



D5.2 Recommendations, insights and reports - I



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Table of Contents

Introduction	5
Main findings and recommendations	7
Findings	7
Recommendations	8
PoC research instruments and procedures	9
E-workshop: The development of the Learning Scenarios	9
E-journals: The implementation of the Learning Scenarios in the classroom	9
Learning Scenarios: Content Analysis	10
Online questionnaires: Participants' attitudes and practices	10
Findings	12
E-workshop: The development of the Learning Scenarios	12
E-journals: The implementation of the Learning Scenarios in the classroom	16
Exploring Learning Scenarios benefits and challenges	16
Investigating students' skills and knowledge acquisition	19
Learning Scenarios: Content Analysis	21
Online questionnaires: Participants attitudes and practices	24
Participants	24
Open Schooling: conceptualisation	27
Open Schooling: attitudes and opinions	30
Teaching Practices: challenges	33
WP5: Pilot I report	3

Participation in Make it Open project	35
Appendix	39

1. Introduction

This document aims to: (i) present research results from the first pilot of the *Make it open* project and (ii) provide practice partners with recommendations regarding developing and implementing the Learning Scenarios.

Make it Open is an EU-funded project that aims to develop an open schooling model of practice and foster culturally diverse learners' communities. The project will support learners (teachers, schools, educators, and students) to connect schools with the community around science, entrepreneurship, maker education, citizen science, creativity, and innovation. And to do so, the consortium will develop an accessible and actionable framework in co-design with teachers. A Proof of Concept (PoC) process will support these activities. Proof of concept, typically derived from an experiment or pilot project, realises a specific method or idea to demonstrate its feasibility and verify with research that some concept or theory has practical potential.

The project builds around **Open Schooling Hubs** in 10 European countries. More than 150 schools will collaborate with enterprises and civil society organisations to run activities where students will solve local communities' challenges using frameworks and tools from the maker education approach. Two pilots precede this Hub stage of the project (further referred to as Pilot I and Pilot II) which will provide a supportive framework by developing content (Learning Scenarios) and tools (Open Schooling Navigator) - see table 1. A Learning Scenario is a roadmap for open schooling, consisting of various activities (Learning Units) and steps that schools can choose and follow. During Pilot I and II, 16 Learning Scenarios will be developed and tested by teachers in eight schools in two rounds. Simultaneously, we will create the online tool - open schooling Navigator - to guide teachers using the Learning Scenarios. **This report describes the Pilot I stage of the project, with recommendations for the following pilot II stage.**

Project Stage	Stage's objectives	Research Subject		Research Instruments	Research Participants
Pilot I	Development and implementation of 8 Learning Scenarios	Learning Scenarios	The development of the Learning Scenarios	Workshop	Consortium partners

			The implementation of the Learning Scenarios in the classroom	E-journals	Teachers
			Learning Scenarios - content	Scenarios analysis	NA
		Participants	Participants attitudes and actions	Online questionnaires	Teachers
Pilot II	Development and implementation additional of 8 Learning Scenarios, and adaptation of 8 Learning Scenarios created in Pilot I - for of total of 16 Learning Scenarios in 4 language versions	2nd iteration of studies from Pilot I with revised and improved instruments (workshop, e-journals, scenarios' analysis, teachers' online questionnaire)			
		Learning Scenarios	Learning Scenarios-product	Activities observations / case studies	Schools, teachers and students
		Participants	Participants attitudes and actions	Online questionnaires	Students
				Field observations	Schools, teachers and students
	Development of digital format of the Open Schooling Navigator	Navigator	Testing of Navigator	Users' test	End-users (teachers, educators)
Hubs	Create Open Schooling Hubs in 10 European countries	Hubs	Functioning of the hubs	Online surveys	Educators
			Description of types of hubs	Hubs functioning analysis - case studies	Learning Communities

Table 1: Make it Open stages and Proof of Concept plan [current report describes step highlighted blue].

This document is divided into four parts: first, the **main findings and recommendations** focus on the practical application of research results from Pilot I; it aims to provide information to practice partners and propose solutions before Pilot II. The second part, **PoC research instruments and procedure**, describes four studies conducted during Pilot I by the PoC Team. The document structure corresponds with the research subject division proposed in the table above: *The development of the Learning Scenarios, The implementation*

WP5: Pilot I report

of the Learning Scenarios in the classroom, Learning Scenarios- content analysis, Participants attitudes, and actions. The last part, **Findings**, presents data and describes findings for each part of the research.

2. Main findings and recommendations

Below, we present the main insights collected during the Pilot I stage of the project. More detailed findings are shown in the next part of this document.

Thanks to this project, I felt more of an educator than a teacher. The teacher teaches, and the educator helps students learn. Such change makes students realise that they are responsible for how much they learn and that, as an educator, I can help them learn.

~R5-EJ3

2.1. Findings

- A. **The project is received positively by teachers.** They recognised the educational value for themselves and their students in being part of MiO. They trust the project and declare having positive feelings toward the program.
- B. **Teachers regarded MiO activities as important and relevant to their teaching practice.** Teachers declared willingness to incorporate some open schooling elements in their daily teaching practice, especially collaboration with external partners (experts, parents) and conducting lessons outside the classroom.
- C. **Key concepts need clear definitions.** The biggest challenge that was observable throughout all research was the lack of unified definitions for core concepts such as *open schooling*, *citizen science*, *growth mindset* etc. Some of the ideas (e.g. citizen science) were unfamiliar to the participants; other definitions varied greatly (e.g. open schooling).
- D. **External collaboration is perceived as valuable but challenging to integrate.** Teachers found collaboration with out-of-school partners (mainly experts) enriching

and beneficial; however, they reported difficulties putting it into practice. Problems were reported with several aspects of collaboration, including finding experts and initiating collaboration; an unclear vision of what the meeting should look like and what role division should be between the teacher and the expert.

- E. **Logistic challenges.** Time management, working with experts, and working with groups were the main challenges identified by the teachers.

2.2. Recommendations

- A. **Clarification of key definitions.** The idea behind *Make it Open* is to put concepts, such as *citizen science* and *open schooling*, into teachers' daily practices; therefore, a correct and clear understanding of those terms by all participants is crucial for the project's success. Unfortunately, research shows a lack of shared understanding of key ideas across partners. Therefore, we recommend conducting a workshop/s (or some other type of intervention) to address this problem.
- B. **Provide support/scaffold collaboration with external partners.** Teachers found collaboration with partners (mainly experts) enriching and beneficial; however, they reported difficulties putting it into practice. Thus, successful partnerships with experts may require additional support from practice partners.
- C. **Incorporating e-journals or evaluations as part of practice partners-teachers collaboration.** Presenting research as an integral part of the process and not as an additional task will result in a higher response rate and richer, more in-depth answers. Hence the PoC team will be able to deliver more accurate and useful information to practice partners.
- D. **Additional information in LS templates.** It is worth considering adding space for teachers' retrospective reflections and tips in the LU, e.g., using the Waag team's "Aha/Oh-Oh Moment." Those additions might be beneficial for teachers who will be adapting existing Learning Scenarios. Other added elements that may be considered in the new template are examples of working sheets, photo documentation, and resources, e.g., links.

3. PoC research instruments and procedures

The Proof of Concept team used four types of research instruments to study the following during the Pilot I phase: developing and implementing the Learning Scenarios, The eight learning scenarios content, and the participants' attitudes and actions. Below we presented the research instruments that were developed for each part of Pilot I.

3.1. E-workshop: The development of the Learning Scenarios

The workshop aimed to summarise the development of the learning scenarios, gather insights and share the different partners' experiences and approaches regarding the development process of the learning scenarios. An online workshop of 90 minutes took place on the 25th of March, 2021. Participants were practice partners from Bloomfield Science Museum Jerusalem in Israel, Copernicus Science Centre in Poland, Forth in the United Kingdom and Waag in the Netherlands. The workshop was moderated by the PoC team and was divided into two group tasks.

3.2. E-journals: The implementation of the Learning Scenarios in the classroom

The journal's goal was to collect data regarding the implementation of the learning scenarios in the classroom. Teachers were required to submit their reflection on the e-journal three times during the implementation phase: 1. in the beginning; after the 1st week of working with students and implementing the LS in the classroom; 2. in the middle of the process; 3. at the end: after the last activity with the learning scenario and their students, teachers reflected on the entire session. The e-journal was designed as a reflection tool for teachers implementing LS in the project. It aims to identify problems, weak points and constraints of the process in real-time. Each e-journal included eight open questions in the form of an online electronic format survey document. The e-journal started with a short introduction that explains the purpose of this tool. It is followed by a few instructive questions that lead teachers to reflect on implementing the learning scenarios in their classroom and the process of using them.

3.3. Learning Scenarios: Content Analysis

The learning scenarios analysis goal was to investigate the product that teachers and partners developed, identify similarities and differences between partners and context, and Identify problems, weak points, and constraints. Therefore, we analyse the activities and learning units according to different criteria like; the learning scenario structure, emphasised skills, and learning goals. In addition, we also focus on *Make it Open* elements included in each learning scenario, like learning by doing, real-world relevance, and other components like engaging with the community and making.

3.4. Online questionnaires: Participants' attitudes and practices

Pre and Post questionnaires were used to investigate the Learning Scenarios during the first pilot. Participants in this study were teachers that implemented and participated in the project. Procedure: links to the online questionnaires were sent to teachers by practice partners twice during the Pilot I phase of the *Make it Open* project: first time in February 2021 at the beginning of the co-creation phase of the project, second in May/June 2021 after finishing or at the final stage of LS implementation in schools.

This tool aims to shed light on how *Make it Open* project participants (teachers) understand and perceive the concept of open schooling and how this understanding changes as the project progresses. These comprise the inclusion of the community in the school and *vice versa*; the involvement of students with experts from the community; it investigates the benefits and challenges regarding open schooling and explores the cultural context regarding open schooling and the perceived advantages of the use of “Maker education” and “Citizen Science” as pedagogies for effective STEM education.

