

School-Community Projects as keys to sustainability & STEM education

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A brilliant mind, a great leader

A fantastic team



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Sharing the passion to improve STEM education and finding a true friendship



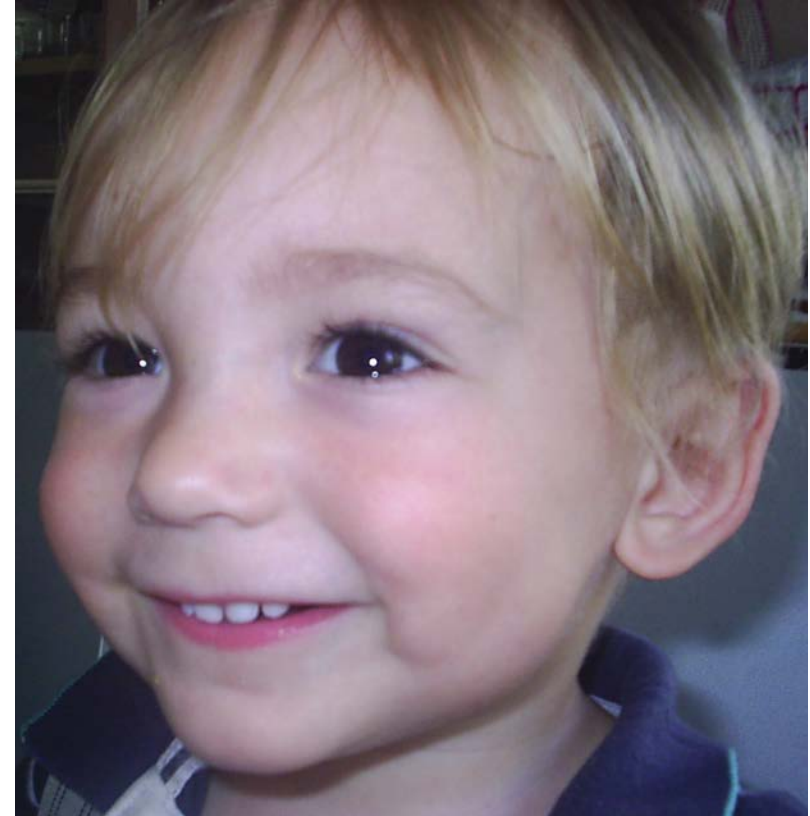
Overview

- Introduction: feeling, sharing, creating, transforming.
- What & why Open Schooling?
- The MOST Project.
- STEM and sustainability education through School Community Projects (SCP): inspiring examples.
- The challenge of impact evaluation.
- Capturing the lessons learnt: characteristics of good SCP.
- Implications for research, policy and practice.

Warming up

feeling, sharing, creating

What does this face express?
Give 3 words



Sharing results

<https://www.mentimeter.com/app/presentation/alia1i2u3j5xxwtf8m2wbkqcnaz4jy9c/m1jje9kgybp/edit>

wonder glad
excitement
happiness joy
emotion innocence

Warming up

feeling, sharing, creating

What does this photo of nature suggest to you
Give 3 words?

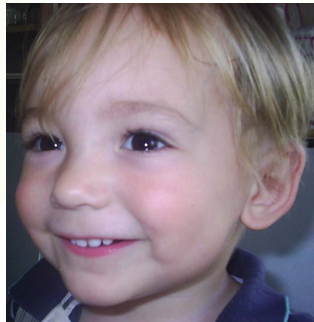


Sharing results

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balance
protection
the earth
joy nature
beauty
peace
environment
need of preservation
our beautiful planet

This talk is about open schooling and....



provoking wonder and excitement
when learning STEM...

connecting STEM education with
preserving nature and caring about
our planet...



Everything start with a question....

Are we equipping future citizens with what they need?

Are we hearing all the voices? Are we engaging everyone or are we loosing talents?

Are we seeding creativity, inspiration and co-creation?

Are we triggering fundamental values, knowledge, capacities and commitment to face current environmental and societal issues?

Is open schooling a way through?

Why Open Schooling (OS)?

European Commission, 2015

Promote partnerships between teachers, students, researchers, innovators, professionals in enterprise and other stakeholders in science-related fields, in order to work on **real-life challenges** and innovations, including associated ethical and social and economic issues.

