D6.4 PROCEEDINGS OF THE FINAL CONFERENCE

Project acronym: OTTER

Project title: Outdoor Science Education for a Sustainable Future

Call: H2020-SwafS-2018-2020

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 101006482

Project no.	**1010010082**
Project acronym:	**OTTER**
Project title:	**Outdoor Science Education for a Sustainable Future**
Call:	**H2020-SwafS-2018-2020**
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Name	Organization
Jelena Kajganović	Geonardo Environmental Technologies

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01	04.03.2024	First Draft	Ömer Ceylan
02	06.03.2024	Final Version	Jelena Kajganović

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1 OTTER project

OTTER is a H2020 funded project that aims to **enhance the understanding of Education Outside the Classroom** (EOC) **approaches** and how they can help **improve the acquisition of scientific knowledge and transferable skills in students**, **specifically in the field of environmental sustainability and the reduction of plastic waste**. It aims to increase interest in scientific topics among young people, while also contributing to the range of innovative educational projects and the increase of scientific citizenship within the EU.

OTTER aims to strengthen educational outside-the-classroom (EOC) **networks within Europe**, connecting experts from four different regions within the continent (**Finland, Hungary, Ireland and Spain**). The strengthening of these networks will be utilised to carry out a programme of EOC pilot schemes and analyse of the effect they have on the performance of participating students, including their levels of sophisticated consumption and scientific citizenship, to increase understanding of the effects of education outside the classroom on EU citizens. The pilot schemes will share a common theme revolving around issues of plastic waste and recycling in order to build upon recent momentum in tackling related global educational, social, and environmental issues and due to the close relationship between reducing plastic waste and the need for more sophisticated consumers.

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2 Project Consortium

Geonardo Environmental Technologies **(GEO)**

European Science Foundation **(ESF)**

University of Groningen **(RUG)**

University of Limerick **(UL)**

Learning Scoop - oppimisen osuuskunta **(LS)**

The Big Van Theory **(TBVT)**

Center for the Advancement of Research & Development in Educational Technology **(CARDET)**

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Executive Summary

3 Objective

This report presents the preparation phase and the proceedings of OTTER's final conference "Beyond the classroom: rethinking STEAM education", which was organised in cooperation with Open Schooling Together (OST) network. The conference took place on 15th February 2024 from 10:00 to 16:00 at the Monnet Delors Room of the NH Hotels Carrefour de L'Europe in Brussels, Belgium.

OTTER final conference had the aim to share the project's findings with a wide range of stakeholders as well as to further promote the tools and materials which were produced within the framework of the project. Cooperation with sister projects from the OST Network ensured both synergies and identifying of common challenges and accomplishments, as well as reaching out to a variety of stakeholders in Brussels and beyond.

Namely, the idea of the conference was not only to present OTTER's main results, but to also provide a broader perspective on pathways to propel STEAM education in Europe with input from experts involved in various open schooling projects. The event was also an opportunity to discover innovative practices and methodologies in STEAM education related to education outside the classroom and engage in concrete discussions on pathways to apply them in real-life settings.

The following section of this report presents the background, preparation and implementation phases of the OTTER conference, as well as summary and conclusions from various session, while the annexes provide a compilation of the official agenda and presentations.

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OTTER Conference "Beyond the classroom: rethinking STEAM education"

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4 Background and Preparation

OTTER final conference was planned to be organised in Brussels back to back with the consortium's final project meeting. The goal of the final conference was on one hand to inform a wide range of stakeholders about OTTER's findings on Education Outside the Classroom (EOC) methods and exploring their implementation in European settings, while investigating how this can help improve acquisition of scientific knowledge and transferable skills in students, specifically in the field of environmental sustainability, and on the other hand to further promote the project's tools such as the Learning Platform and Toolkit with a view to boosting their exploitation.

The consortium considered that cooperating with **sister projects from the OST Network** would provide a much bigger added value and impact as our topics are very much linked and our research and outputs encounter the same challenges. Hence, the topic was selected that is more all-encompassing and covering the topics of all the projects that took part in the panel, World Café sessions and with their posters. Hence, "*Beyond the Classroom: rethinking STEAM education*" as a title was selected to reflect the focus that was slightly broader than just our results focused on EOC and sustainability. OTTER cooperation with OSTogether started earlier: OTTER results were included in several newsletters and OTTER representatives were present at monthly meetings. This is where the idea came from and the planning and invitations already started in November.

We opted for an approach where topics of the keynote speech and panel were going to be broad enough to encompass topics of all the projects present at the conference, as well as to have a World Café structured in such a way that we would have 5 topics, out of which 3 are led by our sister projects. Through various coordination meetings, our teams finalised the sessions' scope, agenda, speakers and other details. This ensured a true collaborative effort and a broad range of topics to be covered under the same umbrella of Open Education and STEAM. **Annex 1** provides the full session description and the final agenda.

The venue chosen had to accommodate both the plenary part and the World Café sessions, while simultaneously having the space to showcase the posters as this was a good way to introduce all the projects present at the event. The consortium opted for a central location as it was important for the venue to be close to institutions and the train station for the participants coming out of town.

During the November-February period, our team intensively promoted the conference which was scheduled to take place on **15th February 2024 from 10:00 to 16:00 at the Monnet Delors Room of the NH Hotels Carrefour de L'Europe in Brussels, Belgium**. During this period, we also brainstormed on and identified the list of speakers, in particular the panellists, in a way to ensure a balanced representation of our own representatives and external speakers as well as of the different stakeholders (see the list and profiles of our speakers in Annex 1).

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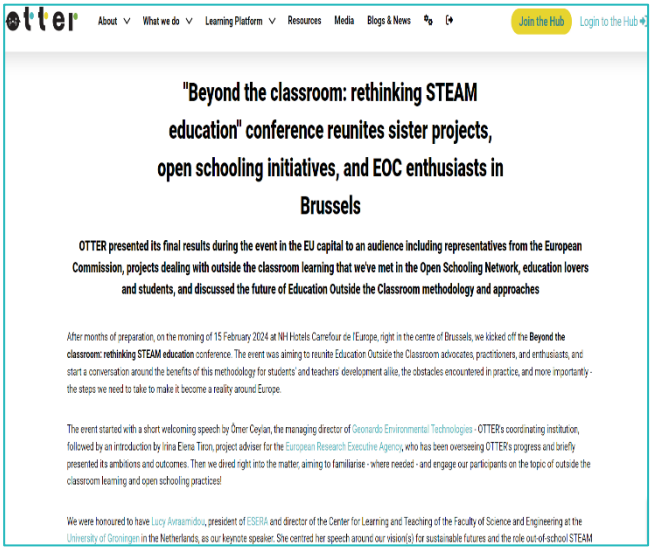
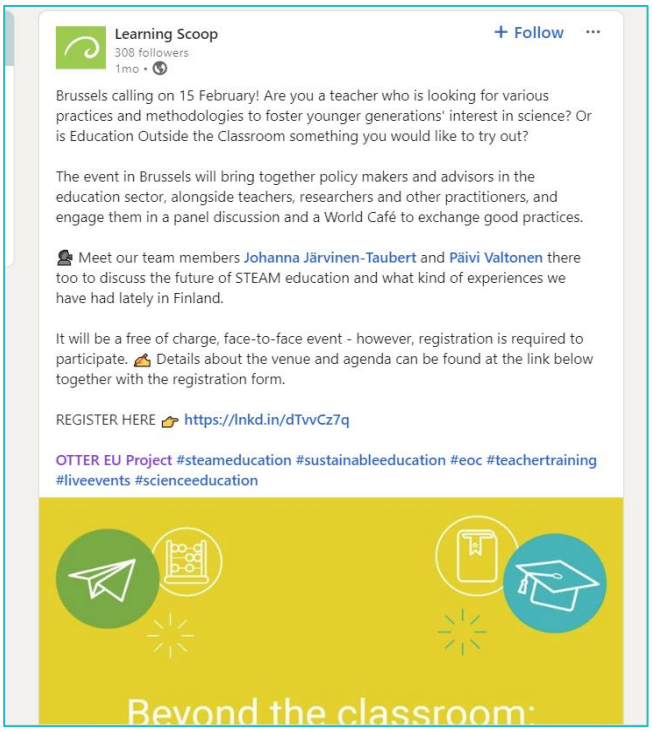
All the OTTER partners, along with sister projects, promoted the conference through their networks, including their social media channels. Additionally, GEO also conducted a detailed search of potential stakeholders specifically in Belgium, including universities, science centres, schools, NGOs, projects, officials, representatives in the EU Parliament, local municipalities, etc. and sent personalized emails. Some of these representatives joined us at the conference, while some could not attend, but asked for the conference proceedings and results. Below is a collection of the screenshots from various promotional efforts.





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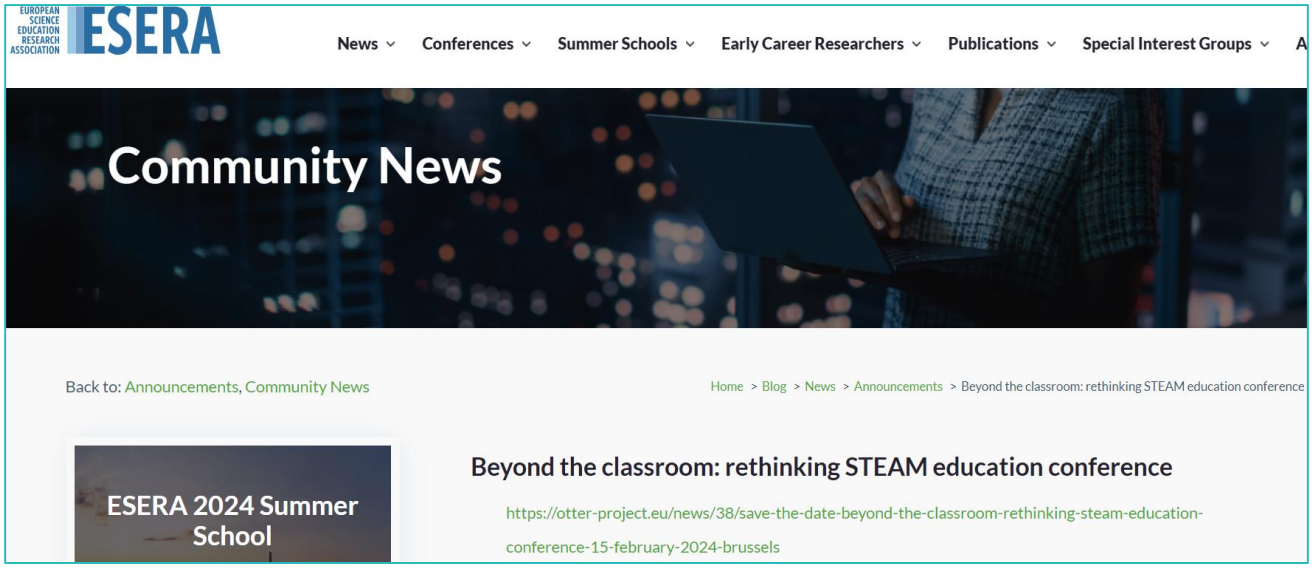

Thanks to these promotional efforts, 76 people registered for our conference. We had 51 participants in the end and we were content with the number of registrations considering a possible low turnout rate, which is increasingly common in similar events.