4. Findings

The following chapter presents findings gathered during research conducted in the Pilot I stage of the *Make it Open* project.

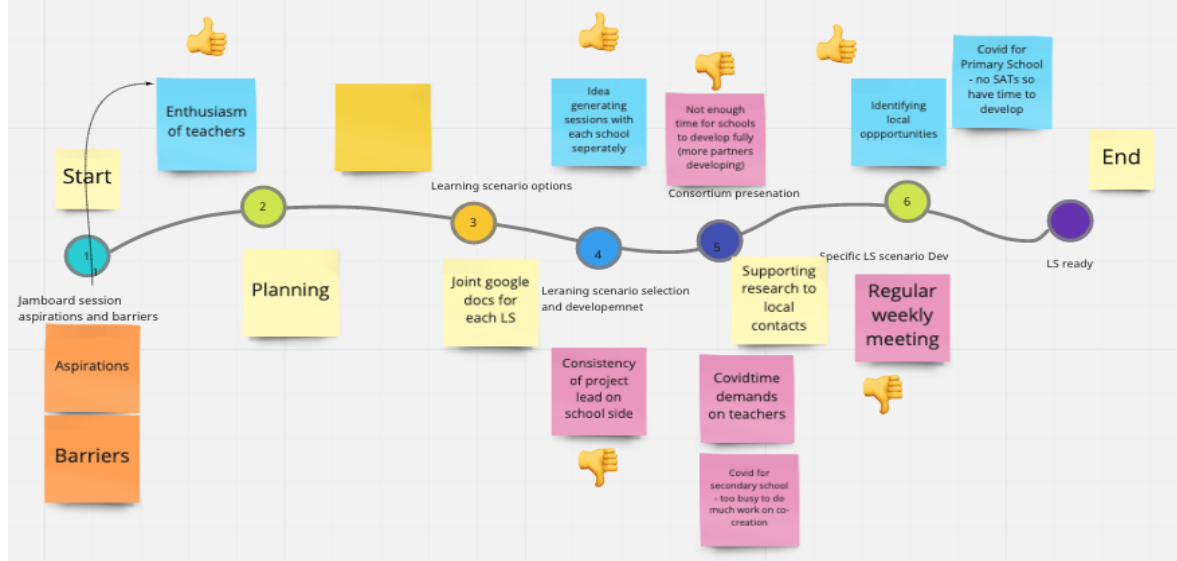
4.1. E-workshop: The development of the Learning Scenarios

The workshop included several online activities to explore the learning scenarios development process with the partners and the teachers (fig. below). We used an online tool to collect participants' ideas and activities results. Analysis of the workshop results illustrates the following:

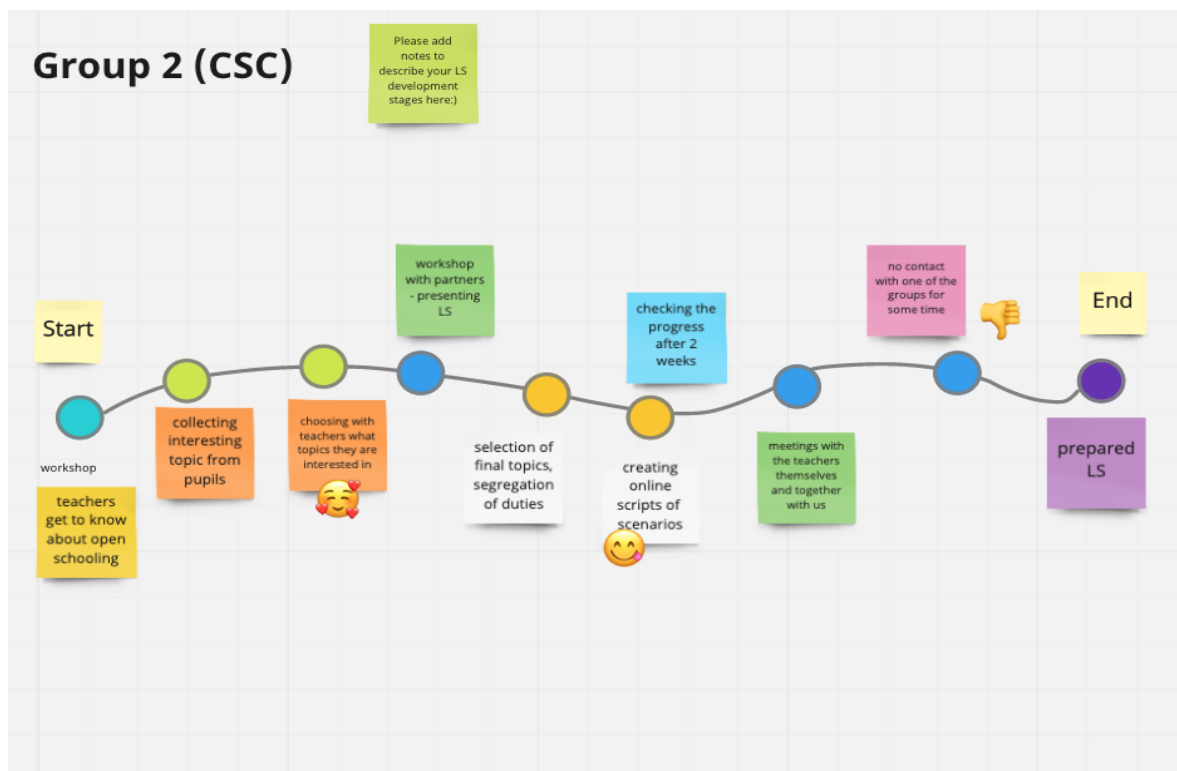
Similarities and commonalities: There are some similar aspects between all partners' LS development process: 1. The development process includes 6-8 steps of development while creating the learning scenarios with the teachers. 2. All partners use a template provided by the Bloomfield Science Museum Jerusalem (BSMJ) to create the LS unit, and 3. All Partners use a combination of different tools to communicate with teachers, e.g., meetings and workshops, shared documents like Google Docs, virtual workspace (Slack), and communicators (WhatsApp).

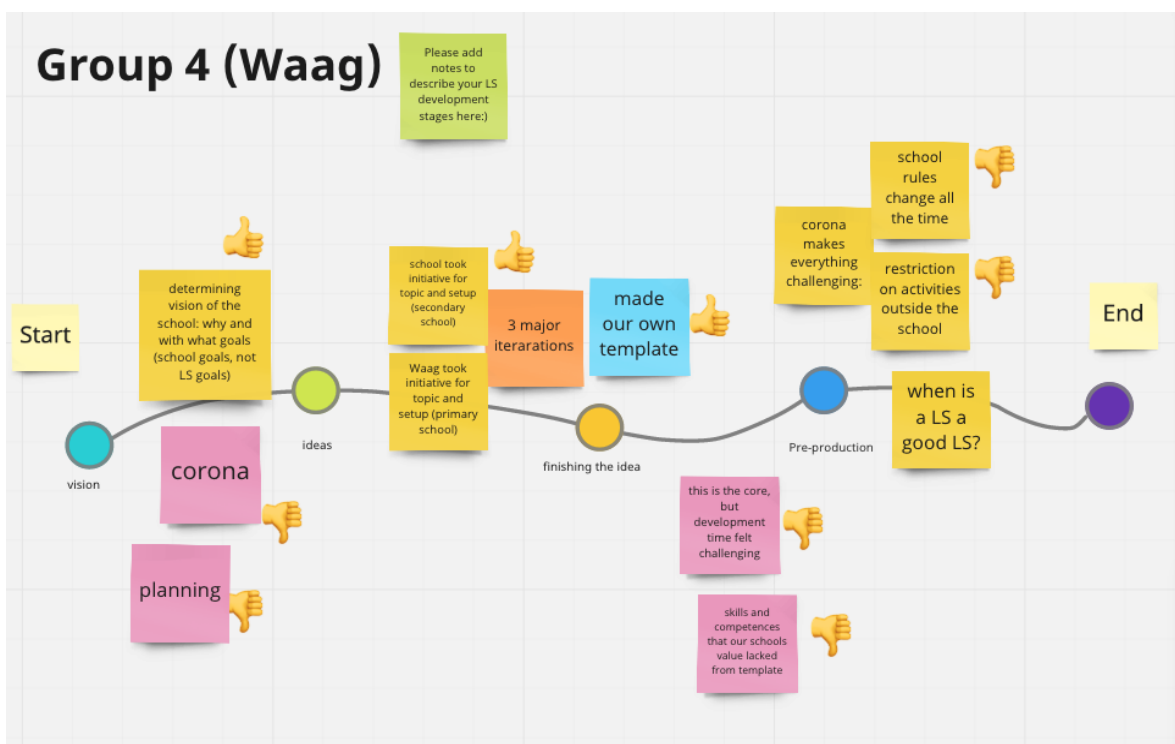
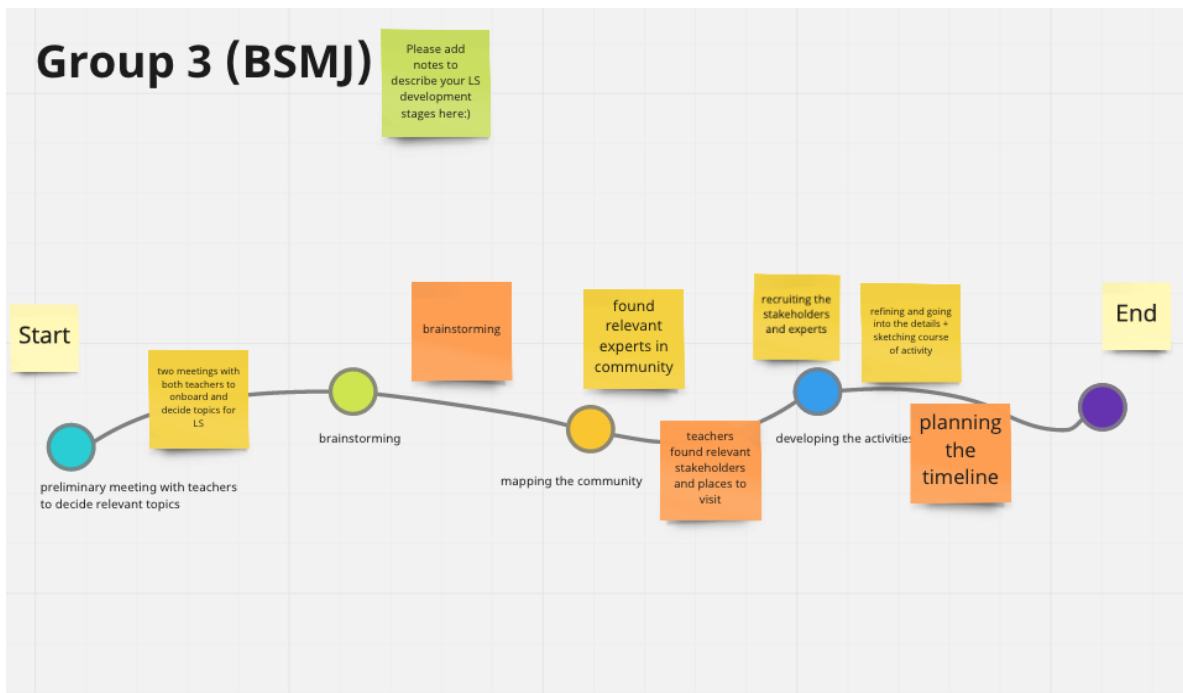
The LS topics selection models: Partners used three selection models of the LS subject: 1. independent teacher's decision, 2. collaborative student-teacher decision, 3. collaborative partners-teachers decision.