European Commission, 2022

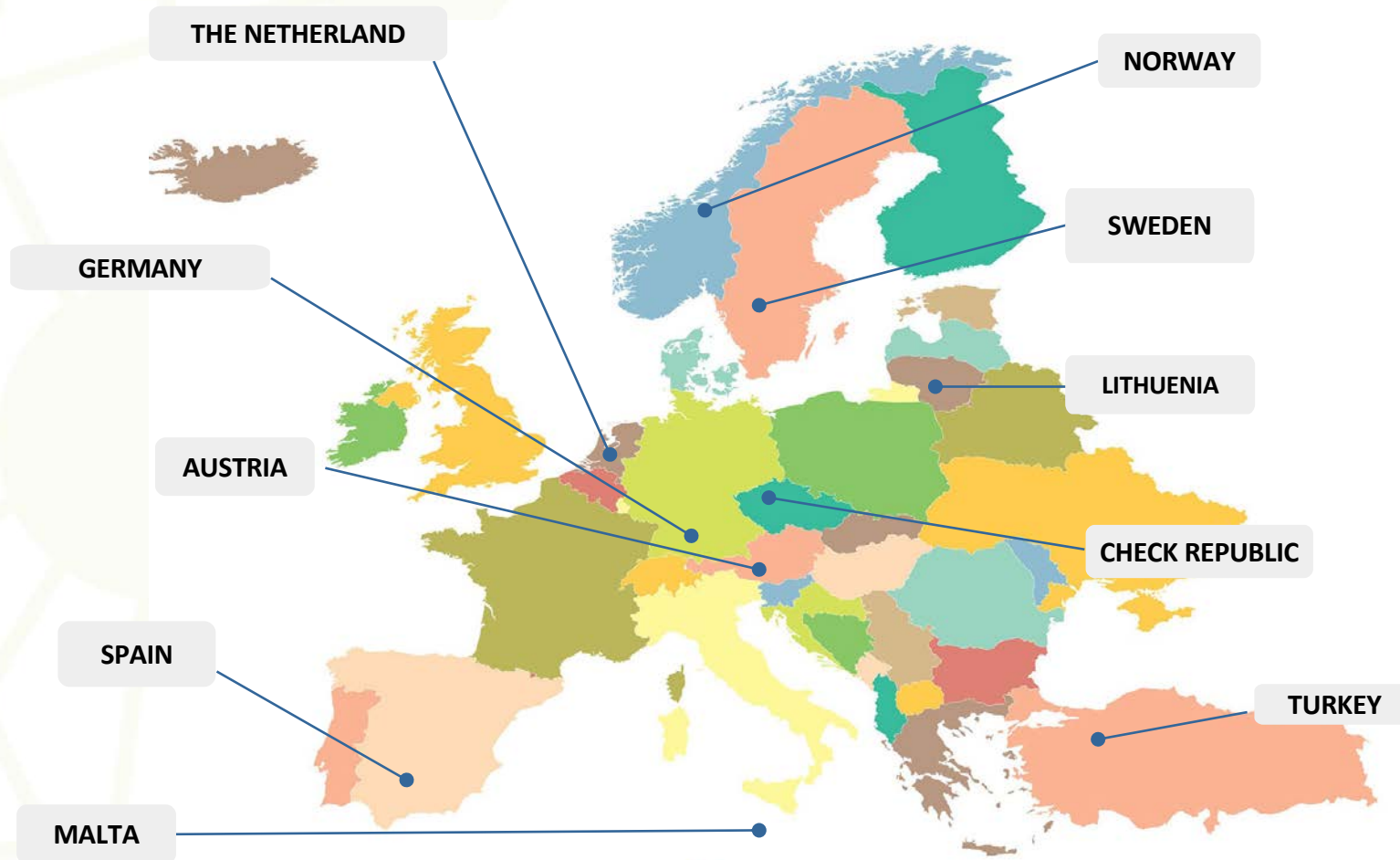
- ...ensuring that young people and adult learners alike are **motivated to learn and to fully engage** in science in society.
- Schools as **agents of general well-being, bringing real-life projects** into the classroom (European Commission 2022).

What does research say

- Real-life contexts promote **context-based learning** (King & Ritchie, 2012).
- Context-based learning provides **meaning and relevance** to what has to be learnt (Broman et al., 2022).
- Opportunities for competence development and **STEM learning for responsible citizenship** (Mass et al., 2022)
- Inquiry about socio-scientific issues **promotes environmental citizenship** (Ariza et al., 2022a, 2022b).
- Fostering **service learning** (Taylor & Lelliott, 2022).

The **MOST** project: Meaningful OS connects schools to communities

23 institutions
10 countries



Open Schooling through **School Community Projects (SCP)**

What are SCP?

Projects that arise from students' interests in relation to their community's needs.

Investigation of local problems related to waste and energy in cooperation with experts, companies, associations...

Co-design and development of sustainable solutions, while meaningfully applying STEM knowledge and skills.

What are SCP?



Features of SCP problems:

- Authentic and Co-created:
 - Shared ownership
 - Motivation
- Environmental issues (waste and energy)
- Multiple possible solutions.
- Meaningful and relevant.
- Context-based mathematics and science learning (knowledge & skills).

What are SCP?

Valued Learning Outcomes:

- Inquiring minds: critical and creative
- Understanding science & math in real-life environmental problems.
- Cross-cutting competencies for sustainability:
 - System thinking competency
 - Collaboration competency
 - Critical thinking competency
 - Self-awareness competency
 - Problem-solving competency
 - Anticipatory competency
 - Normative competency
 - Strategic competency
- Communication skills

What are SCP?

Ways of working:

Within schools, between schools and local communities:

- Student-centred, teachers' guidance.
- Collaborative group work.
- Multi perspective approach to problem.
- Dialogic and interactive.
- Respectful; value mistakes as learning opportunity.
- Attentive to girls' interest and motivation

How do SC look like in practice?

An example from Spain...

