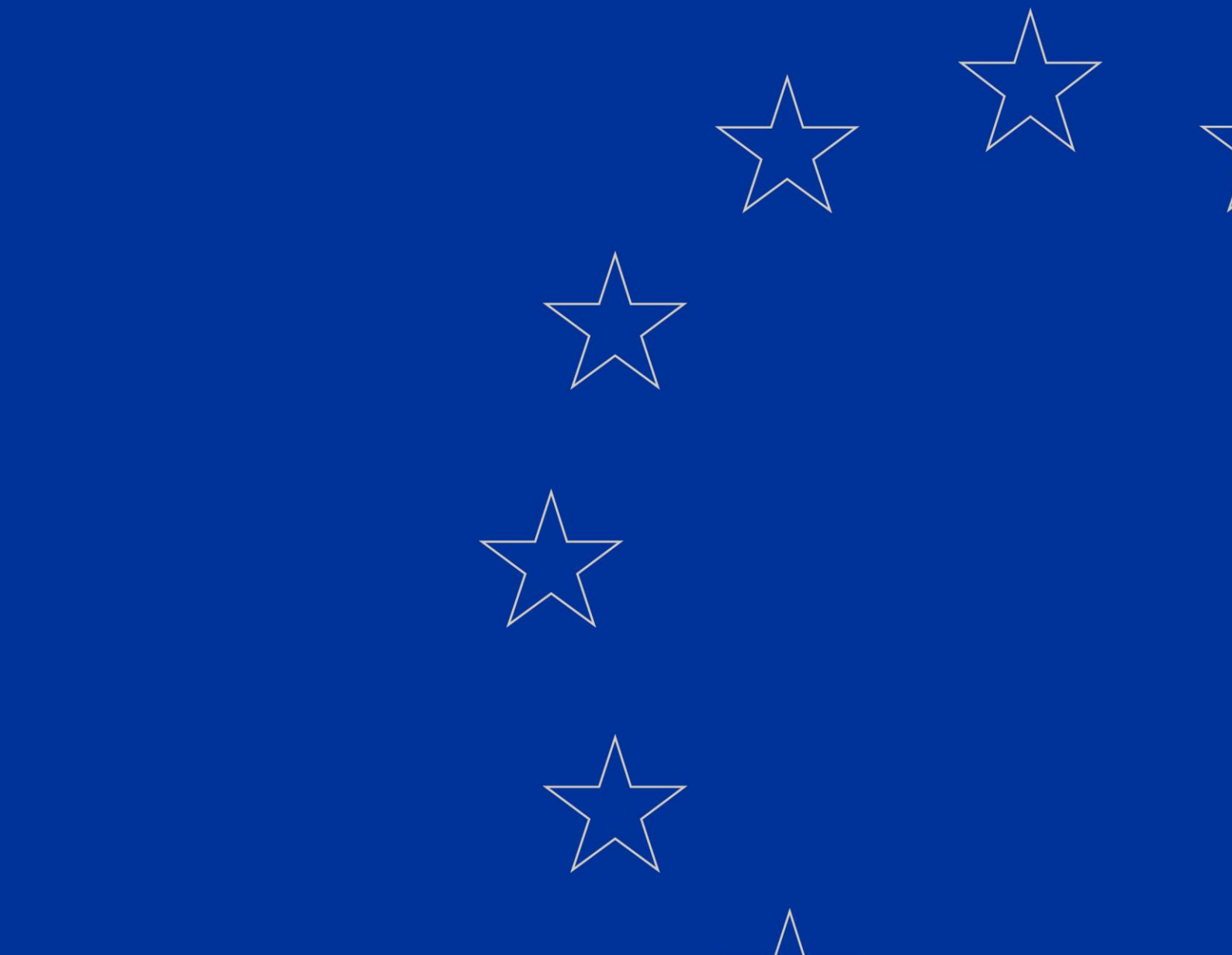
European Commission

Promoting STEM Education in Schools

EU report



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Contact: Maria Podlasek-Ziegler

E-mail: EAC-UNITE-B2@ec.europa.eu

European Commission
B-1049 Brussels

Promoting STEM Education in Schools

EU report

Authors: Lennart Stoy, Laura Galante, Elisa Seminaroti, Adelina Pupelytė

Directorate-General for Education, Youth, Sport and Culture

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1. Introduction

This EU-level report is part of the study o “Promoting STEM Education in Schools”, commissioned by the Directorate-General for Education, Youth, Sport and Culture of the European Commission. It examines EU policy initiatives and European programmes addressing STEM education over the past decade, with a focus on pre-primary, primary, secondary, and initial vocational education and training (VET). The analysis covers formal, non-formal, and informal education. For assessing the EU’s contribution, a broad scope was applied, encompassing individual science, technology, engineering and mathematics disciplines, integrated STEM education, and approaches that combine STEM with arts and creativity, such as STEAM.

The primary objective of this report is to map and analyse EU policy initiatives and strategies, as well as EU-funded programmes related to STEM education. The focus is on EU funding instruments and their contribution to STEM education, including Erasmus+, Horizon Europe, the European Structural and Investment Funds, and others, complemented by a range of European initiatives and their role within the wider EU STEM education ecosystem. The study also reviews definitions of STEM education and STEM competences applied across policy initiatives and funding programmes. Building on this analysis, the report identifies gaps, challenges, and needs at EU level.

The report draws on multiple sources of evidence, including desk research, interviews, programme-level data (where available), and project case studies. Its structure is as follows: Chapter 1 is the present introduction. Chapter 2 presents the background and context; Chapter 3 outlines the methodology; Chapter 4 examines the key features of EU support for STEM education; Chapter 5 reviews synergies with European interventions; Chapter 6 identifies gaps, challenges and policy needs to inform future policymaking; Chapter 7 highlights good practices and the role of STEM competence frameworks; and Chapter 8 concludes with a summary of key findings.

2. Background and context

2.1. The case for STEM competences

In the 21st century, Europe contends with scientific advancement, significant societal transformation, and pressing global challenges. Within this dynamic context, STEM (Science, Technology, Engineering, and Mathematics) education emerges as a pivotal area for addressing the multifarious challenges faced by the European Union. STEM competences are fundamental to research and development, driving innovation and maintaining Europe's competitiveness in the global market. **Multidisciplinary and interdisciplinary approaches** which integrate scientific knowledge from different domains and to apply it in real-world settings are particularly important, as many contemporary challenges cannot be addressed within a single discipline[1]. STEM competences also support personal fulfilment, health, employability, and social inclusion. Thus, they are part of the skills and competences which prepare people for active citizenship and 21st century challenges.

Europe's skills gap in STEM fields is a multifaceted problem which can be traced back to several challenges to be tackled across the entire education biography of learners: Starting from early childhood education over primary and secondary education, up until tertiary education and lifelong learning.

Overall, data shows that achievement in mathematics and science among the 15-year-olds has been stagnant or decreasing over the last decade in most EU Member States (see Chapter 2.3). **Improving STEM outcomes in schools in general** is thus a common challenge across the EU. There is a need to find ways and methods how to **increase motivation and interest in STEM fields** for all learners at school level. Underlying problems related to equity, gender and socioeconomic disparities reinforce this need. Historically, there has been a **significant gender disparity** in STEM fields, with fewer women than men pursuing careers in these areas. Enhancing STEM education in schools provides an opportunity to encourage more girls and young women to engage with STEM subjects, leading to more balanced representation in STEM careers.

Socioeconomic disparities, in particular lower socio-economic backgrounds but also urban-rural divides, are a major factor leading to lower STEM achievements. Thus, increasing the number of students who chose STEM fields for further study and, eventually, their professional careers could be also addressed through measures reducing the effects of socio-economic disparities, as well as overall awareness of the value of STEM for society.

In addition, education systems frequently suffer from systemic problems such as **teacher shortages,** which especially affect STEM fields, and limited

[1] Council Recommendation of 22 May 2018 on key competences for lifelong learning, rec 2.

opportunities for professional development. **School infrastructure** is also critical in enabling state-of-the-art teaching and learning, including through information and communication technology. Thus, meeting the demand of STEM competences needs to be matched by educational reform across various dimensions.

2.2. Recent policy context

At the political level, the recognition of the relevance of STEM education is not a recent phenomenon. The **Council Recommendation of 22 May 2018 on key competences for lifelong learning** has been a key document. Looking at diminishing outcomes in mathematics and science among 15-year-olds based on 2015 data, the Council Recommendation stressed that "the support of competence development in STEM becomes increasingly relevant"[2] for maintaining a high standard of living, high rates of employment, and social cohesion in Europe. Yet, despite political attention to the matter, the most recent TIMMS results covering 2023 and PISA findings from 2022 show no substantial improvements in science and mathematics have been achieved since 2015 (see also Chapter 2.3).

In reaction to the persisting challenges, several key political initiatives have been launched to support STEM education. The **European Education Area** (EEA) was launched in 2020 in order to reinforce European action across all dimensions of education, focusing on aspects such as boosting quality education and outcomes, improving inclusion and gender equality, the role of education in the green and digital transition, supporting teachers and trainers, strengthened higher education institutions, and the internationalisation of education.[3] Targets were set to reduce the share of low-achieving 15-year-olds in mathematics and science to less than 15 percent by 2030. Specific attention was on making STEM more attractive to girls and women.

Also announced in 2020, the **European Skills Agenda** (2020-2025), includes a dedicated action on increasing STEM graduates while highlighting the need for stronger STEM competencies.[4] The **Digital Education Action Plan** (2021-2027), which emphasises adapting the education sector to the digital age, puts a particular focus on enhancing digital literacy and skills through STEM education in schools.[5] Likewise, the **European Year of Skills 2023** emphasised skills

[2] Council Recommendation of 22 May 2018 on key competences for lifelong learning, rec 16.

[3] 'Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on achieving the European Education Area by 2025' (2020), COM(2020) 625 final. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52020DC0625.

[4] See https://employment-social-affairs.ec.europa.eu/policies-and-activities/skills-and-qualifications/european-skills-agenda_en.

[5] See https://education.ec.europa.eu/focus-topics/digital-education/action-plan.

shortages in STEM occupations, underscoring the need for targeted efforts to bridge these gaps.[6]

Recently, the topic has gained further traction due to concerns about Europe's future competitiveness. The **Draghi Report** for example argues that "labour and skills shortages act as a drag on the EU's future competitiveness. They endanger progress in developing emerging technologies, achieving the green and digital transitions, and the development of businesses in strategic technologies."[7] According to the report, one of the root causes is the "deteriorating performance of the education system".[8] Specific aspects highlighted in the report include the underfunding of education systems, lack of high-quality early childhood education, early school leaving, failure to support learners from disadvantaged backgrounds, gender disparities, slow growth in STEM graduates, and a generally decreasing education performance.[9]

Against these surmounting concerns about STEM skills gaps, the **Political Guidelines for the European Commission for 2024-2029** announce a "focus on improving basic skills" and the development of a "STEM Education Strategic Plan". This includes the objective to tackle the drop in performance, a lack of STEM teachers, and the ambition to attract "more girls and women into STEM education and careers".[10] This is elaborated in the **Mission letter to Roxana Mînzatu**, Executive Vice President of the European Commission responsible for Social Rights and Skills, Quality Jobs and Preparedness.[11] The Mission letter stresses the relevance of STEM education for "our overall prosperity and productivity, as well as the success of the twin green and digital transitions".[12]

The **Union of Skills** resulting from this renewed focus on skills includes an **Action Plan on Basic Skills** and a **STEM Education Strategic Plan**. Other initiatives such as the proposed **EU Teacher Agenda**, and a "**Roadmap on the future of digital education and training based on the reviewed Digital**

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[6] Decision (EU) 2023/936 of the European Parliament and of the Council of 10 May 2023 on a European Year of Skills (Text with EEA relevance), rec 2.

[7] "The future of European competitiveness. Part B | In-depth analysis and recommendations", 2024, p. 261.

[8] "The future of European competitiveness. Part B | In-depth analysis and recommendations", 2024, p. 262.

[9] Ibid.

[10] 'Europe's Choice. Political Guidelines for the Next European Commission 2024−2029' (Strasbourg, 18 July 2024), https://commission.europa.eu/document/download/e6cd4328-673c-4e7a-8683-f63ffb2cf648_en?filename=Political%20Guidelines%202024-2029_EN.pdf.

[11] 'Roxana Mînzatu − Mission Letter' (European Commission, 17 September 2024), https://commission.europa.eu/document/download/27ac73de-6b5c-430d-8504-a76b634d5f2d_en.

[12] 'Roxana Mînzatu − Mission Letter' (European Commission, 17 September 2024), https://commission.europa.eu/document/download/27ac73de-6b5c-430d-8504-a76b634d5f2d_en.

Education Action Plan" [13] also seek to address challenges related to the skills gaps in STEM education.

The political attention to boosting STEM competences over the last decade has been supported by a range of EU-level studies into the factors and challenges related to STEM education. These studies include:

- Two studies investigated **gender aspects in STEM**. One was conducted by the Network of Experts working on the Social dimension of Education and Training (NESET), featuring a literature review and analysis of EU-funded projects in relation to gender gaps in STEM.[14] The other study investigated the individual and contextual factors affecting girls' aspirations in STEM areas.[15]
- A study from 2024 conducted by the JRC assessed different definitions of STEM (traditional, integrated, STEAM), as well as specific **challenges related to STEM education** and existing measurement tools (PISA, TIMSS, PIAAC, ICILS).[16] The study was followed by a Policy Brief in 2025 summarising and systematising definitions of STEM, integrated STEM, and STEAM/STE(A)M education.[17]
- A 2022 Eurydice study analysed the **structure of STEM education** across variables such as instruction time, curriculum organisations, and assessment, as well as the variables influencing achievements and motivation.[18]

[13] 'Roxana Mînzatu − Mission Letter' (European Commission, 17 September 2024), https://commission.europa.eu/document/download/27ac73de-6b5c-430d-8504-a76b634d5f2d_en.

[14] European Commission. Directorate General for Education, Youth, Sport and Culture., Addressing the Gender Gap in STEM Education across Educational Levels: Analytical Report. (Publications Office 2024) https://data.europa.eu/doi/10.2766/260477.

[15] Directorate-General for Education, Youth, Sport and Culture (European Commission) and ICF, Girls' Career Aspirations in STEM (Publications Office of the European Union 2021) https://data.europa.eu/doi/10.2766/52684.

[16] Pokropek A, 'STEM Competencies, Challenges, and Measurements: A Literature Review' (JRC Publications Repository, 8 October 2024) https://publications.jrc.ec.europa.eu/repository/handle/JRC138618.

[17] Ortolani Mazzeo, Giovanna, 'STEM and STEAM Education, and Disciplinary Integration: A Guide to Informed Policy Action', 2025, https://publications.jrc.ec.europa.eu/repository/handle/JRC141438.

[18] European Education and Culture Executive Agency (European Commission) and others, Increasing Achievement and Motivation in Mathematics and Science Learning in Schools (Publications Office of the European Union 2022) https://data.europa.eu/doi/10.2797/031821.

- Other studies explored the role of **science education and citizenship**[19] and a 2019 report investigated **STEM-related projects co-funded under Erasmus+**.[20]

The objective of the present report is not to replicate the analysis and findings of these studies, which are still applicable today. The purpose of the report is to zoom in on the different facets of EU level policies and programmes in the field of STEM education to aid decision making and policy design considering the renewed focus on STEM education.

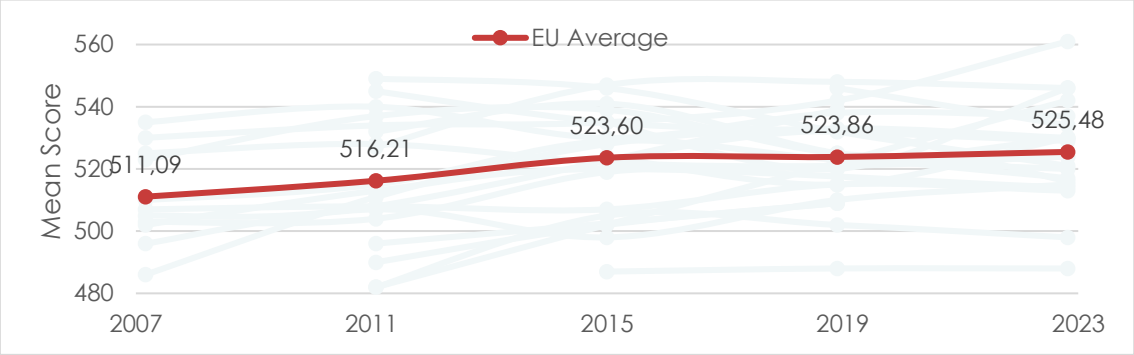
2.3. Mathematics and science performance in the EU

Decreasing performance in mathematics and science is an often-cited argument for STEM education reform. The **most recent PISA and TIMMS results for Europe show do not always show a clear negative trend**. For instance, results from the TIMMS survey for students in fourth and eighth grades show that the average achievement in fourth-grade mathematics in participating Member States has increased from a mean score of 511 to 525 between 2007 and 2023 (Figure 1). Average achievement in science in fourth grade has decreased by four points between 2007 and 2023 in participating Member States (Figure 2).

[19] European Commission: Directorate-General for Research and Innovation, Science education for responsible citizenship – Report to the European Commission of the expert group on science education, Publications Office, 2015, https://data.europa.eu/doi/10.2777/12626.

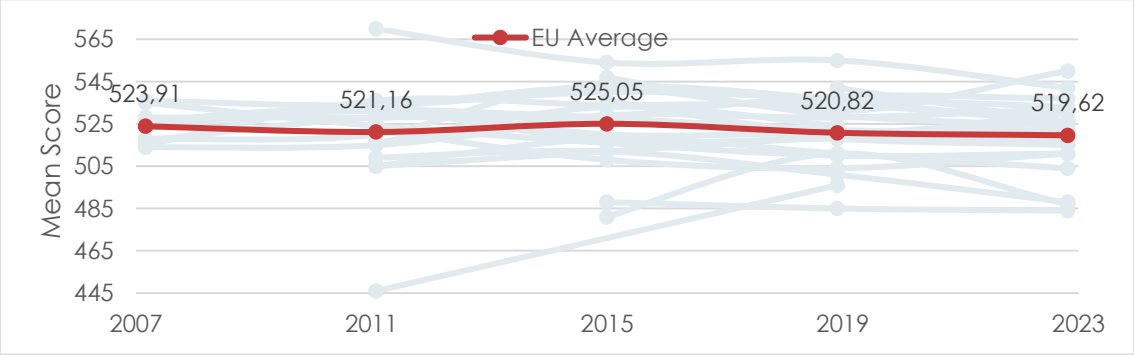
[20] European Commission: Directorate-General for Education, Youth, Sport and Culture, A compendium of inspiring projects in the area of STEM co-funded under the Erasmus+ programme, Publications Office, 2019, https://data.europa.eu/doi/10.2766/111701.