Group 1 (FixEd)



Group 2 (CSC)





Challenges in the process of developing the LS: Partner declared four main challenges during the development of the LS:

- A. **Defining open schooling.** Both partners and teachers had a hard time defining the concept of open schooling. There was no explicit and unified for whole partners instruction on how to define what is open schooling and what elements it includes.
- B. **Logistic and time management.** Organisation and implementation of this complex operation included the following: 1. Identifying local organisations' resources and specific contact like searching for community experts. 2, Difficulty of collaboration between schools, 3. Several Covid-19 safety issues. 3. Local issues that added limitations like timeframe, holidays, and existing school curricula. 4. a limited number of units possible to develop with teachers and 5. the time element: 1. There was not enough time to develop new materials. 2. There was limited time with teachers to develop the LS. 3. it was difficult to fit the LS into the school schedule, and finally, 4.it was hard to fit teachers' ambitious ideas to the school reality.
- C. **The human factor.** The collaboration between partners and teachers on the development of Learning Scenarios included several challenges: 1. The continuity of working together in the development of Learning Scenarios. 2. In cases of working with a single teacher, the development process was dependent on one teacher, 3. No previous experiences, nor established relationship with the school/teacher, 4. Role division in the project, 5. Teachers presented different levels of experience in curriculum development, 6. Various teachers' motivation to the project, and, 7. Different levels of teachers' self-confidence regarding conducting open schooling activities.
- D. **Sustainability.** Partners reported issues regarding making the content (Learning Scenarios and Learning Units) sustainable -how to make a long-term impact on the school or the teacher and at the same time create universal content, e.g., describe the activities/units in LS so that other teachers can reuse them.

To summarise, the collaborative process between Partners and teachers of the LS development was a complex and context-dependent task. Partners presented different models regarding, e.g., number of invited schools and teachers invited to the project (from a single teacher from primary and secondary level to teams of teachers in two school/level); actors involved with topic selection; from Nevertheless, there were several similarities between the development process in all four countries such as using multiple modes of communication (meetings and workshops, working in shared online documents and virtual workspaces. However, some challenges need to be addressed in the next step of Pilot II,

including creating and communicating to teachers a clear definition of the key concept such as *open schooling*.

4.2. E-journals: The implementation of the Learning Scenarios in the classroom

The main aim of the e-journal was to investigate the implementation process of the learning scenarios in the classroom. In addition, this instrument explores the teachers' experience and teaching practices using the learning scenarios. The PoC team collected complete e-journals for nine teachers (2 teachers fill out e-journals together), two incomplete (missing last entry), and one teacher who did not participate in this study. Therefore, the following results do not present a complete overview of the implementation process due to missing data.

Exploring Learning Scenarios benefits and challenges

Positive educational experience. Teachers were enthusiastic about implementing a new inquiry framework with their students. The activities in the project were associated with a *good atmosphere* and *evoking positive emotion*, both in students and teachers, e.g.

"Students are enthusiastic about the classes all the time."[R6-EJ2]; "I enjoy watching the children learn. Thank you for the opportunity to teach this subject and widen my horizons."[R7-EJ2]. Teachers also reported observing *students' interest in the Learning Scenarios subject*, e.g., "I was surprised by the growing interest in the subject. Some students would like to know even more about this topic than we anticipated in this project." [R5-EJ3].

Using elements of open schooling in teaching practices. Participants were asked to point out features they might incorporate into their usual teaching practice. Teachers perceive mentioned elements as beneficial and feasible in classroom settings. Teachers declared that they plan to use some elements of open schooling in their day-to-day teaching practice. Although, some responses included elements that do not belong to open schooling dimensions (as conceptualised in the WP1- D1.1 *Set of user-centred delivery templates*). Participants listed the following elements:

- A. **working with partners** (experts, parents, members of local community, other teachers) was the most frequent answer (9 respondents, e.g. “Certainly, cooperation with the local community and parents/grandparents of students, as well as interviews or consultations with specialists are elements of a new approach for me when working with students that I intend to use in the future.”[Participant R5-EJ3], “Meeting with an external expert and cooperation with the local community. These are elements that will certainly appear in my daily work - they definitely have a positive impact on students and broaden their view of reality by presenting different perspectives.” [Participant R3-EJ3], “lectures of parents that are relevant for the topic” [Participant R8-EJ3]));
- B. **out-of-classroom activities** were recognised as beneficial for the learning process, e.g., “Classes in the field are a great opportunity for action and learning directly from the environment about what most often students learn only from books. In such a lesson, the motivating factors appear spontaneously, provided that the students know exactly what to do and at what time.” [R5-EJ3]. Teachers declared willingness to conduct this type of lessons outside of the project both outdoors -” Being outside more and ensuring this happens across all subjects” [R3-EJ3], “Going outside and measuring the sound level [...]” [R6-EJ3] and indoors “visit to secondary school, I would like to do this more often, also possibly for other fields.” [R1-EJ3];
- C. **students’ collaboration/teamwork** “...learning in groups....”[R7-EJ3]
- D. **“Hands-on” activities** involving ‘make’ activities.” [R7-EJ3];

Elements not directly connected with the open schooling dimension but identified by teachers as part of open schooling practices included “[...] surveying on the street” [Participant R10-EJ3]; and “[...] conducting analysis” [R6-EJ3].

Challenges of implementing Learning Scenarios. Teachers were asked three times to list all the challenges encountered during the implementation of LS in schools. Part of the answers was technical and specific to the concrete LU or activity, but participants also mentioned some universal issues. Following general challenges were reported more than one time or by more than one participant:

- A. **Working with partners.** Teachers reported meetings with the expert as problematic due to **organisational issues** (e.g. I have found it tricky to get an expert for the

following lesson. [R9-EJ1], [...] the technical difficulty of arranging the visit of an expert. [R8-EJ2]); **time constraints** ([...] Little time to organise meetings with experts. [R6-EJ3]); **ill-defined expectation** from the meeting(“Meetings with guests, maybe it was due to insufficient preparation, i.e. not very precisely defined knowledge needs, which we wanted to obtain from experts, it justifies itself with a small amount of time, but I know that it was possible to plan better.”[R2-EJ3]); and **unclear role division** during the activity (“...coordinate a lesson with the physical ed teacher and collaborate with her. “ [R7-EJ3].

- B. **Time management.** Teachers frequently (9 times) pointed to a **lack of time** as a project challenge. Difficulties were reported both on Learning Unit level (too many plan activities in Learning Unit) - “reduce the number of things carried out in one LU” [R3-EJ3]., as well as, on the whole, Learning Scenario scale (“A technical difficulty of finding time for all the units”[R7-EJ3], “Reducing the number of LUs, which would allow more time to complete the others” [R5-EJ3]).
- C. **Difficult content.** Teachers of both primary and secondary education reported that some **elements of scientific inquiry** and **abstract thinking** were challenging for students including planning experiments (“The writing of the experiment plan was difficult for them (students) - they didn't emphasise the important points” [R8-EJ1].); “The hardest part was discussing the measurement results and drawing conclusions from them. It is difficult for students to use the concept of sound intensity level and combine it with sound intensity alone.” [R5-EJ2]). It is worth pointing out that participants also see value in challenging elements - “The level of abstraction required of the children during the preparation and the lesson was a challenge, but also good to think at this level, especially for the oldest children in the group” [R1-EJ3].
- D. **Managing students working in groups.** Working in groups was regarded by teachers as a highly beneficial pedagogical method. Nonetheless, participants pointed out a couple of issues related to using it during the lessons, including **too many students per group, division of work within the team of students** (“The last challenge was that in groups of 5 students some students didn't find a role and did not feel a part. [...] Also I would work in smaller groups- 2-3 students at the most.” [R8-EJ3]); as well as

simultaneously facilitating all the groups by one teacher (“Checking the work of students divided into different groups” [R8-EJ3]).

- E. **Gender differences in students' behaviour.** Two teachers observed differences between girls' and boys' behaviour during some activities: “We started the lesson with a physical exercise of jumping to help concentrate. This part was challenging with the boys because it felt like I was losing control. [...] With the girls, it was great.” [R7-EJ1] and “[...] During the exercise, the girls were more active, resourceful and independent in making decisions. Passive, insecure boys required frequent supervision and evaluation of their decisions.” [R3-EJ3].
- F. **LU structure and technical issues.** Some challenges mentioned by teachers were specific to a particular Learning Unit or activity and revolved around technical problems or ensuring safety (see table 1 in Appendix).