Building an ecologic park – Primary School Gloria Fuertes (ES)

Sensory panels

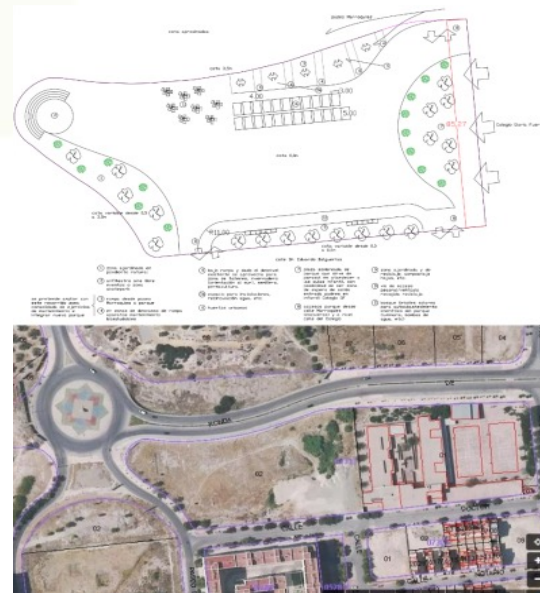
Seedbed, wheels



Nesting areas, gardens
Awareness campaign

Rain collectors
Data collection
Model of the park

**Friendly gender, balanced gender
Collaboration, co-creation, IBL, authentic contexts**



Architect
City hall



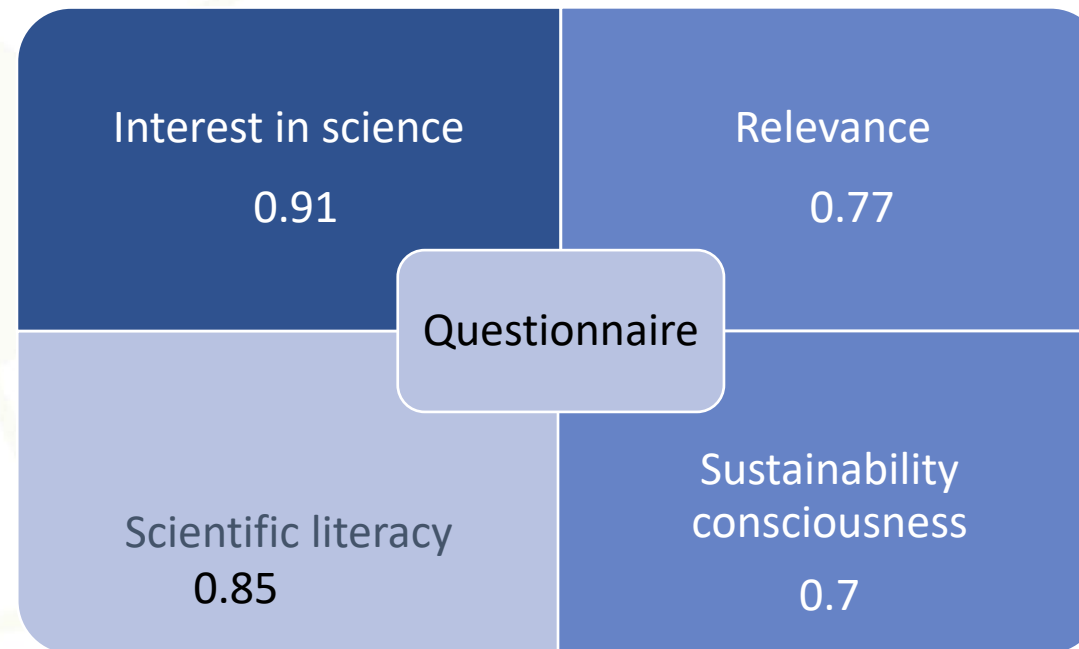
The challenge of learning from and evaluating the impact of SCP

- 1) How do SCPs affect students' **attitudes and beliefs about science**, scientific careers and the **relevance of science** and science education for their lives?
- 2) How do SCPs affect **scientific literacy and participants' awareness** with regards to **environmental challenges** and their role in finding solutions?
- 3) How do participants perceive and experience SCP and what are the **characteristics of good SCPs and the main barriers** for a successful implementation and networking?

The challenge of evaluating the impact of SCP

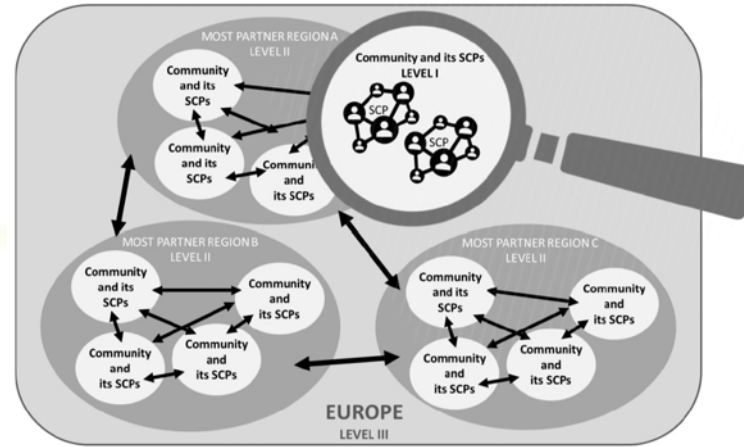


Development of MOST student questionnaire



Understanding and drawing conclusions

ZOOM



Key points

- Cases purposefully selected to illustrate a wide variety/adaptations to different contexts.
- Evaluation based on research evidence, combining quantitative data (impact) and qualitative to develop in-depth views.
- Identify inspiring experiences and good practices and the lessons learnt.
- Recommendations about how to make the most of Open Schooling.

MOST case studies

Any partner should provide **3 case studies**:

1. What are the **characteristics of good SCPs** and the main barriers for a successful implementation and networking?
2. How do participants **perceive and experience SCP**?