Figure 1 Average achievement in fourth-grade mathematics in the EU



Source: IEA, TIMSS 2023

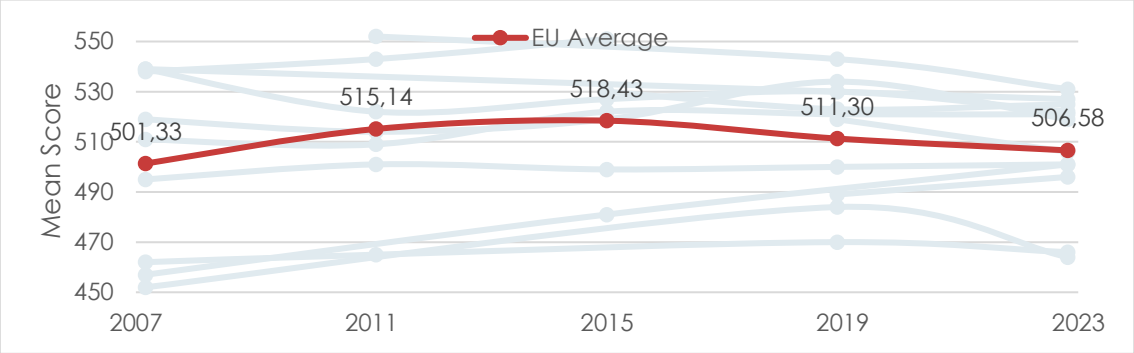
Figure 2 Average achievement in fourth-grade science in the EU



Source: IEA, TIMSS 2023

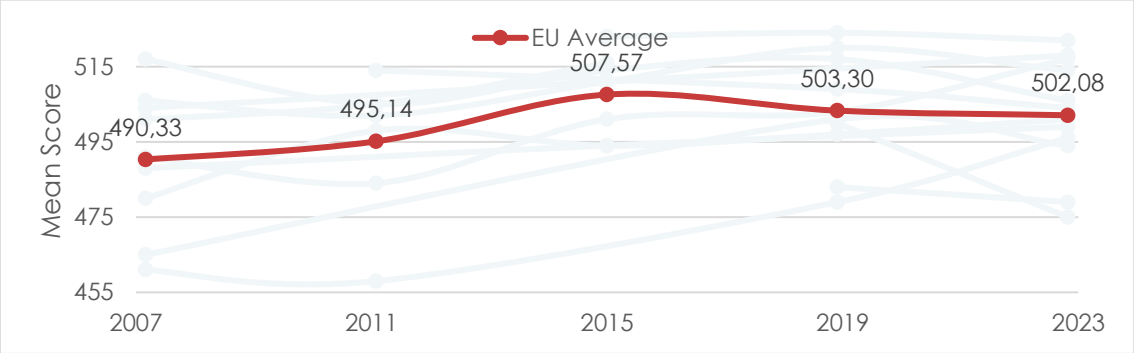
When looking at achievement at eight-grade, however, the overall decrease gets more pronounced. The most recent mean score in science for EU Member States participating in the TIMMS survey is at 506 compared to the peak at 518 in 2015 (Figure 2). In mathematics, the 2023 average score at eight-grade is 502, down five points from the peak in of 507 in 2015 but only one point below the last survey in 2019 (Figure 4).

Figure 3 Average achievement in eight-grade science in the EU



Source: IEA, TIMSS 2023

Figure 4 Average achievement in eight-grade mathematics in the EU



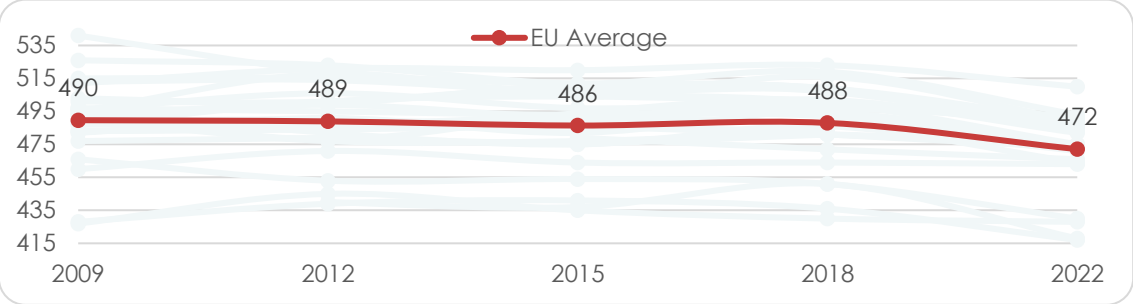
Source: IEA, TIMSS 2023

The TIMSS data shows that the interpretation showing a stark decline does not fully hold up. However, not all EU Member States participate in each TIMSS edition. Thus, the average across the participating Member States is not consistent and not necessarily representative of the entire EU27. Fluctuations are noteworthy in the 2023 eight-grade survey, in which only 13 Member States participated. A full overview of participating Member States and their performance results is presented in Annex I.

PISA results, on the other hand, include a more consistent coverage of 15-year-olds across 26 EU Member States.[21] The available PISA data indicates that the **performance of 15-year-old school students in mathematics and science is in decline in most of the EU countries**. In the EU, the average mathematics score fell from 489 in 2012 to 472 in 2022 (Figure 5). In science, the average achievement fell from 496 in 2009 to 480 in 2022 (Figure 6).

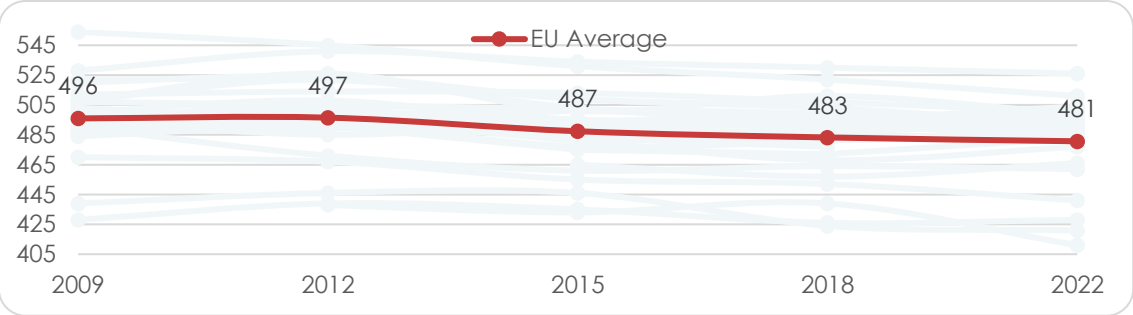
[21] Only Luxembourg is missing from the 2022 survey on science and mathematics. The 2018 and 2015 editions covered the entire EU27.

Figure 5 Average achievement in mathematics (PISA)



Source: OECD, PISA 2022.

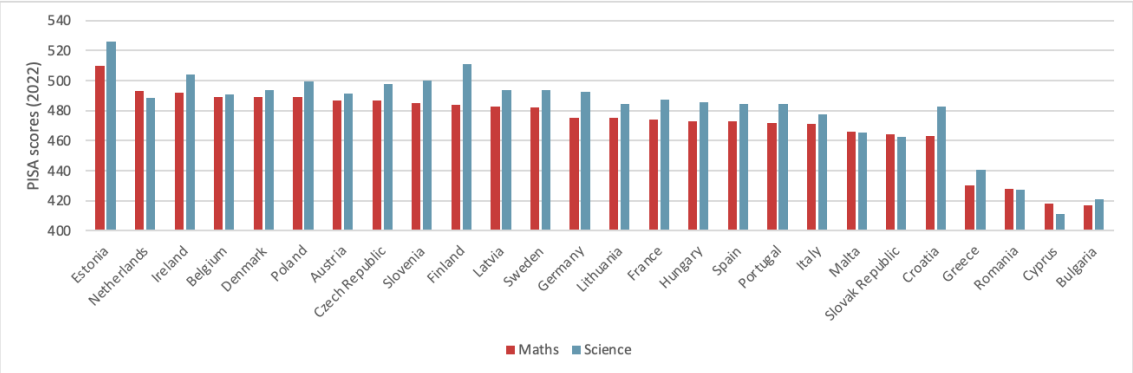
Figure 6 Average achievement in science (PISA)



Source: OECD, PISA 2022

Focusing on the situation within Member States, there are notable disparities between the countries, as shown in Figure 7 below. According to the 2022 PISA results, some EU Member States were in the top 10 performers in the PISA study for both mathematics and science, including Czechia, Denmark, Estonia, Finland, Ireland, Poland and Slovenia. In contrast, Cyprus, Bulgaria, Romania and Greece had the lowest scores for both math and science achievements. These disparities across Member States highlight the need for policy interventions sensitive to the context of national education systems.

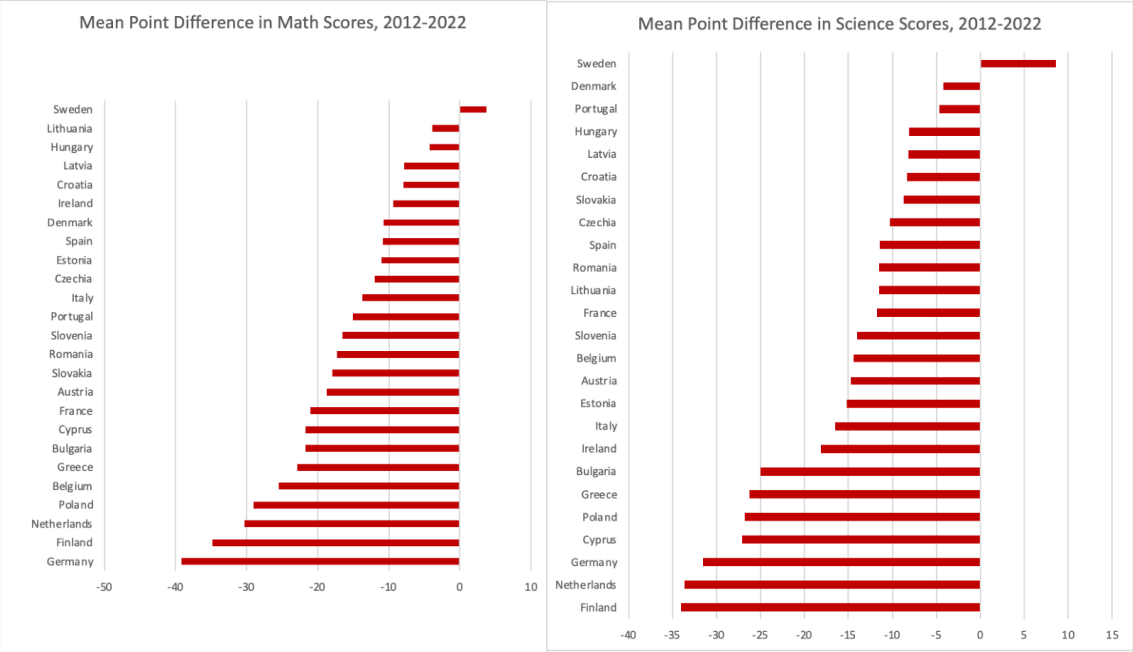
Figure 7 PISA 2022 scores for mathematics and science across the EU Member States



Source: OECD, PISA 2022

Besides the variance in Member States' performances, there was a **decline in mathematics scores between 2012 and 2022**, for all countries except Sweden (Figure 8). Science scores fared slightly better: nine countries did not experience a statistically significant decline in scores between 2012 and 2022 (Czechia, Denmark, Croatia, Hungary, Latvia, Lithuania, Portugal, Slovakia and Sweden).

Figure 8 Mean point difference in students' math and science scores per country (2012-2022)



Source: OECD, PISA 2022

While not strictly in the scope of the analysis, **tertiary education statistics in STEM fields** warrant further attention as well. This is not only due to the importance of STEM graduates for future competitiveness, but also to identify possible challenges in the transition from secondary to tertiary education, as well as differences between Member States. Regarding the number of graduates in STEM fields in tertiary education, the

EU average is at 23 graduates per 1000 inhabitants between the ages of 20 and 29. The highest graduate numbers in STEM fields are recorded in Ireland, with 40.1 graduates, and France, with 35.3 graduates per 1000 inhabitants. At the lower end, Luxembourg reported 5.6 graduates per 1000 inhabitants in STEM fields. Within these figures, there persists a clear gender gap across all Member States. On average, there are almost twice as many male graduates as there are female graduates in STEM fields. According to Eurostat, among STEM graduates, there are 28.9 men per 1000 male inhabitants aged 20 to 29 years but only 16.7 women per 1 000 female inhabitants aged 20 to 29 years across the EU.[22] This gap in graduation rates in STEM fields points to the relevance of motivating more diverse groups to take up STEM studies, such as by increasing girls participation in STEM at an early stage and increasing awareness of career opportunities in STEM sectors by addressing barriers at individual, institutional or contextual level.

[22] Eurostat (n.d.) Tertiary education statistics. Available at https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Tertiary_education_statistics.

3. Methodology

The information in this report was compiled using different methods and sources:

- **Desk research** included a review **of EU-level policy and strategic documents, as well as EU-level studies on STEM education**. **Work programmes**, **written reports, evaluations and impact assessments** of EU level programmes were consulted.
- A core part of the further analysis is based on the **administrative and monitoring data of the relevant EU programmes such as the European structural and investment funds**. It should be noted that the analysis of Erasmus+' contribution to promoting STEM education in schools is provided in a separate deliverable that is a part of this study (Erasmus+ report).
- Desk based research was supported by a total of **eight EU-level interviews with policy makers and stakeholders** through the study team to corroborate and further document the status of EU-level policy and programmes on STEM education in schools. The list of interviews is reported in Annex II.

The **quantitative analysis** of project-level data was conducted for Erasmus+, Horizon 2020 and Horizon Europe and the European Structural and Investment Funds (i.e., European Social Funds+ (ESF+), European Regional Development Funds (ERDF), Cohesion Funds etc.). The respective data sources for project-level information include the Erasmus+ Project Results Platform[23], Cordis,[24] and Kohesio.[25] Our specific approach to identify projects addressing STEM education using search words is explained in more detail in Chapter 3.2.3.

A **qualitative analysis** covered available documents on the programmes mentioned above, and additionally a range of programmes where project-level data was not available in standardised formats. These additional programmes and instruments include the European Institute of Innovation and Technology (EIT), the Recovery and Resilience Facility (RRF), the Technical Support Instrument (TSI)/ Structural Reform Support Programme (SRSP), the Digital Europe Programme (DEP), and the InvestEU programme. This was necessary due to the scattered nature of available programme data as well as limited focus on school-level STEM education of these programmes.

The data collected on EU programmes and associated projects was categorised using a **policy and programme mapping framework** applied throughout the entire study. This approach ensures consistency and enables cross-analysis of different types of

[23] https://erasmus-plus.ec.europa.eu/projects.

[24] See https://data.europa.eu/data/datasets/cordis-eu-research-projects-under-horizon-europe-2021-2027?locale=en and https://data.europa.eu/data/datasets/cordish2020projects?locale=en.

[25] https://kohesio.ec.europa.eu/data/projects/.

evidence.[26] The policy and programme mapping framework was developed based on desk research and identifies five key dimensions of policy supporting STEM education (Table 1). These five dimensions are 1) STEM education governance and infrastructure, 2) STEM teacher development and support, 3) STEM education curriculum, pedagogy, and assessment, 4) STEM non-formal/informal learning, learning support and equity, and 5) Research on promotion of STEM education in schools. Under each of the five dimensions, more granular policy aspects are defined, enabling a more detailed mapping. The framework comprises a total of 26 individual policy aspects, relevant for STEM education. Due to the large number of individual policy aspects, we opted to report quantitative data about selected programmes along the five overarching dimensions.

Table 1 Key dimensions of STEM education policy

STEM education governance and infrastructure: • Basic school infrastructure • Lab infrastructure (including computer labs, computers, tablets, and software) • School leadership • School governance and funding • Quality of school life • Local community engagement projects / initiatives (“whole-school” approach) STEM teacher development and support: • Teacher initial education and training • Support services, including support networks for STEM teachers (e.g., communities of practice, online platforms, etc.) • Formal (continuing) professional development • Campaigns for teacher recruitment • Attracting to and retaining professionals in STEM teaching careers (financial support, different training and career tracks) STEM education curriculum, pedagogy, and assessment: • STEM curriculum content and structure • STEM competence frameworks • Interdisciplinary/integrated STEM teaching (e.g., STE(A)M integrating STEM with Arts, social science/humanities) • Innovative teaching and learning methods, practices or materials (e.g. integration of technology and digital tools in curriculum development) • STEM assessment approaches and practices • Educational environments and infrastructure designed to integrate innovative teaching methods STEM non-formal/informal learning, learning support and equity:

[26] The framework was also applied to country reports and Erasmus+ case studies.

- Non-formal education activities (after-school STEM clubs and programmes, science camps, and summer programmes; STEM volunteer and outreach programmes; maker spaces, fab labs)
- Informal education activities (visits to science centres and museums; online platforms and STEM education resources; public engagement events, workshops, science festivals, public lectures, and science nights)
- Learning support targeted at girls / boys
- Learning support targeted at ethnic minorities, students from low-income families, persons with disabilities, and other vulnerable groups in STEM fields
- Partnerships with industry and other local stakeholders such as NGOs, science museum and centres, public authorities, cultural institutions, universities and research institutions, parents (e.g. support for student industry internships, collaboration between school and non-formal learning providers)
- Delivery of career advice, counselling, guidance
- Mentorship/role model programmes (opportunities to learn from and interact with STEM career professionals)
- Grants/scholarships for students pursuing careers in STEM (e.g. students from disadvantaged socioeconomic background)

Research on promotion of STEM education in schools

- Studies, evaluations, impact assessments, data collection and monitoring on all policy aspects listed above

Source: Technopolis Group

4. EU initiatives and funding programmes

The EU level policy mix is characterised by high-level policy initiatives and strategies alongside operational programmes and projects which translate the policy ambitions into reality. This section presents a set of the key policy initiatives and strategies over the last years as well as the key instruments and programmes.

Particular attention is given to the Erasmus+ programme, the EU's primary funding instrument for education-related actions. The other EU programmes analysed are Horizon Europe/Horizon 2020, European Structural and Innovation Funds (ESIF: ERDF, ESF+ and others), the Digital Europe Programme, the European Institute of Innovation and Technology (EIT), the Recovery and Resilience Facility (RRF), the Technical Support Instrument (TSI) / the Structural Reform Support Programme (SRSP), and InvestEU.

4.1. EU policy initiatives

Over the last decade, several initiatives have sought to foster STEM education development, recognising the need for STEM skills as well as policy intervention in this area. Since education is a **Member State competence** as defined by Article 6 and Article 165 of the Treaty on the Functioning of the European Union (TFEU), EU-level actions are supportive in character and do not include, for example, regulatory intervention or legal acts. The EU support coordinates or complements Member State activities.[27] This also delineates the spectrum of actions conducted as part of funding programmes such as Erasmus+. This chapter presents the key initiatives their specific role in supporting STEM education.

In the **2017 Communication on School development and excellent teaching for a great start in life**,[28] school level education in STEM is linked to cooperation between higher education, business, research and schools, stressing the interconnected nature of the challenge, in particular to combat stereotypes and gender gaps. In addition, the Communication emphasised the benefits of STEM education which incorporates "economic, environmental and social challenges or arts and design, demonstrating its

[27] For Art 6, see Treaty on the Functioning of the European Union, OJ C 202, 7.6.2016, http://data.europa.eu/eli/treaty/tfeu_2016/art_6/oj; for Art 165, see Treaty on the Functioning of the European Union, OJ C 115, 9.5.2008, http://data.europa.eu/eli/treaty/tfeu_2008/art_165/oj.

