding and retention**
- **Immersion/Realism**
- **Problem-solving & critical thinking**
- **Groupwork**
- **Conversation / Public speaking**
- **Empathy and Knowledge**

Findings

Class-wide discussion (students) & Semi-structured interviews (teachers)

- **Understanding and retention**:
  "This is not the usual way we view such things in class. This way helps us understand better the topic" (Girl)
  "The majority of the students understood that it is a complicated issue, a chain of events" (Teacher)
  " I believe that this, let's say, practice-based way of learning helps them retain the information, so they hold on to the knowledge even after graduation" (Teacher)
  "The benefits are many as you can cover larger parts of the necessary curriculum while the retention level remains high. In comparison to simply teaching them in class... in the traditional way" (Teacher)
- **Immersion/Realism**:
- **Problem-solving and critical thinking**:
- **Groupwork**:
- **Conversation / Public speaking** :
- **Empathy and Knowledge**:

Findings

Class-wide discussion (students) & Semi-structured interviews (teachers)

- **Understanding and retention**:
- **Immersion/Realism**:

  "A 'real-life' way to watch the lionfish up-close" (Girl)

  "We felt transported somewhere else. It was nice being able to feel as if you were in the sea" (Girl)

  "When the camera angle is turning down, you try to follow it. It feels like you jump in the sea alongside the diver" (Girl)
- **Problem-solving and critical thinking**:
- **Groupwork:**
- **Conversation / Public speaking** :
- **Empathy and Knowledge**:

Findings

Class-wide discussion (students) & Semi-structured interviews (teachers)

- **Understanding and retention**:
- **Immersion/Realism**:
- **Problem-solving and critical thinking**:

  “Let’s make it rotate 360 degrees. This will help us cover a larger range” (Boy)

  “When you asked them to review the code of the robot they had to think in terms of coding, in terms of commands given to the robot. This is a skill, to ‘read’ these commands and interpret their meaning and then altering them” (Teacher)

  “They started thinking of different potential solutions. Have you heard what this student said? The one who proposed sterilizing lionfish. Let's find a way to prevent them from multiplying. They got thinking what other solutions might be there” (Teacher)

  “Maybe if the robot could capture the fish, but also alter its DNA somehow to stop multiplying. Only catching the fish might not be enough” (Boy)
- **Groupwork**
- **Conversation / Public speaking** :
- **Empathy and Knowledge**:

Findings

Class-wide discussion (students) & Semi-structured interviews (teachers)

- **Understanding and retention**:
- **Immersion/Realism**:
- **Problem-solving and critical thinking**:
- **Groupwork**:

  "They work together, building on each other's ideas, building on each other's obtained knowledge; on the efforts and thoughts of the other. They learn and help each other at the same time (Teacher)

  "Some of them would not have achieved these results have they worked on their own" (Teacher)

  "It feels great when we get to work in groups with our classmates, it helps" (Girl)
- **Conversation / Public speaking**:
- **Empathy and Knowledge**:

Findings

Class-wide discussion (students) & Semi-structured interviews (teachers)

- **Understanding and retention**:
- **Immersion/Realism**:
- **Problem-solving and Critical thinking**:
- **Groupwork**:
- **Conversation / Public speaking** :

  "It helped them in communicating their ideas, communication skills can be developed through such activities. Discussing with their classmates, expressing their ideas in front of a larger audience. I mean ideas being communicated from their groups to the entire classroom" (Teacher)

  "We are often surprised by their interesting opinions. The point is for the students to be given the opportunities and time to freely express them" (Teacher)
- **Empathy and Knowledge**:

Findings

Class-wide discussion (students) & Semi-structured interviews (teachers)

- **Understanding and retention**:
- **Immersion/Realism**:
- **Problem-solving and Critical thinking**:
- **Groupwork**:
- **Conversation / Public speaking** :
- **Empathy and Knowledge**:

  "We are studying a species that is not at fault. Just at the wrong place the wrong time. It would pose no threat if it was inhabiting the Indian Ocean like it used to. We as humans and our actions forced it to come over here. Of course here the positive side of technology can contribute; not on how we can use it to destroy but to protect nature instead" (Girl)