5 Implementation and follow up

The structure of the conference was also created to reflect different perspectives and cover both OTTER results specifically, but also cross-cutting topics of all the projects we invited to take part in it. Short welcoming speech by **Ömer Ceylan**, the managing director of Geonardo Environmental Technologies - OTTER's coordinating institution, gave an introduction to both conference and OTTER project, while **Irina Elena Tiron**, OTTER's project adviser at the European Research Executive Agency briefly presented the project's ambitions and outcomes.

The keynote speech "**Imagining sustainable futures: the role of out-of-school STEAM education**" by **Lucy Avraamidou**, president of ESERA and director of the Center for Learning and Teaching of the Faculty of Science and Engineering at the University of Groningen in the Netherlands, was centred around our vision(s) for sustainable futures and the role out-of-school STEAM education plays in them. Lucy invited the audience to reflect on their own ideas for a more sustainable 2030 and drew attention to the current setbacks of the educational system. She spoke of schools as "disimagination machines", highlighting the standardisation of thinking, the decontextualisation of learning experiences (which makes it hard for students to link them to their day-to-day lives), and our obsession with rankings and measurements (that can drive further apart students). Science is everywhere - and Lucy emphasised the need to build a healthier, more balanced relationship with our natural environment, precisely through out-of-school practices, taking into account the Sustainable Development Goals, as well.

Deirdre O'Neill as a representative of University of Limerick, one of the partners in OTTER, focused on OTTER results specifically in her presentation "**New EOC methodologies: learnings from the OTTER**

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project". She introduced OTTER methodology implemented through the pilots, sharing the impressions of both teachers and students who participated, and the results (that also translated to our deliverables), were numerous. Deirdre highlighted students' increased awareness of their nearby environment (for example, a river they'd never examined closely before), the applicability of scientific knowledge in real life, as well as the possibilities of exploring careers in STEAM. She emphasised the importance of having role models (the students were taken to science labs where they spoke to accomplished scientists), but also the impact these activities had on teachers' motivation. Both presentations can be found in **Annex 2**.

A panel discussion that followed, named "**The future of EOC: benefits and obstacles**" focused on the potential pathways towards making EOC a reality in various European school contexts and challenges to those pathways. With Jelena Kajganovic, OTTER's coordinator, as moderator, the panel featured four notable guests: Stephanos Cherouvis (senior project manager at ECSITE), Federico Iannuli (researcher and project manager for The Lisbon Council), Zsuzsanna Kray (science officer at European Science Foundation), and Dr. Aravella Zachariou (Head of Unit of the Education for Environment and Sustainable Development, Cyprus Pedagogical Institute and chair of the UNECE ESD Steering Committee). The animated discussion revealed many challenging points, such as:

- The lack of empowerment and support teachers feel in conducting outside the classroom activities
- The absence of resources to make these activities happen
- The lack of understanding and awareness of the benefits of Education Outside the Classroom among parents, who are often keener on students acquiring "marketable" skills rather than the soft skills this methodology develops
- The rigid curricula that leave little room for teachers to go beyond the classroom
- The heterogenous curricula - huge differences in approaches can be seen from one EU member state to another

However, it was recognized that projects like ours and those present in the room have been working tirelessly to advance the recognition and implementation of outside the classroom learning and that the perception is changing slowly, but surely.

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The second part of the day was dedicated to a co-working session in the format of a **World Café**. After lunch, participants were divided into five groups, each with its own theme (EOC practices at primary and secondary level, Pathways to EOC accreditation, Incorporating technology in EOC activities, Creating sustainable networks, From innovative practices to effective change). Within these smaller groups, they explored solutions and exchanged ideas, switching the groups every 30 minutes to take part in other groups' discussions. More on these conclusions below.

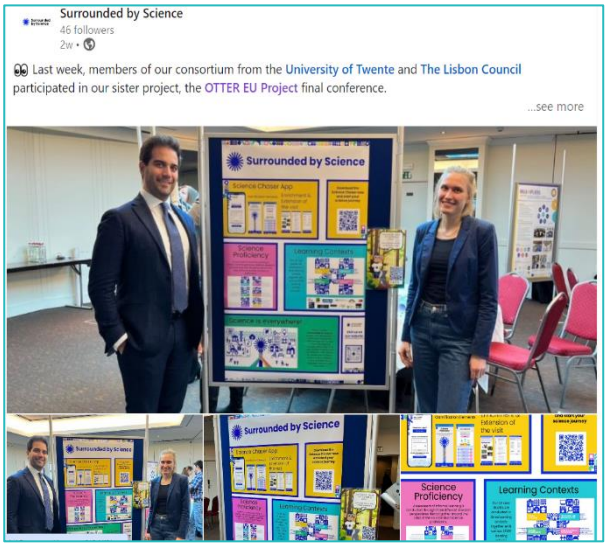
Lastly, we had the honour of having **Andrei Linţu**, Head of Sector of REA.C4 Reforming and Enhancing European Research and Innovation, close the conference, provide feedback for the OTTERs, and discuss future funding opportunities for projects dealing with education.

In addition, the conference provided space for various projects to present their **scientific posters**. Overall, there were 3 posters from OTTER:

- *Out-of-Classroom Science Education in Europe: a mapping study of practices and paths to accreditation* by University of Groningen and University of Limerick
- *Explore the OTTER Learning Platform* by Geonardo
- *Water in our Lives* by Scoil Íde (OTTER pilot school from Ireland).

In addition to these, **nine other projects** were present with their posters:

- Road-STEAMer
- MULTIPLIERS
- Bugs 2 the Rescue
- EcoSTEAM
- Pacify-D
- Neteland - STEM-land
- Surrounded by Science
- SHORE
- CONNECT.



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5.1 Workshop conclusions

5.1.1 Supporting EOC Practices at Primary and Secondary Level

Ciara Breen, Sarah Kelly (OIDE/ Scoil Ide) and Martina Scully Brennan (St Flannan's College Ennis) – OTTER Pilot Ireland

Pilot teachers from Ireland have been presenting the main points that make teachers choose to be a part of projects like this, as well as what creates motivation to deal with EOC. The main takeaway was that their choices were influenced by the prospect of collaborating with an esteemed organisation such as UL, coupled with the availability of funding. Additionally, the unwavering support from the principal bolstered their confidence in making sound professional decisions.

While the project seamlessly aligned with the curricular objectives, its execution transcended the confines of traditional classroom settings. The ample time they dedicated to collaborative planning emerged as a cornerstone of the project's success. It allowed them to refine their approach, address potential challenges proactively and foster a collaborative environment conducive to innovation and growth. In doing so, they were able to harness the full potential of the project, resulting in a rewarding and enriching experience for all involved stakeholders.

They emphasized that the principal support, especially in terms of time for planning and a feeling of being trusted as a professional in their field were the recurring themes discussed. Freeing up teachers for planning is an ideal situation for the success of projects. They highlighted that the fact that the relationship between third level institutions and Primary schools has changed for the better and this has allowed for support between educational stakeholders. This is concluded to be a huge positive, and was fundamental in their choice of this project.

They concluded that they would love to be able to continue this project, and hope that it is accredited as a European curriculum which can be rolled out, as the carefully scaffolded planning template is an ideal template for cross-curricular planning for EOC.

5.1.2 Pathways to EOC accreditation

Nathália Azevedo (University of Groningen) and Zsuzsanna Kray (European Science Foundation), OTTER Project

This session was tackling one of the most challenging issues raised at the conference. It started with the premise that the state-of-the-art of EOC accreditation at EU level, in terms of preparation, appearance, or integration, is scattered. Research from the OTTER project has not demonstrated current feasibility of EOC accreditation at EU-level but has led to consider potential pathways towards the development and promotion of high level and harmonised quality of EOC practices, including:

1. microcredential system – via teacher training
2. adherence to school networks – ecoschool networks / labels

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3. provision of a framework / methodology supported by self-assessment quality sections for example.

Questions raised were what is the feasibility of an EU-wide accreditation system at this point of time in the EU and what are the prerequisites needed to have an EU-level accreditation system.

After setting the context, the discussion took a step back to question a previous issue: why accreditation? What do we gain from it compared to educational systems in the EU? Some of the conclusions, but also additional questions raised are the following:

- Recognising what a person knows is recognising their learning journey
    - But is accreditation considered important for the individual?
- We can consider language schools/systems as examples for certification and accreditation
- Will the accreditation system be based on trust? On peer validation?
- An accreditation system for EOC needs to be connected with something else, for example, as part of quality education
- What are the incentives for seeking accreditation, and after being accredited, what happens?
- How many steps are necessary to be accredited?
- The format of the institution being accredited also affects the criteria for accreditation.
- Other stakeholders need to be included in the scheme: directors, universities...
- EOC needs to be in dialogue with open schooling in a broader sense
- Why would a school want to seek accreditation: do they receive training? Benefits?
- Is it possible to think of a collaboration system, a collaboration network to be accredited?

5.1.3 Incorporating technology in EOC activities

Federico Iannuli (Lisbon Council) and Clarissa Lang (University of Twente) – Surrounded by Science Project

During the World Café Session about the topic 'Incorporating Technology in Education Outside Classroom Activities,' two perspectives were taken. First, the perspective of the users (activity visitors), and second, the perspective of the providers (activity creators and activity providers).