Investigating students' skills and knowledge acquisition

Implementation of Learning Scenarios was perceived as beneficial for students. According to teachers, students improved their knowledge of competencies in various areas. Analysis of the answers showed that all nine teachers observed learning in students. Additionally, most participants list more than one area of development (5 teachers).

STEM literacy. Elements from this area were mentioned by four teachers and included **preparing, conducting and presenting experiments** (“...what scientific experiment is and what rules govern it (outlined of course)”[R3-EJ3]; “ They learned how to formulate a scientific principle and think how to summarise it and simplify it so that non-experts could understand.” [R7-EJ3]), and **learning by doing** (“They have found that they can create teaching aids and models themselves, and that they learn better by doing these things than by just reading textbooks.” [R5-EJ3], “...they could measure things by themselves and reach conclusions.” [R5-EJ3]).

Soft skills. Teachers observed improvement in areas such as **teamwork** (“...collaboration,...” [R10-EJ3], “they work better and better in the group” [R3-EJ3]); **perseverance** and **responsibility** (“ that you have to call someone five times so that someone remembers about the meeting[...]” [R2-EJ3] and **independence** (“The students learned independence”[R5-EJ3].)

Management skills. This group included [planning](#) and [organisational skills](#) and [resourcefulness](#) (“...plan, organise...” [R10-EJ3]; “... responsibility and resourcefulness.” [R5-EJ3]).

Knowledge. Four teachers pointed out specific topics such as “aerodynamics” [R1-EJ3] or “How our skeleton works with muscles and tendons...” [R7-EJ3] as an educational gain for students. It is worth mentioning that two participants listed knowledge as the only area of educational improvement.

4.3. Learning Scenarios: Content Analysis

The PoC team has analysed eight developed and used in the school settings Learning Scenarios. Scenarios were developed for two levels of education: primary for students between 9 and 12 years old; and secondary for teenagers (12 to 16 years old). The number of Learning Units varies from 5 to 11, as does the duration of LU (range from 45 to 135 min).

Learning Scenario	level	country	students age	LU units	time per LU
Exercise and physical activity (Improve community well-being)	primary	Israel	10 -12	7	45 min
Food travels (zero waste kitchen)		Poland	9+	5-7	60-120 min
Air pollution (How clean is our air?)		Great Britain	9-11	9-11	30-90 min
Forces of nature (exploring motion by various means)		The Netherlands	9-12	7	180 min
Dealing with waste (litter in a public environment)	secondary	The Netherlands	12 - 14	10	2 x 50 min
Zero waste school (circular economy, 6R)		Great Britain	13-14	7	60 min
Our moving world: Physics Everywhere		Israel	13-15	7	45 min
Sounds around us (noise and silence)		Poland	13-16	10	45-135 min

Table 1: General information about Learning Scenarios.

Template: proposed structure of Learning Scenarios is clear and logically organised; also modular, flexible which means that it is easy to customise Learning Scenarios to different needs, e.g., select some elements, omit others and reused in a different order.

Customization of the LS template: Teams customize templates to their needs adding new features like sources information (links), examples of used materials (e.g., research sheets), photo documentation (e.g., “How clean is our air?”). In two LS, “Dealing with waste” and “Forces of Nature” templates include new sections “Aha Moment” and “Oh-Oh Moment”. Both are a type of reflection tool for the teachers to describe and share insights and valuable experience or processes observed during the LU (for positive- “Aha Moment”, and challenging, not according to plan “Oh-Oh Moment”).

Content of LS: Descriptions of the activities vary across Learning Scenarios from a very general list of activities in the Learning Units to detailed step-by-step instructions with examples, additional resources and duration for each activity.

- A. **“Open Schooling” elements:** location - during LS, teams visited between 2 to 4 outside of school places, including museums, parks, botanical gardens, and shops. Roles - each project engages at least two external collaborators (range: 2-6), primarily experts (musicians, doctors), other teachers and students, family members (parents, grandparents and siblings) and community members. Type of out-of-school activities included field trips (all LS) and special events (e.g. Scientific Playground Opening Event). Practices: each learning scenario has real-world relevance; includes designing, making or hands-on activities; includes learning by doing elements. Citizen science elements: Poc team used EU definition of this term - Citizens participation in the scientific research process in different possible ways: as observers, as funders, in identifying images or analyzing data, or providing data themselves.¹ Using this definition none of the Learning Scenario have met those criteria.
- B. **Practices, skills and competencies:** analysing this element turned out to be problematic - declared practices, skills and competencies that students were supposed to develop during particular LU were in some cases hard to verify due to lack of sufficiently detailed description of the activities. Additionally, in cases of less known terms like “growth mindset,” there is a possibility of using more than one definition by the participants.

¹ source: <https://ec.europa.eu/digital-single-market/en/citizen-science>

To summarise, all Learning Scenarios seemed to meet the project's criteria with the exception of citizen science elements (at least according to definition proposed above). This concept showed to be problematic for participants (both teachers and partners) in two other studies. PoC team was unable to verify declared targeted skills and competencies in LU due to insufficient description of the activities. Finally, Learning Scenarios were customised by the teams - some new elements were added such as "Aha/Oh-oh Moments", examples and additional resources.

4.4. Online questionnaires: Participants attitudes and practices

Due to the significantly lower response rate in the post-questionnaire, the results, especially comparisons pre and post Pilot, should be interpreted cautiously.

Participants

In total, fourteen teachers participated in the project from 4 countries. All collaborating teachers took part in the pre-survey (n =13), but the post-survey response rate was lower (n = 9), with only eight respondents taking part in both surveys.

There are differences in frequencies between countries (illustrated in fig. 1), with an overrepresentation of polish teachers (n =6). The Polish team is an exception with four collaborating schools - a pair for each level of education (primary and secondary). In other countries, there was usually a single teacher from a single school invited to the project for each level, which gives two schools per country.

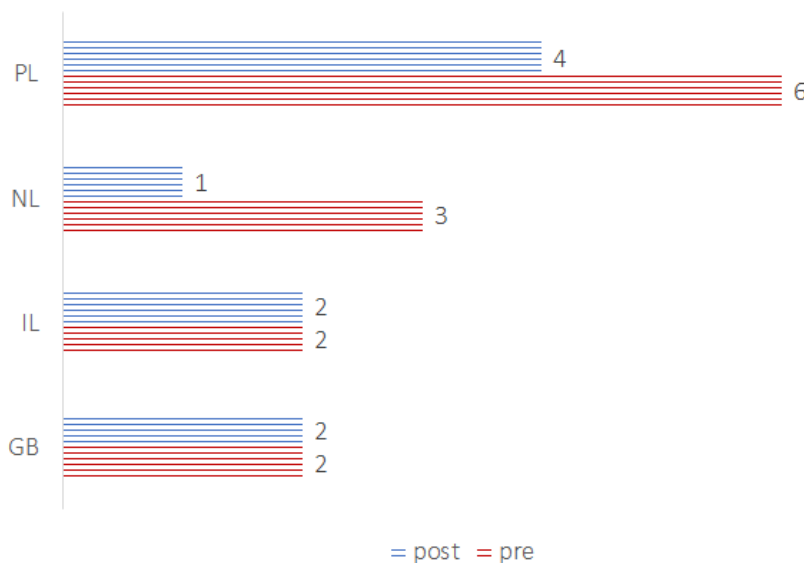


Figure 1: Number of participating teachers from each country. Q: Where do you work (country)?

Teaching Experience. Participants have extensive experience in teaching – more than 2/3 respondents had working experience more than five years; also in working in the schools that are taking part in the MiO project (only two teachers were working less than two years in the school).

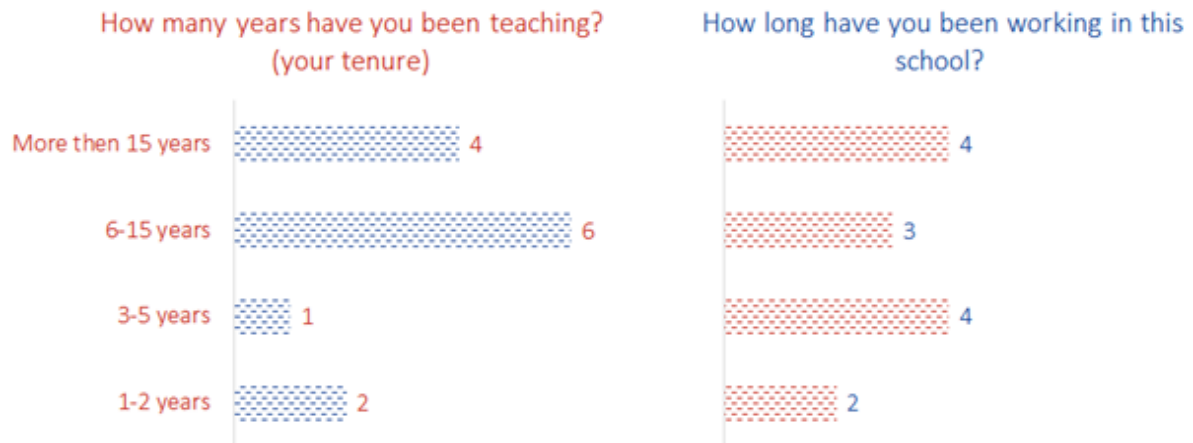


Figure 2: Years of teaching experience.

Recruited participants work in both primary and secondary schools, and most of them teach more than one class, and only four of them teach pupils younger than 9-year-old (fig.3). Answers “other” included children older than 14 years.