[28] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on School development and excellent teaching for a great start in life (COM/2017/0248 final). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52017DC0248.

relevance for daily life". [29] Through this broad definition, the Communication links STEM education with methods reflecting problem- or challenge-based learning, as well suggesting a move towards integrating STEM with arts in a 'STEAM' (science, technology, engineering, arts, mathematics) approach.

In a similar orientation, STEM was also recognised as a priority field in the **2018 Council Recommendation on key competences for lifelong learning.** The Recommendation highlighted several key challenges, including the need "to motivate more young people to engage in science, technology, engineering and mathematics (STEM) related careers", the suggestion to "link science education more closely with the arts and other subjects", as well as to promote "inquiry-based pedagogy, and engaging with a wide range of societal actors and industries".[30]

The key competence framework defined in the Recommendation featured "Mathematical competence and competence in science, technology and engineering" as one of the eight key competences.[31] An overview of the key competences in STEM across the dimensions knowledge, skills, and attitudes is shown in Table 2.

Table 2 STEM key competencies

Domain	Knowledge	Skills	Attitudes
Mathematics	Understanding of numbers, operations, mathematical concepts.	Applying mathematical principles in various contexts.	Respect for truth, willingness to evaluate validity.
Science	Fundamental principles of the natural world, scientific methods.	Investigation through methodologies, evidence-based conclusion drawing.	Curiosity, ethical concern, support for safety and sustainability.
Technology	Principles, impacts of technology on the natural world.	Use of technological tools for evidence-based decisions.	Critical appreciation, responsibility towards environmental and societal impacts.
Engineering	Engineering principles and their application to solve problems.	Designing, building, and testing solutions to real-world problems.	Ethical considerations in design and implementation.

Source: Pokropek (2024) based on 2018 Council Recommendation on key competences for lifelong learning.

Within the context of the **European Education Area (EEA)**, STEM-related elements are present under several priorities of this strategic framework for European

[29] Ibid.

[30] Council Recommendation of 22 May 2018 on key competences for lifelong learning 2018 ((2018/C 189/01)), rec 16.

[31] The key competence framework for lifelong learning derived from the recommendations was also released as a standalone document in 2019. See Directorate-General for Education, Youth, Sport and Culture (European Commission), *Key Competences for Lifelong Learning* (Publications Office of the European Union, 2019), https://data.europa.eu/doi/10.2766/569540.

cooperation in education and training. For example, *Strategic Priority 1: Improving quality, equity, inclusion and success for all in education and training* refers to improving basic skills as defined by the 2018 Council recommendation. As highlighted in Chapter 2.2, a key target in the EEA monitoring framework is that the "share of low-achieving 15-year-olds in reading, mathematics and science should be less than 15%, by 2030""[32] The supporting data for the indicators is to be taken from PISA surveys.

In addition, EEA *Strategic Priority 5*: *Supporting the green and digital transitions in and through education and training* puts STEM competences in the context of the green and digital transition, relating it to issues such as digital education and skills, environmental and sustainability education, as well as investment in education and training infrastructure. It emphasises the relevance of linking STEM education with the arts, arguing that "it is important to modernise science, technology, engineering, arts and mathematics (STEAM) fields of study".[33]

One of the key mechanisms steering the EEA is the strategic framework working groups which for the most part do not explicitly address STEM.[34] This is evidenced by the activity reports of the working group for the 2021-2025 period where no focus on STEM can be found.[35] However in the 2025 planning, the Working Group Schools: Learning for Sustainability explicitly addresses "STEM education and sustainability and green careers".[36] The working group was formed following the Council Recommendation of 16 June 2022 on learning for the green transition and sustainable development, which invites Member States to support educators by "encouraging and enabling, where appropriate, transformative and interdisciplinary teaching and learning using both traditional and innovative learning approaches, including hands-on learning, the STEAM approach, hackathons, service learning and gamification".[37]

Another key policy initiative is the **EU Skills Agenda**.[38] "Action 7: Increasing STEM graduates and fostering entrepreneurial and transversal skills" is the key action relating

[32] Council Resolution on a strategic framework for European cooperation in education and training towards the European Education Area and beyond (2021-2030) (2021/C 66/01).

[33] Ibid.

[34] See https://wikis.ec.europa.eu/display/EAC/European+Education+Area.

[35] European Commission: Directorate-General for Education, Youth, Sport and Culture, Working groups (2021 – 2025) – Periodic report – November 2021 – March 2023, Publications Office of the European Union, 2023, https://data.europa.eu/doi/10.2766/858252.

[36] https://wikis.ec.europa.eu/display/EAC/Learning+for+Sustainability.

[37] Council Recommendation of 16 June 2022 on learning for the green transition and sustainable development 2022/C 243/01 (Text with EEA relevance), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32022H0627(01).

[38] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: European Skills Agenda for sustainable competitiveness, social fairness and resilience (COM(2020) 274 final).

to STEM education. The aim of Action 7 is to increase the number of STEM graduates. Specific activities are intended to promote the attractiveness of STEM studies and careers, address teacher shortages in STEM, promote science education in R&I actions, as well as supporting an "integrated framework and learning continuum inter alia between secondary and higher education systems, education and business in partnership with business professionals" and "research-based methods" in STEM education.[39]

EU Skills Agenda's "Action 3: EU support for strategic national upskilling action" incorporates Commission support for the development of "holistic, whole-of-government national skills strategies". Specific focus is on "skills to accompany the digital and green transitions such as those delivered through Science, Technology, Engineering and Mathematics (STEM) studies".[40] Similarly to linking STEM skills and the green and digital transition in the EEA Strategic framework, the EU Skills Agenda also places STEM under "Action 6: Skills to support the twin transitions". The Communication on the Skills Agenda stresses that "STEM (Science, Technology, Engineering and Mathematics) skills are critical to drive the twin transitions. In a time of fast technological innovation, companies need people with high level skills in STEM subjects", further explaining that a "high level of STEM skills is crucial to foster innovation in cutting-edge ICT areas such as AI or cybersecurity".[41] Reducing the gender gap, in particular in tertiary education, is seen as a key strategy in this regard.

Under the **Digital Education Action Plan** (DEAP), **"**Action 13 Women's participation in STEM studies and careers" is dedicated to reducing the gender gap in STEM studies and careers.[42] Targeted activities under this action include the organisation of the "Girls Go Circular" programme through the EIT, ESTEAM festivals, as well as support to higher education programmes based on an **interdisciplinary STEM approach**. In addition, there are specific STEM-related performance indicators for the Girls Go Circular initiative. The programme aims to "engage 40,000 young female students in training on the circular economy and digital skills by 2027", to "organise five Girls and five Women ESTEAM Fests and one final event"; and to "include STEM as a priority in the 2021 and 2022 Erasmus+ annual work programme".[43]

Building on the DEAP, two Council Recommendations were adopted. First, the **2023 Council Recommendation on the key enabling factors for successful digital education and training** calls for improving equal access to learning opportunities, while "building science, technology, engineering, arts and mathematics (STEAM)

[39] Ibid.

[40] Ibid.

[41] Ibid.

[42] https://education.ec.europa.eu/focus-topics/digital-education/action-plan/action-13.

[43] Ibid.

learning environments that can foster digital pedagogy through an interdisciplinary approach".[44] Second, the **2023 Council Recommendation on improving the provision of digital skills and competences in education and training** recommends Member States to develop cross-curricular approach linking digital skills with different subjects, and improving their assessment, as well as teacher training. Integrating digital skills and competences with STEAM is given specific focus in the Recommendation.[45]

In 2025, the **Union of Skills** initiative was announced by the European Commission, which highlights the need for policy action against skills shortages and gaps.[46] As part of the Union of Skills, focus lies on enhancing STEM skills and competences. The **STEM Education Strategic Plan** revealed as part of the Union of Skills establishes STEM education as a strategic pillar in EU education policy.[47] The plan sets out three key objectives:

- **Lead**. Anchor STEM as a strategic pillar in the EU's education and skills policy. This includes proposing 2030 EU-level STEM targets, establishing a European STEM Executive Panel to advise on strategic issues, and improving STEM skills intelligence by measuring graduate outcomes and anticipating sector-specific needs.
- **Level Up**. Build a stronger and more inclusive EU STEM talent pipeline. Actions under this objective involve developing a STEM competence framework, working towards a European degree for engineers, launching the "STEM Tech Talent Induction" to attract more young people to STEM careers, piloting STEM education centres for schools to foster local and regional learning ecosystems, and piloting the development of "STEM skills foundries" in strategic sectors for mentoring young student entrepreneurs.
- **Lift Barriers**. Advance women in STEM and inspire future innovators. Initiatives include launching "Girls Go STEM" to train 1 million young women by 2028, initiating "STEM Futures" to identify and disseminate successful STEM education practices, showcasing and exchanging good practices to attract and

[44] Council Recommendation on the key enabling factors for successful digital education and training of 23 November 2023, https://data.consilium.europa.eu/doc/document/ST-15741-2023-INIT/en/pdf.

[45] Council Recommendation on improving the provision of digital skills and competences in education and training of 23 November 2022, https://data.consilium.europa.eu/doc/document/ST-15740-2023-INIT/en/pdf.

[46] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions The Union of Skills (2025). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52025DC0090.

[47] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on A STEM Education Strategic Plan: skills for competitiveness and innovation (COM/2025/89 final), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52025DC0089.

support girls and women in STEM apprenticeships, and piloting a "STEM Specialists Fellowship" to attract top international STEM experts.

In parallel, the **Action Plan on Basic Skills**, also introduced in 2025, as part of the Union of Skills package,[48] reinforces foundational learning in reading, maths, science, digital and citizenship. It complements the STEM strategy by advocating for evidence-informed pedagogical approaches, improved teacher support, and systemic interventions to ensure all learners acquire essential skills for life and work.

4.2. STEM definitions in the EU policy

This study investigates how STEM is conceptualised across different contexts. Various definitions and approaches to STEM are evident in EU initiatives and policies. A recent publication carried out by the Joint Research Centre highlights these variations, distinguishing between traditional and integrated STEM education, as well as STEAM education with arts and other disciplines, providing valuable clarity on these evolving educational frameworks.[49] A policy brief from early 2025 summarises key concepts based on this publications (see Table 3).

Table 3 Key definitions for STEM and STEAM education

Concept	Definition
STEM education	Combines science, technology, engineering, and mathematics in a multi- or interdisciplinary approach to create a unified, dynamic educational framework.
Integrated STEM education	STEM disciplines are seen as interconnected domains rather than isolated disciplines, mirroring the intricacy of real-world issues. Frequently relies on multi-, inter-, or transdisciplinary integration. Expands the skill set of core STEM education with transversal skills.
STEAM or STE(A)M education	Typically integrates core STEM disciplines with the broader perspectives of the arts, social sciences and humanities (SSH), along with other fields to tackle real-world challenges, mainly through multi-, inter-, and transdisciplinary approaches. It trains students with transversal skills relying on arts-based methods and approaches (design thinking, storytelling, visualisation) as well as complementing technical and transversal skills with social and ethical insights.

Source: Mazzeo (2025) [50]

[48] European Commission, *Action Plan on Basic Skills*, Brussels, 2025.

[49] Artur Pokropek, 'STEM Competencies, Challenges, and Measurements: A Literature Review' (2024) https://publications.jrc.ec.europa.eu/repository/handle/JRC138618.

[50] Mazzeo O G, 'STEM and STEAM Education, and Disciplinary Integration: A Guide to Informed Policy Action' (2025) https://publications.jrc.ec.europa.eu/repository/handle/JRC141438, p. 7.

This categorisation responds to the 2018 Council Recommendation on key competences for lifelong learning, where key competences are defined for each of the four main STEM subjects: mathematics, science, technology, and engineering (see Table 2). These competences include transversal skills, notably "critical thinking, communication, collaboration, and creativity, which form a core part of the educational framework that prepares students for modern society and economy".[51] Furthermore, integrating the arts and other subjects in an interdisciplinary approach, as well as inquiry-based pedagogy are argued to increase motivation in STEM. Similarly, the 2017 Communication on School development and excellent teaching for a great start in life emphasises the value of connecting STEM education explicitly to "economic, environmental and social challenges or to arts and design" underlining the importance of STEM teaching to real-life application.[52]

The term **STEAM** gained prominence with the European Education Area strategic framework, which linked it to the modernisation of science, technology, engineering and mathematics education. However, despite this acknowledgement, the monitoring framework for the EEA currently focuses only on achievements captured by targets for reading, mathematics, and science, not transversal or even integrated STEM competences. Similarly, the EU Skills Agenda from 2022 predominantly addresses STEM, without specific reference to STEAM or related concepts. In contrast, the Council Recommendation on key enabling factors for successful digital education and the Council Recommendation on improving the provision of digital skills and competences in education and training released in 2023 explicitly mention STEAM education and its integration with digital skills. The Digital Education Action Plan continues to reference integrated STEM, although it adopts the term STEAM in the context of the ESTEAM festival action line.

The **Erasmus+ Regulation**, emphasises that the "Programme should be able to support any field of study and should, in particular, contribute to strengthening the Union's innovation capacity by supporting activities that help people develop the knowledge, skills, competences and attitudes they need in forward-looking study fields or disciplines such as **science, technology, engineering, arts and mathematics (STEAM**)".[53] However, the Erasmus+ programme guides have used both STEAM and STEM terminologies reflecting an evolution of the concept during the programming periods. For example, the **2021 Erasmus+ programme guide** mentioned "Promoting interest and excellence in science, technology, engineering, and mathematics (STEM) and the STEAM approach" at the school level, and argues that the "STEM approach

[51] Pokropek, 2024, p. 16.

[52] Ibid.

[53] Regulation (EU) 2021/817 of the European Parliament and of the Council of 20 May 2021 establishing Erasmus+: the Union Programme for education and training, youth and sport and repealing Regulation (EU) No 1288/2013 (Text with EEA relevance), rec 15.

should be promoted through interdisciplinary teaching".[54] At the higher education level, the guide prioritises "developing STEM/STEAM in higher education, in particular women participation in STEM", calling for the "development and implementation of fit-for-purpose STEM higher education curricula, following a STEAM approach".[55] This dual terminology is also evident in individual calls. For example, the 2021 call *Lot 2: Alliances for Sectoral Cooperation on Skills (implementing the "Blueprint")* called for development of training content and curricula that "include notably transversal skills and STEAM disciplines".

The **2025 Erasmus+ Work Programme** highlights STEM again as a component to motivate students, stating that the "programme will also encourage participation of women and girls in STEM fields of study, especially in engineering, ICT and advanced digital skills, through a STEAM approach."[56] In an explanatory footnote of the same document, STEAM is defined as he "use of multidisciplinary pedagogies (teaching of science in political, environmental, socio-economic, and cultural contexts […] for making STEM subjects and careers more attractive. This is also known as the STEAM approach to science education and embraces the creative potential of connecting STEM education with the arts, the humanities, and the social sciences".[57]

Furthermore, the Work Programme closely links STEM with digital skills, arguing that "science, technology engineering and mathematics, the so-called STEM disciplines, are crucial to successfully master the green and digital transitions. However, Europe faces shortages of STEM skilled people – and, in particular, ICT specialists". It further argues that a "key element in the Commission's strategies is the STEAM approach to science education. This emphasis is similarly reflected in the Council Recommendation of 16 June 2022 on learning for the green transition and sustainable development.[58] The staff working document accompanying this recommendation anticipates that "active and engaging learning for environmental sustainability can potentially increase interest and motivation to study STEM" and that, vice versa, "sciences and science education have traditionally played an important role in advancing environmental education and learning for sustainability".[59]

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[54] https://erasmus-plus.ec.europa.eu/sites/default/files/2021-09/2021-erasmusplus-programme-guide_v3_en.pdf.

[55] Ibid.

[56] https://erasmus-plus.ec.europa.eu/sites/default/files/2024-10/awp-erasmus-oct-2025_en.PDF, p. 18.

[57] https://erasmus-plus.ec.europa.eu/sites/default/files/2024-10/awp-erasmus-oct-2025_en.PDF, p. 18.

[58] Council Recommendation of 16 June 2022 on Learning for the Green Transition and Sustainable Development 2022/C 243/01 (Text with EEA Relevance)' (2022), footnote 19, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32022H0627%2801%29.

[59] Commission Staff Working Document Accompanying the document Proposal for a Council Recommendation on learning for environmental sustainability, SWD(2022) 3 final, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52022SC0003&qid=1647944730205.

Finally, STEM definitions also appear in the **Horizon Europe Strategic Plan 2025-2027**. In this document, the connection between STEM and other disciplines, in particular social sciences and humanities (SSH), is stressed. It stipulates that "SSH is fundamental for paving the way to interdisciplinary collaborations with knowledge of science, technology, engineering, and mathematics (STEM), while maintaining a human-centric focus".[60]

In summary, many earlier key documents start with references to STEM – science, technology, engineering and mathematics – as the main concept, including the identification of crucial skills gaps across the EU. STEAM is later introduced and frequently referred to as a strategic approach to nurture broader interest and participation in STEM fields, especially to motivate girls and women and attract them into STEM careers. There is however no coherent definition of STEAM competences beyond the transversal skills defined in the 2018 Council Recommendation on key competences for lifelong learning. Besides the arts and the humanities and social sciences, information technology and digital skills competences are also linked to STEM. This relation is most visible in digital policy interventions such as the Digital Education Action Plan and the 2023 Council Recommendations on digital learning. Notions of STEM competences and STEAM approaches also appear in policy documents on education for sustainable development, pointing to the mutually beneficial relationship between STEM and sustainability education.[61] The variety of definitions used throughout EU policy underlines the relevance of recent attempts to streamline them to promote a common understanding of STEM education and its approaches.[62]

[60] Directorate-General for Research and Innovation (European Commission), Horizon Europe Strategic Plan 2025-2027 (Publications Office of the European Union 2024) https://data.europa.eu/doi/10.2777/092911, p. 40.

[61] Council Recommendation of 16 June 2022 on Learning for the Green Transition and Sustainable Development 2022/C 243/01 (Text with EEA Relevance)' (2022), footnote 19, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32022H0627%2801%29.; Commission Staff Working Document Accompanying the document Proposal for a Council Recommendation on learning for environmental sustainability, SWD(2022) 3 final, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52022SC0003&qid=1647944730205.

[62] Mazzeo OG, 'STEM and STEAM Education, and Disciplinary Integration: A Guide to Informed Policy Action' (2025) https://publications.jrc.ec.europa.eu/repository/handle/JRC141438; Artur Pokropek, 'STEM Competencies, Challenges, and Measurements: A Literature Review' (2024) https://publications.jrc.ec.europa.eu/repository/handle/JRC138618.

4.3. Contribution of EU funding programmes

4.3.1. Contribution of Erasmus+

The Erasmus+ programme is the EU's key funding programme for all levels of education. In the 2021–2027 period, the budget available for Erasmus+ is approximately EUR 26 billion.[63] In the 2014–2020 period, the budget of Erasmus+ amounted to EUR 14.7 billion. Erasmus+ is divided into different strands, also known as Key Actions (KA). Under Key Action 1 "Mobility of Individuals", Erasmus+ funds the mobility of teachers and students. Through Key Action 2 "Cooperation among organisations and institutions", different types of cooperation and partnership projects are supported. Key Action 3 "Support to policy development and cooperation" encompasses policy development projects, including data collection, analysis, experimentation, policy dialogue, knowledge transfer and more. Outside of the three Key Actions, Jean Monnet Actions promote knowledge and awareness about the European Union and Sport projects support collaboration and participation related to physical activities. The three Key Actions are in the scope of the study, whereas Jean Monnet Actions and Sport actions are not included due to their difference in scope.[64]

In order to gain a reasonable estimate of the overall number of STEM-related projects and the financial support made available to them, we performed a keyword search on all Erasmus+ good practices available on the Erasmus+ Project Platform.[65] This high-level overview is further complemented by a more detailed analysis of the Erasmus+ Good Practice Inventory and fifteen case studies carried out by the project team.

