

Advancing Open Schooling Ecosystems in Europe

D4.2 Policy Brief II

Executive Summary

This policy brief presents findings from the ICSE Science Factory project (2023-2026), a transfer-oriented Open Schooling initiative implemented in five countries (Germany, Portugal, Croatia, Cyprus, and Türkiye). The project combined multiple activity formats (Open Schooling Activities, Lighthouse Activities, Interactive Career Talks, and local partnership formats) with a mixed-methods evaluation including pre-/post-questionnaires and qualitative data.

The findings indicate positive patterns in student motivation, engagement, and perceived relevance of science across countries and activity types. They also suggest that the different formats served complementary functions, with outcomes varying by institutional support, resources, and educational level. At the same time, the available evidence is stronger for identifying implementation patterns and plausible mechanisms than for establishing long-term causal effects. A central implication of this brief is that Open Schooling should be assessed not only as a student-focused approach, but also as a possible practice-based model of teacher professional development. Current evidence suggests potential in this area, but stronger research is needed to determine the scale and durability of effects on teaching practice and professional beliefs.

The brief, therefore, recommends a clearer policy distinction between transfer/scaling projects and dedicated effectiveness research. European projects have already generated substantial knowledge on how Open Schooling can be implemented; the next priority should be either systematic scaling of established implementation approaches or rigorous research on effectiveness and cost-effectiveness.

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1. Introduction

Over the past years, Open Schooling has become a recurring approach in European STEM education projects. Across initiatives, schools have collaborated with external actors such as universities, municipalities, NGOs, and community partners in formats including citizen science, challenge-based learning, and school–community collaboration. These projects show

that Open Schooling is best understood as a flexible implementation approach rather than a single format.

The ICSE Science Factory project builds on this European Open Schooling landscape as a transfer-oriented project. It was implemented in five countries (Germany, Portugal, Croatia, Cyprus, and Türkiye) and combines practical implementation with a mixed-methods evaluation to generate policy-relevant evidence on outcomes, implementation conditions, and scaling potential. Its main contribution lies in linking implementation practice with policy learning across different contexts.

The current draft refers to projects such as *Make it Open*, *Multipliers*, *Schools as Living Labs*, *GEM*, and *MOST* as part of the existing European Open Schooling evidence base. Across these projects, recurring findings indicate positive effects on student interest, engagement, and the perceived relevance of science, especially when learning is linked to real-

world or societal questions. At the same time, previous work also shows strong contextual dependence: implementation quality and outcomes vary with local support structures, teacher capacity, and collaboration conditions.

Despite this progress, several policy-relevant questions remain open. These include: (1) under which conditions Open Schooling most strongly supports student motivation and perceived relevance of science; (2) how different activity types contribute to outcomes across contexts; (3) how equitable and inclusive these effects are across learner groups; (4) what direct and lasting benefits Open Schooling creates for teachers, especially regarding teaching practice and professional beliefs; and (5) when the additional coordination effort of Open Schooling leads to sufficient educational benefit to justify scaling. These questions are central for future funding decisions, particularly because European projects have already generated substantial implementation knowledge, while the effectiveness and cost-effectiveness of Open Schooling remain less clearly established.

2. ICSE Science Factory Approach: Activities and Implementation Design

The ICSE Science Factory was designed as a transfer-oriented Open Schooling project combining several complementary activity types. The approach assumes that wider uptake in schools requires more than isolated Open Schooling projects and instead depends on an implementation ecosystem with different entry points and levels of intensity.

Open Schooling Activities (OSAs) were the core format of the project. They engaged teachers and students in science learning linked to real-world and socially relevant questions and required the highest level of planning, coordination, and pedagogical flexibility. OSAs represent the main format for deeper Open Schooling implementation.

Lighthouse Activities (LHAs) served as more accessible formats that connected schools with

external partners in structured learning settings. Compared with OSAs, they required less long-term coordination and therefore served as lower-threshold entry points, supporting early collaboration experiences and trust-building.

Interactive Career Talks (ICaTs) connected students with STEM professionals and role models. Their primary function was to strengthen career orientation and perceived relevance of science learning, while also increasing school readiness for external collaboration.

Local partnership conventions and public fairs supported networking, dissemination, and local visibility. They added a community-facing dimension and contributed to ecosystem-building beyond individual classrooms.

Together, these formats were designed to balance intensity and feasibility. ICaTs supported orientation, LHAs provided accessible collaboration experiences, and OSAs enabled deeper implementation. Combined with networking formats, this structure aimed to reduce implementation barriers and strengthen institutional readiness across diverse school contexts.