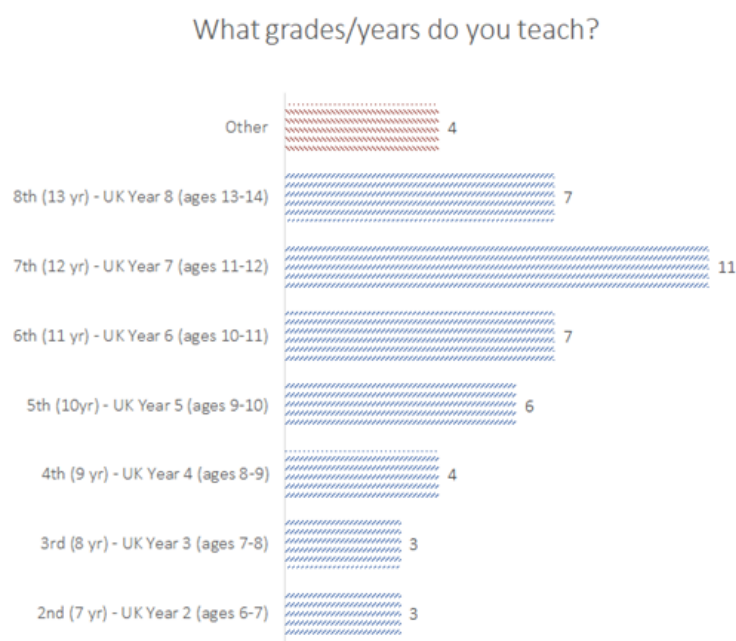


Figure 3: Grades taught by teachers. More than one answer was possible.

The majority of participants teach multiple subjects, mostly STEM-related (red bars in fig. 4). It is worth noting that primary school teachers are responsible for all or most of the topics covered in the curriculum.

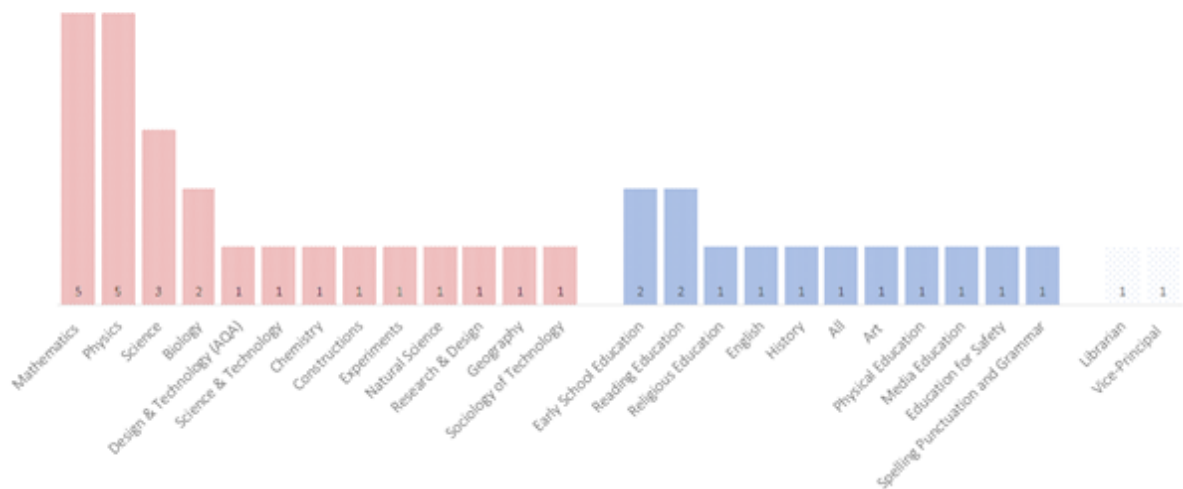


Figure 4: Subjects. Q: Which subject/s do you teach?". There is more than one answer possible.

Collaborating teachers are familiar with conducting school projects with the community. The majority of respondents (9 out of 13) had experiences working with outside of school partners (fig. 5) .

Have you already done any activities with the community and with your students?

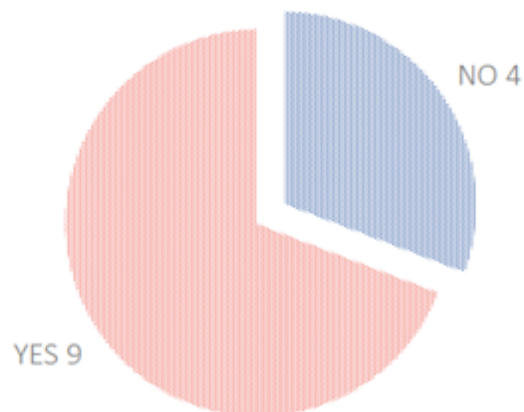


Figure 5: Subjects. Q: Which subject/s do you teach?". There is more than one answer possible.

Open Schooling: conceptualisation

The conceptualization of open schooling changed during the project. When teachers were asked about what “open schooling” meant to them, the concept of open schooling and could not characterize it very well. Exploring their answer, we found that most teachers did not use all dimensions to define open schooling, but there is a change between pre and post answers. Despite the lower number of participants (9 instead of 13), the number of the dimension stays similar or significantly higher (for the “who” dimension) except for the “where” category (decreases from 7 to 6).

Open Schooling dimentions

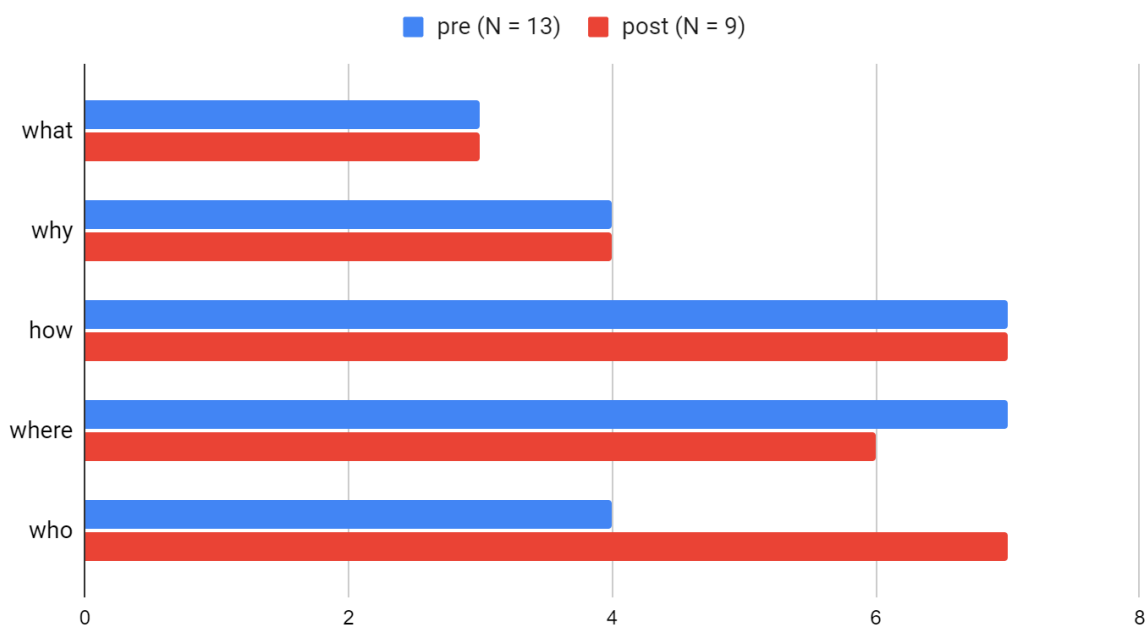


Figure 6: Places of learning. Q: When & where was the last time you learned something new? (please, add details such as if it was an informal/formal environment? How many hours/days did it take? etc.)

In general, after the project, teachers’ explanations were richer and more detailed. For a detailed description of open schooling see the table below.

Resp. code	Pre questionnaire	Post questionnaire
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R1	Working with real problems. Students aren't only learning about the subject, but also get empowered by the context and working with the neighbourhood. Learning with more meaning.	Learning outside the classroom. Involving other people then the teachers. Show off your work.
R2	Learning in an open ended way, There can be more than one outcome, It's investigative and relevant to everyday life.	Collaborative and outdoor learning. Working in groups as much as possible and taking the learning outside where possible.
R3	Working together with the neighbours, parents, library, secondary school, role models, etc.	-
R4	Connecting with our environment.	-
R5	For me an open school is a school that encourages learning outside the boundaries of the school. The understanding that learning occurs all the time and everywhere. That the school should use and connect to this learning.	Learning that is practical, which includes going out into the field, self-exploration and asking questions. Learning that allows students to choose. Choose the field in which they want to delve deeper, choose the way they research it, and choose the way they want to present their products. Learning that brings students together with different ways of looking at the topic they are learning.
R6	Getting students out of the rigid classroom environment to create new experiences that they will learn from and be able to apply to their lives. Enriching the pupils' education.	-
R7	Teaching in a more attractive way! guiding students to learn and acquire skills (not spoon feeding!)	Expanding the teaching beyond the four walls of the classroom and making the teaching more relevant to the everyday life of the students by adding to the teaching all sort of outside elements from the surrounding and from the community
R8	The school open for the needs of students and the local community, cooperating	Unlimited space for inquiry and research

R9	Combining the content of school curricula with problems and challenges in life are projects which allow for the initiative and greater activation of the students. Learning does not only take place in school classrooms based on school textbooks, but often outside the school.	Open schooling is the use of various sources of knowledge available at school and outside of it, but above all, it is the creation of space for students to be active and learn by doing, i.e. experimenting, observing, interviews, meetings with experts and the ability to ask questions and use knowledge thus acquired.
R10	In my opinion, this is a method of work of students and teachers with local institutions from which students and teachers can get a lot of interesting information. It's learning, experiments outside the classroom.	-
R11	Cooperation between the teacher and the student, working with the project method, social projects, seeking external support, e.g. among the local community	-
R12	Dialogue, cooperation, being together, courage	Now it means the power to draw from the representatives of different occupations and from people with specific skills, also it means friendly institutional relations and building relationships with others for school.
R13	Open schooling means being able to design the teaching process according to your own ideas, students' needs and the challenges of today's world, without any restrictions. Open schooling also means being able to leave the school space and take the education process elsewhere.	Open schooling is primarily about introducing an atmosphere of informal learning to school - an attempt to connect these two worlds, for example by leaving the traditional school space (classroom) and going to public spaces (yard, street). It is also a process of inclusion of others - even outsiders - which can strengthen the education process.
R14	-	Utilising resources, experiences and opportunities beyond the confines of the school classroom and curriculum to engage learners and give them a sense of how school based curriculum learning fits in with real-life scenarios.