4.3.1.1. Programme-level analysis

The official Erasmus+ project results platform offers various search functions, including a topical search for STEM projects. However, in practice, within the scope of this study, it is difficult to identify the actual number of projects relevant for STEM education in school, that have been supported by Erasmus+ so far. This is because the topics

[63] https://erasmus-plus.ec.europa.eu/programme-guide/part-a/priorities-of-the-erasmus-programme/budget.

[64] Jean Monnet Actions and Sport Actions were included in the keyword search and results screened, without resulting in any match for STEM-related projects.

[65] The project records were made available by the European Commission. This includes only finished projects with a mark as "good practice", that is a final score of 80 out of 100. Projects not reaching this threshold were not included. The total number of all Erasmus+ projects addressing STEM education is thus expected to be higher.

attributed to projects on the Erasmus+ database often do not fully capture this projects' thematic scope and the key policy aspects relevant for STEM education.[66]

To gain a better understanding of the scale of the programme's support to STEM education in schools, a keyword search of the project description and the project title was conducted by the study team on a database of 20 000 project entries obtained from the European Commission. On this dataset, a search for individual STEM concepts and STEM subjects was conducted to filter out projects that are unlikely to address STEM concepts (Table 4).

Table 4 Search approach for Erasmus+ STEM projects

Only projects that contain STEM specific keywords in the title and description, including both the occurrence of STEM concepts and individual STEM subjects were retained. Wildcards were used to find concepts which occur in different spelling variants (e.g., maths – math – mathematics):

- STEM concepts: 'STEM'; 'STE(A)M'; 'STEAM', 'MINT'
- STEM subjects: 'scien*'; 'natural science*', 'technolog*'; 'engineer*'; 'math*'; 'physic*'; 'chemi*'; 'digital'; 'biolog*'; 'ICT'; 'Art*'; 'informatic*'

Source: Technopolis Group

Both programming periods' project results are broken down into the respective Key Actions and types of projects in Table 5 and Table 6. The search resulted in a total of 4289 projects consisting of 4110 projects for the 2014–2020 programming period, and 179 projects for the 2021–2027 programming period. The total budget for the 2014–2020 programming period was at EUR 593 million, whereas the value of projects identified for the 2021-2027 programming period has amounted to EUR 14.6 million so far. The difference in the scale is likely explained by the fact that the 2021–2027 programming period is ongoing; many projects are still to pass their final evaluation to be included into the good practice repository of the European Commission. More projects are expected to be launched over the entire programming period.

The identified projects occurred most frequently in Key Action 1 and Key Action 2 across both programming periods. These actions make up most Erasmus+ good practice projects relevant for STEM education in schools in terms of the number of projects and the absolute amount of funding disbursed. Key Action 2 and 3 projects have a slightly higher average grant amount, reflecting the different scope, duration and ambition of these projects compared to Key Action 1 projects. Key Action 3 supports policy development projects, including data collection, analysis, experimentation, policy dialogue, knowledge transfer and more. Projects under Key

[66] Topics include terms such as 'Science, Technology, Engineering and Maths (STEM)' topic – 569 projects (school education level), "natural science topic' – 936 projects, 'Key competences (including mathematics and literacy)' − 2705 projects.

Action 3 addressing STEM education are the least frequent in both periods, with only 11 projects identified for the 2014-2020 period and no project found for the 2021-2027 period so far.

While only 179 projects have been recorded for the **2021–2027 programming period** so far**,** the overall trend is similar to the previous programming period. Mostly projects from Key Action and Key Action 2 have been identified through our approach. The average amount of funding of the latter is slightly lower than in the previous programming period. Key Action 1 projects record a large drop in average funding (EUR 183 000 in 2014 vs EUR 32 000 in 2021). The differences may be explained by effects of the Covid-19 pandemic, and, to a lesser extent, reporting cycles for specific types of grants or other reasons outside the scope of this study, such as a possible time lag in adding projects to the Erasmus+ Project Results Platform.

The total EU grant awarded to KA1 and KA2 projects amounts to almost EUR 600 million, with an almost even share between the two. EUR 304 million were awarded to KA2 projects and EUR 288 to KA1 projects. The average funding for Key Action 1 projects is approximately two-thirds of the Key Action 2 and Key Action 3 projects. While the budget allocated to KA3 is lower than for KA1 and KA2, the contrast between the large number of KA1 and KA2 projects and the low number of projects under the KA3 signal some potential for stronger exploitation of policy reform instruments for promoting STEM education in schools.

Table 5 Erasmus+ projects during 2014–2020 programming period

Key Action	Number of projects	Sum of EU grant award in euros	Average of EU grant award in euros
KA1: Learning mobility of individuals	2438	288.733.476,60	118.430,47
KA2: Cooperation for innovation and the exchange of good practices	1661	304.621.507,02	183.396,45
KA3: Support for policy reform	11	487.074,55	44.279,50
Total	**4110**	**593.842.058,17**	**346.106,42**

Source: Technopolis Group based on Erasmus+ Project Results Platform

Table 6 Erasmus+ projects during 2021–2027 programming period

Key Action	Number of projects	Sum of EU Grant award in euros	Average of EU Grant award in euros
KA1: Learning mobility of individuals	112	3.660.672,28	32.684,57
KA2: Cooperation among organisations and institutions	67	10.981.052,20	163.896,30
Total	**179**	**14.641.724,48**	**196.580,88**

Source: Technopolis Group based on Erasmus+ Project Results Platform

Table 7 below summarises the geographical distribution of the coordinators of the identified projects across countries participating in Erasmus+ over both programming periods. Countries strongly represented in the sample include larger EU Member States such as Spain with the highest number of projects (541), followed by Germany (330), Poland (303), France (262), and Italy (234). Medium-sized to smaller Member States are also featured with a large number of projects, including Czechia with 209 actions, followed by Slovakia (200), Belgium (162), Croatia (131) and Romania (124). The remaining Member States are found to have between 100 and 13 projects in the case of Luxembourg. In addition, Turkey coordinated 88 projects, and the United Kingdom is represented with 206 projects, too, owing to the period covered by the data.

Table 7 Geographical distribution of E+ projects

Coordinator country	KA1	KA2	KA3	Total
Austria	45	62	1	**108**
Belgium	101	61		**162**

Coordinator country	KA1	KA2	KA3	Total
Bulgaria	14	21		**35**
Cyprus	63	33	1	**97**
Czech Republic	158	51		**209**
Germany	143	187		**330**
Denmark	19	11		**30**
Estonia	20	21		**41**
Greece	37	55	1	**93**
Spain	387	154		**541**
Finland	33	27		**60**
France	134	128		**262**
Croatia	95	36		**131**
Hungary	185	29		**214**
Ireland	93	14	1	**108**
Italy	125	109		**234**
Lithuania	21	79		**100**
Luxembourg	9	4		**13**
Latvia	47	32		**79**
Malta	23	11		**34**
Netherlands	48	48		**96**
Poland	119	184		**303**
Portugal	79	25		**104**
Romania	80	43	1	**124**
Sweden	61	40	1	**102**
Slovenia	67	21	1	**89**
Slovakia	118	82		**200**
Iceland	28	8	2	38
Liechtenstein	8	11		19
North Macedonia	8	3		11
Norway	13	11		24
Serbia	2	3		5
Turkey	56	30	2	88
United Kingdom[67]	111	94		205
Total	2550	1728	11	4289

Source: Technopolis Group based on Erasmus+ Project Results Platform

[67] The United Kingdom was an EU Member States and a programme country until 2020. The number covers only projects for the period 2014 until 2020.

4.3.1.2. Projects in the good practice inventory

A deeper analysis of selected Erasmus+ projects was part of the creation of the good practice report, a separate deliverable of this project. Supporting this analysis was a coding based on keywords occurring in the project title and description reflecting the key policy aspects relevant for STEM education in schools that were covered in the study (Table 8).

Table 8 Search approach for Erasmus+ STEM good practice inventory

Following the first keyword search of project titles and descriptions of STEM and STEAM concepts and STEM subjects, a further search was employed to identify more insights on the level and type of education, as well as specific policy aspects.

- Level of education: pre?primary; primary; secondary; vocational; VET; transiti*
- Type of education: 'formal'; 'non?formal'; 'informal'
- Disadvantaged groups: 'vulnerab*'; 'disadvantage*'; 'socioeconomic background/status'; 'ethnic minorit*'; 'under?skilled'; 'under?perform*', 'access'; 'disab*' 'migra*'
- Gender equality and inclusion: 'girl*'; 'wom?n'; 'female', 'gender'; 'LGBTQ*', 'inclusi*' 'role?model*'
- STEM competences: 'competenc*'; 'skill*'; 'career*'; 'motivati*'; 'engagement'
- Teaching STEM: 'training'; '(professional) development'; 'capacity (building)'
- Teacher shortages: 'teacher'; 'shortage'; 'recruitment'; 'specialist'
- Learning/teaching methods: 'learning'; 'method*'; 'methodologies'; 'approach*'; 'didactic*'; 'pedagog*'; 'interdisciplinary'; 'curricul*'; 'program*'
- STEM education opportunities: 'extracurricular'; 'after?school'; 'opportunity'
- Whole school approach: 'parent*'; 'partnership*'; 'local partnership'; 'community'; 'whole?school*'
- School governance: 'govern*'; 'leadership'

Monitoring and evaluation: 'monitoring'; 'evaluati*'; 'assessment'; 'impact'

Source: Technopolis Group

Out of the 4,289 Erasmus+ good practice projects identified as relevant to STEM education in schools during the initial stage of developing the inventory, a total of 231 project descriptions and entries on the Erasmus+ Project Results Platform were subsequently subjected to manual screening. Particular attention was given to ensuring that the sample of these projects reflected diversity in terms of project type, coverage of key policy areas, levels and types of education, as well as geographical representation. Following the assessment of impact, innovation, and scalability dimensions during the screening of 231 projects, a total of 127 projects were retained for inclusion in the good practice inventory.[68] The selected 127 projects were tagged with the key policy aspects analysed in this study, as well as education levels. The inventory thus permits more granular insights into the specific contribution of Erasmus+ to various policy areas in STEM education. Projects could be tagged with multiple

[68] Several ongoing Erasmus+ Teacher Academies focusing on STEM education were added into the set of screened projects. The original data set only included finalised projects.

policy aspects and multiple education levels (pre-primary, primary, secondary, VET[69]) and types of education (formal, non-formal, informal) if relevant.

Table 9 presents the number of projects identified in the inventory by Key Action, distinguishing between the 2014–2020 and 2021–2027 programming periods. With regard to the types of projects, the inventory includes relatively fewer Key Action 1 projects. This reflects the fact that learning mobility actions generally have a more limited scope, often consisting of short-term mobility assignments, job shadowing, or exchanges involving a small number of teachers attending training courses and applying lessons learned in their home institutions.

Due to their scale and often similar approaches, KA1 projects are less likely to meet all selection criteria applied in the inventory (impact, innovation, scalability) and thus provide fewer examples of innovation or wide-reaching impact. Their small scale also makes it more challenging to find evidence for innovative and good practices in the project documentation. Nevertheless, KA1 projects constitute a large share of Erasmus+ activities. Their accessibility and lower entry threshold for schools make them an important vehicle for supporting STEM education – particularly through teacher development – and for gradually scaling good practices across schools in Europe.

Table 9 Erasmus+ programme types

Programming period Erasmus+ programme types	Number of projects
2014–2020	**110**
Key Action 1 – Learning mobility of individuals	**21**
Key Action 1 – School education staff mobility	13
Key Action 1 – VET learner and staff mobility	4
Key Action 1 – VET learner and staff mobility with VET mobility charter	2
Key Action 1 – Youth mobility	2
Key Action 2 – Cooperation for innovation and the exchange of good practices	**78**
Key Action 2 – Partnerships for Creativity	3
Key Action 2 – Partnerships for Digital Education Readiness	1
Key Action 2 – School Exchange Partnerships	15

[69] This means initial vocational education and training (VET schools).

Programming period Erasmus+ programme types	Number of projects
Key Action 2 – Strategic Partnerships addressing more than one field	1
Key Action 2 – Strategic Partnerships for higher education	3
Key Action 2 – Strategic Partnerships for school education	36
Key Action 2 – Strategic Partnerships for Schools Only	13
Key Action 2 – Strategic Partnerships for vocational education and training	4
Key Action 2 – Strategic Partnerships for youth	2
Key Action 3 – Support for policy reform	**11**
Key Action 3 – Dialogue between young people and policy makers	2
Key Action 3 – Forward looking cooperation projects	5
Key Action 3 – Policy experimentations	1
Key Action 3 – Social inclusion through education, training and youth	1
Key Action 3 – Youth Dialogue Projects	2
2021-2027	**17**
Key Action 1 - Mobility of individuals	**1**
Key Action 1 – Short-term projects for mobility of learners and staff in school education	1
Key Action 2 – Cooperation among organisations and institutions	**16**
Key Action 2 – Cooperation partnerships in school education	2
Key Action 2 – Small-scale partnerships in school education	1
Key Action 2 – Teacher Academies	13

Source: Technopolis Group

Table 10 matches the projects captured in the inventory with the policy aspects covered in the study. The data shows that there is a strong tendency of Erasmus+ projects to focus on *STEM education curriculum, pedagogy, and assessment*, as well as *STEM non-formal/informal learning, learning support and equity*. *STEM teacher*

development and support also feature frequently in the good practice inventory.[70] The policy aspect *STEM education governance and infrastructure* is addressed in approximately 40% of actions. In practice, this aspect concerns education governance, not school infrastructure (such as labs for science education). The newly introduced Erasmus+ Teacher Academies focus on *STEM teacher development and support*, *STEM education curriculum, pedagogy, and assessment*, as well as *STEM non-formal/informal learning, learning support and equity.* Lastly, the policy aspect of research on STEM education in schools was identified in only 2 out of the 127 projects. This indicates a potential gap in the coverage of projects within the Erasmus+ programme that focus on monitoring and evaluation in the field of STEM education in schools.

Table 11 presents a breakdown of project types by the levels of education addressed. A clear trend emerges towards secondary education institutions and their students as the main target group, with 46 out of 127 projects focusing exclusively on this level. Pre-primary and primary education are addressed in only 3 and 16 projects, respectively. In addition, 14 projects cover all levels of education except VET. Furthermore, 16 projects target both primary and secondary education.

VET schools are addressed in 17 projects. Of these, 9 projects focus solely on VET, 7 projects combine VET with general secondary education, and 1 project targets VET together with general primary and secondary education.

Among the 13 selected Erasmus+ Teacher Academies, 11 were found to address all levels except VET (i.e. pre-primary, primary, and secondary), suggesting the added value of this instrument in covering multiple levels of education as well as transitions between them.

Overall, the findings highlight a concentration of STEM education projects at the secondary level, while pre-primary and primary education remain underrepresented. This underrepresentation may indicate either programming challenges within Erasmus+ in responding to the needs of these levels, or difficulties faced by smaller education establishments in participating in the programme.

Table 12 displays the level of school education crossed with the high-level policy dimensions. The patterns here continue, with a tendency to match up secondary education with the STEM education curriculum and pedagogy, non-formal education, as well as teacher professional development and training.

[70] The detailed overview of policy aspects is reported in Annex III.

Table 10 Policy dimensions addressed in good practice projects

Programming period	2014-2020				2021-2027			
Policy dimension	**Total**	**KA1: Learning mobility of individuals**	**KA2: Cooperation for innovation and the exchange of good practices**	**KA3: Support for policy reform**	**Total**	**KA1: Mobility of individuals**	**KA2: Cooperation among organisations and institutions**	**Total**
STEM education governance and infrastructure	43	8	28	7	2	0	2	45
STEM teacher development and support	52	15	32	5	16	1	15	68
STEM education curriculum, pedagogy, and assessment	97	18	72	7	17	1	16	114
STEM non-formal/informal learning, learning support and equity	81	19	54	8	14	0	14	95
Research on promotion of STEM education in schools	2	0	0	2	0	0	0	2
Total number of projects	**110**	**78**	**21**	**11**	**17**	**1**	**16**	**127**

Source: Technopolis Group based on Erasmus+ Project Results Platform

Table 11 Education levels addressed in good practice projects

	Education levels										
Programming period / key action / project type	**Pre-primary**	**Pre-primary, Primary, Secondary**	**Primary**	**Primary, secondary**	**Primary, secondary, VET**	**Secondary**	**Secondary, VET**	**Tertiary**	**VET**	**Other**	**Total**
2014-2020	**3**	**3**	**15**	**19**	**1**	**42**	**7**	**1**	**9**	**10**	**110**
KA1: Learning mobility of individuals			**7**	**3**		**3**	**2**		**5**	**1**	**21**
School education staff mobility			7	3		3					13
VET learner and staff mobility							1		3		4
VET learner and staff mobility with VET mobility charter							1		1		2
Youth mobility									1	1	2
KA2: Cooperation for innovation and the exchange of good practices	**3**	**3**	**8**	**13**		**35**	**3**	**1**	**3**	**9**	**78**
Partnerships for Creativity			1	1		1					3
Partnerships for Digital Education Readiness				1							1
School Exchange Partnerships	3		2			10					15
Strategic Partnerships addressing more than one field								1			1
Strategic Partnerships for higher education		1	1						1		3
Strategic Partnerships for school education		2	1	9		16				8	36
Strategic Partnerships for schools only			3	2		7	1				13
Strategic Partnerships for vocational education and training									1		4
Strategic Partnerships for youth										1	2
KA3: Support for policy reform				**3**	**1**	**4**	**2**		**1**		**11**
Dialogue between young people and policy makers							2				2
Forward looking cooperation projects				2	1	1			1		5
Policy experimentations						1					1

	Education levels										
Social inclusion through education, training and youth				1							1
Youth Dialogue Projects						2					2
2021-2027		**11**	**1**	**1**		**4**					**17**
KA1: Mobility of Individuals						**1**					**1**
Short-term projects for mobility of learners and staff in school education						1					1
KA2: Cooperation among organisations and institutions		**11**	**1**	**1**		**3**					**16**
Cooperation partnerships in school education				1		1					2
Small-scale partnerships in school education						1					1
Teacher Academies		11	1			1					13
Total	**3**	**14**	**16**	**20**	**1**	**46**	**7**	**1**	**9**	**10**	**127**

Source: Technopolis Group based on Erasmus+ Results Platform

Table 12 Level of education vs policy dimensions

		Policy dimension				
Level of education	**Number of projects**	**STEM education governance and infrastructure**	**STEM teacher development and support**	**STEM education curriculum, pedagogy, and assessment**	**STEM non-formal/informal learning, learning support and equity**	**Research on STEM education in schools**
Pre-primary	3	3	0	3	3	0
Pre-primary, primary, secondary	14	2	12	13	13	0
Primary	16	6	10	15	14	0
Primary, secondary	20	6	12	20	13	0
Secondary	46	16	24	42	30	1
Primary, secondary, VET	1	1	1	1	0	1
Secondary, VET	7	4	2	4	7	0
VET	9	3	5	6	7	0
Tertiary	1	0	1	1	1	0
Other	10	4	1	9	7	0
Total	**127**	**45**	**68**	**114**	**95**	**2**

Source: Technopolis Group based on Erasmus+ Project Results Platform

The overview shows that most analysed Erasmus+ good practice projects address core instructional dimension, in terms of **STEM curriculum, pedagogy and assessment** as well as **STEM teacher development and support.** These findings reflect the programme's core strengths in fostering practice-based innovation and collaboration, as well as enhancing teacher capacity. In contrast, there is a weaker representation of **governance and infrastructure-related aspects** of STEM education, pointing to gaps in how structural and institutional enablers of STEM reform are supported through Erasmus+ initiatives. The most notable gap concerns **research and evaluation related to STEM education** in schools, which was only identified in two out of the 127 projects in the inventory.

