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Policy brief for Policy Makers on the COSMOS Approach

Open schooling approach to science education



COSMOS (Creating Organizational Structures for Meaningful Science education through Open Schooling for all) / cosmosproject.eu

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This project was funded by the European Union's Horizon 2020 research and innovation programme under grant agreement no 101005982

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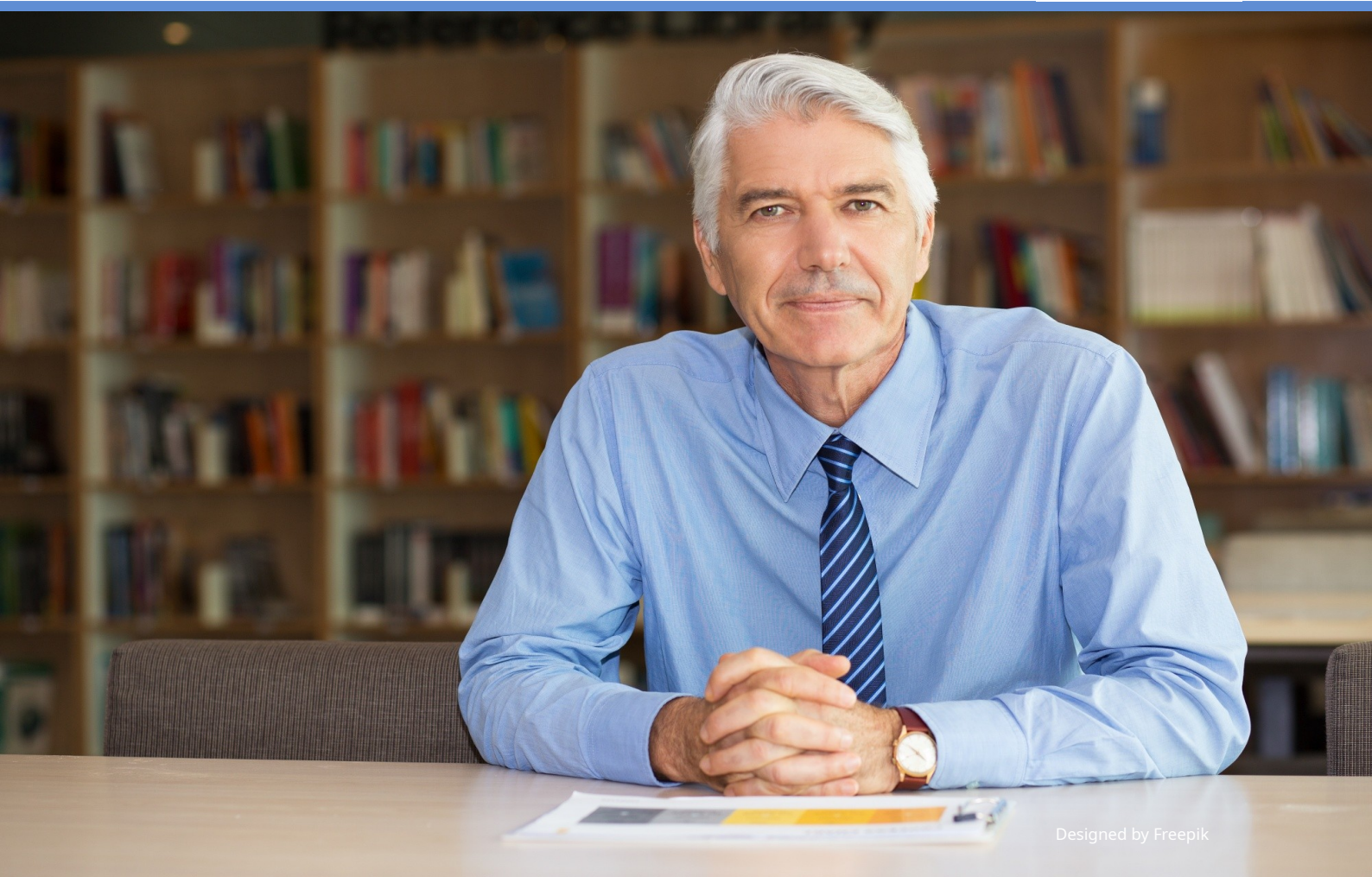
Introduction to the Policy Briefs on the COSMOS Approach

This document compiles a series of policy briefs developed as part of the COSMOS project, an EU-funded initiative under the Horizon 2020 Research and Innovation programme. Each policy brief is designed to address the unique needs and perspectives of key stakeholders – **teachers, school leaders, policymakers, and the European Commission**. The goal of these briefs is to provide clear, evidence-based recommendations that promote the adoption of the COSMOS open schooling approach across various educational and policy contexts.

The development of these policy briefs was guided by a structured framework (D2.1 COSMOS Framework; Sarid, et al. 2024¹) that emphasized conciseness, actionable insights, and alignment with the COSMOS project's objectives. The guidelines ensured each brief focuses on the essential components of COSMOS: Core Organisational Structure for Promoting Open Schooling (CORPOS), Communities of Practice (CoP), Socio-Scientific Inquiry-Based Learning (SSIBL), and Teacher Professional Development (TPD). Together, these elements form a cohesive model that fosters educational innovation, community engagement, and critical socio-scientific inquiry within schools.