Table 2: Conceptualization of open schooling. Q pre: "What does "Open schooling" mean to you and how would you describe it in 2-3 sentences?"; Q post: "After teaching the learning scenario, what does "Open schooling" mean to you and how would you describe it in 2-3 sentences?"

Learning conceptualization: teachers were asked to write about the last time they learned something new. According to the finding, 70% of the teachers affiliated learning with formal learning methods. Only 30% of the teachers conceptualized learning with informal learning methods. For example Informal learning is: “rowing a boat” and formal learning: “foreign language in individual classes with a foreign language teacher”.

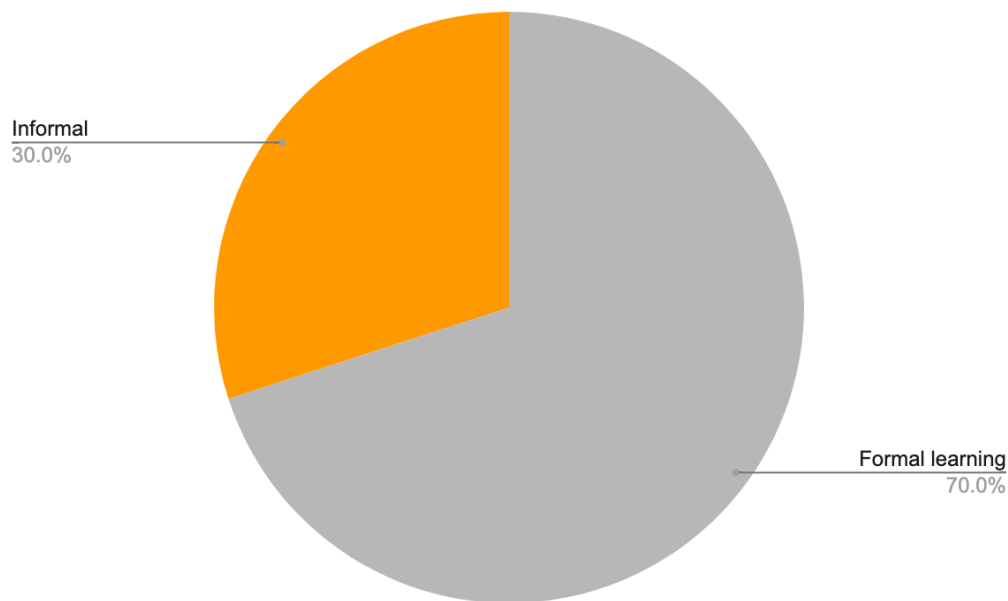


Figure 7: Places of learning. Q: When & where was the last time you learned something new? (please, add details such as if it was an informal/formal environment? How many hours/days did it take? etc.)

Open Schooling: attitudes and opinions

In general, teachers find open schooling practices beneficial both in pre-and post-test. However, we can observe shifts in opinion regarding the following issues. First, in comparison to the pre-test, more participants after the Pilot I found that the statements "open schooling raises social mobility" and "including parents in the learning process empowers the students" are not relevant to their practice. Second, in the case of opinion about the statement "Collaborating with community members strengthens the student's sense of belonging", all participants agreed with the sentence; however, there is a visible decrease of "strongly agree" after Pilot I (see fig. below)

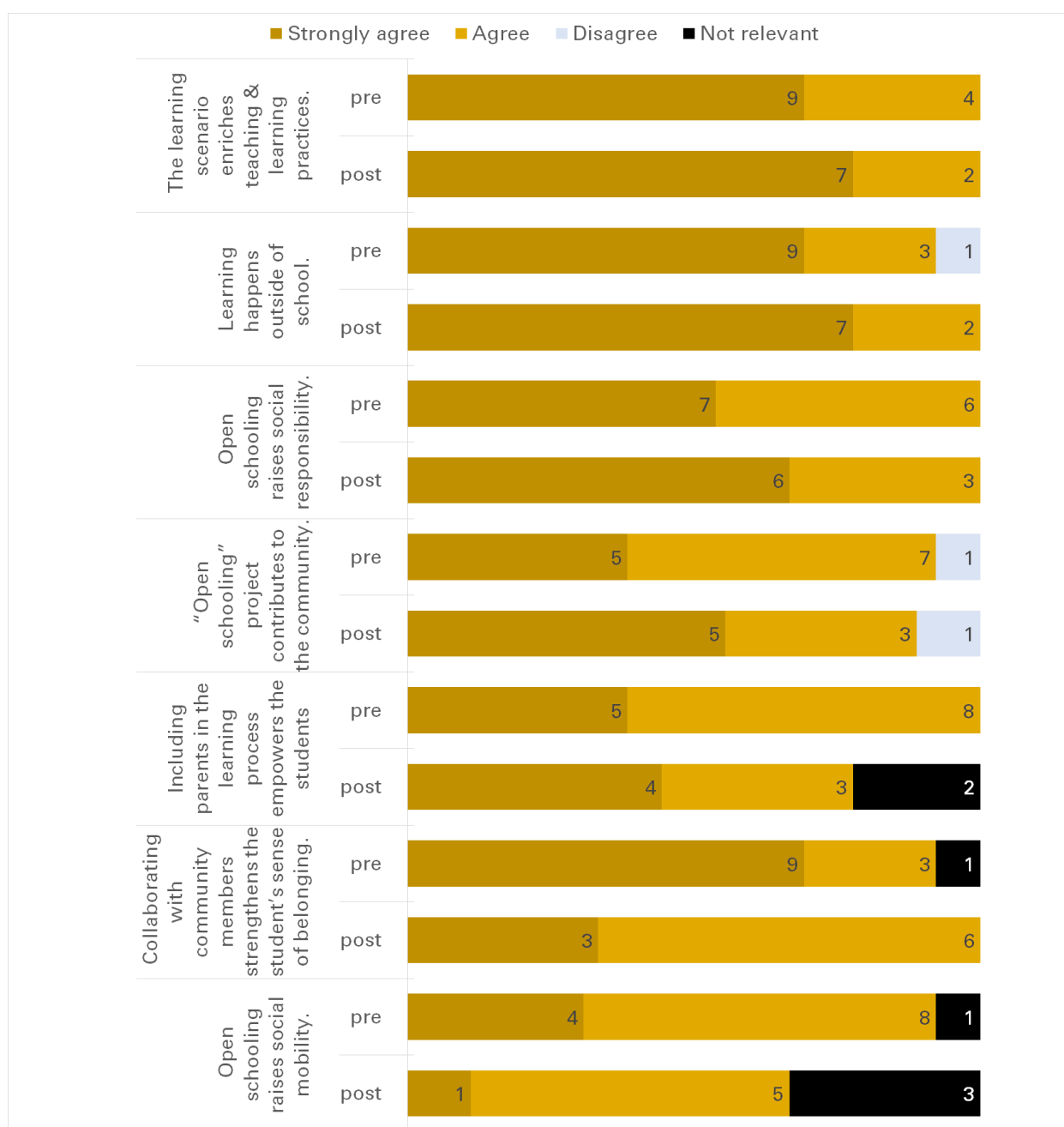


Figure 8: Attitudes and opinions about open schooling concepts. Q: How do you feel about the following statements? $N_{pre} = 13$, $N_{post} = 9$

“Citizen Science” is not a familiar concept for teachers. After participation in Pilot I, there seems to be a slightly better understanding of the concept, but at least 2 participants declared not knowing this term. Additionally, in contrast to “Hands-on” activities (see paragraph below), respondents' opinions vary greatly (see fig. 9).

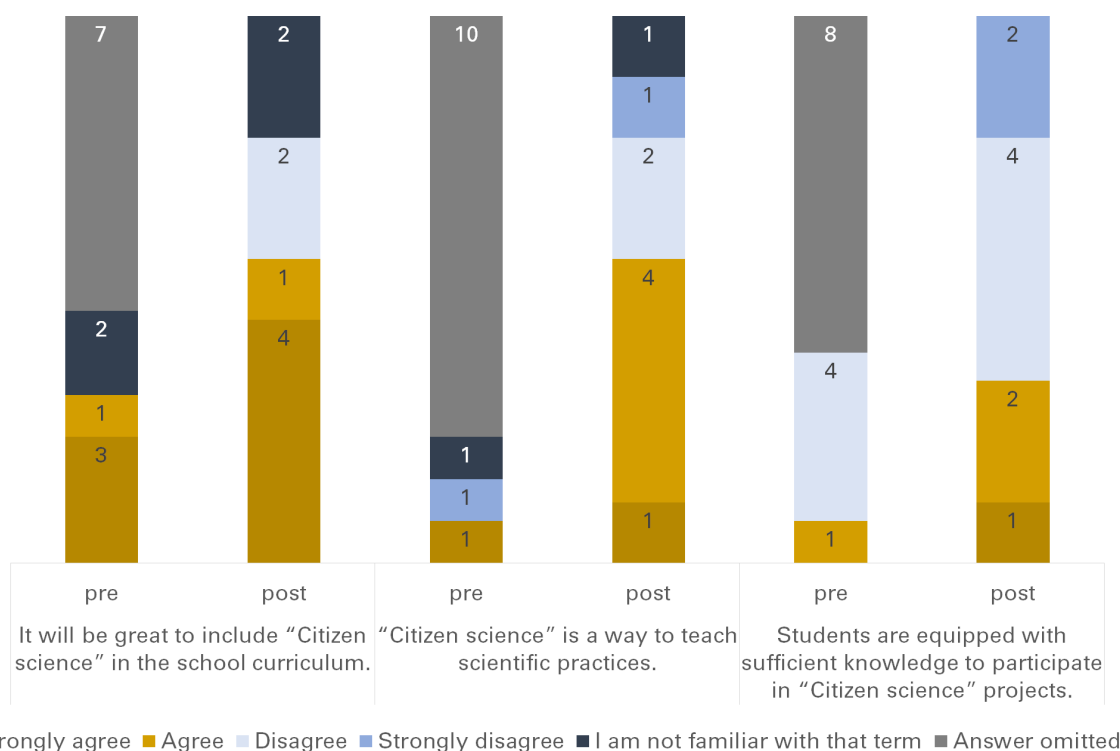


Figure 9: Attitudes and opinions about Citizen Science. Q: How do you feel about the following statements? N pre = 13, N post = 9.