Instruments:

- General guidelines and questions to conduct MOST group interviews
- Forms to collect background information from participants
- Template to report on regional case studies

Any on which including at least:

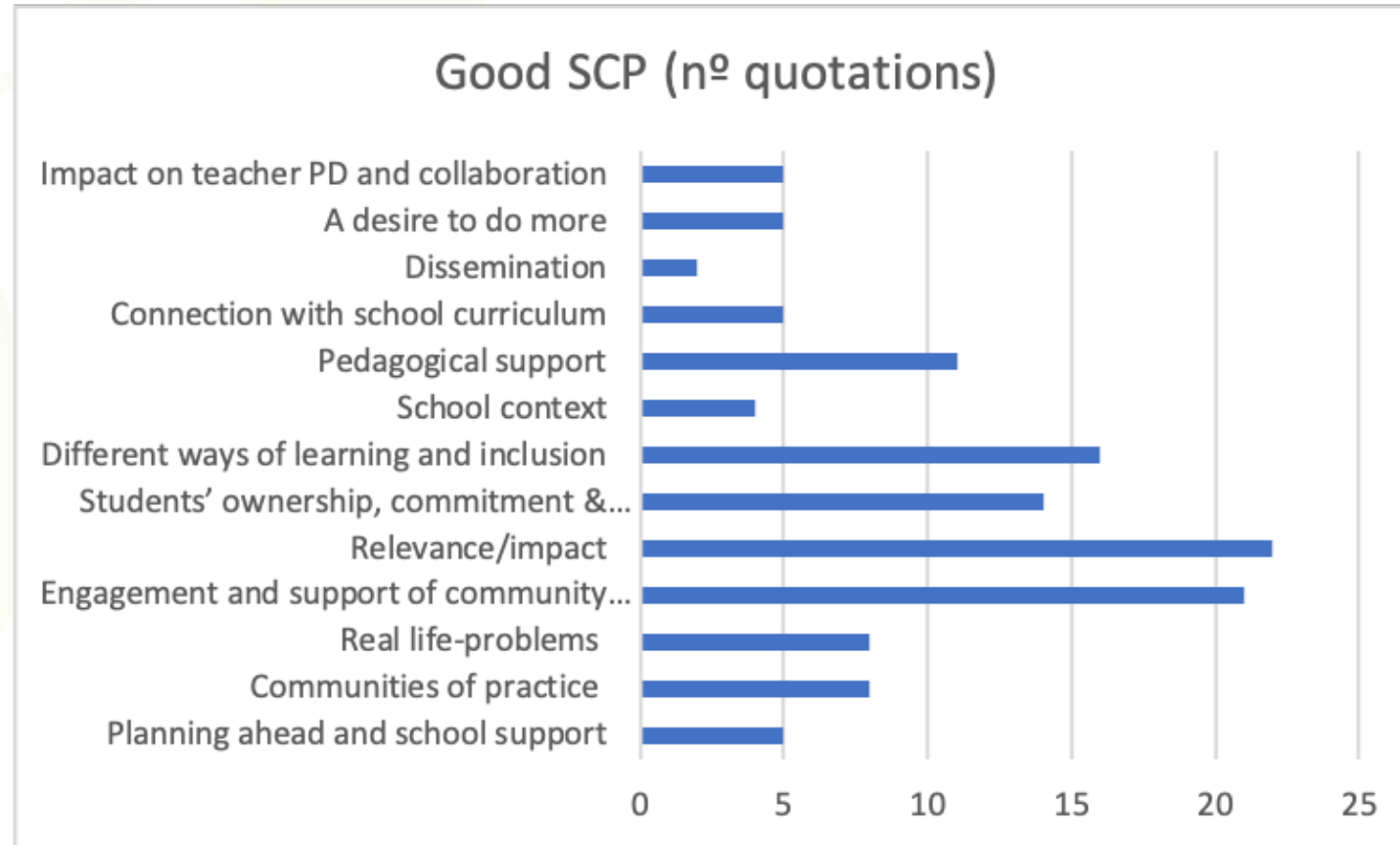
- **Students' group interview** (3-5 students)
- **Stakeholders' group interview** (5 stakeholders)



Research questions and case studies

1. What are the characteristics of **good SCP** and the **main barriers** for a successful implementation?
2. How are SCP **perceived by participants** (teachers, students and community members)?
3. What kind of **STEM learning** takes place and how do SCP help students to **understand environmental problems and their role** in solving them?

What are the characteristics of good SCP



What are the characteristics of good SCP

Real life problems

*“When students are presented with a **problem that is artificial or just for show**, they may become disengaged or feel that their time and efforts are not being valued”
(Czech teacher)*

*“... I like it because **I work on what will serve me in my life**” “This is the future!” “**All classes should be like this**”
(Spanish student).*

“This is for real, not only school!” (Norwegian student).

What are the characteristics of good SCP

Relevance & impact

“They value how relevant was the project for people”
(Czech student).

“...the belief that the thing they are doing will help their
lives and those around them...” (Czech student).

“Students wants to grow more and to increase their
impact in the community and raise the awareness people
that could join their goals” (Norwegian observer).

What are the characteristics of good SCP

Engagement and support of community members

“Educating young people is a joint project, not just of teachers and parents, but of all of us. “Outsiders” bring new impulses and different ways of seeing and thinking to the school, which is why such projects are important” (German stakeholder).

“...their presentation on climate change to the city council was meaningful and the city council members liked it. That's why they supported the project financially.” (CZ teacher).