  "Another student said: well why should we kill it? It is not the lionfish's fault, we don't have the right to kill it. These are valuable conversations. Students gain perspectives from different angles" (Teacher)

  "They empathized with the topic. They realised the difficulties caused to the fishermen, so they had to recommend solutions for this problem" (Teacher)

Findings

Class-wide discussion (students) & Semi-structured interviews (teachers)

- **Improvement possibilities**

Findings

Class-wide discussion (students) & Semi-structured interviews (teachers)

- **Improvement possibilities:**
  “The Canvas activity is not for everyone. Not all of the students are on the same level when it comes to expressing themselves by writing. They should have been able to do so of course! All of them should have been able to come to form some opinions and then write them down in a concise manner. Some of them give up when they are asked to write” (Teacher)
  “The students had no experience with similar tools which limits their ability to quickly and easily fill them out. Perhaps if they got to use these Canvases a few more times, or even something similar they would do much better” (Teacher)
  “Maybe some of them needed more visuals on the canvas and maybe if you used easier words for the Canvas would be better for some student to engage” (Teacher)
  “Some technical issues such as the problem with downloading the video. Some of them did not have sufficient space on their cell phones. The compatibility of mobile phones was also an issue.” (Teacher)

Findings

01 Questionnaire for students.

02 Class-wide discussion with students.

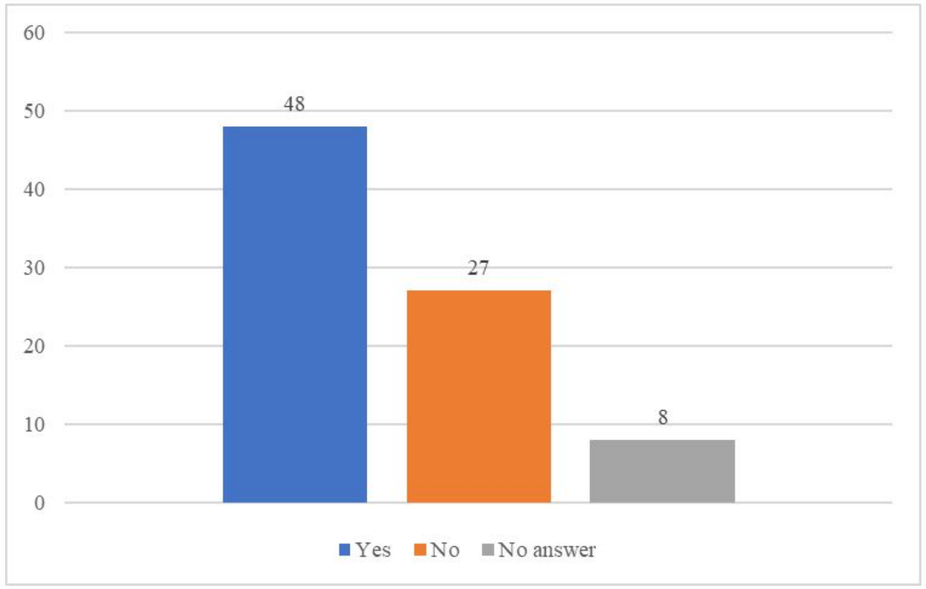
03 Semi-structured interviews with teachers.