“Hands-on” activities were almost unanimously rated as a beneficial method of teaching and learning; however, post-survey results showed a slight decrease in these beliefs (fewer answers “strongly agree” in comparison to the first study - see fig. 10).

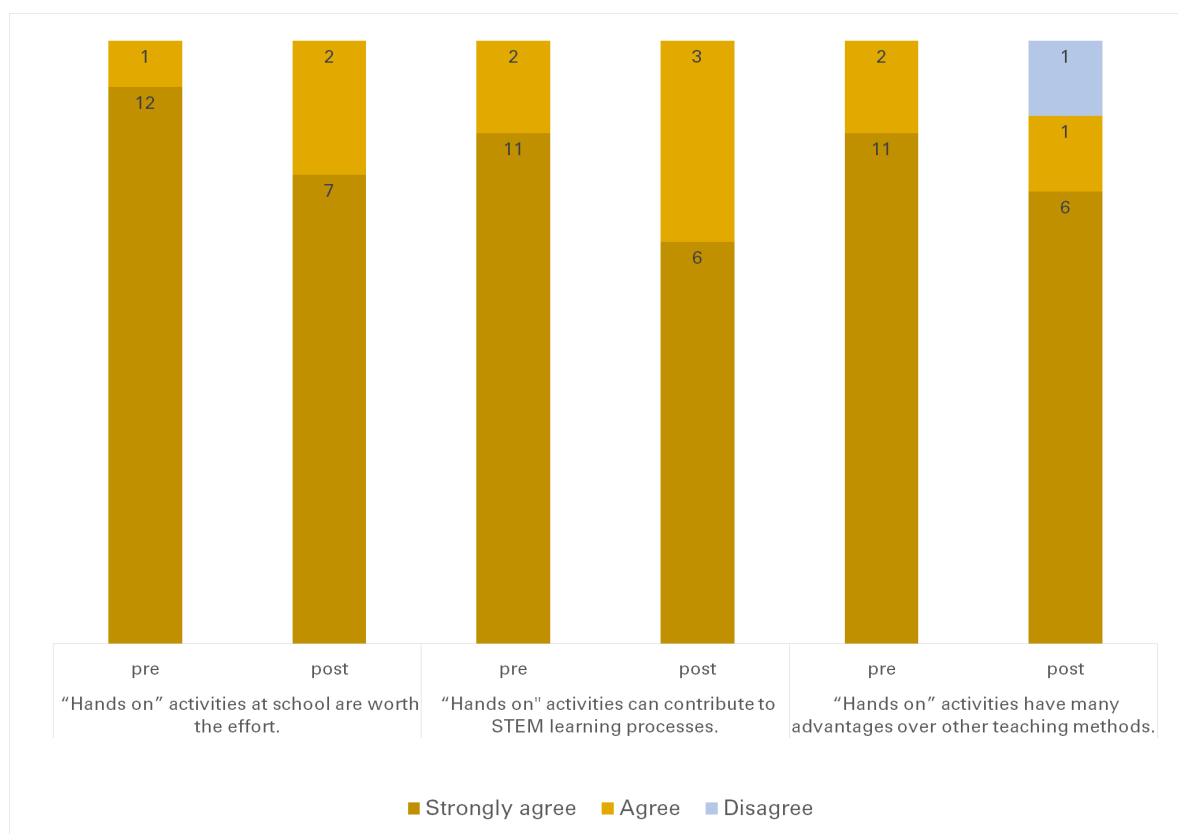


Figure 10: Attitudes and opinions about Hands-on activities. Q: How do you feel about the following statements? $N_{pre} = 13$, $N_{post} = 9$

Teaching Practices: challenges

Opinions about the open schooling challenge, in general, were diverse among teachers. Although teachers see the benefits in collaboration with various partners, both in pre and post-test, at least half of respondents think it is hard to recruit parents and experts. The most significant changes are observable in 2 statements – the majority of respondents in post-test agrees that The teachers can spend time planning "open schooling" activities; also, they find arranging excursions less easy in post-test than at the beginning of the project. See fig. below.

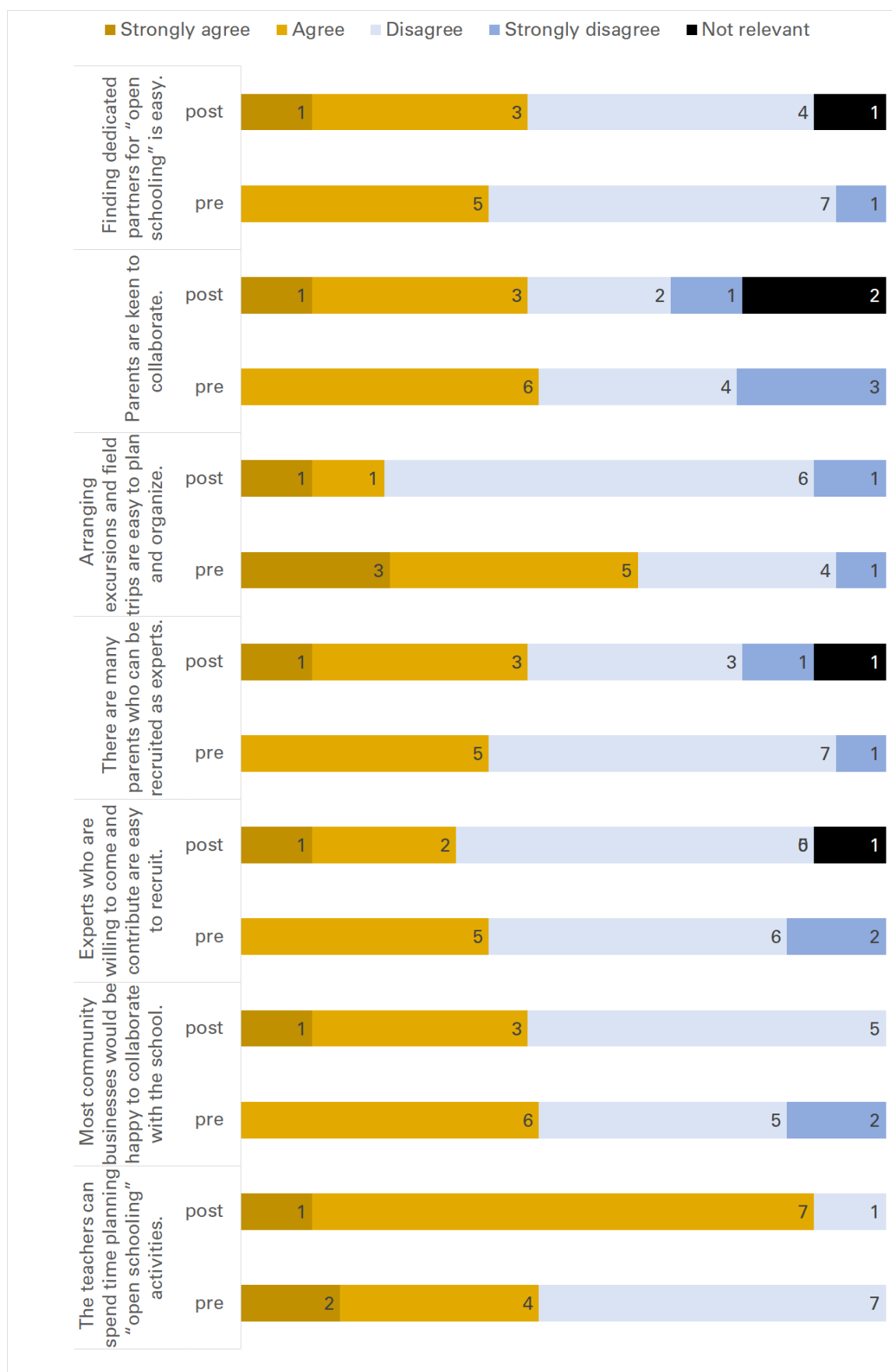


Figure 11: Attitudes and opinions about open schooling concepts. Q: How do you feel about the following statements? N pre = 13, N post = 9.

Participation in *Make it Open* project

Concerns: After Pilot I, four aspects of the project remain concerning (at least half of respondents voiced concern, visualised at the chart in orange): resources of experts, pandemic, safety, funding. The post-survey level of concern increased for resources of experts and safety and significantly decreased for pandemic and teacher training.