“They understand that the strong point of the SCP has been intergenerational collaboration and the opening of the SCP to society” (Spanish observer).

What are the characteristics of good SCP

Communities of practice

*“The cooperation of more teachers at school is important. When teachers **work together on a community** project, they can pool their resources and share the workload, which can lead to a more efficient and productive implementation process. Of course, there's always a teacher who's not interested. But you need at least some of the same mindset as you...” (Czech teacher)*

*“The **collaboration between the different stages has been very enriching**, and we have seen how all the students from kindergarten to secondary education have collaborated. I believe that **programming** from children to high school can be **organized around these themes**” (Spanish school leader).*

*“I found the **teacher group quite engaged** and helpful in the learning process. I am not sure about its impact on teachers’ professional development but can assume this project has had a **positive added effect on their collaboration skills** within the school environment and local community” (Norwegian teacher).*

What are the characteristics of good SCP

Commitment,
ownership and
empowerment

“...creating serious commitment to the SCP in initially unwilling students (Dutch teacher).

The students display a central role in the determining main questions of the SCP, doing research, collect data, reaching conclusions (Turkish teacher).

“The experience was very empowering for the students in fact two of the interviewees represented their school in a parliamentary session where school representatives (from ekoskola) share their environment-related concerns and recommendations with members of the Maltese parliament” (Maltese observer).

What are the characteristics of good SCP

Different ways of learning and inclusion

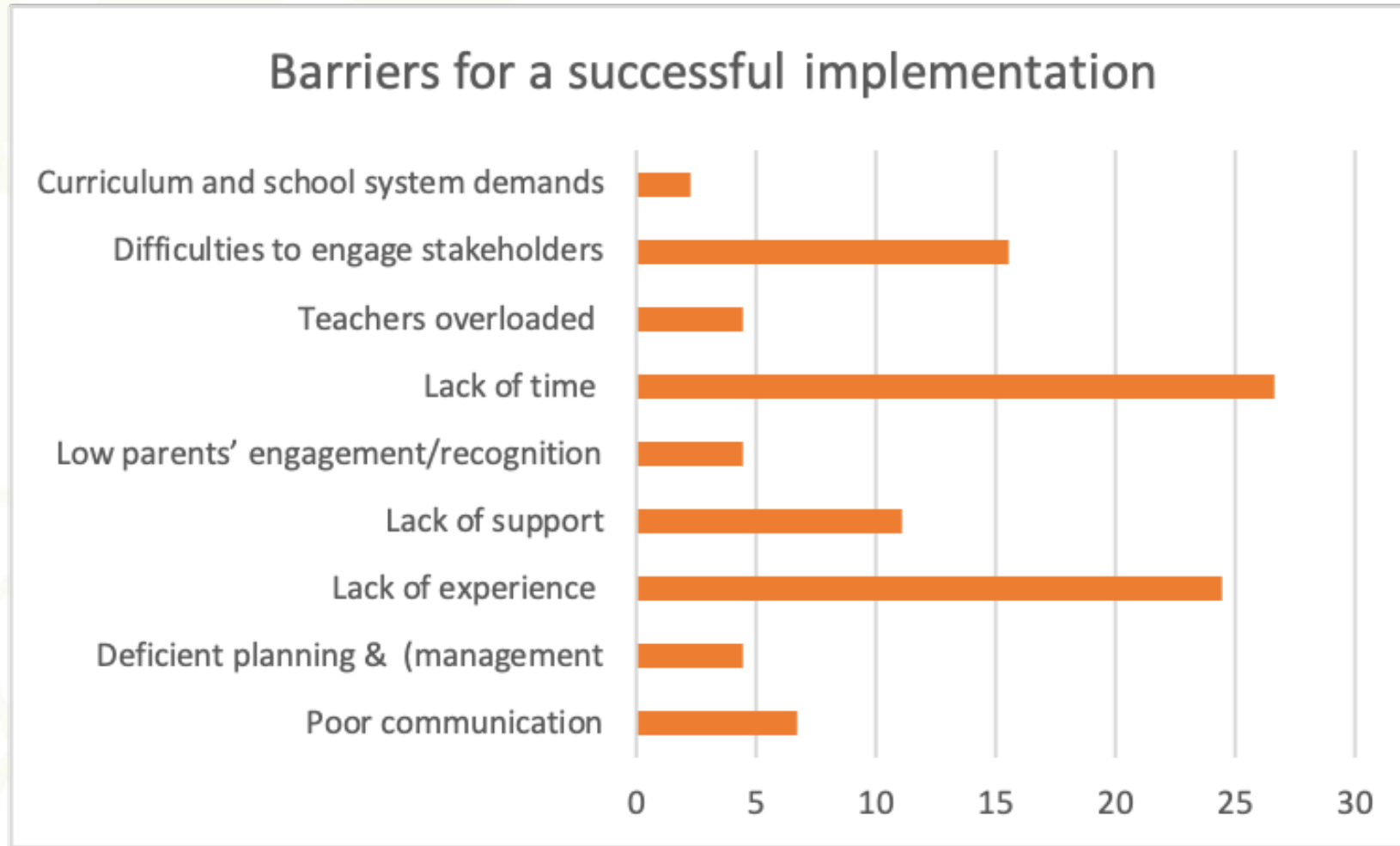
***All students are included and can contribute in some way.** As one student said, “everyone had some way of helping” (Maltese teacher).*

Awareness of **multiple interests/needs** involved (Dutch observer). “...Projects enabling **different roles for students** (Czech observer).