The main point that was stressed from the perspective of activity users was that the technology should increase the level of interactivity during the activities and also as a way to help people's engagement. According to this, it should be used to enrich the activity through games (especially) and visuals that are focused on creating emotional engagement, like creating personalized avatars or characters. Furthermore, technology should be used as a tool for scaffolding visitors through the experience and increasing the learning benefit of the experience by adapting to the level of the user. To ensure that the technology does not take away from the 'on-the-spot' experience, extension material like readings or extra videos should

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be left for when the user has finished the activity and wants to deepen their knowledge of the topic at home. Additionally, technologies in EOC can increase users' knowledge by incorporating new methods like AI. With this, AI could be used as a tool to help navigate the ocean of new information and answer questions. The need for personalization was also stressed to create a tailored and interest-fitting experience for the users (age, personal interest, education level, etc.). Last, technology should also encourage and connect users to similar activities and topics to ensure the possibility of further deepening topics and building a deep level of interest if wished.

When talking about incorporating technology into EOC from the perspective of activity creators and providers, the first topic that was mentioned was how to help improve and create existing activities. Furthermore, technology should extend its purpose of enriching and extending the activities by simultaneously collecting and evaluating the current activities. For providers, it is essential to know what people do while they are experiencing their activities, how they spend their time, and what they like and dislike. Through this data repository, they will be able to create new activities or improve their old ones based on insights from their activities. An excellent way to enhance a platform that would provide suggestions for creating and evaluating activities could be to make use of AI and a chatbot that answers questions in a Q&A manner. In that way, activity providers can receive help and be scaffolded in their process of creating and evaluating their activities by learning from the data and experience of other activity providers. To create fair and equal access, institutions should consider providing the required technical devices so everyone, even without these devices, is able to participate and profit from the activities.

5.1.4 Creating sustainable networks

Annette Scheersoi and Jana Schilbert (University of Bonn) – MULTIPLIERS Project

In the MULTILIERS World Café session on creating sustainable networks for out-of-school education, key challenges were identified including financial aspects, communication, organization, coordination, resources, and motivation. Participants emphasized the importance of securing EU follow-up funding for coordination, fostering strong relationships among network partners based on common visions and trust, and utilizing platforms to facilitate meetings and share expertise. Suggestions included implementing membership fees for network participation, offering extrinsic motivations such as certifications or awards, and engaging local stakeholders like universities and businesses. Participants recognized motivation as the primary challenge, highlighting the need for a common goal and values to drive sustainable solutions. Overall, the session confirmed the interconnected nature of challenges and the central role of motivation in sustaining networks beyond the project's duration.

5.1.5 From innovative practices to effective change

Stephanos Cherouvis (Ecsite network) – RoadSTEAMers Project

The Road-STEAMer project run a 90-minute workshop on STEAM practices as real-life use-cases.

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The primary objective of the project is to formulate a STEAM roadmap for science education in Horizon Europe. This roadmap constitutes a strategic plan aimed at guiding the European Union's principal funding program for research and innovation in promoting heightened interest in STEM fields. The approach involves integrating artistic methodologies, emphasising creative thinking and applied arts (the "A" in 'STEAM'). The consortium endeavours to deliver this roadmap for Europe by:

- fostering collaboration and co-creation with stakeholder communities in science education, research, innovation, and creativity
- adopting a bottom-up approach that prioritises educational practice and the agency of practitioners over high-level conceptualizations of STEAM and generic top-down plans for its incorporation into science education
- concentrating on strategies to harness the power of STEAM approaches, exemplified through noteworthy cases and best practices

Participants were invited to share their ideas on the 5 + 1 criteria that Road-STEAMer is using to map and anlyse STEAM practices: these are Creativity, Collaboration, Disciplinary Inter-relations, Real-world Connections, Thinking – Making – Doing, Inclusion – Personalisation – Empowerment (with Equity as an underlying value). In particular, they were asked to reflect upon their own STEAM/STEM practices and offer feedback on the validity on this approach. Then, dialogue focused on STEAM practices as real-life use-cases (the Real-World Connections criterion) with an emphasis on two aspects: a) Conditions for impactful STEAM practices addressing societal challenges (such as climate crisis, sustainability, democracy, trust in science, etc.), with students and stakeholders working as researchers (both inside and outside the classroom), in inquiry-based or problem-based projects that attempt to deliver aspects of the science curriculum through a range of STEAM activities; b) what are the skills needed/addressed in such activities.

This was a really engaging exercise with extremely valuable feedback and lively discussions with the participants. It demonstrated the huge interest in STEM/STEAM activities that go beyond both standard prescribed learning outcomes and assessment and the classroom walls, as well as interest in activities that address certain soft skills (with leadership and active citizenship being the two repeatedly surfacing).

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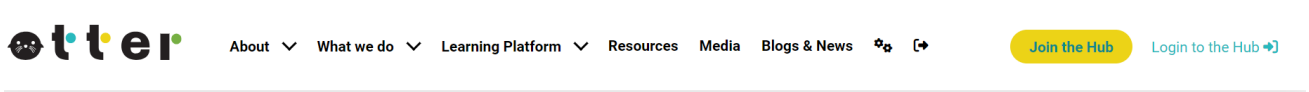

"Beyond the classroom: rethinking STEAM education" conference reunites sister projects, open schooling initiatives, and EOC enthusiasts in Brussels

OTTER presented its final results during the event in the EU capital to an audience including representatives from the European Commission, projects dealing with outside the classroom learning that we've met in the Open Schooling Network, education lovers and students, and discussed the future of Education Outside the Classroom methodology and approaches

After months of preparation, on the morning of 15 February 2024 at NH Hotels Carrefour de l'Europe, right in the centre of Brussels, we kicked off the **Beyond the classroom: rethinking STEAM education** conference. The event was aiming to reunite Education Outside the Classroom advocates, practitioners, and enthusiasts, and start a

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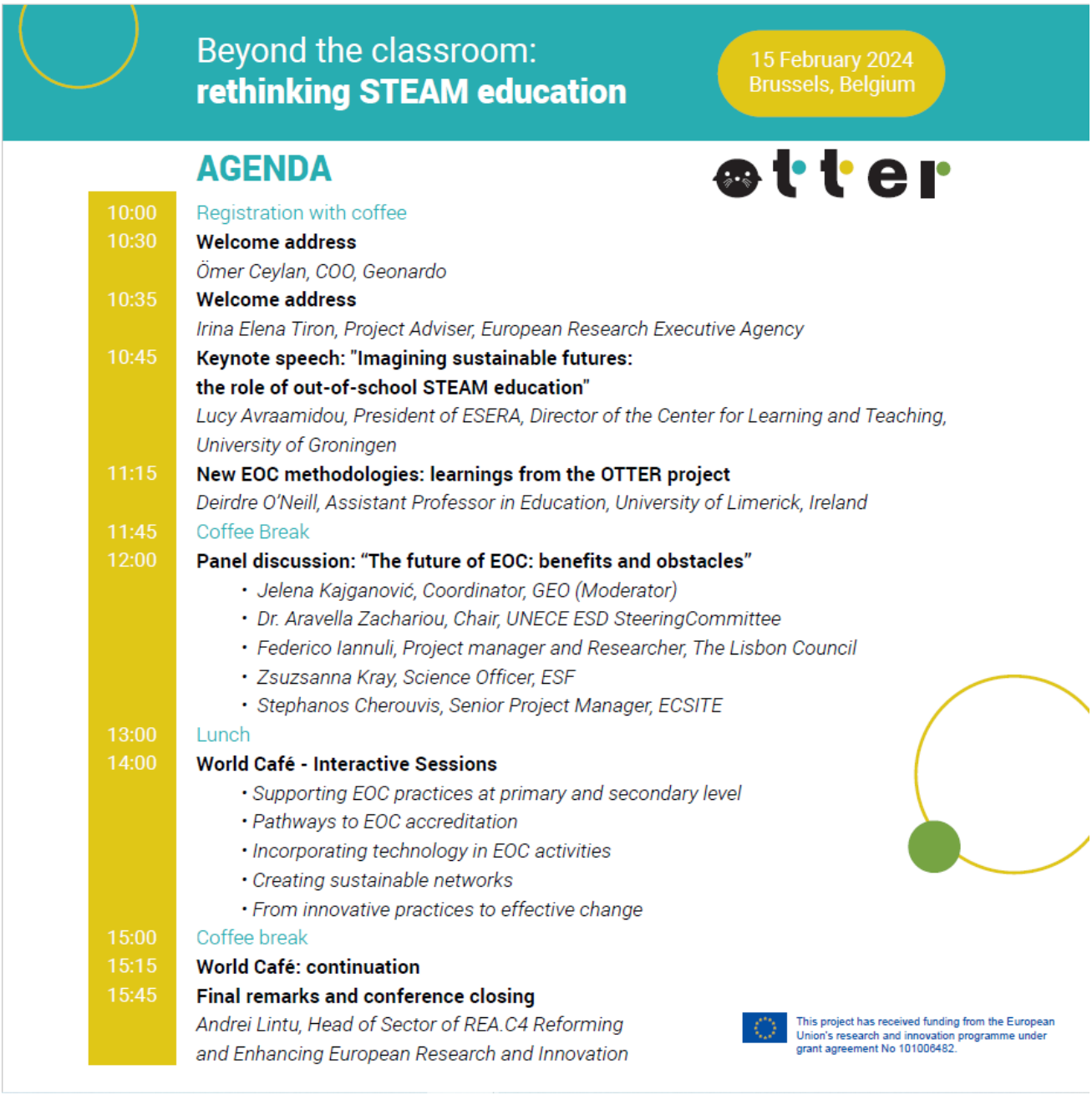
6 Annex I: Agenda and Speakers



Beyond the classroom:
rethinking STEAM education

15 February 2024
Brussels, Belgium

AGENDA

10:00	Registration with coffee
10:30	**Welcome address** *Ömer Ceylan, COO, Geonardo*
10:35	**Welcome address** *Irina Elena Tiron, Project Adviser, European Research Executive Agency*
10:45	**Keynote speech: "Imagining sustainable futures: the role of out-of-school STEAM education"** *Lucy Avraamidou, President of ESERA, Director of the Center for Learning and Teaching, University of Groningen*
11:15	**New EOC methodologies: learnings from the OTTER project** *Deirdre O'Neill, Assistant Professor in Education, University of Limerick, Ireland*
11:45	Coffee Break
12:00	**Panel discussion: "The future of EOC: benefits and obstacles"** • *Jelena Kajganović, Coordinator, GEO (Moderator)* • *Dr. Aravella Zachariou, Chair, UNECE ESD SteeringCommittee* • *Federico Iannuli, Project manager and Researcher, The Lisbon Council* • *Zsuzsanna Kray, Science Officer, ESF* • *Stephanos Cherouvis, Senior Project Manager, ECSITE*
13:00	Lunch
14:00	**World Café - Interactive Sessions** • *Supporting EOC practices at primary and secondary level* • *Pathways to EOC accreditation* • *Incorporating technology in EOC activities* • *Creating sustainable networks* • *From innovative practices to effective change*
15:00	Coffee break
15:15	**World Café: continuation**
15:45	**Final remarks and conference closing** *Andrei Lintu, Head of Sector of REA.C4 Reforming and Enhancing European Research and Innovation*

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Lucy Avraamidou is the President of the European Science Education Research Association (ESERA) and the Director of the Center for Learning and Teaching at University of Groningen. Her research focuses on Science Education and explorations of what it means to teach and understand science, in both formal (schools) and informal environments (museums, science parks, outdoor settings - the sites we have been focusing on as well in our work on Education Outside The Classroom).