Findings

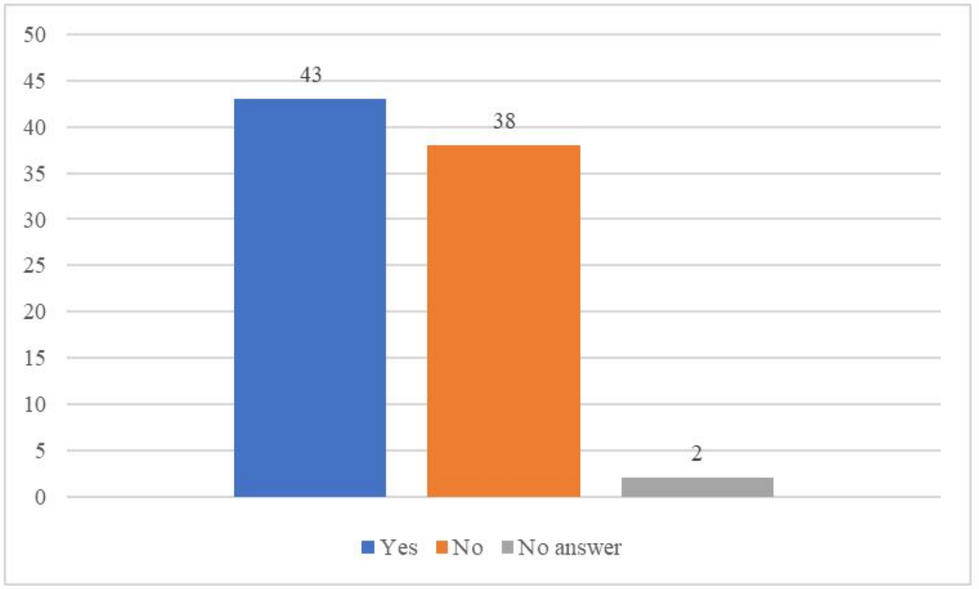
Questionnaire for students

The questionnaire had two parts and consisted of the following subscales:

- Demographics and Introductory Questions (5 variables, i.e. questions)
- Environmental Activism (4 variables, i.e. questions)
- Environmental Threats (4 variables, i.e. questions)
- Personal actions related to the Environment (4 variables, i.e. questions)



Previous participation in environmental programs at school (M= 1.23; SD: 0.61)



Previous experience with 360VR technology (M=1.43; SD:0.54)

Findings

Questionnaire for students

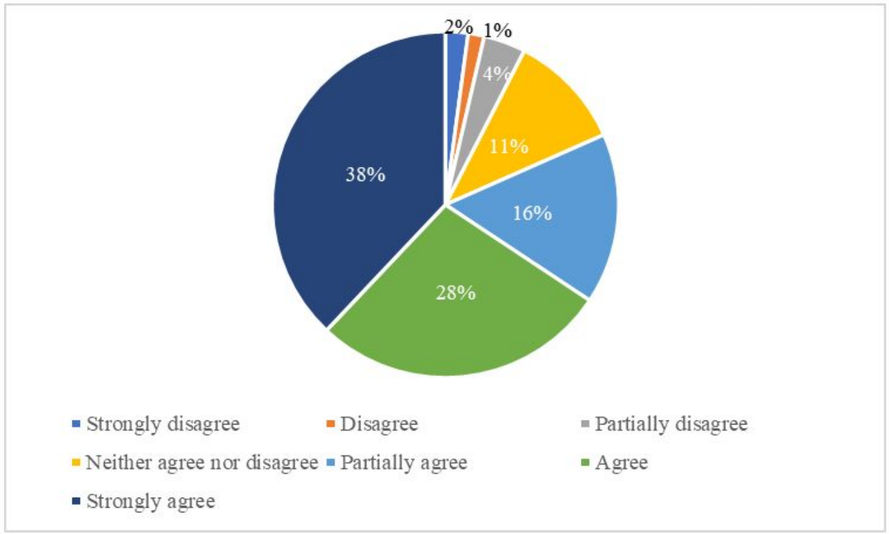
Environmental activism

1.I am in the position to understand that the preservation of the environment is important for the future of humanity.

2.I am in the position to actively participate in activities related to the environment.

3. I am in the position to join groups that are involved with the environment.

4.I am in the position to convince others that the preservation of the environment is important.



It seems that students tend to agree that they are in the position to take some steps towards environmental activism (M= 5.71; SD: 0.37).