This ecosystem perspective is central to the project's policy relevance. It addresses a key challenge of Open Schooling: educational potential alone is insufficient if implementation demands exceed school capacity. The focus, therefore, lies not only on individual activities but on enabling conditions for sustainable uptake.

3. Methodology

ICSE Science Factory was designed as a transfer-oriented project rather than a purely research-driven intervention. Its methodology focused on implementing Open Schooling across diverse national and institutional contexts and on understanding the conditions that support uptake in schools over time. Building on the activity ecosystem described in Chapter 2, the project combined complementary formats to strengthen readiness, trust, and

implementation capacity, with the aim of making Open Schooling more feasible for schools with different starting points. This implementation logic is central to the policy relevance of the project.

The evaluation followed a mixed-methods approach covering the three main activity formats (ICaTs, LHAs, and OSAs) across five countries (Germany, Portugal, Croatia, Cyprus, and Türkiye). Quantitative evidence was collected through pre- and post-questionnaires with students and adult participants, focusing on attitudes toward science, motivation, self-efficacy, perceived learning, and interest in science careers. This was complemented by qualitative data (teacher interviews, student focus groups, and case studies) in order to capture participant experiences and implementation conditions in greater depth. The combination of data sources allowed for triangulation across formats and contexts and strengthened the interpretation of results.

The evaluation provides robust evidence on participant experiences, perceived outcomes, and implementation patterns across countries and activity types. At the same time, some policy-relevant issues - especially long-term changes in teacher beliefs and practices, broader community diffusion effects, and cost-effectiveness - cannot yet be fully quantified with the available data. The findings should therefore be read as a strong basis for policy learning and further targeted research, rather than as a complete long-term impact assessment.

4. Findings

The project reached approximately 5,950 participants through LHAs, 3,740 through OSAs, 3,970 through ICaTs, and 2,740 through local partnership conventions and public fairs.

Across countries and activity types, the evaluation indicates positive patterns in student motivation, engagement, and attitudes toward science. Participants also reported a stronger

perceived relevance of science in relation to everyday life and societal issues.

The three activity formats contributed in different ways. ICaTs mainly supported career orientation and contact with role models. LHAs supported interdisciplinary collaboration and cooperation with external partners. OSAs combined inquiry, teamwork, and community participation and showed the broadest profile of reported educational and social outcomes. Across formats, Lighthouse Activities show the most stable positive mean values across attitudinal dimensions, while Open Schooling Activities display greater variability, reflecting their higher complexity and stronger contextual dependence.

Positive outcomes were reported across all five countries, with contextual variation in implementation conditions and average results. The WP5 Evaluation Report (D5.2) reports stronger average outcomes for Portugal and Germany, while also noting differences in institutional support and available resources across countries. Differences were also reported across educational levels, with stronger effects in primary education and more implementation constraints in secondary education (e.g., timetable and exam-related pressures). Pre-/post-comparisons indicate that positive changes in motivation and perceived learning are more clearly observable in primary education, while effects in secondary education are weaker and more heterogeneous, suggesting that curricular flexibility and institutional conditions significantly influence outcome patterns.

The evaluation indicates broadly inclusive participation across genders, with similar reported levels of motivation and engagement. Findings on scientific self-efficacy are more differentiated: quantitative results show limited variation, while qualitative data suggest gains in confidence, curiosity, autonomy, and understanding of inquiry and collaboration.

Qualitative data point to recurring patterns related to teachers. Teachers highlighted the importance of external collaboration,

institutional support, and practical feasibility for implementation. The material also suggests teacher reflection on teaching practice and increased openness to collaborative and less tightly controlled formats, but the available evidence does not allow a full assessment of long-term changes in beliefs or classroom practice. While qualitative evidence indicates reflective shifts in teachers' perspectives, the current data do not yet provide robust evidence of sustained changes in classroom practice over time.

5. Discussion

The findings indicate positive patterns in student motivation, perceived relevance of science, and participatory learning across the project activities. They also show that the activity formats served different functions and that implementation outcomes depended on contextual and institutional conditions. At the same time, the available evidence is stronger for identifying implementation patterns and plausible mechanisms than for establishing long-term causal effects.

A plausible added value of Open Schooling is the involvement of external actors, which can expand the thematic and practical scope of school-based projects. This may enable more complex learning environments than schools would typically implement on their own and may reduce barriers for teachers by sharing responsibility and expertise. Open Schooling projects often involve external partners and public-facing elements, which can increase visibility within schools and local communities. This likely supports dissemination and follow-up activities, but the scale and reliability of these diffusion effects are not yet sufficiently quantified.