Deirdre O'Neill is an Assistant Professor at the UL - School of Education (SoE) University of Limerick whose work focuses on the links between sustainability and STEAM education and the innovative practices that can be adopted to bring students closer to science. Deidre is also passionate about and involved in addressing unconscious bias and gender stereotyping when it comes to pursuing careers in STEAM.

Dr. Aravella Zachariou, Head of the Unit of Education for Environment and Sustainable Development (ESD) at the Cyprus Pedagogical Institute. From 2017, she has also been chairing the UNECE ESD Steering Committee, leading, on behalf of Cyprus, the "Action Plan for ESD in the Mediterranean Region".

Dr. Zachariou is the author and co-author of various books, handbooks, and educational tools on ESD, participating in many projects as a senior expert, researcher, coordinator, and consultant.

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Federico Iannuli is a project manager and researcher at The Lisbon Council. He is involved in the work of Surrounded by Science, our sister project that is designing a systematic assessment methodology to asses the impact of out-of-school #science activities, by conducting field studies and innovative data collection methods.

Jelena Kajganovic is a senior project manager at Geonardo Environmental Technologies, with extensive experience in working on educational projects both in Horizon Europe and Erasmus+. For the past two years and a half, she has been coordinating OTTER's work on Education Outside the Classroom.

Zsuzsanna Kray is a sustainability expert and science officer at the European Science Foundation. In our project, she has organised the OTTER Labs (activities where we implemented outside the classroom activities with pupils) in two schools in Budapest, Hungary.

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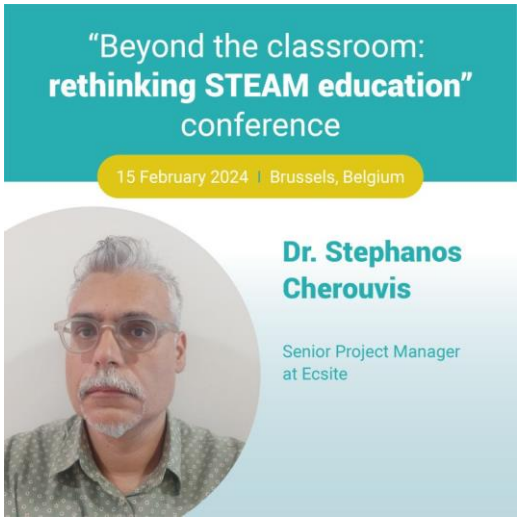

Dr. Stephanos Cherouvis is a senior project manager at Ecsite - European network of science centres and museums, with more than a decade of experience working on international projects, dealing with science education, science communication, citizen science and technology-enhanced education, among others.

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7 Annex II Presentations

Imagining sustainable futures:
the role of out of school STEAM education

Lucy Avraamidou
University of Groningen, NL

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the future | the problem with schooling | the problem with the Museum | the futures we desire

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the future

think of a postcard from the future

Join at menti.com | use code 2443 8580

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think of a postcard from the future
58 responses

Future

- How is the future made?
- Who is benefiting from the future?
- What is our role in (re)shaping the future?
- What is the relationship between education and the future?
- What is the role of out-of-school STEAM education in (re)shaping the future?

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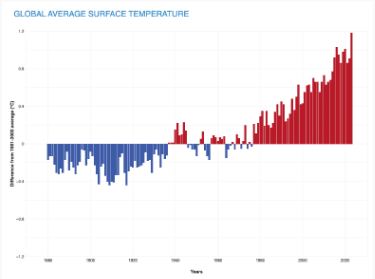
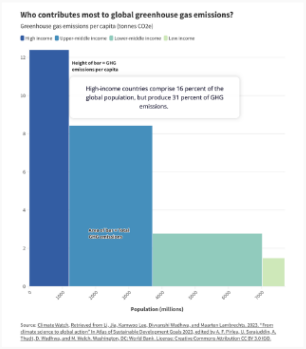
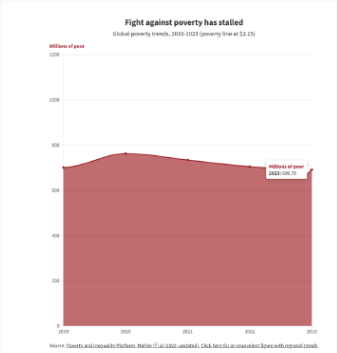
Imagine yourself in 2030

Future (?)

- Developments in science, technology, and society: AI dystopia?
- Climate crises and planetary health destruction
- Growing inequalities: destruction, poverty, displacement







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Possible Future(s): the role of education

- The sustainability goals for 2030 are interconnected
- Learning is intergenerational
- Learning does not happen only in schools/universities
- Educational 'success' needs to be redefined with a focus on pedagogies of resistance and care instead of pedagogies for the economy
- Educational institutions need to stop obsessing with neoliberal paradigms and rankings and invest in bringing about social change, mitigating inequalities, and contributing to more democratic and socially just futures

The problem with schools

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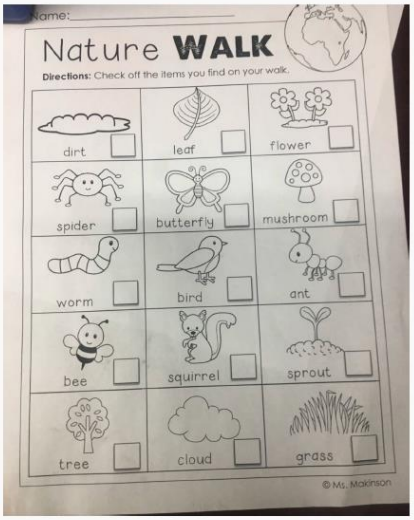
School as a disimagination machine

- Schools as a dead zone for imagination (Giroux, 2014)
- Confusing education with training
- Domination of standardisation of thinking
- Decontextualisation of learning experiences
- Obsession with measurements and rankings
- Market-driven educational reform



- **Out-of-school science spaces** as sites for cultivating

1. Imagination
2. Hope
3. Care
4. Resistance

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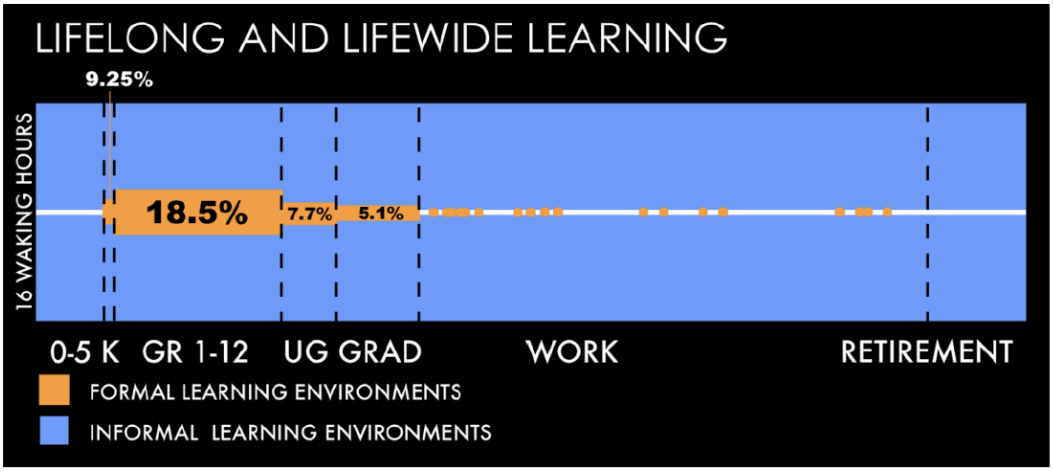

Bell, 2009

Where is science?

- Laboratories
- Science centres and museums
- Botanical gardens
- Farms
- Community settings
- Science festivals
- Science cafes
- Social media (twitter, tik-tok, fb, youtube etc)
- Purposefully curated spaces
- ...

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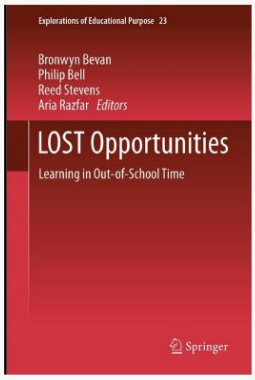
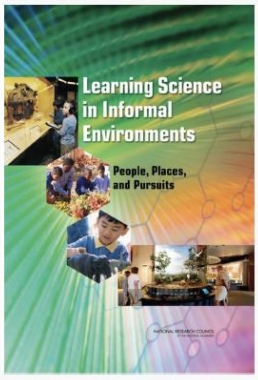
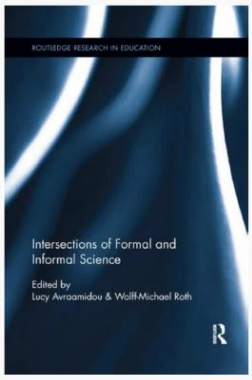
what do we know from research?