Findings

Questionnaire for students

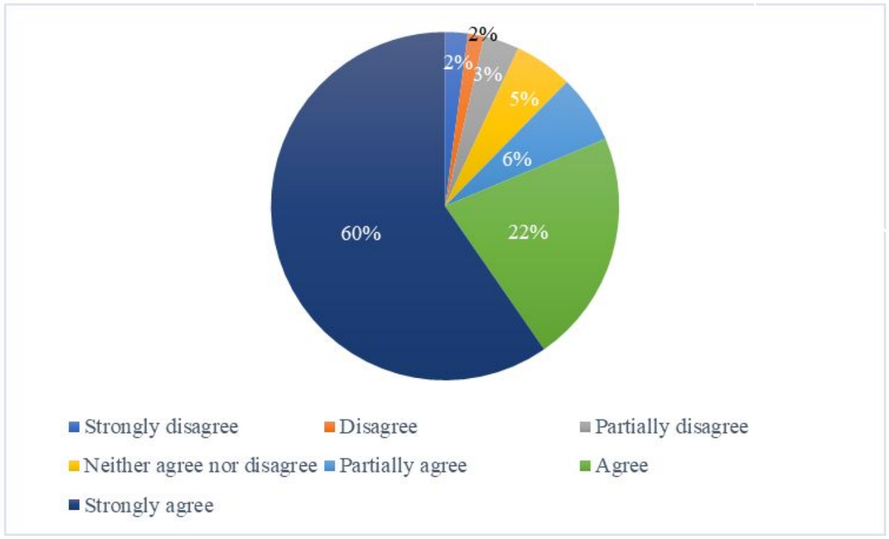
Environmental threats

1.I am in the position to understand how human actions affect the environment.

2.I am in the position to understand how the ecosystem is threatened by human actions.

3.I am in the position to understand that animals and plants are endangered by climate change.

4.I am in the position to understand that humans are part of the ecosystem, just like animals and plants.



The students tend to agree that they are in the position to comprehend the role of humans and their actions in affecting the environment, how the various species are endangered by climate change and how humans are part of the ecosystem alongside different other species (M= 6.15; SD:0.12).

Findings

Questionnaire for students

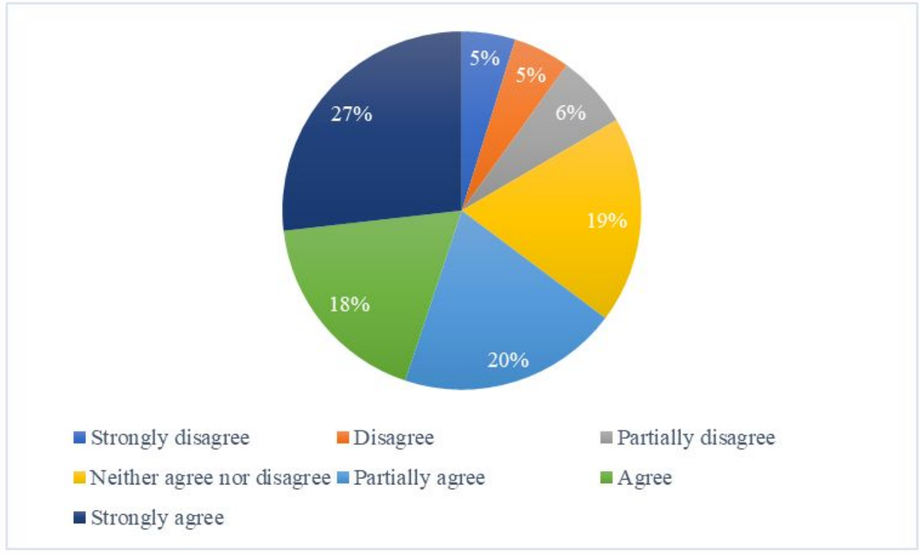
Personal actions related to the environment

1.I am in the position to change my daily habits to positively impact the environment.

2.I am in the position to save water on a daily basis.

3.I am in the position to avoid using the car whenever possible to reduce air pollution.

4.I am in the position to reduce the use of electricity daily.



The students tend to partially agree that they are in the position to change their own everyday habits to positively impact the environment (M=5.0.5;SD:0.25).

Conclusion

- The findings of this study offer meaningful perspectives into the effectiveness of this learning experience, towards the enhancement of students' understanding, retention, empathy and knowledge acquiring towards action taking in issues related to climate change.

- The significance of fostering soft skills such as team collaboration, problem-solving and effective communication of ideas also emerged through our analysis.

- It is becoming clear that the design of relevant learning experiences can play a pivotal role in increasing the confidence of both students and their teachers in engaging in such fruitful conversations and activities.

THANK YOU!

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