As a result, the analysis finds a risk of Erasmus+ generating limited evidence on how STEM teaching practices translate into improved student learning, engagement, or equity, and what works in STEM education across contexts. Consequently, the analysis emphasises a broader policy need for enhanced investment in research, data collection, and performance monitoring. Key Action 3 (Support for Policy Reform) projects are also underutilised, missing out on the potential to anchor practice in broader policy learning, system-level change, or strategic knowledge production.

Erasmus+ projects largely act as catalysts for bottom-up innovation and contribute to capacity-building within participating organisations. The broad reach of beneficiaries across the three Key Actions generates momentum for change at organisational level and helps sustain institutional partnerships. However, this strong focus on the organisational level makes it more challenging to identify programme impacts at national level, for instance in relation to systemic policy development or research-driven transformation.

Stronger coordination with Horizon Europe and other EU-level programmes would enhance knowledge transfer, cross-programme learning, and connections between practice and policy. This would, in turn, reinforce effective innovation in schools, build a stronger evidence base, and support strategic policy dialogue on STEM education at European level.

4.3.2. European Structural and Investment Funds

European Structural and Investment Funds (ESIFs) such as the European Regional Development Fund (ERDF) or the European Social Fund/European Social Fund+ (ESF/ESF+) are a major source of European investment in strategic priorities at the regional level, including in education. The ERDF, governed by Regulation (EU) 2021/1060, aims to strengthen economic and social cohesion by correcting regional imbalances, with investments targeted at innovation, research, the digital agenda, support for small and medium-sized enterprises, the low-carbon economy, and sustainable urban development. The ERDF supports education by funding infrastructure and technological advancements in educational institutions. The ESF+, established under Regulation (EU)

2021/1057, focuses on enhancing employment opportunities, promoting social inclusion, and investing in education and skills development to support labour market adaptability and combat poverty. In relation to education, the ESF+ provides support for improving access to quality education, enhancing lifelong learning opportunities, and fostering the development of relevant skills for the labour market. Supporting key competences, including those in “mathematics, science, technology, arts and engineering”, is one of the specific objectives of the ESF+.[71]

To ascertain the contribution of the various ESIFs to STEM education, we conducted an analysis of project titles and descriptions available online. For this purpose, project data was downloaded from the Kohesio database[72] on 22 November 2024 and filtered using the search strategy explained in Table 13.

Table 13 Search approach to ESIF and Horizon Europe projects

Only projects that contain STEM specific keywords in the title and description, including both the occurrence of STEM concepts and individual STEM subjects were retained. Wildcards were used to find concepts which occur in different spelling variants (e.g., maths – math – mathematics):

- STEM concepts: ‘STEM’; ‘STE(A)M’; ‘STEAM’, ‘MINT’
- STEM subjects: ‘scien*’; ‘natural science*’, ‘technolog*’; ‘engineer*’; ‘math*’; ‘physic*’; ‘chemi*’; ‘digital’; ‘biolog*’; ‘ICT’; ‘Art*’; ‘informatic*’
- Education concepts: “education", "skills", "skill", "competence", "competency", "competencies", "training”
- School level education search terms: "primary", "secondary", "vocational", "youth", "young", "preprimary", "adolescent", "student", “school”

The search was structured so that each project included in the list had to be positive for at least one search term from the STEM concepts and STEM subjects, one search term relating to education concepts, and one search term for school-level education. While this approach does not prevent the occurrence of false positives in the resulting data, the staggered approach combining different search terms was chosen to minimise the risk of projects mistakenly identified as falling under the scope of the study.

Source: Technopolis Group

Table 14 provides an overview of the total number of projects identified using this approach per funding programme, as well as the total and average EU contribution. ESF and ERDF lead the table with 32 954 projects and 7848 projects respectively falling under the search criteria. More than 1800 projects fall into the

[71] See Regulation (EU) 2021/1057 of the European Parliament and of the Council of 24 June 2021 establishing the European Social Fund Plus (ESF+) and repealing Regulation (EU) No 1296/2013, art 4(f-g), art 2(1)(5) http://data.europa.eu/eli/reg/2021/1057/oj.

[72] See https://kohesio.ec.europa.eu/data/projects/.

category of ‘multi-fund’ and ‘undefined’ programmes, which contains Interreg projects, as well as operational programmes that combine different sources. Overall, the ESIF may fund more projects than Erasmus+ with 42 707 projects and a contribution of almost EUR 8.5 billion.

Table 14 Number of projects and budget across ESIF

Funding programme	Number of projects	Total EU contribution in euros	Average EU contribution in euros
Cohesion Fund	16	50.127.220	3.580.516
European Regional Development Fund	7 848	3.229.143.058	425.167
European Social Fund	32 954	4.751.620.207	165.090
Instrument for Pre-accession Assistance	26	13.698.253	526.856
Just Transition Fund	1	27.258.599	27.258.599
The European Neighbourhood Instrument	45	47.628.626	1.058.414
Youth Employment Initiative	16	4.718.888	393.241
Multi-fund and undefined	1 801	362.488.051	634.830
Total	**42 707**	**8.486.682.900**	**229.085**

Source: Technopolis Group based on Kohesio

Table 15 shows the projects by country, making visible a very heterogenous landscape across Member States. The number of projects ranges from 0 in Ireland to 10 398 in Czechia. While some differences may be attributed to the different size of Member States, the different scale of ESIF programmes in Member States, gaps in reporting or potential false positives following the search strategy, the wide range in the number of projects per country may indicate how differences in the programming and design of ESIF operational programmes affect their relevance for STEM education in schools. Further research into the operational programmes as well as the funded projects could shed light on the results but is out of scope of the current report.

Table 15 Number of ESIF projects per Member State

Country	Single country projects	Interreg projects coordinated in MS	Total projects per country
Austria	18	103	121
Belgium	22	0	22
Bulgaria	207	5	212
Croatia	113	2	115
Cyprus	7	0	7
Czechia	10 398	8	10 406
Denmark	9	20	29
Estonia	71	17	88
Finland	718	48	766
France	1 738	34	1 772
Germany	2 003	5	2 008
Greece	2 037	28	2 065
Hungary	4 857	0	4 857
Ireland	0	3	3
Italy	8 700	33	8 733
Latvia	165	1	166
Lithuania	771	31	802
Luxembourg	1	0	1
Malta	4	0	4
Netherlands	68	60	128
Poland	6 414	28	6 442
Portugal	571	8	579
Romania	619	46	665
Slovakia	970	3	973
Slovenia	41	2	43

Country	Single country projects	Interreg projects coordinated in MS	Total projects per country
Spain	1 628	0	1 628
Sweden	58	14	72
Total	42 208	499	42 707

Source: Technopolis Group based on Kohesio

Table 16 depicts which funds support STEM related projects in the EU27. The overall pattern is derived from the data summarised in the previous tables. Member States, such as Czechia, Italy, Poland, and Hungary, feature strongly in this overview. Considering the notable differences in size of these four Member States, this indicates that the size of the country is not the sole predictor of the number of STEM-related projects identified using this approach. This is notable in the comparison of Greece and Germany, both of which are host to slightly more than 2000 projects, despite their difference in population. In addition, Latvia implements less than 25 percent of the number of projects of Lithuania, despite being roughly two-thirds of the population of the neighbouring country.

While ESF/ESF+ projects make usually up the majority among the ESIF funded projects, their average EU contribution is roughly only a third of ERDF projects. Notably, in Member States such as Romania, Slovakia and Spain, ERDF projects make up the bigger share. Again, this might be due to different priorities across the two programmes and Member States.

Table 16 ESIF projects per fund per Member State

Country (coordinator)	Fund name	Number of projects	Total EU budget in Euro	Average EU budget in Euro
Austria	ERDF	59	61.166.471,30	1.036.719,85
	ESF	18	*missing*	*missing*
	Multi-fund and undefined	44	78.997.111,12	1.795.388,89
Belgium	ERDF	2	644.000,00	322.000,00
	ESF	20	6.733.368,67	354.387,82
Bulgaria	ERDF	47	143.138.541,97	3.045.500,89
	ESF	158	126.618.685,01	816.894,74
	Instrument for Pre-accession Assistance	4	1.212.692,06	303.173,02
	Multi-fund and undefined	2	312.233,86	156.116,93
	European Neighbourhood Instrument	1	828.159,16	828.159,16
Croatia	ERDF	31	48.198.020,55	1.554.774,86
	ESF	57	105.898.648,80	1.857.871,03
	Instrument for Pre-accession Assistance	2	1.216.765,02	608.382,51

Country (coordinator)	Fund name	Number of projects	Total EU budget in Euro	Average EU budget in Euro
	Multi-fund and undefined	25	5.633.419,24	225.336,77
Cyprus	ERDF	7	1.017.031,82	145.290,26
Czechia	Cohesion Fund	2	216.173,76	108.086,88
	ERDF	859	254.024.388,36	295.721,06
	ESF	9545	357.101.275,01	37.412,39
Denmark	ERDF	21	22.548.589,86	1.073.742,37
	ESF	8	9.668.783,41	1.208.597,93
Estonia	ERDF	30	4.702.486,87	156.749,56
	ESF	53	17.081.283,96	322.288,38
	European Neighbourhood Instrument	5	1.368.271,23	273.654,25
Finland	ERDF	241	58.028.927,72	240.783,93
	ESF	525	86.026.944,50	164.487,47
France	ERDF	176	115.757.369,04	657.712,32
	ESF	1136	445.840.979,83	392.465,65
	Multi-fund and undefined	448	253.881.876,64	566.700,62
	Youth Employment Initiative	12	4.718.887,82	393.240,65
Germany	ERDF	53	4.762.131,08	529.125,68
	ESF	1954	406.354,02	101.588,51
	Multi-fund and undefined	1	640.000,00	640.000,00
Greece	Cohesion Fund	2	*missing*	*Missing*
	ERDF	116	8.111.856,68	1.013.982,09
	ESF	1919	*Missing*	*Missing*
	Instrument for Pre-accession Assistance	6	4.744.308,23	790.718,04
	Multi-fund and undefined	10	6.621.470,94	662.147,09
	European Neighbourhood Instrument	8	5.808.504,68	726.063,09
	Youth Employment Initiative	4	*missing*	*missing*
Hungary	ERDF	1334	610.871.214,89	492.638,08
	ESF	3461	717.324.042,45	218.097,92
	Instrument for Pre-accession Assistance	6	1.926.590,50	321.098,42
	Multi-fund and undefined	56	15.381.356,77	384.533,92
Ireland	ERDF	3	19.978.628,03	6.659.542,68
Italy	ERDF	2057	57.403.002,68	27.919,75
	ESF	6668	267.843.805,49	40.465,90
	Multi-fund and undefined	1	1.020.582,05	1.020.582,05
	European Neighbourhood Instrument	7	20.982.467,13	2.997.495,30
Latvia	ERDF	107	215.761.260,22	2.016.460,38

Country (coordinator)	Fund name	Number of projects	Total EU budget in Euro	Average EU budget in Euro
	ESF	58	68.542.250,34	1.181.762,94
	European Neighbourhood Instrument	1	110.032,20	110.032,20
Lithuania	ERDF	173	173.590.497,09	1.009.247,08
	ESF	623	283.145.183,24	454.486,65
	European Neighbourhood Instrument	6	6.019.817,93	1.003.302,99
Luxembourg	ESF	1	130.000,00	130.000,00
Malta	ERDF	1	2.400.000,00	2.400.000,00
	ESF	3	164.292,80	54.764,27
Netherlands	ERDF	70	133.245.296,79	1.903.504,24
	ESF	58	4.861.730,00	110.493,86
Poland	Cohesion Fund	9	49.471.157,52	5.496.795,28
	ERDF	868	568.131.203,71	654.529,04
	ESF	5560	1.664.292.053,89	299.333,10
	European Neighbourhood Instrument	5	6.208.077,44	1.241.615,49
Portugal	ERDF	41	23.336.970,25	569.194,40
	ESF	538	255.807.738,12	475.479,07
Romania	ERDF	430	324.212.099,17	753.981,63
	ESF	216	215.484.430,64	997.613,10
	Instrument for Pre-accession Assistance	8	4.597.896,86	574.737,11
	European Neighbourhood Instrument	11	5.939.196,41	539.926,95
Slovakia	Cohesion Fund	3	439.888,37	146.629,46
	ERDF	669	178.345.634,40	267.384,76
	ESF	300	93.097.427,79	311.362,63
	European Neighbourhood Instrument	1	364.099,41	364.099,41
Slovenia	ERDF	5	2.076.624,82	1.038.312,41
	ESF	37	*missing*	*missing*
	Just Transition Fund	1	27.258.599,00	27.258.599,00
Spain	ERDF	408	165.698.257,31	406.123,18
	ESF	6	*missing*	*missing*
	Multi-fund and undefined	1214	*missing*	*missing*
Sweden	ERDF	40	31.992.552,99	799.813,82
	ESF	32	25.550.929,26	798.466,54
Total		**42 707**	**8.486.682.900,18**	**229.085,00**

Source: Technopolis Group based on Kohesio[73]

[73] Some funds, such as the European Neighbourhood Instrument, are not considered ESIF, but are included in the Kohesio database and were therefore included in the analysis. The Youth Employment Initiative was integrated into the ESF+ for the period 2021-2027.

4.3.3. Horizon Europe and Horizon 2020

The EU framework programmes for research and innovation, Horizon Europe and Horizon 2020, are key funding instruments supporting research and innovation activities of beneficiaries from Member States and selected associated countries. Our analysis covers both programmes, spanning the period from 2014 until today.

- **Horizon Europe**, running from 2021 until 2027 with a total budget of EUR 93.5 billion offers various support mechanisms under three pillars.[74] Pillar 1 funds bottom-up research projects, notably through the European Research Council (ERC) and the Marie Sklodowska-Curie Actions (MSCA). Pillar 2 supports collaborative research projects across a range of challenge-based clusters. Pillar 3 supports innovation activities under the European Innovation Council (EIC), the European Innovation Ecosystems (EIE) and the European Institute of Innovation and Technology (EIT). An additional action line supports widening participation and strengthening of the European Research Area (WIDERA).
- **Horizon 2020** was organised around three main pillars: Excellent Science, aimed at strengthening the EU's world-class science base through initiatives like the European Research Council and Marie Skłodowska-Curie Actions; Industrial Leadership, focused on enhancing Europe's industrial capabilities in key technologies and supporting innovative SMEs; and Societal Challenges, which targeted research in areas of broad societal concern such as health, climate change, and security. In addition to these pillars, Horizon 2020 included horizontal components like Spreading Excellence and Widening Participation and Science with and for Society, aiming to foster inclusiveness and public engagement in science. Horizon 2020 had a budget of approximately EUR 80 billion and ran from 2014 until 2020.

Based on an analysis of project titles and descriptions funded under Horizon Europe and Horizon 2020, more than 50 Horizon Europe projects and 61 Horizon 2020 projects were identified as addressing STEM education topics.

Table 17 provides an overview of Horizon Europe projects by pillar and project type. Most projects (34 out of 58) were funded under the MSCA-CITIZENS programme (European Researchers' Night) , which primarily promotes science communication and public engagement, particularly among school-age learners. This concentration indicates a strong emphasis on outreach and awareness-raising within the Horizon Europe portfolio.

A further 11 projects were launched under Pillar 2 of Horizon Europe, addressing themes such as soil, ocean, governance, cultural heritage, and societal transformations. These projects demonstrate how STEM education is increasingly embedded in responses to broader sectoral and societal challenges.

[74] The predecessor, Horizon 2020, ran from 2014 until 2020 with total budget of EUR 80 billion.

Six projects were supported under Widening participation and strengthening the European Research Area, including both ERA policy actions and projects linked to access and inclusiveness. These illustrate how STEM education is being integrated into measures designed to improve research capacity and equality across Member States.

Finally, nine projects were funded through bottom-up research instruments under Pillar 1: four MSCA Postdoctoral Fellowships, two MSCA Staff Exchanges, and one ERC grant.[75] While smaller in number, these projects show how investigator-driven research can also generate outputs relevant for STEM education.

Taken together, the portfolio shows both concentration and diversity: a strong focus on science outreach through MSCA-CITIZENS, complemented by more targeted projects in societal challenge areas, ERA policy implementation, and bottom-up research. This mix highlights the flexibility of Horizon Europe in addressing STEM education through multiple entry points but also raises questions about coordination and coherence across the different strands.

Table 17 Horizon Europe STEM education projects

Pillar / type of project	Number of projects
Pillar 1: ERC	**1**
ERC-2021-COG	1
Pillar 1: European Researchers Night	**34**
HORIZON-MSCA-2022-CITIZENS-01-01	15
HORIZON-MSCA-2023-CITIZENS-01-01	19
Pillar 1: MSCA-Postdoctoral Fellowship	**4**
HORIZON-MSCA-2021-PF-01-01	2
HORIZON-MSCA-2022-PF-01-01	1
HORIZON-MSCA-2023-PF-01-01	1
Pillar 1: MSCA-Staff Exchange	**2**
HORIZON-MSCA-2022-SE-01-01	2
Pillar 2: Cluster / Mission area	**11**
HORIZON-MISS-2022-SOIL-01-07	1
HORIZON-MISS-2022-OCEAN-01-08	1

[75] The full list of projects is reported in Annex III.

Pillar / type of project	Number of projects
HORIZON-CL6-2021-GOVERNANCE-01-11	1
HORIZON-CL6-2022-GOVERNANCE-01-01	1
HORIZON-CL2-2021-TRANSFORMATIONS-01-04	2
HORIZON-CL2-2023-TRANSFORMATIONS-01-06	2
HORIZON-CL2-2023-TRANSFORMATIONS-01-05	2
HORIZON-CL2-2023-HERITAGE-01-08	1
Widening participation and strengthening the European Research Area	**6**
HORIZON-WIDERA-2021-ERA-01-70	2
HORIZON-WIDERA-2022-ERA-01-81	1
HORIZON-WIDERA-2023-ERA-01-10	1
HORIZON-WIDERA-2024-ERA-01-11	1
HORIZON-WIDERA-2021-ACCESS-03-01	1
Total	58

Source: Technopolis Group based on CORDIS

Table 18 provides an overview of STEM education projects funded under Horizon 2020 by pillar and project type. Only three European Researchers' Night projects were identified, in stark contrast to Horizon Europe, highlighting that the two programming periods are not directly comparable. Two additional MSCA projects were identified: an international training network (ITN) preparing a cohort of doctoral candidates, and an individual fellowship.