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Out-of-school science: a synthesis of empirical evidence

- More natural spaces for learning
- Have the potential to re-structure power dynamics
- Provide organic opportunities for active engagement and interactions in authentic learning environments
- Provide opportunities for experimentation through play
- Potential to enhance motivation for learning
- Potential to support an appreciation for science and its value to society
- Potential to support an understanding of the nature of science and the work of scientists

the problem with the Museum

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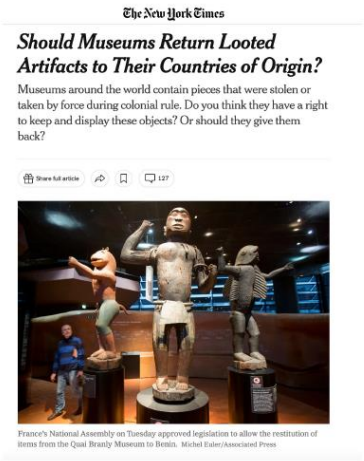
The problem with the Museum

- Who will go to the Museum?
- Who will pay for the Museum?
- Whose story is it?
- Who owns the artifact?
- Where is learning?
- The Museum as a space for reproducing colonialism and restricting access to the privilege


The New York Times

Should Museums Return Looted Artifacts to Their Countries of Origin?

Museums around the world contain pieces that were stolen or taken by force during colonial rule. Do you think they have a right to keep and display these objects? Or should they give them back?

France's National Assembly on Tuesday approved legislation to allow the restitution of items from the Quai Branly Museum to Benin. Michel Euler/Associated Press


Decolonising museums isn't part of a 'culture war'. It's about keeping them relevant

Dan Hicks

Let's be open to the idea of returning stolen cultural objects, and remaking international relationships with honesty

'Britain's museums sorely need revitalisation, and the question of human remains and artefacts offers a position from which to see debates around them in a clearer light.' The V&A, London, December 2020. Photograph: Alicia Canter/The Guardian

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the futures we desire

Imagining Possible Futures

- Future in its plurarity
- Healthier and more balanced relationships with our natural habitat as well as social environments
- More sustainable and socially just futures

Dutch police are experimenting with eagles trained to capture drones mid-flight. HAYDN BARTLETT/CODDY/GETTY IMAGES

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Pedagogies

- Pedagogies of hope
- Pedagogies for imagination
- Pedagogies of Care & Resistance
- Culturally responsive and sustaining pedagogies
- Asset-based pedagogies

Cultural Studies of Science Education (2022) 17:637–660
https://doi.org/10.1007/s11422-021-10082-4

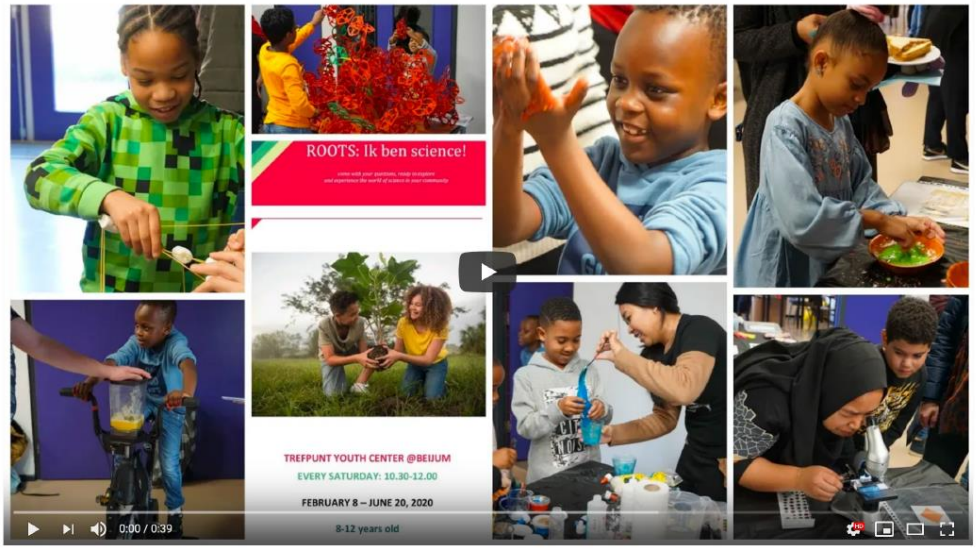
ORIGINAL PAPER

Culturally relevant/responsive and sustaining pedagogies in science education: theoretical perspectives and curriculum implications

Theila Smith[1] · Lucy Avraamidou[2] · Jennifer D. Adams[3]

Received: 28 June 2020 / Accepted: 14 September 2021 / Published online: 24 February 2022

Abstract
The main focus of this paper is to put forward an argument about the value of asset-based, culturally relevant/responsive and sustaining pedagogies in science education, especially in former colonial contexts. Countering the framing hegemony of science education through a historically Euro-dominant lens, we call for a critical analysis of the state of science education in the Netherlands by exploring, specifically, the Dutch Caribbean community which includes Suriname and the former Dutch Antilles and Aruba and the need to respond with a more culturally relevant and sustaining pedagogical stance. In doing so, we provide a concrete example of a CR-SP-focused community-based STEAM program for young children and their parents in the north of the Netherlands. We hope that this paper will provide the foundation to springboard conversations among educators and researchers with an interest in designing, enacting and researching CR-SP-informed programs and curricula geared for historically marginalized families and children.



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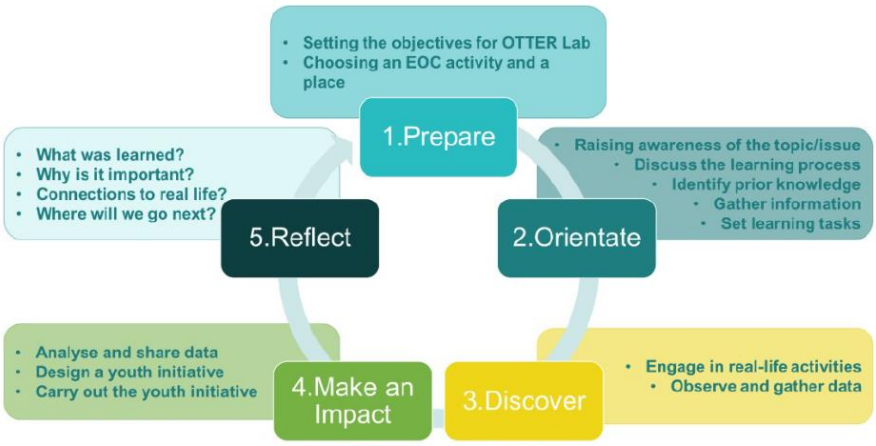

Image 1: Five steps of OTTER Lab

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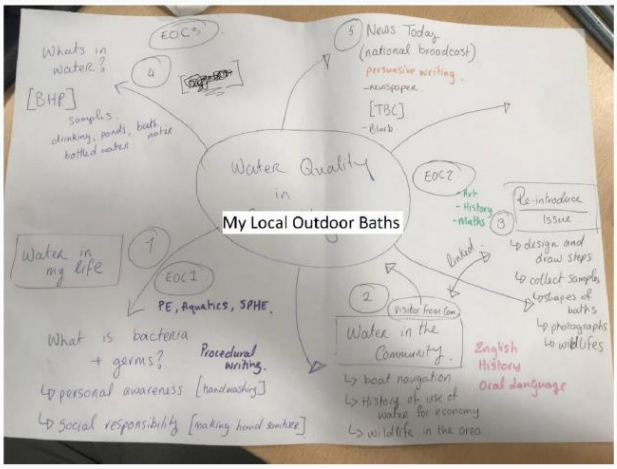
the local over the global &
personaly meaningful learning



local environments as
sites for experimentation

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authentic investigations

play and agency for learning

Image 4: School C students during the EOC activity

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- Out-of-school science spaces as sites for cultivating:
  - Imagination
  - Hope
  - Care
  - Resistance

l.avraamidou@rug.nl

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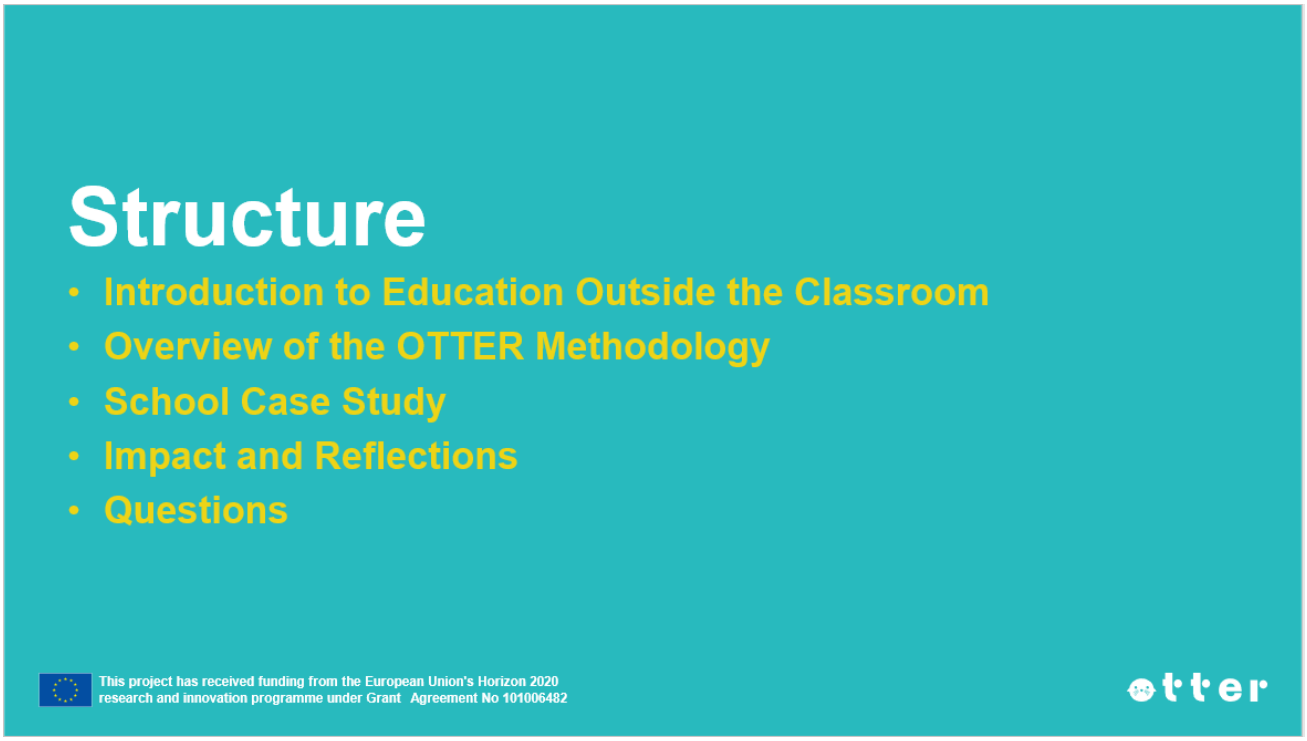