To create these briefs, we drew on the insights and recommendations from the COSMOS open schooling roadmaps (D6.2 Open Schooling Roadmaps), as well as implementations and lessons learned from this work at the primary (D3.1/D3.2) and secondary school level (D4.1/D4.2), case studies from schools implementing COSMOS across Europe (D6.1 Report on case studies, developed by partners, centred on particularly interesting SSIBL-CoP implementations in their countries during Round 1 and 2), and extensive research during the entire process (D7.1 Final Evaluation of COSMOS). Each brief highlights the specific benefits, expected outcomes, and tailored policy recommendations suited to its target audience. This document provides a comprehensive resource to guide educational stakeholders in understanding, implementing, and sustaining the COSMOS approach to science education reform, enhancing both student learning and community collaboration.

¹ A. Sarid, J. Boeve-de Pauw, A. Christodoulou, M. Doms, N. Gericke, D. Goldman, P. Reis, A. Veldkamp, S. Walan & M. C. P. J. Knippels (2024). Reconceptualizing open schooling: towards a multidimensional model of school openness. *Journal of Curriculum Studies*, 1–19. <https://doi.org/10.1080/00220272.2024.2392592>



COSMOS in a Brief for Policy Makers: An Effective Model for Open Schooling through Science Education

Executive Summary

The COSMOS project provides an innovative model for open schooling that aligns science education with community engagement and socio-scientific inquiry. Aimed at policymakers, this brief presents the COSMOS approach and its potential to modernize education by embedding inquiry-based, community-driven learning within schools. COSMOS centres on four key components: CORPOS, CoP, SSIBL, and TPD, each supporting a framework that fosters critical thinking, ethical decision-making, action competence, and real-world problem-solving. The brief outlines policy recommendations to support COSMOS adoption, including encouraging partnerships with community organizations, integrating SSIBL into curricula, and providing funding for teacher training. Through these measures, policymakers can foster an educational system that aligns with EU goals for inclusive, innovative, and active citizenship. COSMOS empowers students to become engaged citizens capable of addressing today's socio-scientific challenges, making it a valuable model for policy-driven educational reform.

Background and Context

Education systems today face increasing demands to address complex global challenges like climate change, public health, and sustainability, which require a scientifically literate and socially responsible citizenry. Traditional education often fails to prepare students adequately for these socio-scientific challenges, emphasizing rote learning over critical engagement with real-world issues. COSMOS addresses this gap by fostering open schooling practices that connect schools with their communities, encouraging inquiry-based learning grounded in socio-scientific issues. This approach aligns science education with the needs of society, transforming students into active participants in their communities.

Key Components of the COSMOS Approach

1. **Core Organisational Structure for Promoting Open Schooling (CORPOS) or Open Schooling Team:** establishes a formal team within each school, including teachers, community members, and other stakeholders, to institutionalize open schooling practices. This organizational structure fosters sustained engagement by creating a network of support for implementing and maintaining COSMOS activities. CORPOS provides the infrastructure needed to connect educational goals with community priorities, ensuring that the open schooling model is embedded within the school's strategic vision.
2. **Community of Practice (CoP):** facilitates collaboration between educators and local stakeholders, such as scientists, health professionals, environmental experts, and business leaders. These partnerships enrich learning by bringing real-world expertise and perspectives into the classroom. CoPs foster a collaborative learning environment where students, teachers, and community members work together on projects that address local and global socio-scientific issues.
3. **Socio-Scientific Inquiry-Based Learning (SSIBL):** is a model that encourages students to explore complex socio-scientific issues through research and action. With stages including "Ask, Find Out, Act," SSIBL equips students to engage critically with topics like sustainability, public health, and civic responsibility. This framework promotes critical thinking, ethical decision-making, and problem-solving, preparing students to tackle real-world challenges.
4. **Teacher Professional Development (TPD):** COSMOS provides targeted TPD to support teachers in implementing SSIBL and CoP models. By enhancing teachers' skills in inquiry-based and community-centred approaches, TPD fosters an educational environment where teachers are prepared to lead COSMOS initiatives effectively. TPD emphasizes reflective teaching practices and collaborative learning, creating a sustainable model of professional growth that supports COSMOS goals.

Outcomes and Benefits

1. **Increased Student Engagement and Motivation:** COSMOS's focus on real-world, inquiry-based learning makes education more engaging for students. By exploring issues relevant to their communities, students find greater purpose in their studies and are motivated to participate actively in learning.
2. **Enhanced Critical Thinking and Problem-Solving Skills:** The SSIBL approach cultivates students' ability to analyse information, weigh ethical considerations, and develop solutions to complex issues. These skills are essential for informed, responsible citizenship in a society that faces diverse socio-scientific challenges.
3. **Enhanced action competence towards sustainability:** COSMOS approach develops students' knowledge about their own possibilities to contribute to a more sustainable future through individual and collective action, boost their self confidence in their capacity to create an impact regarding SSIs, and ultimately to feel empowered and driven to engage in action taking.
4. **Stronger School-Community Connections:** Through CoPs, COSMOS promotes partnerships between schools and community organizations, including NGOs, businesses, and local government. These collaborations provide students with access to real-world expertise and resources, enriching the educational experience and fostering a sense of shared responsibility between schools and communities.