Beyond MSCA, a range of other Horizon 2020 programmes supported STEM-related activities. Nine projects were funded under Industrial Leadership calls, three under the Societal Challenges work programme, and two through the Green Deal. These illustrate how STEM education was embedded in sector-specific challenges, linking education with industrial and societal priorities. The Spreading Excellence and Widening Participation programme funded three projects addressing gender equality in STEM, reflecting the EU's broader policy commitment to equality and inclusiveness.

A substantial share of STEM-related activities was supported through Science with and for Society (SwafS) strand. Many of these projects promoted science communication and outreach, including two dedicated coordination and support actions that strengthened the Scientix network. In addition, two specific calls in 2014–2015 on "Innovative ways to make science education and scientific careers attractive to young people" resulted in a cluster of ten projects. Finally, one project

funded under the SME Instrument / EIC pilot developed a robotics and ICT learning platform, demonstrating how innovation-oriented instruments can also generate outputs relevant for STEM education.

Overall, Horizon 2020 support for STEM education was more dispersed across programme areas compared to Horizon Europe. While the portfolio contained fewer outreach-focused actions, it demonstrated a strong orientation towards embedding STEM education within industrial, societal, and equality-related priorities.

Table 18 Horizon 2020 STEM education projects

Pillar / type of project	Number of projects
European Researchers Night	**3**
H2020-MSCA-NIGHT-2016	1
H2020-MSCA-NIGHT-2018	1
H2020-MSCA-NIGHT-2020bis	1
MSCA-Individual Fellowship and International Training Networks	**2**
H2020-MSCA-IF-2018	1
H2020-MSCA-ITN-2020	1
Industrial Leadership	**9**
H2020-ICT-2015	2
H2020-ICT-2016-2017	5
H2020-COMPET-2014	2
Societal challenges	**3**
H2020-SC6-REV-INEQUAL-2016-2017	1
H2020-SC6-TRANSFORMATIONS-2018-2019-2020	1
H2020-SPACE-2018-2020	1
Green Deal Call	**2**
H2020-LC-GD-2020	2
Spreading Excellence and Widening Participation	**3**
H2020-WIDESPREAD-2014-2015	1

Pillar / type of project	Number of projects
H2020-WIDESPREAD-2016-2017	1
H2020-WIDESPREAD-2018-2020	1
Science with and for Society	**38**
H2020-GERI-2014-2015	1
H2020-SEAC-2014-2015	10
H2020-SwafS-2016-17	4
H2020-SwafS-2018-2020	21
H2020-IBA-SWFS-SCIENTIX-2016	1
H2020-IBA-SWFS-SCIENTIX-2020	1
SME Instrument / EIC	**1**
H2020-EIC-SMEInst-2018-2020	1
Total	61

Source: Technopolis Group based on CORDIS

To gain a better idea of the thematic scope of Horizon-funded projects, the study team conducted a mapping of the projects against the policy aspects for STEM education examined in this study, grouping them indicatively into several archetypical clusters rather than presenting each project individually. The grouping of Horizon Europe projects is enriched by several H2020 projects identified through the interviews and desk research, such as resources published by the Directorate-General for Research and Innovation of the European Commission.[76]

The results of this exercise and project examples are reported in Table 19. The first cluster comprises **European Researchers' Night** projects, which aim to increase awareness of STEM careers and attract students to STEM fields. These projects primarily promote science education, outreach, and public engagement, with a strong focus on school-age learners.

A second cluster includes projects addressing STEM education in the context of **sectoral and societal challenges**. These initiatives provide targeted education opportunities and foster cross-sectoral partnerships between schools,

[76] See e.g., European Commission: *Directorate-General for Research and Innovation, Bridging the gender gap in STEM – Strengthening opportunities for women in research and innovation*, Publications Office of the European Union, 2022, https://data.europa.eu/doi/10.2777/774922.

universities, industry, and other organisations. Examples include projects linked to food systems, soil health, water, and sustainability.

A third cluster brings together projects directly supporting **STEM policymaking** (e.g. SENSE, ROAD-STEAMer, SEER), including work on STEAM approaches (STEAMbrace, ROAD-STEAMer). These projects typically develop roadmaps, conduct large-scale analyses of STEM education approaches and policies, and build awareness among stakeholders. They also support collaboration between academia, industry, and schools, with activities ranging from teacher training to the development of new methodologies and digital learning tools.

Finally, several projects explicitly focus on **attracting girls and women into STEM**, reflecting the priority given to gender equality in EU R&I policy, including Horizon Europe requirements on Gender Equality Plans and the ERA Policy Agenda 2022–2024[77]. Activities in this cluster address gender equality in STEM education up to tertiary level as well as in research and innovation careers. Supporting actions are documented in the 2023 ERA Monitoring Report, a DG RTD policy brief on Gender Equality Plans, and a dedicated factsheet. Collectively, these efforts seek to reduce gender disparities in STEM pathways and professional roles.

In Horizon 2020, a large group of projects addressed **open schooling approaches to STEM education.** These projects investigated and promoted whole-school approaches and ecosystem engagement to improve STEM education. Likewise, Horizon 2020 funded a cluster **science education and science awareness projects.** These were the result of the two dedicated calls in 2014−2015.[78] Both topics are not present in Horizon Europe to a similar degree, which could make them interesting cases to investigate for impact and sustainability.

In addition, several more research-oriented Horizon-funded projects address issues such as **inequality**, **inclusivity, and the efficiency or effectiveness of education policies**. While not always focused exclusively on STEM, their findings have potential relevance for evidence-based policymaking in STEM education and beyond. Some of these initiatives are supported by bottom-up instruments such as MSCA and ERC grants, illustrating how investigator-driven research can contribute to the education policy agenda. Finally, at least three projects specifically examine aspects of STEM teaching, e.g. in mathematics, and may provide insights how to improve student performance in this area.

[77] See e.g. Action 5. Promote gender equality and foster inclusiveness under https://european-research-area.ec.europa.eu/policy-agenda-2022-2024/deepening-truly-functioning-internal-market-knowledge.

[78] See https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/SEAC-1-2014 and https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/SEAC-1-2015.

Table 19 STEM education aspects addressed in Horizon Europe projects

Grouping	Examples	STEM education aspects
European Researchers' Night	• All European Researchers' Nights projects	• Informal education activities (visits to science centres and museums; online platforms and STEM education resources; public engagement events, workshops, science festivals, public lectures, and science nights)
STEM related to industrial ecosystems and societal challenges	• Innovative Education for the BioEconomy • CLEVERFOOD • LOESS • ProBleu • OTTER • Our Space Our Future • EUSPACE-AWE	• Informal education activities (visits to science centres and museums; online platforms and STEM education resources; public engagement events, workshops, science festivals, public lectures, and science nights) • Local community engagement projects / initiatives ("whole-school" approach) • Innovative teaching and learning methods, practices or materials (e.g. integration of technology and digital tools in curriculum development)
STE(A)M policy and roadmaps	• SENSE • Road-STEAMer • SEER • ICSE Science Factory • STEAMbrace • SySTEM 2020	• Interdisciplinary/integrated STEM teaching (e.g., STE(A)M integrating STEM with Arts, social science/humanities) • School governance and funding • STEM curriculum content and structure
Gender and inclusion related projects	• STREAM IT • AGRIGEP • Shemakes.eu, • EQUALS-EU • INCLUDE • WE4STEM	• Learning support targeted at girls / boys • Non-formal education activities (after-school STEM clubs and programmes, science camps, and summer programmes; STEM volunteer and outreach programmes; maker spaces, fab labs) • Partnerships with industry and other local stakeholders such as NGOs, science museum and centres, public authorities, cultural institutions, universities and research institutions, parents (e.g. support for student industry internships, collaboration between school and non-formal learning providers)
Open schooling approach to STEM education	• SEAS • PULCHRA • CONNECT • Make it Open • SALL • MOST • PAFSE • MULTIPLIERS • FEDORA • COSMOS	• Local community engagement projects / initiatives ("whole-school" approach) • Partnerships with industry and other local stakeholders such as NGOs, science museum and centres, public authorities, cultural institutions, universities and research institutions, parents (e.g. support for student industry internships, collaboration between school and non-formal learning providers)

Grouping	Examples	STEM education aspects
Science education and science awareness projects	• SciCar • SEAS • CREATIONS • STEM4youth • C4S	• Non-formal education activities (after-school STEM clubs and programmes, science camps, and summer programmes; STEM volunteer and outreach programmes; maker spaces, fab labs) • Informal education activities (visits to science centres and museums; online platforms and STEM education resources; public engagement events, workshops, science festivals, public lectures, and science nights)
Research projects on assessment and evaluation of education policies	• UNEQUAL ED • CLEAR • SCIREARLY • EFFEct • MapIE • MTSS-K • PERFORM • SellSTEM	• Studies, evaluations, impact assessments, data collection and monitoring on all policy aspects • STEM assessment approaches and practices • School governance and funding • Learning support targeted at ethnic minorities, students from low-income families, persons with disabilities, and other vulnerable groups in STEM fields • Learning support targeted at girls / boys
Specific STEM subjects	• LI-PrimaryTeachers • ProDiME • SPATHS	• Innovative teaching and learning methods, practices or materials (e.g. integration of technology and digital tools in curriculum development) • STEM curriculum content and structure • STEM assessment approaches and practices • Formal (continuing) professional development

Source: Technopolis Group based on CORDIS

Overall, projects funded under Horizon 2020 and Horizon Europe address a wide range of policy dimensions in STEM education. The research and innovation programmes offer advantages compared to other instruments, such as more flexible funding modalities for beneficiaries. The portfolio includes a mix of Coordination and Support Actions (CSAs) advancing policy priorities, bottom-up projects funded through MSCA and ERC, and public engagement activities such as European Researchers' Night. This diversity illustrates the programme's potential to support different types of STEM education interventions. At the same time, the dispersion of projects across programme strands highlights challenges of coordination, coherence, and mutual learning−both within Horizon Europe and in relation to complementary initiatives under Erasmus+ and the European Structural and Investment Funds (ESIF).

4.3.4. Digital Europe Programme

The Digital Europe Programme (DEP) is a key EU funding initiative established to accelerate the digital transformation across Europe. With a budget exceeding EUR 8 billion, the programme focuses on enhancing the digital infrastructure and

providing financial support to projects in areas such as artificial intelligence, cybersecurity and advanced digital skills.

To evaluate whether any DEP-funded activities targeted STEM-related topics, we conducted an analysis of its work programmes. Strategic Objective 4 of the 2023–2024 work programme focuses on “Advanced Digital Skills”. One key topic covered by Objective 4 is “Boosting digital skills of young people, in particular girls”. With a dedicated budget of EUR 121 million, the actions financed under this objective aim to foster collaboration between academia, research, and industry to draw a larger students’ audience. The calls funded under this topic address the shortage of students enrolling in science, technology, engineering and/or mathematics and ICT-related disciplines, funding the organisation of summer schools and other activities aimed at generating greater interest in digital careers. Additionally, there is a clear focus on addressing girls’ underrepresentation in ICT by implementing targeted actions to close the gap.

The DEP Work Programme 2023−2024 highlights 2021 statistics indicating that only 4.5% of all graduates pursued digital and ICT education, of whom just 19% were women, although women accounted for one-third of graduates in STEM fields overall. By focusing on these areas, these calls underline the importance of targeted measures aiming at increasing enrolment but also creating a more inclusive digital talent pool across Europe. Further details regarding the calls for this topic, such as budget allocations, specific target beneficiaries, and other relevant information, are provided in Table 20. One example of project financed under this call is “Code4Europe − empowering the new generation of Young Digital Europeans”, an ongoing project aiming at transforming and expanding EU Code Week, which attracts a larger audience of young students to digital careers.

Table 20 DEP call “Boosting Digital Skills of young pupils, in particular girls”

Action Type	CSA
Funding	6 million
Duration	24 months
Level of education	Primary, secondary, VET, tertiary
Type of education	Non-formal, Informal
Key beneficiaries	• Students − specific groups (e.g. girls), vulnerable and marginalised groups • Schools • Higher education institutions

Scope	• Supporting STEM education opportunities through non-formal and informal educational activities (e.g. competitions, fairs, museums, • Student career counselling • Local community engagement and partnerships to promote STEM education/whole school approach • Learning support, equal access and inclusivity in STEM education (policies addressing targets groups, such as persons with lower socioeconomic background, migrants, persons with disabilities, gender aspects, etc.)

Source: Digital Europe Programme Work Programme 2023−2024[79]

4.3.5. European Institute of Innovation and Technology (EIT)

The Institute of Innovation and Technology (EIT) is an EU body founded in 2008. Its aim is to promote collaborations between business, universities and research institutions across countries to enhance innovation in EU. Key activities of the EIT are carried out within the Knowledge and Innovation Communities (KICs), which are partnerships focused on a variety of topics, such as digital transformation, climate, health, food and so on.

Addressing the gender gap in STEM education within EIT activities is one of the core objectives in EIT's 2021−2027 Strategy.[80] The EIT implements initiatives in line with action 13 of the Digital Action Plan 2021−2027, "Women's participation in STEM studies and careers". This commitment is consistently reflected in EIT's Annual Reports.[81]

A key initiative relating to school-level education in this regard is "Girls Go Circular", launched in 2020, and managed by EIT Raw Materials in collaboration with other KICs and DG EAC.[82] The project's learning programme targets young girls, aged 14−19, with the aim of providing them with digital and entrepreneurial competences. Since its inception, more than 38 000 young girls from across Europe have completed the program. According to EIT's 2023 annual report, the program has been implemented in 24 EU countries and aims to expand to all 27 Member States.[83] One of the project's key initiatives is the "Women and Girls in

[79] See https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/digital-2023-skills-04-boostingdigit.

[80] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32021D0820.

[81] Available inter alia at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32021D0820 (2020), https://eit.europa.eu/sites/default/files/2022-24_20220621_gb72-24_eit_caar_2021.pdf (2021), https://eit.europa.eu/sites/default/files/2023-07/2023-19_20230621-GB77-19_EIT%20CAAR%202022-2.pdf (2022), and https://eit.europa.eu/sites/default/files/2023-07/2023-19_20230621-GB77-19_EIT%20CAAR%202022-2.pdf (2023).

[82] https://eit-girlsgocircular.eu/.

[83] https://eit.europa.eu/sites/default/files/2024-06/GB%20Decision%2023-2024%20EIT%20CAAR%202023_web.pdf.

STEM Forum", a flagship event now in its fourth edition. The Forum gathers key stakeholders to develop strategies to promote gender equality in STEM and ICT and encourage girls to develop their careers in this field.

4.3.6. Recovery and Resilience Facility (RRF)

The Recovery and Resilience Facility (RRF) is a funding instrument designed by the European Commission as a response to the crisis caused by the Covid-19 pandemic. The facility was established in 2021 with the aim of financing national reforms and investments under six pillars, including digital and green transitions; smart, sustainable and inclusive growth; and social and territorial cohesion. The European Commission has earmarked EUR 650 billion to be distributed through both grants and loans to Member States. To receive the funding, Member States had to submit their national plans delineating the reforms and investments to be implemented.

In order to identify whether initiatives addressing STEM have been funded via the RRF, a review was conducted of relevant documents, including annual reports, evaluation studies and thematic analyses.[84] The scope of the analysis was identifying activities related to science, technology, engineering, and mathematics (STEM) and science, technology, engineering, arts and

[84] The following documents were screened: Commission Staff Working Document. Mid-term evaluation of the Recovery and Resilience Facility, SWD(2024)70 final, https://commission.europa.eu/document/download/17c82840-518c-4c3d-ba98-7dae436b3a70_en?filename=SWD_2024_70_1_EN_autre_document_travail_service_part1_v4.pdf; Report from the Commission to the European Parliament and the Council. Review report on the implementation of the Recovery and Resilience Facility, COM(2022)383 final, https://commission.europa.eu/document/download/96dd4c8b-1aa5-4f15-8508-61b06a0ce5a2_en?filename=com_2022_383_1_en.pdf; Report from the Commission to the European Parliament and the Council on the implementation of the Recovery and Resilience Facility: Moving forward, COM(2023)545 final/2, https://commission.europa.eu/document/download/3b4a06ba-21f1-40e6-ae33-4d308ddb98da_en?filename=COM_2023_545_1_EN_0.pdf; Recovery And Resilience Scoreboard. Thematic analysis Digital skills and education (2024) https://ec.europa.eu/economy_finance/recovery-and-resilience-scoreboard/assets/thematic_analysis/scoreboard_thematic_analysis_digital_skills.pdf; Recovery And Resilience Scoreboard. Thematic analysis Equality (2023), https://ec.europa.eu/economy_finance/recovery-and-resilience-scoreboard/assets/thematic_analysis/scoreboard_thematic_analysis_equality.pdf; Recovery And Resilience Scoreboard. Thematic analysis Education (2021), https://ec.europa.eu/economy_finance/recovery-and-resilience-scoreboard/assets/thematic_analysis/6_Education.pdf; Recovery And Resilience Scoreboard. Thematic analysis Research and Innovation (2024), https://ec.europa.eu/economy_finance/recovery-and-resilience-scoreboard/assets/thematic_analysis/scoreboard_thematic_analysis_research_and_innovation.pdf; Recovery And Resilience Scoreboard. Thematic analysis Adult learning and skills (2023), https://ec.europa.eu/economy_finance/recovery-and-resilience-scoreboard/assets/thematic_analysis/scoreboard_thematic_analysis_%20adult_learning_skills.pdf.

mathematics (STEAM), such as educational reforms, teachers' trainings, support for school infrastructure.

The document review shows that the National Recovery and Resilience Plans have indeed been leveraged to support education policies, and in certain cases to encourage STEM education within schools. The findings show that RRF funds were primarily used to modernise school infrastructure and address the gender gap in STEM. The thematic analyses further highlighted the necessity of measures aimed at fostering inclusivity, reducing barriers for women and underrepresented groups in STEM fields, and advancing skills. Several Member States, e.g. Bulgaria, Portugal, Croatia, Lithuania and Italy, used the funds to advance skills development and strengthen their education systems. Italy and Portugal included in their RRP actions to enlarge women's participation in STEM education. Bulgaria and Lithuania invested in the modernisation of school infrastructure, for instance, creating new STEM centres and laboratories. Table 21 provides a breakdown of the measures undertaken by each country identified in the RRF thematic analyses. It also links them to the associated STEM education policy aspects to highlight the national priorities and to enable comparison with other STEM education interventions examined in this study.