*“The teaching staff has been able to detect skills in the **students that they would not otherwise have perceived, they have realized that students are very capable** and very competent children, which has a very positive effect on their motivation” (Spanish observer).*

*“SCP gave students “an opportunity to flourish” by allowing them the “opportunity to talk to each other, reach a compromise, see things, experience, make mistakes and **learn from their mistakes**” (Maltese teacher)*

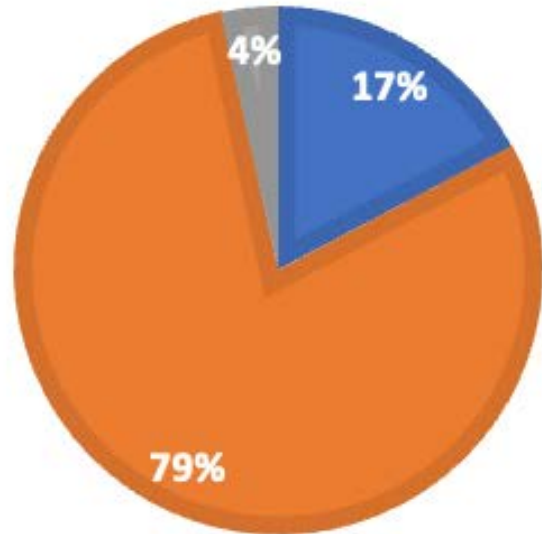
What are the main barriers for a successful implementation?



Quotations

How were school-community projects experienced by participants?

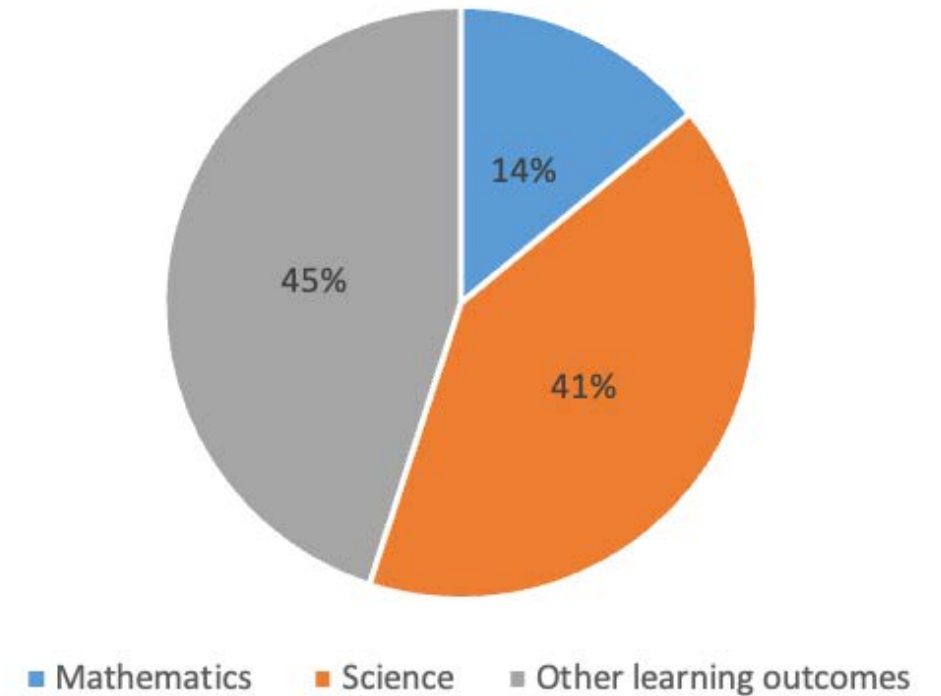
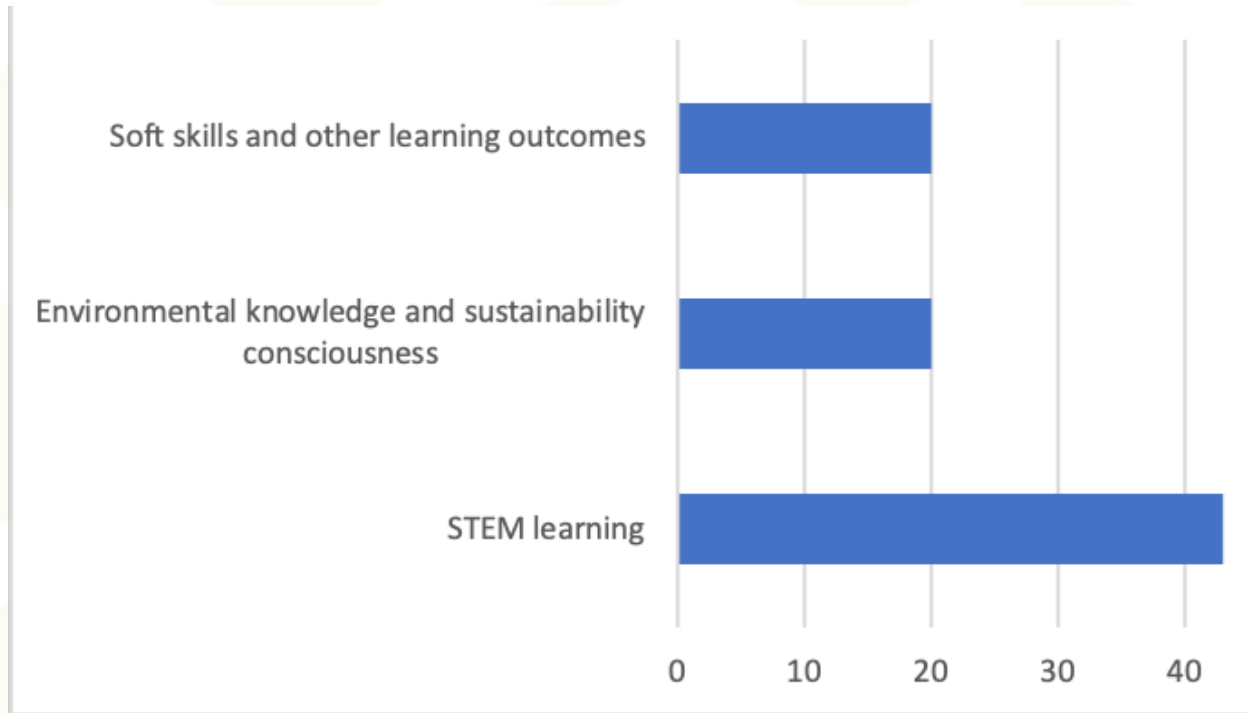
- Enjoyment, enthusiasm
- Feeling that it was worthy, satisfaction, proud, gratitude
- Unique beautiful experience