Continuous Professional Development for Teachers: TPD ensures that teachers are well-equipped to facilitate inquiry-based, community-connected learning. By providing ongoing professional support, COSMOS promotes a culture of reflective practice, empowering teachers to adapt and thrive in a dynamic educational landscape.

Policy Recommendations

1. **Promote Partnerships with Community Organizations:** Policies should encourage schools to build partnerships with local organizations, such as government agencies, NGOs, businesses, and scientific institutions. These partnerships are crucial for providing students with access to resources and expertise that enrich the learning experience. Early stakeholder involvement ensures that COSMOS initiatives are aligned with community needs and fosters broader support for open schooling practices.
2. **Integrate SSIBL and Open Schooling Principles into Curriculum:** National and regional policies should provide flexibility for schools to incorporate SSIBL and open schooling practices into the curriculum. This integration ensures that socio-scientific inquiry becomes a core part of science education, fostering skills that are essential for students' future roles as engaged citizens.
3. **Encourage Flexible Teaching Methods:** Policies should support teaching methods that allow for inquiry-based and project-based learning focused on real-world issues and

action. This flexibility empowers teachers to adapt their methods to students' interests and community contexts, creating a more relevant and engaging educational experience.

4. **Allocate Funding for Teacher Professional Development and Open Schooling**

Projects: When integrated into pre- and in-service teacher training, the COSMOS approach can contribute to boosting teachers' competencies to boost students' attitudes towards science and active citizenship. Sufficient funding and opportunities are critical to support teacher training in COSMOS principles and to cover the resources needed for open schooling projects. Investment in TPD ensures that teachers have the skills and knowledge to implement COSMOS effectively, while funding for projects enables schools to sustain and scale open schooling practices.

5. **Incentivize Schools to Adopt COSMOS Approach:** Governments should consider offering grants, recognition programs, or other incentives to encourage schools to adopt COSMOS. Such incentives can drive widespread adoption of open schooling practices and foster innovation in science education, ultimately benefitting both students and communities.

Challenges and Solutions

1. **Resource Limitations:** Open schooling initiatives require time, funding, and materials that may not always be readily available. Schools can mitigate these challenges by forming partnerships with local organizations that provide additional resources. Furthermore, governments can support open schooling by offering targeted funding for schools implementing COSMOS.
2. **Resistance to New Teaching Approaches:** Some educators and administrators may be reluctant to adopt SSIBL and CoP models due to unfamiliarity or perceived difficulty. Governments can address this challenge by promoting awareness of COSMOS benefits and providing TPD opportunities to ease the transition to new methods.
3. **Equity and Inclusion:** Open schooling practices should be accessible to all students, including those in under-resourced or marginalized communities. Policies must ensure that COSMOS initiatives prioritize equity, offering additional support for schools in disadvantaged areas to participate fully in open schooling.
4. **Balancing Open Schooling with Curriculum Requirements:** While COSMOS promotes flexibility, schools may find it challenging to balance curriculum demands with open schooling projects. A potential solution is to align SSIBL projects with curricular goals, ensuring that socio-scientific inquiry complements rather than competes with existing educational objectives.

Glossary

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| Alma Löv | Museum of Unexp. Art |
| BBC | Beit Berl College |
| COSMOS | Creating Organisational Structures for Meaningful science education through Open Schooling for all |
| CORPOS | Core ORganisational Structure for Promoting Open Schooling |
| CoP | Community of Practice |
| HEI | Higher Education Institution |
| IE-UL | Instituto de Educação da Universidade de Lisboa |
| KdG | Karel De Grote Hogeschool katholieke hogeschool |
| KU | Karlstad University |
| MoE | Ministry of Education |
| SDG | Sustainable Development Goals |
| SSI | Socio-Scientific Issue |
| SSIBL | Socio-Scientific Inquiry-Based Learning |
| SOTON | University of Southampton |
| STEM | Science Technology Engineering Mathematics |
| TPD | Teacher Professional Development |
| UU | Utrecht University |
| WP | Work Package |
| WSC | Winchester Science Centre |

Project partners



Utrecht University, Freudenthal Institute (Project Coordinator)
The Netherlands



University of Southampton
England



Karel de Grote University of Applied Sciences and Arts, Centre of Expertise in Urban Education, Belgium



Karlstads University, Research Centre SMEER (Science, Mathematics, Engineering Education Research), Sweden



University of Lisbon, Institute for Education, Portugal



Beit Berl College, Faculty of Education, Israel



Euroface Consulting, Czech Republic



Universiteits Museum Utrecht



Winchester Science Centre & Planetarium



Winchester Science Centre (WSC), England



Alma Löv Museum, Sweden



Ciência Viva, National Agency for Scientific and Technological Culture, Portugal



Ministry of Education, Department for Research and Development, Experiments and Initiatives