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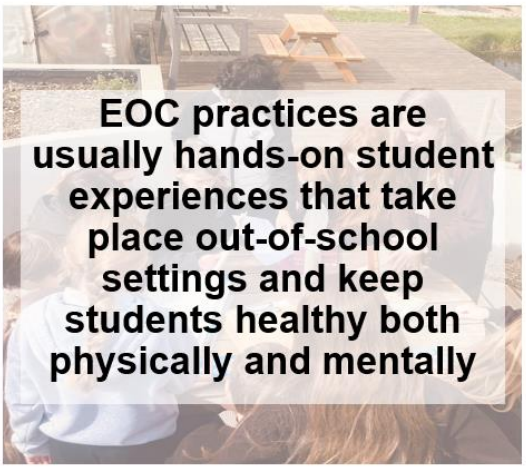
What is Education Outside the Classroom (EOC)?



- Structured learning experience
- Takes place beyond the classroom environment (Kendall et al., 2006)
- A method of teaching
- A movement to redefine school
- A theory about how education should be viewed
- An understanding that education exists in a social, economical, political and geographical context (Bentsen, Mygind & Randrup, 2009)

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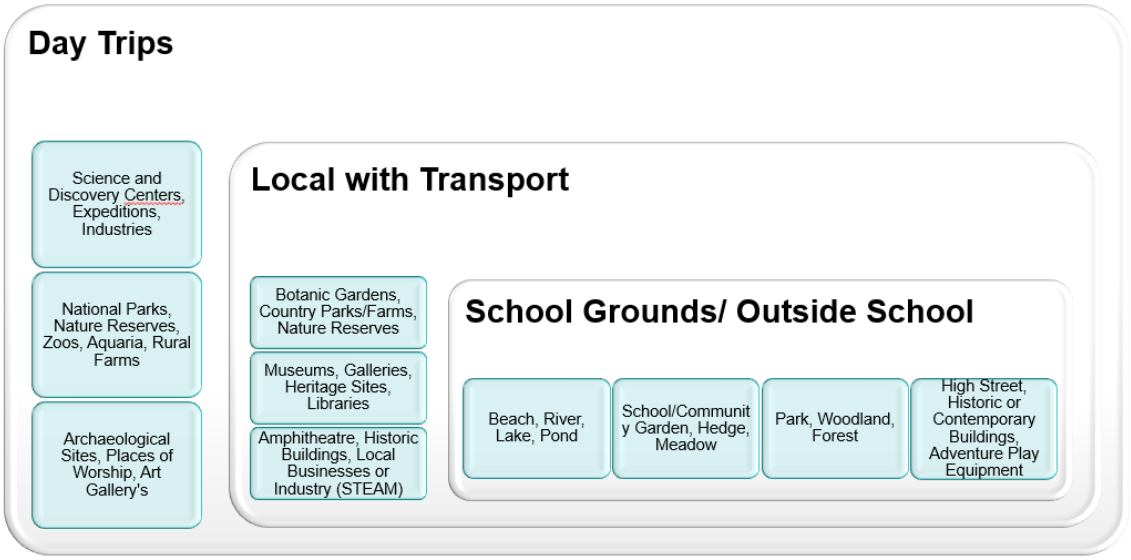
Examples of EOC Sites



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A Review of the Literature – Benefits

- Student interest and everyday experience in nature
- Authentic learning environments
- Investigation and contemplation occur naturally
- Promotes positive attitude towards nature
- Positive outcomes on students' learning, knowledge, motivation, interest and enjoyment
- Nature supports social interaction, emotional skills develop in the natural environment,
- Fewer social conflicts compared to regular indoor teaching
- Outdoor classroom teaching is active; it develops motor skills and enhances physical activity (Laine, Elonheimo & Kettunen 2018; McCormack et al,. 2022)

D2.1 LITERATURE REVIEW AND COMPENDIUM OF SUCCESSFUL PRACTICE

Who are we?

Funded by the European Union

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OTTER Aims and Objectives

In OTTER project, we aim at **increasing the interest in scientific topics among young people through Education Outside the Classroom** (EOC) methods and pedagogies.

Furthermore, we want to understand how EOC can help improve the acquisition of **scientific knowledge** and **transferable skills*** in students, specifically in the field of environmental sustainability.

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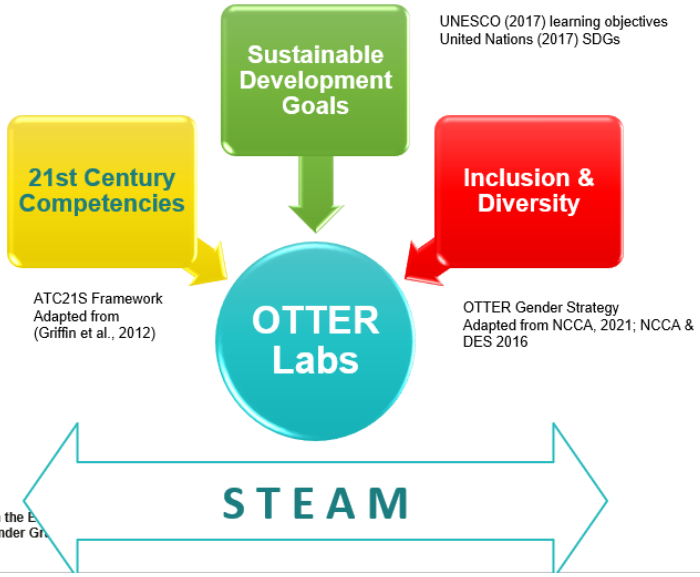
OTTER Lab Design Principles



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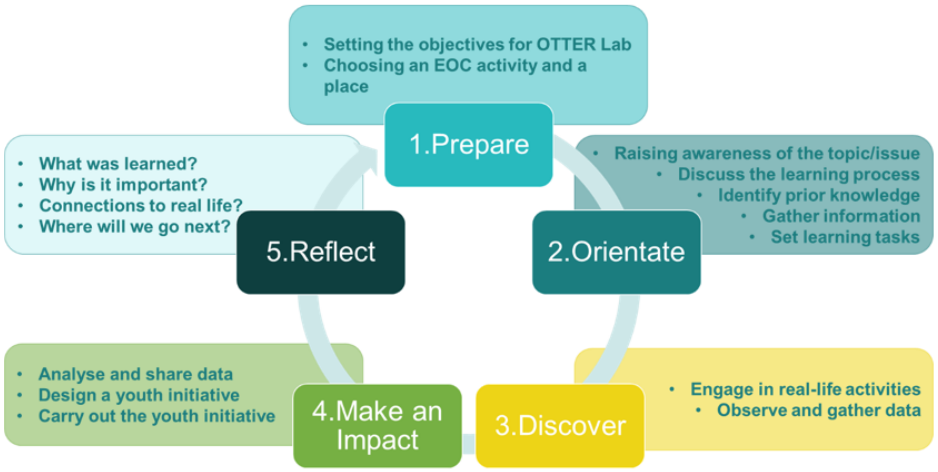
OTTER Lab Approach to EOC



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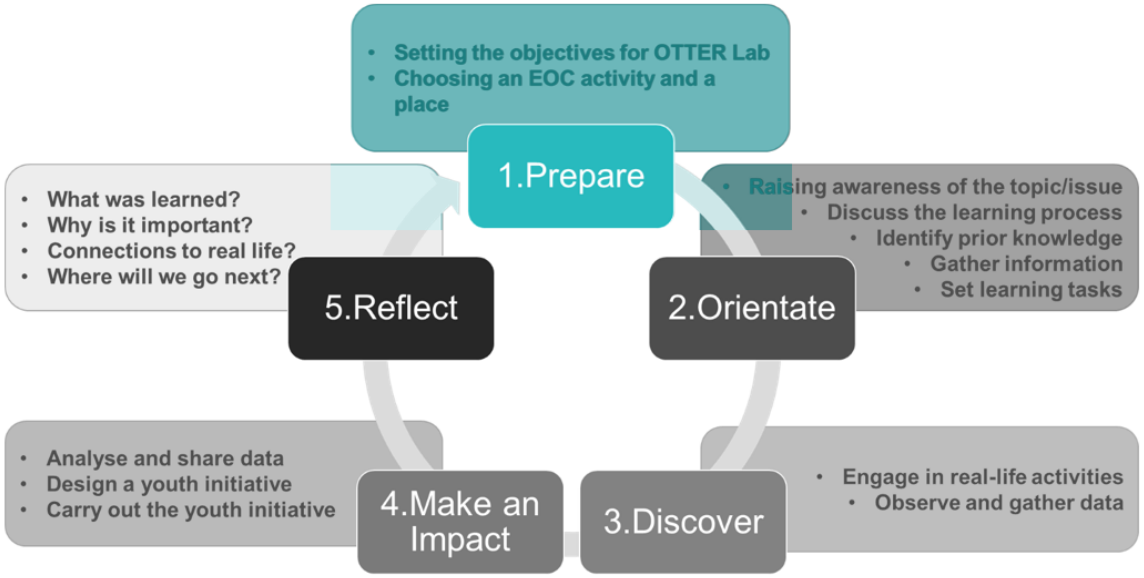