*“It felt pretty good, because you know you do garden work, you **do something for school, for the environment and for yourselves and others**. So that felt really good” (Austrian student).*

“It is always wonderful to see how proud students can be of their sustainability projects. And not only them. After planting the shrubs and trees isolating the traffic one mother said: Thanks to the children there will be reduction of air and noise pollution and it enhances aesthetic appeal of the area. Every green brunch helps” (Czech teacher).

Students' learning through SCP



Quotations

Clustering

Students learning through school community projects

STEM learning

*“In relation to maths and statistics: survey analysis - **percentages, diagrams, average, area measurements/estimations**” (Norwegian observer).*

*“They could recall and showed a deep understanding of **warmth/energy Flow** through materials” (Dutch observer).*

*“They learned about **chemistry elements** in the environment and the environmental impact of devices made of particular elements...” (Spanish observer).*

*“Sometimes the science behind the project didn't amuse them, but when they could do something practical, they always got excited. However, at least scientific concepts, such as the importance of **soil quality and water availability**...” (Czech teacher).*

Students learning through school community projects

Sustainability consciousness

“Students now understand better the statement “think globally and act locally”. They think about wasting their food...they try to change their behavior and eating habits...They see a bigger picture of environmental problems (carbon footprint, etc.).” (Czech teacher).

“My daughter has become more conscious of human impact on climate change and how we can combat climate change by reducing energy consumption. I found other pupils quite engaged in the process, they seemed to know quite a lot about energy production and global warming, as well as being keen to teach parents about how to save energy and money spent on electricity bills” (Norwegian parent).

Students learning through school community projects

Other learning outcomes

“We learned different things in the SCPs, **things we wouldn't have learned in the normal classroom** setting. Research on how to build raised beds” (Austrian teacher).

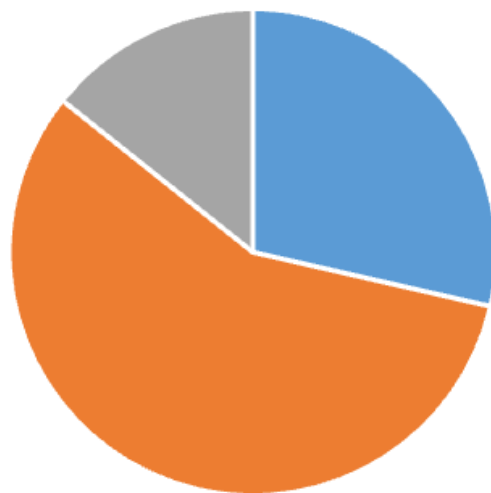
“...one of the positive characteristics of the SCP was that it also taught the children **“life skills, how to cooperate, (and) critical thinking”** rather than “just how to recycle” (Maltese parent).

“Parents, teachers, school leaders value soft skills, critical thinking and the engagement they gain” (Norwegian observer).

“Being active citizens...be aware of what is happening around you. Do something about it!” (Maltese teacher).

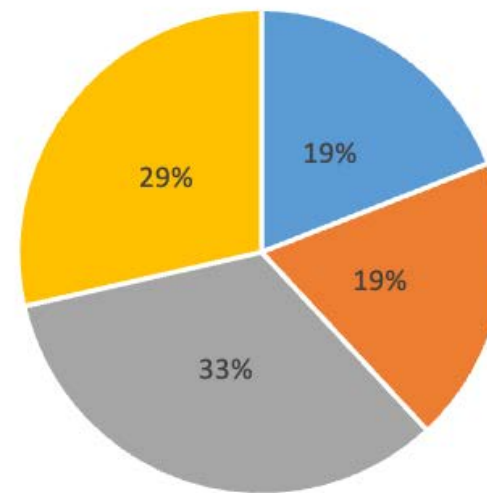
Clustering SCP selected for case studies