Table 21 National RRF plans addressing STEM education

Member State	Action title	STEM education policy aspect
Bulgaria	• Creation of STEM laboratories • Enhancement of STEM subjects in schools • Reform of STEM curricula	• STEM curricula reforms/regulation • Basic school infrastructure • Lab infrastructure (including computer labs, computers, tablets, and software) • Others
Croatia	• Measures to foster skills development, including STEM and ICT • Strengthening STEM	• Others
Italy	• Investment to enhance women's participation in STEM	• Learning support, equal access and inclusivity in STEM education (policies addressing targets groups, such as persons with lower socioeconomic background, migrants, persons with disabilities, gender aspects, etc.)
Lithuania	• Measures upgrading STEM centres	• Basic school infrastructure • Lab infrastructure (including computer labs, computers, tablets, and software) • Others
Portugal	• Youth Impulse Steam • Adults Impulse	• Learning support, equal access and inclusivity in STEM education (policies addressing targets groups, such as persons with lower socioeconomic background, migrants, persons with disabilities, gender aspects, etc.) • Lab infrastructure (including computer labs, computers, tablets, and software) • Others

Source: Own compilation based on RRF thematic analysis

In the case of **Bulgaria**, the programme support focuses on the development of STEM education infrastructure. National STEM centres are being established using the RRF, and more than 2 200 STEM laboratories are being set up within schools.[85] The national and regional STEM centres are built in collaboration with higher education institutions.[86] Funding available for school-level STEM infrastructure amounts to approximately EUR 270 million.[87] This funding ads to other sources supporting renovations and upgrading of school infrastructure.[88] Updates of curricula are supported through the "elaboration of methodological notes, guidance, training materials and programmes for training teachers how to teach in STEM education".[89] Work on quality standards and indicators to measure learning outcomes is also foreseen.[90]

The **Portuguese** programme illustrates a slightly different approach. Here, a stronger focus lies on tertiary education and adult education. Targets of this programme include increasing the number of higher education STEAM graduates by 10 percent, doubling the number of adults participating in upskilling, enhancing higher education infrastructure, and establishing consortia working on STEAM education. The consortia are led by universities in broad partnerships with other stakeholders, such as schools and businesses. The programme thus supports updates of university-level programmes in the broad areas of STEM subjects, as well modernising their facilities. 33 consortia and programmes have received support.[91]

In **Croatia**, the programme sought to improve working conditions of researchers in STEM and ICT fields, including training, mobility, and knowledge valorisation support.[92] While this measure is justified with the intention to "bring more students and researchers into the STEM and ICT fields", only indirect effects on STEM education at school can be expected.

[85] https://commission.europa.eu/projects/stem-centres-and-innovation-education_en.

[86] https://stem.mon.bg/stem-centres/.

[87] https://sf.mon.bg/?go=page&pageId=549&lang=en.

[88] https://sf.mon.bg/?go=page&pageId=550&lang=en.

[89] See https://nextgeneration.bg/upload/77/Table+Complementarity+ENG+update.pdf.

[90] See https://weteachdata.eu/stem-centres-and-innovations-in-education-project-bulgaria/.

[91] All information is available at https://wwwcdn.dges.gov.pt/sites/default/files/brochura_en.pdf.

[92] https://commission.europa.eu/business-economy-euro/economic-recovery/recovery-and-resilience-facility/croatias-recovery-and-resilience-plan/croatias-recovery-and-resilience-supported-projects-nation-wide-investment-scheme_en.

4.3.7. Technical Support Instrument (TSI) and Structural Reform Support Programme (SRSP)

The **Technical Support Instrument** (TSI), successor of the **Structural Reform Support Programme** (SRSP), has been designed to provide technical support to EU Member States to develop and implement reforms that enhance economic growth and improve the overall institutional, administrative, and structural environment. Thus, the instrument can in principle foster structural reforms in education systems of Member States. With a budget of EUR 864 million for the period 2021−2027, TSI programmes equip Member States with ad-hoc expertise to implement reforms in several areas, including digital and green transition, health, skills and education and training. The programme operates using a bottom-up approach, because interventions are initiated at the request of the Member States.

Under the previous SRSP, a range of horizontal projects covering school education were supported across Member States. For example, Belgium has implemented a project "Setting up a National Quality Framework on Early Childhood Education and Care", whereas Austria has conducted an activity "Setting up a comprehensive education monitoring system". Czechia has implemented a project "Addressing regional disparities in education performance by promoting inclusiveness", while Croatia developed a "Quality Assessment System of in-service teacher training provided by Education and Teacher Training Agency". However, no SRSP project was explicitly focused on STEM education.[93]

To determine whether the follow-up TSI programme has funded initiatives related to STEM, we reviewed its annual programmes and flagship projects, as well as country factsheets.[94] Flagship projects are selected for their capacity to address critical needs shared by Member States and their alignment with the EU priorities. One of these projects is the 2024 "Flagship on Skills: Fostering skills development systems better adapted to the labour market", which provides support to the Member States in the implementation of reforms aimed at having at least 60 percent of adults engaged in annual training, and at least 78 percent of the working-age population employed by 2030. Some of the support measures implemented under this flagship are specifically focused on STEM, although for adults and in tertiary education.[95] Moreover, the 2023 Flagship "YOUTH FIRST – supporting children and youth wellbeing, education, training, social protection and labour prospects" also focussed on cross-cutting challenges in education and

[93] All examples from https://commission.europa.eu/system/files/2020-03/rss-technical-support-per-country_en.pdf.

[94] See the TSI annual programmes at https://commission.europa.eu/publications/technical-support-instrument-financing-decisions-and-annual-work-programmes_en.

[95] See https://reform-support.ec.europa.eu/document/download/5248a834-c155-44e1-a3f1-c85462b3c422_en?filename=FlagshipTSI2024_Skills.pdf; https://reform-support.ec.europa.eu/tsi-2024-flagship-flagship-skills-fostering-skills-development-systems-better-adapted-labour-market_en.

training, such as quality and equity in education, inclusivity, recognition of prior learning and policy evaluation.[96]

According to data collected by the European Commission, 127 projects were implemented across EU Member States in the policy area "Skills, education, and training".[97] Here, the tendency to address cross-cutting priorities in education policy appears to continue from the SRSP. Austria, for example, implemented projects on the digitalisation of the Austrian education system[98] and on the framework conditions for staff in early childhood education and care to enhance the quality of education for children.[99] In addition, a project on Forecasting and steering the teaching workforce in Austria was implemented[100], and similar activities were conducted in Italy and Ireland. Belgium implemented projects on ICT capacity in schools, as well as a collaborative project with the Netherlands on digital competences in teacher professional development.[101] The TSI was also used in other Member States to inform the development of national skills strategies[102] as well as the Operational Framework for All-Day Lower Secondary Schools in Cyprus.[103] Greece developed a national framework for quality assurance of non-formal education and assessment and validation of prior learning.[104] Finally, Romania hosted an activity on the governance of pre-tertiary education.[105]

As part of multi-country projects, Portugal and Bulgaria collaborated on raising the quality of early childhood education and care by strengthening governance,

[96] https://reform-support.ec.europa.eu/youth-first-supporting-children-and-youth-wellbeing-education-training-social-protection-and-labour_en.

[97] https://reform-support.ec.europa.eu/our-projects/projects-interactive-map_en.

[98] See https://reform-support.ec.europa.eu/what-we-do/skills-education-and-training/digitalisation-austrian-education-system_en.

[99] See https://reform-support.ec.europa.eu/what-we-do/skills-education-and-training/improving-staff-working-conditions-better-quality-early-childhood-education-and-care-austria_en.

[100] See https://reform-support.ec.europa.eu/what-we-do/skills-education-and-training/perfect-match-forecasting-and-steering-future-and-present-teaching-workforce-austria_en.

[101] See https://reform-support.ec.europa.eu/our-projects/country-factsheets/belgium_en.

[102] See https://reform-support.ec.europa.eu/what-we-do/skills-education-and-training/developing-bulgarias-national-skills-strategy_en.

[103] See https://reform-support.ec.europa.eu/what-we-do/skills-education-and-training/operational-framework-all-day-lower-secondary-schools-cyprus_en.

[104] See https://reform-support.ec.europa.eu/what-we-do/skills-education-and-training/support-design-national-framework-quality-assurance-non-formal-education-and-assessment-and_en.

[105] See https://reform-support.ec.europa.eu/what-we-do/skills-education-and-training/strengthening-management-romanian-education-system_en.

monitoring and evaluation.[106] And Ireland and Finland engaged on inclusive quality education.[107]

According to the information available online, however, these projects are not dedicated to STEM education. Nonetheless, the range of projects on cross-cutting horizontal aspects (e.g. teacher shortages, education governance, inclusive education, or ECEC) implemented under the TSI display the potential for taking up STEM-related topics as part of future projects.

4.3.8. InvestEU

The InvestEU programme was launched in 2021 to mobilise private investment in strategic priority areas of the EU. The remit of InvestEU includes investments in the "promotion of scientific and technological advances, of culture, education and training".[108] The programme's investment opportunities include a **social investment and skills policy window**, which comprises microfinance, social enterprise finance, social economy and measures to promote gender equality, skills, education, training and related services, social infrastructure, including health and educational infrastructure and social and student housing, social innovation, health and long-term care, inclusion and accessibility, cultural and creative activities with a social goal, and the integration of vulnerable people, including third country nationals" (emphasis added).[109] Investment in (STEM) education and education infrastructure are falling under this investment 'window'

Thus, in principle, InvestEU financing can address policy areas related to STEM education as identified by this study, including gender aspects, skills, as well as infrastructure. Overall, projects under the social investment and skills window reached a guarantee of EUR 1578 million as of October 2024, representing 7 percent of the total guaranteed amount of EUR 23.9 billion.[110]

The implementation of InvestEU financing programmes is done by intermediaries such as the European Investment Funds (EIF), European Investment Bank (EIB), or the Council of Europe Development Bank (CEB). For example, the European Investment Funds is the implementing partner for operations including:

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[106] See https://reform-support.ec.europa.eu/what-we-do/skills-education-and-training/raising-quality-early-childhood-education-and-care-strengthening-governance-monitoring-and_en.

[107] See https://reform-support.ec.europa.eu/what-we-do/skills-education-and-training/fostering-inclusive-quality-education-finland-and-ireland_en.

[108] Regulation (EU) 2021/523 of the European Parliament and of the Council of 24 March 2021 establishing the InvestEU Programme and amending Regulation (EU) 2015/1017, art 3(d), https://eur-lex.europa.eu/eli/reg/2021/523.

[109] Ibid., art 8(d).

[110] https://investeu.europa.eu/investeu-programme/investeu-fund/investeu-indicators_en?prefLang=de#key-indicators-selection.

- Framework Operation #7 for Social Impact Equity Product[111]
- Framework Operation #13 for Skills, Education and Training[112]
- Framework operation #32 for Microfinance, Social and Skills Guarantee Product/ Skills, Education and Training[113]
- Framework Operation #42 For Skills Education and Training[114]

Identifying the exact support for STEM-related activities in this system is a challenge. Data made available by the EIF, for example, only lists the final recipients[115] and financial intermediaries selected by the EIF portfolio guarantees.[116] From this information, no insights into STEM-related activities can be derived.

The EIB on the other hand releases information on final recipients and the policy area supported through InvestEU in 2023.[117] Here, two projects can be identified as addressing education and training infrastructure, although at the tertiary level since beneficiaries are higher education institutions in Ireland and France, respectively. In the case of Ireland, the loan backs the development of the Cork University Business School.[118] In the French project, infrastructure investments into Ecole Polytechnique are intended to replace an obsolete laboratory and other facilities, which should then enable the university "to train up to 20% more students in STEM fields".[119] These projects are part of the EIB's broad portfolio of loans given to education-related projects with a focus on education infrastructure.[120]

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[111] https://investeu.europa.eu/investeu-operations-0/investeu-operations-list/framework-operation-7-social-impact-equity-product_en.

[112] https://investeu.europa.eu/investeu-operations-0/investeu-operations-list/framework-operation-13-skills-education-and-training_en.

[113] https://investeu.europa.eu/investeu-operations/investeu-operations-list/framework-operation-32-microfinance-social-and-skills-guarantee-product-skills-education-and_en.

[114] https://investeu.europa.eu/investeu-operations/investeu-operations-list/framework-operation-42-skills-education-and-training_en.

[115] https://www.eif.org/InvestEU/guarantee_products/ieu-debt-visibility-report-final-recipients.pdf

[116] https://www.eif.org/InvestEU/guarantee_products/ieu-debt-visibility-report-financial-intermediaries.pdf.

[117] https://www.eib.org/attachments/general/lists/investeu-final-recipients-beneficiaries-en.pdf.

[118] https://www.ucc.ie/en/news/2023/ucc-secures-eib-support-for-new-cork-university-business-school-.html.

[119] https://investeu.europa.eu/system/files/2023-01/INVEU-ICR-0063-2022%20-%20IC9%20SISW%20-%20CAMPUS%20POLYTECHNIQUE_scoreboard.pdf.

[120] For a long list of approved projects beyond InvestEU, see https://www.eib.org/de/projects/loans/index.htm?search=&sortColumn=loanParts.loanPartStatus.statusDate&sortDir=desc&pageNumber=0&itemPerPage=9&pageable=false&language=DE&defaultLanguage=DE&loanPartYearFrom=2020&orLoanPartYearFrom=true&loanPartYearTo=20

A final example of funding allocated through InvestEU is the CEB, which also guarantees loans for InvestEU projects with a specific focus on the social investment and skills window.[121] The CEB does make a more comprehensive list of projects available on its website.[122] Examples include renovation and construction of school and daycare facilities,[123] digitalisation of schools[124] or school lab facilities[125]. However, the information provided by the CEB does not confirm whether these projects were directly or indirectly enabled by the InvestEU programme.

Thus, while it can be reasonably assumed that the InvestEU programme and European financial institutions support school infrastructure and other investments that affect the delivery of STEM education, the information available is not granular enough for conclusions about the scale and scope of this financial support instrument. The monitoring indicators used for the programme are also not supporting conclusions in this direction.

4.3.9. Others

Beyond the confines of the programmes already outlined above, support to STEM activities is also provided by the **Single Market Programme.** The programme usually funds activities related to the EU single market, such as data collection and capacity building about the single market, but it also finances individuals, consumers and business representatives and support to development of standards.[126]

This programme promotes the **ESTEAM festivals** organised as part of the Digital Education Action Plan. Girls' ESTEAM festivals targets girls aged 8−17, as well as teachers and parents. Women's ESTEAM festivals are focussed on female participation in STEM careers and professional development.[127] The first ESTEAM festivals took place in 2022, and several events have been held

25&orLoanPartYearTo=true&orCountries.region=true&orCountries=true&sectors=5001&orSectors=true.

[121] See https://coebank.org/en/project-financing/ceb-and-investeu/.

[122] See https://coebank.org/en/project-financing/projects-approved-administrative-council/.

[123] https://coebank.org/en/project-financing/projects-approved-administrative-council/education-investments-in-the-city-of-vantaa/.

[124] https://coebank.org/en/project-financing/projects-approved-administrative-council/education-and-childcare-in-nuremberg-phase-ii/.

[125] https://coebank.org/en/project-financing/projects-approved-administrative-council/smart-labs-digitalization-of-the-albanian-education-system/.

[126] For an introduction about the programme, see https://commission.europa.eu/funding-tenders/find-funding/eu-funding-programmes/single-market-programme/overview/background_en.

[127] https://eismea.ec.europa.eu/news/empowering-women-and-girls-through-digital-and-entrepreneurial-competences-esteam-fests-and-2022-03-07_en.

annually, most recently in Brussels and Helsinki in 2025. Online communities support interactions of participants beyond the physical events.[128] According to a recent analysis, approximately 4 400 girls and women have participated in the 18 events. Based on this analysis, a set of lessons learned has been developed. Key recommendations include the use of real-life challenges and role models, and adapting the festivals to the local contexts, involving schools and other local stakeholders such as universities or non-governmental organisations.[129]

In addition, the **European Cooperation in Science and Technology (COST)** programme supports bottom-up networks of researchers. One action funded by the programme addresses the topic “Building on scientific literacy in evolution towards scientifically responsible Europeans (EuroScitizen)”. It brings together different experts working towards improving education related to evolutionary biology.[130]

[128] See https://eismea.ec.europa.eu/esteam-fests-and-communities-girls-and-women_en.

[129] Deloitte and European Innovation Council and SMEs Executive Agency (European Commission), ‘Empowering Girls and Women in Entrepreneurship, Science, and Technology: 10 Lessons Learned from ESTEAM Fests across Europe’ (Publications Office of the European Union, 2025) https://data.europa.eu/doi/10.2826/5221722.

[130] https://www.cost.eu/actions/CA17127/.

5. Synergies with interventions and initiatives relevant for STEM education implemented by other stakeholders active at European level

Besides EU programmes, bottom-up stakeholder initiatives and networks play a key role in advancing STEM education throughout and across Europe. This chapter briefly presents selected initiatives supporting STEM education and summarises their contributions to the development of STEM education. A specific focus is on activities that are organised by STEM stakeholders and are in principle independent from EU activities (though often funded by various EU funding sources), which may complement the initiatives and interventions by the EU.

- The **EU STEM Coalition**[131] is an EU-wide network of national STEM platforms and other organisations which work to strengthen STEM education. The Coalition offers those partners a stable platform to share experiences and good practices. It also helps transmit information from the EU level to members and vice versa. Some of its activities are funded through Erasmus+ and other projects. The activities support various target audiences, notably local/regional authorities, higher education institutions, and indirectly teachers and students. The Coalition promotes work to address challenges related to STEM education in schools. The relevance for EU level policy is notable in terms of data collection and monitoring on STEM education practices across EU Member States, as well as disseminating them to key stakeholders. Politically, the STEM Coalition's role is recognised in the Digital Education Action Plan, which highlights that "new higher education programmes for engineering and information and communications technology based on the interdisciplinary STEAM approach" should build" on the EU STEM Coalition to support the establishment of national STEM platforms and disseminating the results of Erasmus+-funded projects".[132]
- The **European Schoolnet**, an organisation connecting education ministries across Europe, has several roles in supporting STEM education. The organisation is partner in a range of European projects on this topic, and its role is recognised under Action 7 of the European Skills Agenda, with a focus on "dissemination of research results on science education".[133] Through its **Scientix platform**, the organisation provides a steady community of practice on STEM education for teachers and other stakeholders. In addition, European Schoolnet maintains the **STEM Alliance** which extends the network

[131] https://www.stemcoalition.eu/.

[132] https://education.ec.europa.eu/focus-topics/digital-education/action-plan/action-13.

[133] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions European Skills Agenda for sustainable competitiveness, social fairness and resilience (COM(2020) 274 final).

to companies and employers with an interest in STEM education. Through its activities, the STEM Alliance enables the creation of STEM education networks and the implementation of studies, evaluations, data collection and monitoring of STEM education.

- The **European Science Education Research Association** (ESERA) supports research into science education is. The members of ESERA, academic researchers on science education, contribute to the studies e.g. on effective learning and teaching strategies, evaluations, data collection and monitoring. The network organises regular conferences and summer schools and hosts several special interest groups on research topics as well as research methods.[134]
- The **Association for Teacher Education in Europe (ATEE)** connects individuals and organisations (such as HEIs) active in teacher education. ATEE hosts an R&D community on science and mathematics education, providing a link between research into teaching education and the education of pre-service and in-service teachers.[135]
- **Science on Stage** is a pan-European community of science teachers active in 35 countries. The initiative aims to increase teachers' capacity to teach science subjects. It hosts a database of teaching materials and supports regular teacher training events such as regular festivals on science education.[136]
- The **European Space Education Resource Office (ESERO)** is hosted by the European Space Agency (ESA) that supports science education in 22 ESA Member States. The initiative provides teacher support and classroom resources. ESERO actions are implemented through national projects together with local science education centres, supporting informal learning, promoting STEM career aspiration, and providing support networks for STEM educators.[137]
- The **International Centre for STEM Education (ICSE)** hosted by the University of Education Freiburg in Germany is a research centre which "focuses on practice-related research and its transfer into practice".[138] ICSE works on the international and national levels in partnership with other universities and organisations. The centre hosts international conferences and events to connect stakeholders and it participates in several EU-level projects.[139]

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[134] https://www.esera.org/.

[135] See https://atee.education/rd-communities/science-and-mathematics/.