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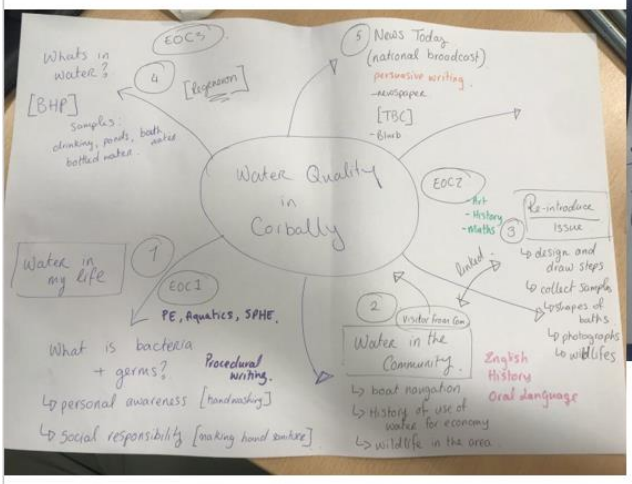

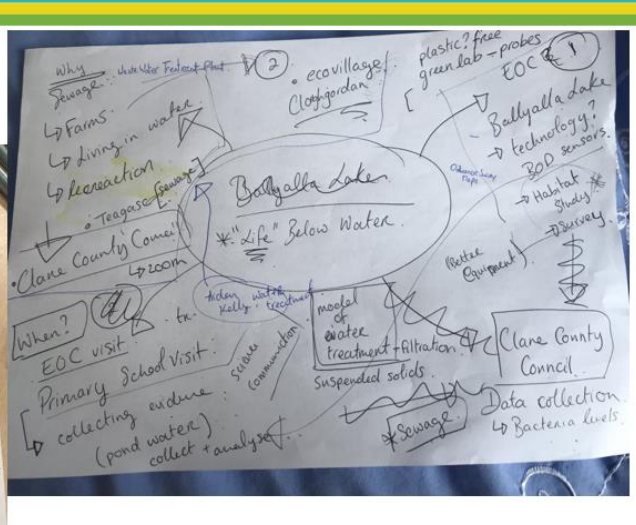

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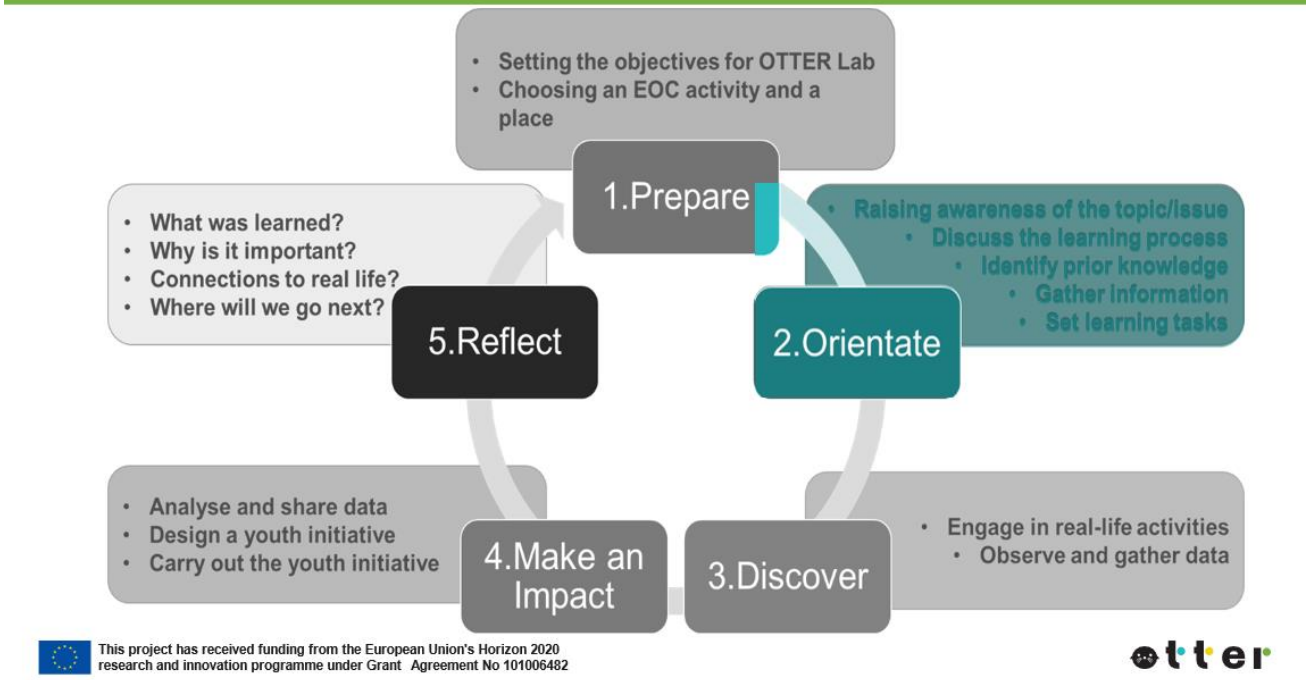
(SCIENCE)	OTTER Lab Outcomes		Identifying Suitable Learning Objectives from the Curriculum		
			Knowledge	Skills	Attitudes, Values, Ethics
Sustainable Practices	Sustainable Development Goals (related to OTTER)	Life Below Water	• identify the interrelationship of the living and non-living elements of local and other environments • become aware of the importance of the Earth's renewable and non-renewable resources • recognise and investigate human activities which have positive or adverse effects on local and wider environments **• observe, identify and examine the animals and plants that live in local habitats and environments**	• identify positive aspects of natural and built environments through observation, discussion and recording • identify and investigate a range of common materials in the immediate environment **• explore the origins of these materials** **• identify the interrelationships and interdependence between plants and animals in local and other habitats** **• observe and explore some ways in which plant and animal behaviour is influenced by, or adapted to, environmental conditions**	• recognise how the actions of people may impact upon environments • come to appreciate the need to conserve resources **• foster an appreciation of the ways in which people use the Earth's resources**
	1. Ways of Thinking	Creativity and innovation		• communicate and evaluate the design plan using sketches, models and information and communication technologies	
		Critical thinking, Problem Solving, Decision Making		• ask questions that will identify problems to be solved • ask questions that will help in drawing conclusions and interpreting information • collect information and data from a variety of sources, including observations in the environment, classroom observations and experiments, photographs, books, maps and information and communication technologies	


Setting the objectives for OTTER Lab
Choosing an EOC activity and a place
1.Prepare
Raising awareness of the topic/issue
Discuss the learning process
Identify prior knowledge
Gather information
Set learning tasks
2.Orientate
Engage in real-life activities
Observe and gather data
3.Discover
Analyse and share data
Design a youth initiative
Carry out the youth initiative
4.Make an Impact
What was learned?
Why is it important?
Connections to real life?
Where will we go next?
5.Reflect
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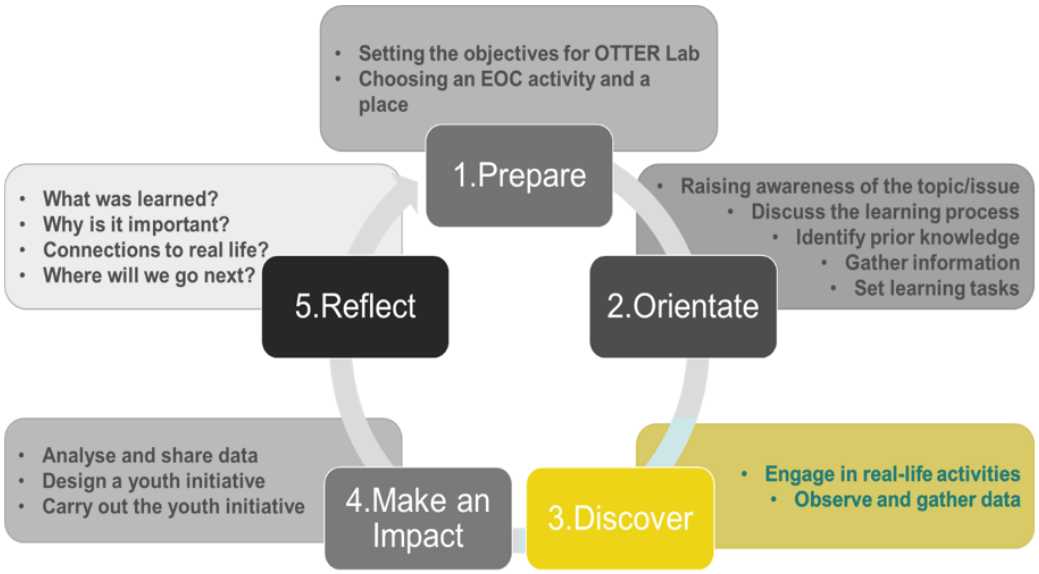
In-Class Activities (Pre/post learning
Cross Curricular Links
SPHE
Science
SESE
History
Geography
Maths
Primary Language
Visual Arts



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Mini EOC's during the year

Mentoring between the classes – Buddy system

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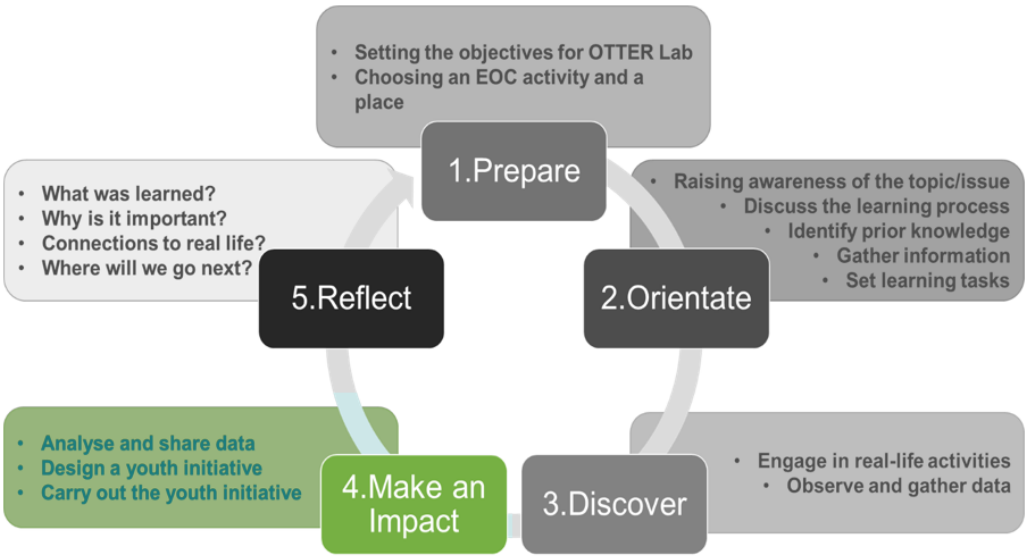