Educational setting



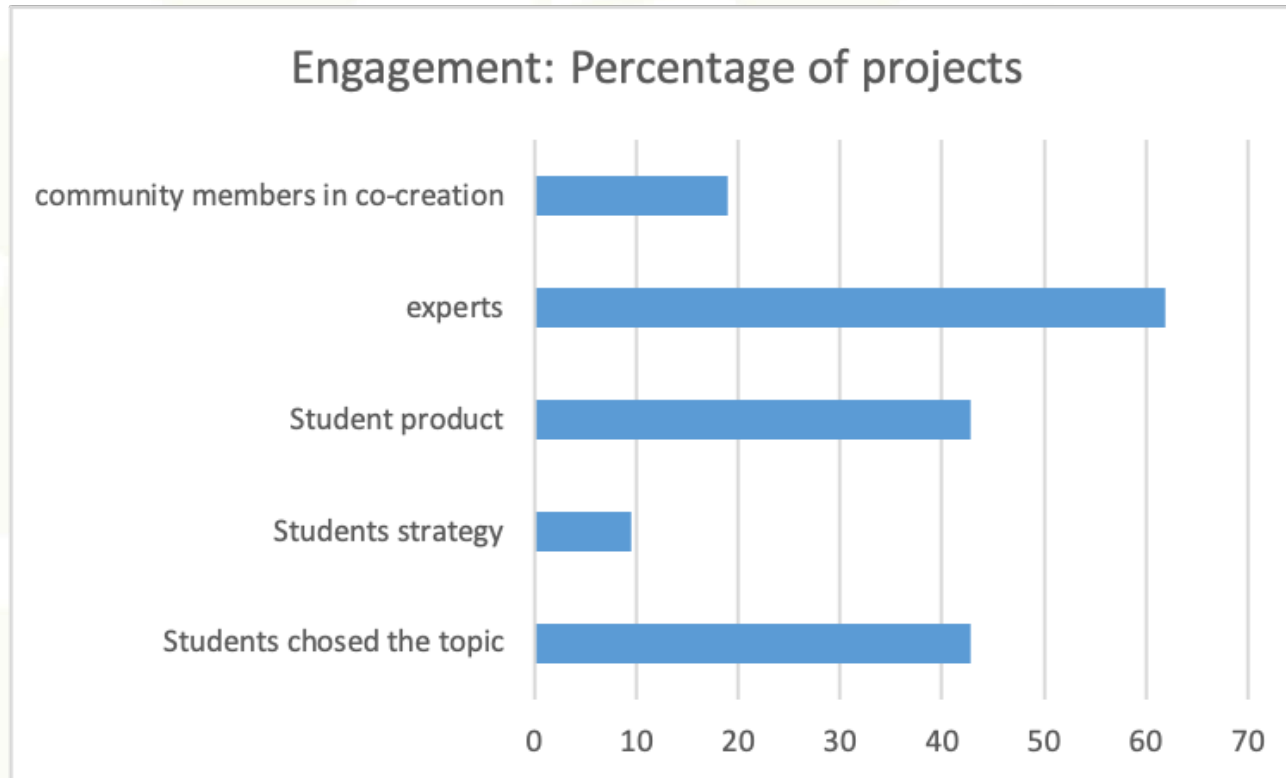
■ Primary school ■ Secondary school ■ Other educational settings

Duration

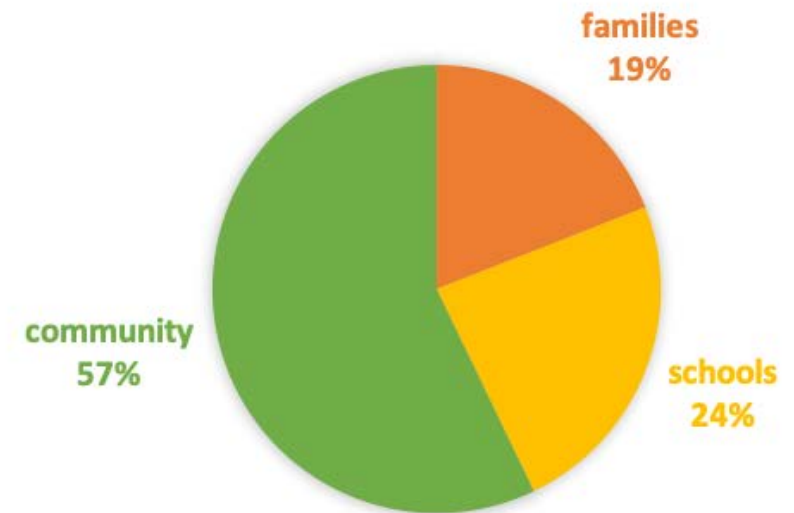


■ 1 week or less ■ 1 month or less ■ 1-3 months ■ More than 3 months

Clustering SCP selected for case studies



GENERATION OF SOLUTIONS/PRODUCTS USEFUL FOR



Implications

Teaching and learning

Contextualised learning in Sustainability problems (locally relevant with global implications).

Meaningful and useful STEM learning to solve problems, make informed decisions and create innovative solutions.

Society

STEM for active and informed citizenship.

Responsive and responsible citizens.

School as hubs of social transformation & community well-being.

Schools that empower and promote agents of change.

Co-creation of sustainable solutions.

Research/Policy

Innovative evaluation instruments for scientific literacy and learning relevance, including science interest and sustainability consciousness.

Comprehensive and rich perspective:

Qualitative/quantitative data.

Different sources: teachers, students, members of the community.

Wide variety of different contexts (different ages, culture, conditions: duration, implication for the community.

Implication: lessons learnt for making the most of open schooling.