The findings suggest that Open Schooling may support practice-based teacher learning through guided implementation, external collaboration, and reflection. This is a potentially important added value, because changes in teacher practice could affect many student cohorts over time. However, this teacher-level

impact remains undermeasured and should not yet be treated as fully established.

The findings also confirm that Open Schooling is organisationally demanding. Coordination with external stakeholders requires time, communication, and local capacity, which can limit uptake. For policy, the key question is therefore not only whether Open Schooling is educationally promising, but under which conditions the additional effort is justified.

The ICSE Science Factory ecosystem approach addresses this feasibility problem by combining lower-threshold and higher-intensity formats. This implementation logic may improve readiness and uptake, but its comparative effectiveness and cost-effectiveness require further study.

The project highlights four policy-critical open questions:

1. How strongly and sustainably does Open Schooling affect teacher beliefs and classroom practice?
2. How far do effects diffuse beyond direct participants (e.g., colleagues, schools, local communities)?
3. Which combinations and levels of activity intensity are needed for broader and lasting impact?
4. Which implementation models provide the best balance between educational benefit and coordination effort?

6. Conclusions

The ICSE Science Factory findings indicate that Open Schooling-related activities can support student motivation, perceived relevance of science, and participatory learning. They also show that outcomes depend on implementation conditions, institutional support, and local context. The main conclusion is therefore not only that Open Schooling is promising, but that implementation design is central to its viability.

A key conclusion of this brief is that Open Schooling may represent an innovative,

practice-based form of professional development for teachers. By combining external expertise, guided implementation, and reflection in authentic school settings, it may create conditions for professional learning that differ from conventional training formats. However, this should be treated as a high-priority research question rather than as a confirmed effect.

The findings justify continued strategic attention to Open Schooling, but they also show that

future funding should be more explicit about its primary objective. Policy should distinguish more clearly between projects aimed at scaling implementation and projects aimed at establishing effectiveness. Future decisions on wider expansion should be based on stronger evidence regarding teacher-level impact, diffusion, and cost-effectiveness.

Policy Recommendations

1. Separate scaling from evidence-building in future funding

Future EU and national calls should clearly distinguish between:

- transfer/scaling projects, focusing on structured uptake in schools, and
- effectiveness research projects, focusing on causal impact and cost-effectiveness.

Calls should define distinct evaluation expectations and impact criteria for each type, rather than combining both aims within one funding scheme.

Expected impact: Clear differentiation will increase implementation depth in scaling projects and methodological rigour in research projects, thereby improving both feasibility and the quality of evidence.

2. Fund dedicated research on Open Schooling effectiveness

If Open Schooling is to be expanded strategically, its effects should be examined in dedicated research projects with:

- clearly defined outcome measures,
- longitudinal designs where feasible,
- explicit analysis of contextual moderators (school level, institutional support, partnership intensity).

Priority areas should include student motivation and learning, sustained changes in teacher practice, and cost-effectiveness across formats.

Expected impact: Targeted effectiveness research will enable more reliable funding decisions by clarifying which models generate durable outcomes and under which institutional conditions.

3. Test Open Schooling explicitly as a teacher professional development model

Future programmes should examine Open Schooling not only as a student-focused intervention, but as a potential practice-based model of teacher professional development.

Research should investigate:

- durability of practice change,
- diffusion within schools,
- interaction between guided implementation and professional learning.

Expected impact: Clarifying teacher-level effects could shift Open Schooling from short-term project activity to a structurally anchored professional learning model with broader systemic reach.

4. In transfer projects, fund implementation ecosystems and coordination capacity

Where Open Schooling is funded for transfer, support should explicitly include:

- coordination time for teachers,
- structured partnership brokerage,
- institutional anchoring within school development plans,
- continuity mechanisms beyond project duration.

Without dedicated coordination capacity, uptake is likely to remain limited to highly motivated contexts.

Expected impact: Strengthened coordination structures will increase implementation feasibility and reduce dependence on individual commitment, improving scalability across diverse school settings.

5. Build on existing implementation knowledge and focus on the next step

Given the substantial implementation knowledge already generated at the European level, future funding should prioritise either:

- (a) structured scaling of validated implementation models with clear feasibility criteria, or
- (b) rigorous research on effectiveness and cost-effectiveness.

The primary policy objective of each funding line should be explicitly defined in advance.

Expected impact: Strategic prioritisation will prevent duplication of exploratory pilots and enable more cumulative knowledge development at the European level.

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