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Youth Initiatives

School 1: 6-8yrs

School 2: 16-18yrs

School 3: 16-18yrs

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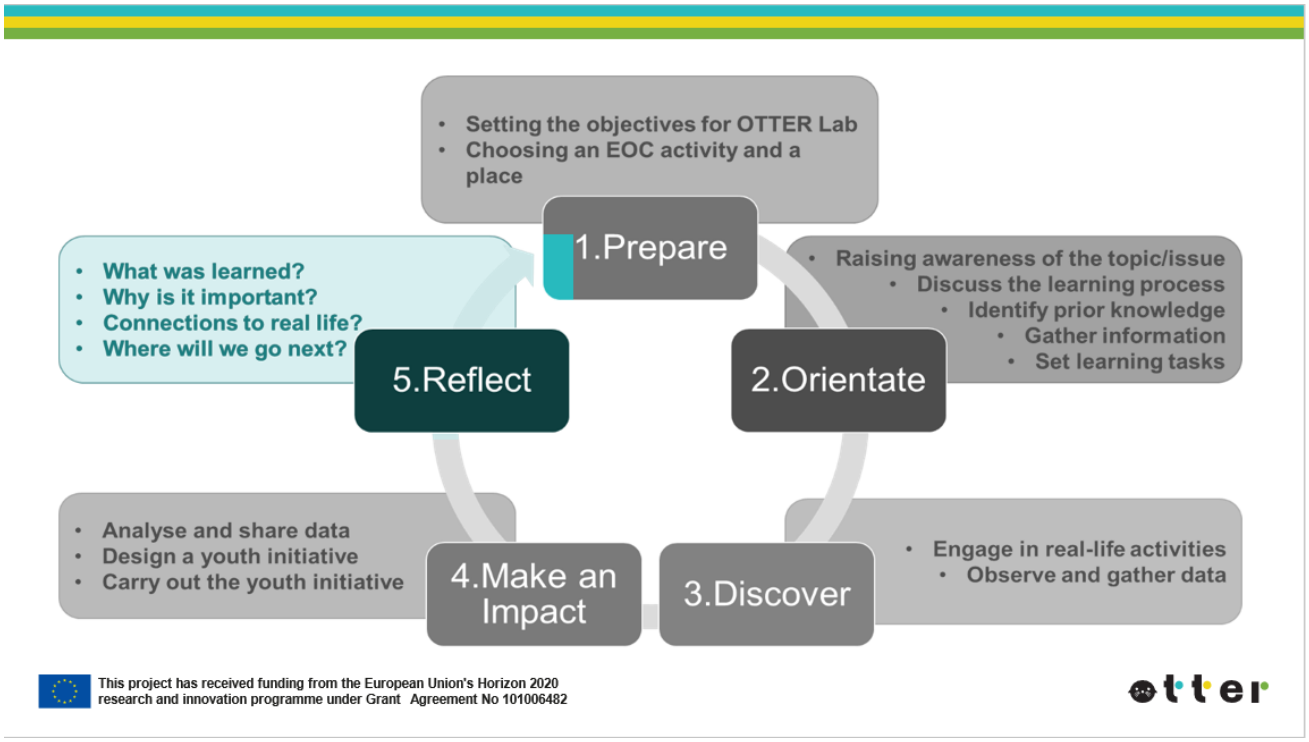

Researching OTTER

- RQ1: How does young people's engagement in the project activities increase their motivation for learning science?
- RQ2: How does education outside the classroom help build citizenship?
- RQ3: How does young people's engagement in the project's activities support the development of their knowledge about the SDGs?
- RQ4: How does young people's engagement in the activities influence their aspirations for scientific careers?

Pre and post student surveys

Teacher interviews

Student Focus groups

Student Artefacts

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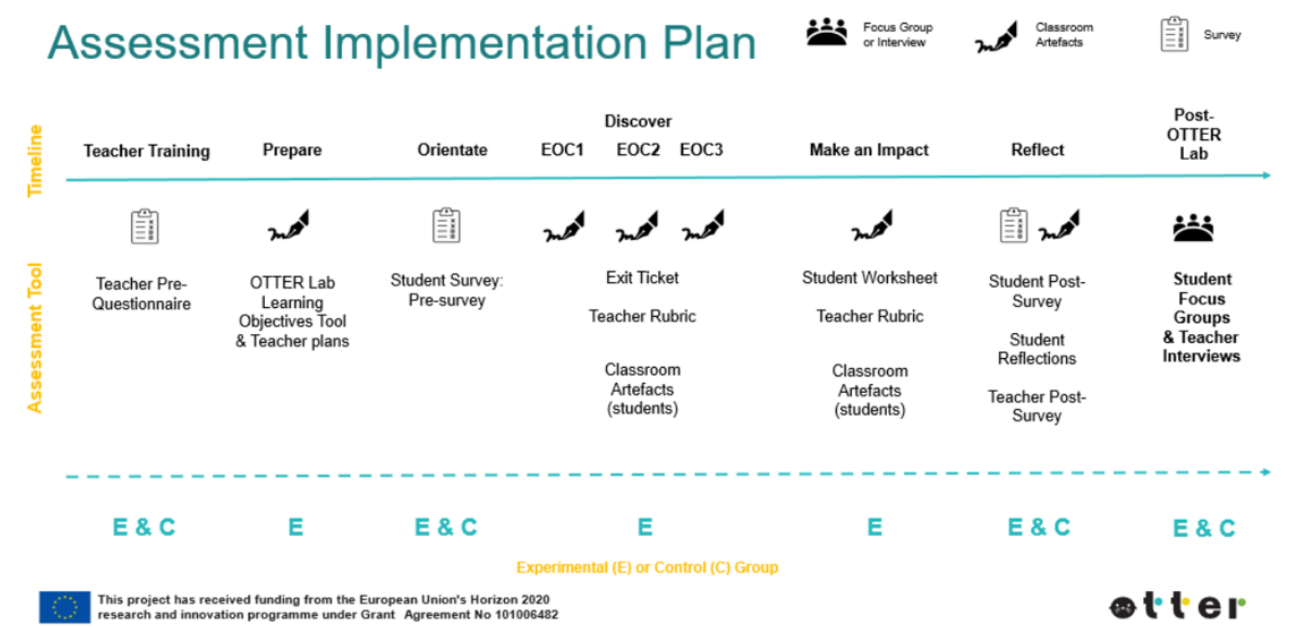

RQ 1: How does young people's engagement in the project activities increase their motivation for learning science?

- Enhanced Student Learning
- *...there's some students there who...wouldn't get the H1 [high grades], but they're fantastic workers, they're brilliant at communication, they're brilliant at leading a team, their brilliant IT skills, and just even, I suppose, acknowledge that and give some kind of a percentage towards the overall grade, and... they've gone up in their grades because of this project (Irish Teacher)*

- *"I think that in this Otter lab children were more enthusiastic and if you now today ask something about plastic now they would tell you with this: "oh, did you mean that they are this hard plastic and it was made of oil" and all kind of this kind of things" (Finnish Teacher).*

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RQ 1: How does young people's engagement in the project activities increase their motivation for learning science?

- Collaboration & Building Relationships
  - In the student data, comparing the control and experiment group revealed significant shifts in the responses of students who completed OTTER labs in relation to their ability to develop good relationships with classmates.
- Student Agency in the Wider School Environment
  - *"But at the same time with its point of information and with actually getting petitions, because if you just do dissemination people pass by, but if you do a signature collection, there is a record that people are in favor of this," (Spanish Student).*

RQ2: How does education outside the classroom help build citizenship?

- Connections to the Community
  - *"The [Local historian]'s grandson was in the second class, so that for him, that was gorgeous too. That we had his granddad in as resident expert" - Irish Teacher.*
- Integrated and Varied Learning Experiences
  - *We tried to record it, but before we tried to record it, we researched the content. On the one hand, what the topic should be that we would talk about. And what questions to ask each other, whether it should be an interview-like thing. (...) How to communicate in front of, say, a camera. It was. How should I take things seriously (Hungarian Student)*

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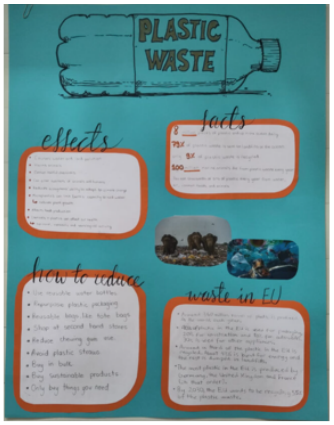

RQ3: How does young people's engagement in the project's activities support the development of their knowledge about the SDGs?

- Connections to the local environment
  - *"even to look at a local amenity from the point of view of, I suppose they were more invested in the importance of water quality cause a lot of the students actually swim in the area." - Irish Teacher*
- Hands-on experience
  - *"I think I learned a lot during the project and when listening to the others' projects as well. It was very fun to do it with my friends and I think there were many things about plastic packaging, and it's affects around the world that I learned a lot more and I really liked learning how I can make an impact to make a more sustainable future." (Finnish Student)*

RQ4: How does young people's engagement in the activities influence their aspirations for scientific careers?

- *"You learn and understand the theory because when you are in class…they explain to you cannot be related to your reality and you cannot interact with it and in this way, the fact that your knowledge is useful in a real context makes that knowledge much more enriching and really makes you have it present in your life and that in the end everything you learn has to be useful for something (Spanish Student)*
- *"And they really liked her, they didn't know her [Greta Thunberg] before. And I think, I feel, that her personality or her story inspired the children and that's when these initiatives came up to go and pick up rubbish" (Hungarian Teacher).*

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Other Key Considerations

- Structure for Education Outside the Classroom Experiences
- Multiple EOC Interactions Matter
- Facilitating Teacher Professional Learning
- Embedding Opportunities for Assessment in Learning Experiences
- Learning Science to Affect Change

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