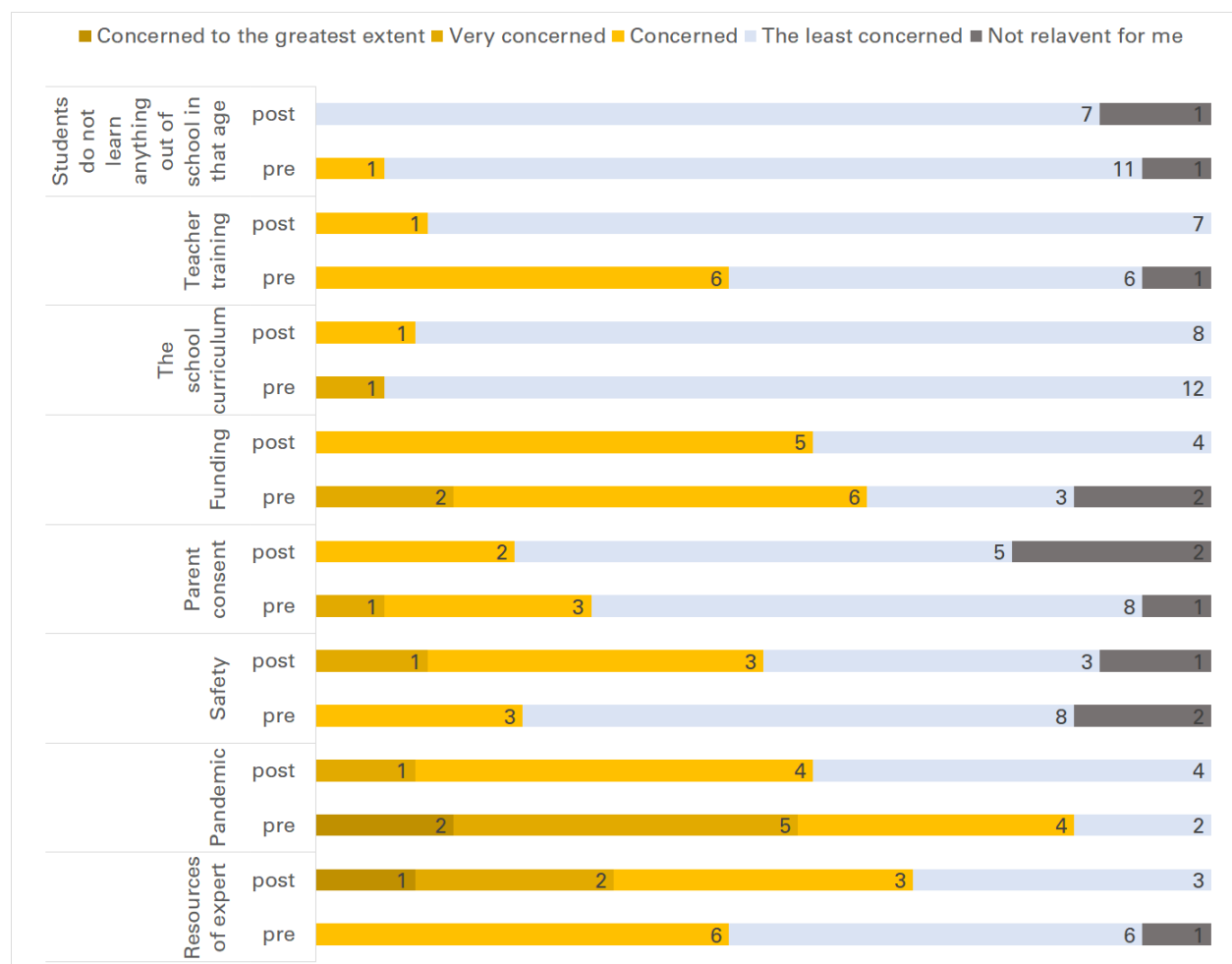


Figure 12: Concerns. Q pre: How do you feel about the following concerns regarding the project? Q post: After teaching the learning scenario, how do you feel about the following concerns regarding the project? N pre = 13, N post = 9.

Implementation: Teachers pointed out various issues needed to scale up "open schooling", including time, approval from parents and headmasters, support with fostering collaboration with external partners, changes in teachers attitudes and practices. Interestingly, issues connected with funding were raised only in pre-survey (see table below).

Issues categories	pre-survey (n = 13)	post-survey (n= 9)
Time e.g. “[...]more teaching hours in science would be helpful!”	1	4
Support with collaboration with the partners “Help with engagement from outside of school.”	2	2
Teachers’ attitude and practice “[...]convincing teachers that this method is more effective and more fun...”	1	2
Parents and headmaster approval “[...]get approval from the school headmaster.”	3	1
Change in curriculum “More flexible lessons plan.”	1	1
Funding “Money”	3	0
Students’ attitude “Good intentions of students.”	1	0

Table 3: List of the issue categories and frequency of occurring in answers. Qpre: What is needed in order to implement “open schooling” at your school?; Qpost: After teaching the learning scenario, what is needed in order to scale up “open schooling” units at your school? Explain.

Majority of reported issues overlapped with the teacher’s concerns presented in the previous paragraph. Recurring topics include time management and collaboration with the experts.

Affective component: In general, teachers in both surveys were very confident and enthusiastic about the project.

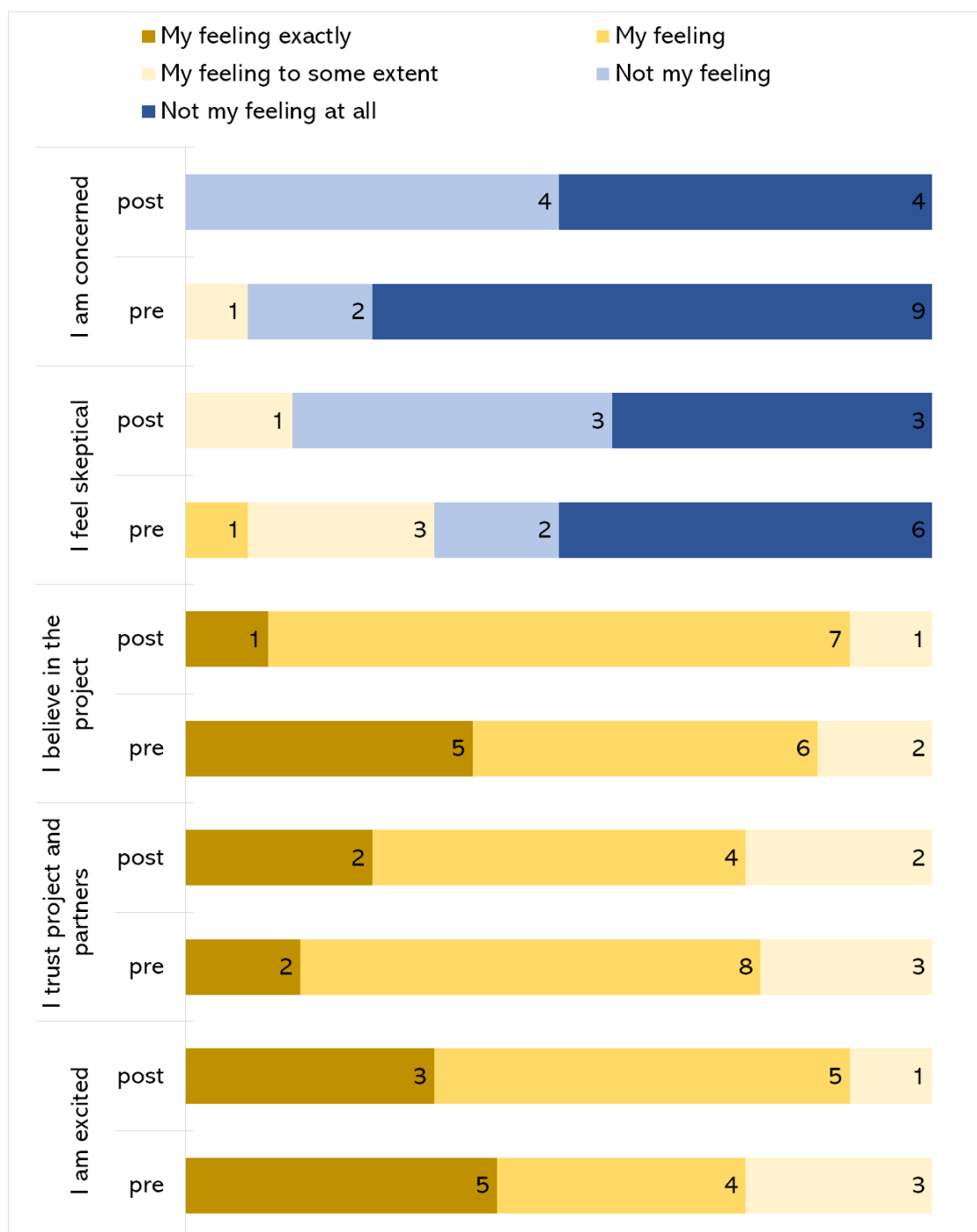


Figure 12: Feelings Q: How do you feel about the following statements? Q pre: “How well do these statements describe your feeling towards participation in “Make It Open” project? 1- not my feeling at all 5- my feeling exactly”; Q post: “After teaching the learning scenario, how well do these statements describe your feeling towards participation in the “Make It Open” project? 1- not my feeling at all 5- my feeling exactly” Npre = 13, N post = 9.

Findings from this research component are similar and complementary to the results from other Pilot I studies. Teachers involved with the project present a continuingly positive

attitude toward it. Open schooling conceptualisation improved during the course of the project but still varies across the group. The identified challenges include collaboration with external partners and time restrictions.

5. Appendix

Learning Scenario	Reported problem
Forces of nature	Securely attach the balloon to the wheelbase. Adhesive tape caused the balloon to burst, giving the balloon a kind of 'room' on the car again caused a lot of resistance.
Food travels	I would increase the layer of waste to rot in each sample.
Sound around us	I would reduce the number of places visited when walking because of the limited time. I would choose the park as the last place visited during the walk and there, in nature, the students would analyze the measurement results. You would have to prepare for it in advance and take cards and writing and drawing accessories with you.
Our moving world: Physics Everywhere	I think we need to plan the work sheets better- so that they would include more details- and a place to write the measurements. I would go to the playground twice each time with half of the class.
Air Pollution	Due to the faulty app it was hard to measure the pollution with the children.
Dealing with waste	Obstacles due to birds breeding season

Table 4: List of technical problems during implementation of Learning Scenarios reported in e-journals by teachers.