[136] https://www.science-on-stage.eu/.

[137] https://www.esa.int/Education/Teachers_Corner/European_Space_Education_Resource_Office.

[138] See https://icse.eu/about-us/what-is-icse/.

[139] See https://icse.eu/international-projects/.

- Supporting informal learning is part of the mission of the **European Network of Science Centres and Science Museum (ecsite)**. Ecsite has a membership of 301 organisations, mainly science centres and museums, but also companies, research organisations and science festivals.[140] The organisations promotes knowledge exchange on science education, for example through interest groups on research and evaluation as well as diversity, and maintains a resource database for science educators.[141] Through participation in EU-funded projects,[142] regular events and awards, Ecsite contributes broadly to capacity building in informal science education in Europe.

Overall, these initiatives offer different benefits and create synergies with the European STEM education landscape. They provide structure and spaces for the engagement of key stakeholders; they host communities of practice and make resources available to wider audiences. The EU STEM Coalition, Scientix and Ecsite provide crucial links between the EU level and the national, regional or local level and offer feedback channels into EU-level and national policy making from these communities. Others, such as ESERA, ATEE and ICSE provide research insights in science education, ensuring that science education, including teacher education, is based on latest evidence. In addition, several groups promote interest in STEM fields, such as Science on Stage, with a focus on engaging science teachers, and Ecsite, which brings together stakeholders in informal science education. The contribution of these initiatives is a critical factor in shaping STEM education, often taking place synergistically with EU policies and programmes.

[140] https://www.ecsite.eu/.

[141] https://www.ecsite.eu/activities-and-services/resources.

[142] See https://ecsite.wildapricot.org/EU-Projects/.

6. Gaps, challenges and needs in STEM education policy

As highlighted through the analysis above, the EU policy initiatives and programmes support a wide spectrum of activities in STEM education. Nonetheless, the analysis also suggests potential gaps relating to the scope as well as monitoring and evaluation of these activities. From these gaps, several needs have been identified, relating to improved definitions, improved monitoring and evaluations, strengthened EU-level governance of STEM education and better communication with stakeholders

6.1. Gaps and challenges

Monitoring

A key challenge is the collection of reliable data about EU interventions and their effectiveness. There is currently no consistent monitoring of STEM-related interventions across the range of EU programmes. Erasmus+ stands out as the only exception, with a dedicated tag which records STEM-related projects available on the Erasmus+ platform. No such tagging (and thus systematic reporting) exists for the variety of projects supported by Horizon Europe, ESIFs, as well as the RRF programme and financial instruments such as InvestEU.

Similar constraints persist at the level of individual projects. While projects across different funding programmes (Erasmus+, ESF+ etc.) typically report the number of direct beneficiaries of the projects (e.g., students, teachers, and activities implemented), their effects on achievement of students in STEM fields are not monitored. Hence, EU-funded projects do not generate consistent data about the effects STEM interventions on student achievements. The screening of Erasmus+ or Horizon Europe projects did not identify actions which seek to address this gap.

Monitoring also relates to the targets of EU policy in supporting STEM education. At school level, a key target is to reduce the share of low-achieving 15-year-olds in science and mathematics, according to the EEA monitoring framework. [143] There have been, so far, no targets foreseen for younger pupils, e.g., based on TIMSS or other data. In addition, the monitoring indicator is limited to science and mathematics and does not reflect the tendency to employ a broader definition of STEM education, which goes beyond individual subjects, including integrated STEM and STEAM approaches.

[143] Council Resolution on a strategic framework for European cooperation in education and training towards the European Education Area and beyond (2021-2030) (2021/C 66/01).

These gaps in relation to STEM-related monitoring limit the understanding how policies and interventions really make a difference in supporting STEM education and hinder the identification of evidence-based good practices at programme level.[144]

Coverage of STEM education policy dimensions across programmes

Our analysis of the EU programmes supporting STEM education shows a heterogenous coverage of policy aspects, indicating several gaps in the portfolio. The Erasmus+ good practice projects, analysed in more detail in a separate report, largely address STEM curricula and pedagogy, as well as all formal, non-formal and informal learning. They also frequently promote the professional development of teachers, but less so in terms of systematic reforms of teacher careers. Erasmus+ projects support interventions in STEM education governance (e.g., whole-school approaches) although again rarely in the form of systematic reforms with a reach beyond individual schools. Erasmus+ rarely supports research into STEM education in schools, as it occurred only in two projects in the Erasmus+ good practice inventory. Investment in infrastructure is out of scope for Erasmus+ funding.

The research framework programmes (Horizon 2020, Horizon Europe) have a broad scope and showcase a variety of interventions related to STEM education. Through a set of coordination and support actions (CSAs), resources are invested in policy action supporting STEM curricula reforms and STE(A)M policies. Non-formal and informal STEM education opportunities are promoted through European Researchers' Nights and Researchers at Schools projects. In addition, based on the objective in the European Research Area to foster women's participation in STEM careers, a range of projects addresses gender-related aspects. The breadth of different topics and calls within Horizon Europe has led to projects addressing student assessment, competence frameworks, evaluation, school leadership, funding and governance, also in individual STEM subjects. Such projects also originate from bottom-up calls under Pillar 1.

ESIF (ERDF, ESF+), the RRF and InvestEU can disburse funding for improving (physical) education infrastructure. The results obtained through the keyword search of the Kohesio database indicate that there is likely a contribution to STEM education initiatives and infrastructure. Yet, a detailed investigation of the ESIF projects on STEM education could not be conducted as part of this study. Further research into the ESF+ and other structural funds could be advisable.

The analysis also identifies gaps across all EU programmes. Several key issues are not addressed, such as research into the effectiveness of STEM education, but also campaigns for teacher recruitment and actions to attract and retain professionals in STEM teaching careers (e.g., financial support, different training

[144] The Erasmus+ analytical report developed in parallel details project-level good practices and lessons learned.

and career tracks) are frequently absent. A similar gap exists for the transitions between school levels.

Education levels and transitions

The policy and programme mix covers all levels of education. Erasmus+ projects target all levels from pre-primary to tertiary education, however with a relative concentration of interventions at the secondary level. While the primary level is served as well, pre-primary education is the least represented under Erasmus+. Generally, transitions between education levels appear to be the subject of projects only on a case-by-case basis. The newly launched Teacher Academies were found to have a more overarching focus and should be studied for their contribution not just on teacher professional development in STEM, but also on challenges related to the transition between education levels.

Projects funded under Horizon Europe tend to concentrate on secondary to tertiary level education, with a focus on careers in STEM fields and reducing gender gaps. This includes the MSCA CITIZEN programme in Horizon Europe and the ESTEAM actions supported by the EIT. Initiatives such as Girls Go Circular and selected national RRF programmes (e.g., in Italy) cover this aspect too.

Structure of education systems

The degree of structural change which EU-projects without additional reforms can bring about in education systems is limited. For example, primary and secondary schools have more limited resources and capacities to engage in European-level projects and to adopt EU-level results, compared to higher education institutions. Early childhood education and care providers have even fewer resources available. This is also related to the limited autonomy in schools compared to higher education institutions and the confines of usually pre-defined curricula at primary and secondary level. Project based interventions (especially in the form of individual mobility projects or school-level partnerships) address challenges in STEM education in schools but are at risk of being confined to the local or institutional level without efforts to disseminate them and to scale up good practices. The uptake and dissemination of results on the other hand is also hampered by limited availability of resources after the end of a project.

Only some EU-level programmes, such as ESIF and RRF, support reforms and interventions at regional or national level. They have the potential to improve basic school and lab infrastructure or working conditions of teaching staff, which is largely out of scope of the Erasmus+ and Horizon Europe programme. To understand the impact of those programmes that already address STEM education, a better monitoring and evaluation approach may be beneficial.

Challenges related to coordination have also been identified by the Draghi Report which points out structural aspects relating to policy making, namely a “lack of willingness among Member States […] to go beyond soft forms of coordination”

as well as “a lack of systematic evaluations, preventing learning about the effectiveness of alternative strategies and refining of interventions”,[145] which mirrors the findings supported by this analysis.

The Draghi Report also diagnoses demand-side factors hampering EU-level efforts. Notably, the report finds an “insufficient involvement of industry in developing job-specific skills” and an underutilisation of “skills intelligence”, meaning reliable, granular and comparable information on skills needs”.[146] In other words, the understanding of which STEM competences are needed by employers, as well as which ones are taught effectively and in which way, is not sufficiently available at EU level.

Societal interest in STEM fields

Societal factors such as the visibility of STEM professions and careers are often crucial to motivate young people to choose STEM studies and careers. Various EU level actions aim to address this gap, including in Erasmus+ and Horizon Europe projects, but also initiatives such as ESTEAM seek to nurture interest in STEM fields.

Motivating teachers to take up STEM teaching roles, on the other hand, is rarely a part of the analysed initiatives and programmes. Aside from Erasmus+ projects which support teacher professional development, career factors for STEM teachers such as pay, working conditions, career paths, workload, or recognition of the teaching profession are not reflected in these actions.

Programming and coordination

Overall, the spectrum of EU programmes offers a variety of funding and support mechanisms for different stakeholders and types of activities, ranging from individual mobility programmes, school cooperation and strategic partnerships, research projects, policy coordination and support actions, to outreach and communication activities, as well as support for school infrastructure. There are also innovations in the programming mix, such as the Erasmus+ Teacher Academies, trialling new approaches and expanding teacher professional development. Our analysis has found that all these instruments are being used to promote STEM education.

Parallel to the challenge of monitoring and evaluating ongoing interventions, this broad range of programmes also poses a challenge to the coordination and transfers of good practices across initiatives. For instance, policy related projects under Horizon Europe (e.g., RoadSteamer, SEER, STEAM Europe) and Erasmus+ provide crucial analysis, networks and good practice to foster STEM

[145] The future of European competitiveness Part A | A competitiveness strategy for Europe”, 2024, p. 37.

[146] Ibid.

education in Europe. Lessons learnt from such projects must be disseminated to relevant policy makers, stakeholders and beneficiaries of other projects under Erasmus+, Horizon Europe, ESIFs, RRF, InvestEU, and others, and sustained were relevant.

6.2. Needs

The identified gaps and challenges allow an identification of EU policy needs to improve STEM education. Pokropek proposes four high-level objectives for EU policy, namely to “Increase student interest, participation, and achievement in STEM; expand student access to effective STEM teachers and leaders; Reduce STEM talent and skills gaps; Build community awareness and support for STEM”.[147]

Against the backdrop of these high-level objectives of STEM education policy, the analysis points to several aspects which needs to be addressed by policy.

Clearer STEM definitions

Using a consistent definition for STEM education would help aligning interventions and programmes and designing more robust monitoring systems. Besides the definitions provided in the 2018 Council Recommendation on key competences for lifelong learning, other EU-level documents use extensions such as STEAM or STEAME. Integrated STEM or STEAM approaches are presented as methods to increase interest in STEM fields and to improve achievements in STEM education. This situation results in a mix of relevant definitions being used in EU-level documents and programmes, meaning that in practice, “different concepts of STEM education exist in parallel with different ideas about best educational practices.” [148]

While the current situation offers flexibility for stakeholders to implement projects tailored to the local context, it poses challenges for the definition of specific targets and for the monitoring and evaluation of STEM projects. This is noteworthy since a key policy objective is to increase the number of STEM-field graduates in tertiary education, which can be interpreted both through the lens of integrated STEM fields or through the lens of individual disciplines. The recent policy brief on STEM education definitions, including integrated STEM and STEAM education, represents a crucial step towards a more streamlined approach across EU policy.[149]

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[147] See also Pokropek, 2024, p. 5.

[148] Pokropek, 2024, p. 5.

[149] Ortolani, Giovanna Mazzeo, ‘STEM and STEAM Education, and Disciplinary Integration: A Guide to Informed Policy Action’, 2025, https://publications.jrc.ec.europa.eu/repository/handle/JRC141438.

Improved monitoring and evaluation

In parallel with a consistent definition, efforts should be made to streamline monitoring and evaluation methods covering STEM interventions. Improved monitoring and evaluation would empower evidence-based policies and interventions.

Improvements are necessary for both monitoring of EU level interventions as well as evaluation of the effectiveness of STEM and STEAM education approaches. Large-scale investments are being funnelled into STEM education through the EU funding programmes, but projects are not systematically tagged for STEM education across programmes. This fact complicates monitoring efforts and limits the opportunities for policy evaluation and effective learning from good practices, as well as coordination across programmes. Improving the monitoring of programmes and projects should go hand in hand with the evaluation of the effectiveness of interventions. As the Draghi report points out, "one of the most important factors for developing STEM education is increasing the number of well-designed studies on the effectiveness of STEM and STEAM education, particularly in the European context, where there is a significant lack of such research."[150] Thus, better designed studies yielding insights into which interventions are effective are needed.[151] This could include experimental and longitudinal designs, relying on clearly defined outcomes and measuring tools. According to the Draghi Report, monitoring could be tied with funding requirements, suggesting that "to improve the efficiency and scalability of skills investments, the disbursement of EU funds should be coupled with stricter accountability and impact evaluation."[152]

In relation to improving monitoring, the question of a coherent definition of STEM and STEAM education concepts arises again. As highlighted above, the current EEA monitoring framework only includes targets for the performance of 15-year-olds in mathematics and science, which does not reflect the broader understanding of STEM education.[153] One possibility could be to update monitoring instruments with additional indicators such as the PISA Creative Thinking Assessment.[154] The STEM skills monitoring mechanisms proposed under the STEM Education Strategic Plan, STEM skills intelligence and the future European Skills Intelligence Observatory, also making use of the European

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[150] Ibid.

[151] Ibid.

[152] The future of European competitiveness Part A | A competitiveness strategy for Europe", 2024, p. 37.

[153] ORTOLANI Giovanna Mazzeo, 'STEM and STEAM Education, and Disciplinary Integration: A Guide to Informed Policy Action', 2025, https://publications.jrc.ec.europa.eu/repository/handle/JRC141438.

[154] Pavlos Koulouris, Vasileios Liakopoulos, and Petros Stergiopoulos, 'Deliverable 3.2 Analysis of Policy Gaps for STEAM' (Road-STEAMer 2024) https://www.road-steamer.eu/wp-content/uploads/2024/08/D3.2-Analysis-of-Policy-Gaps-for-STEAM.pdf.

Semester reporting process for Member States may, may be crucial in addressing this gap at EU level.[155]

Strengthened governance

Improved coordination of the large portfolio of EU programmes could reinforce evidence-based STEM education in Europe. Despite the prominence given to STEM competences in various policy initiatives, the absence of this topic in key EEA bodies such as the strategic framework working groups could limit the opportunities for policy learning and design of new interventions. A stronger institutional anchoring of STEM education should thus be a consideration for future strategies.[156]

Improved governance relates to the recommendation of the Draghi Report "to become more responsive to the changing skill needs and skill gaps identified by the skills intelligence. Curricula need to be revised accordingly, also involving employers and other stakeholders."[157] Such an ambition needs an effective governance mechanism which is inclusive and captures all relevant stakeholders needed to effectively improve STEM education and meet policy targets. New bodies created under the Union of Skills initiative and the STEM Education Strategic Plan, such as the European Skills High-Level Board and the STEM Executive Panel, could play a key role in filling this gap.

Improved communication

Interviewees consulted during this study highlighted the potential of better communicating the utility of various funding programmes towards Member States and schools to improve STEM education. For example, while Erasmus+ or ESF+ are widely known, relevant stakeholder such as education policy makers on regional and national level need to be aware of the opportunities offered by programmes such as RRF, InvestEU, or the TSI to use them for STEM education interventions.

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[155] See https://education.ec.europa.eu/sites/default/files/2025-03/STEM_Education_Strategic_Plan_COM_2025_89_1_EN_0.pdf.

[156] This need depends on better knowledge of the project portfolio across programmes (facilitated, for instance, by flagging projects or more regular analyses of the portfolio) and is therefore closely related to improvements in monitoring of Erasmus+ and other EU programmes.

[157] The future of European competitiveness Part A | A competitiveness strategy for Europe", 2024, p. 37.

7. EU policy mix and STEM competence frameworks

7.1. Role of the EU policy mix and potential for synergies between different instruments

One of the key findings emerging from this study is **the fragmented yet potentially complementary landscape of EU funding for STEM education**. While numerous programmes address aspects of STEM teaching and learning, from transnational exchange to infrastructure development, **a systemic approach to exploiting synergies between them remains underdeveloped**. Combining different funding instruments to support the full range of needs, such as infrastructure, digital tools, teacher development, and educational content, can play a decisive role in enabling effective STEM education at the local level. This is especially relevant in the context of schools and communities seeking to modernise their educational offerings while ensuring inclusion and sustainability.

The analysis of over 42,000 projects funded through the European Structural and Investment Funds (ESIF), notably ESF+ and ERDF, highlights the breadth of STEM-related investment across Member States. These projects have contributed significantly to infrastructure development, provision of laboratory and digital equipment, and capacity-building for teachers. For example, Czechia alone implemented over 10,000 ESIF-supported STEM-related initiatives, while Poland, Hungary, and Italy also demonstrated substantial uptake. Despite this, the variation across Member States in the number and type of projects suggests a need for better strategic alignment and knowledge-sharing mechanisms to scale good practices.

In contrast, Erasmus+ plays a key role in fostering innovation in teaching and learning through school partnerships, teacher exchanges, and curriculum development, particularly promoting interdisciplinary and STEAM approaches. The Erasmus+ programme emphasises motivation and inclusion −especially of girls and underrepresented groups in STEM −and promotes cross-border cooperation. However, it does not finance large-scale physical infrastructure or systemic reforms. Therefore, to meet the complex demands of STEM education −ranging from digital transformation and inclusive pedagogy to equitable access and local relevance −a coordinated use of Erasmus+ alongside ESIF, Horizon Europe, and other instruments becomes essential.

Horizon Europe and its predecessor Horizon 2020 further enrich this ecosystem by supporting research and innovation in STEM education. As detailed in the report, over 100 projects were identified under these programmes, covering areas such as integrated STEM/STEAM teaching (e.g. ROAD-STEAMer, STEAMbrace), gender equality (e.g. Shemakes.eu, STREAM IT), and community engagement (e.g. Make it Open, PULCHRA). These projects often produce scalable models and toolkits that can inform national and regional strategies,

especially when complemented by the capacity and investment resources of ESIF or the policy tools of the Recovery and Resilience Facility (RRF).

The Digital Europe Programme (DEP) has targeted digital skills, particularly among young girls, with actions such as “Boosting Digital Skills of young pupils, in particular girls,” which directly address the gender gap in digital and STEM education. The Recovery and Resilience Facility (RRF) has enabled Member States to invest in education reforms and infrastructure. As identified in national RRF plans reviewed in this study, STEM is often embedded within broader digital and green transition strategies − creating another opportunity for alignment with Erasmus+ initiatives.

At the policy level, this synergy aligns with the broader objectives outlined in the European Education Area (EEA), the European Skills Agenda, and the Digital Education Action Plan, as well as the Union of Skills and the Action Plan on Basic Skills, all of which promote integrated approaches to skills development and educational transformation. Yet, the study finds that the synergies across programmes often remain implicit or coincidental, rather than being the result of a deliberate, strategic policy design. Interviewees also highlighted that technical and administrative complexities, such as differing eligibility rules, timelines, and monitoring frameworks, pose practical barriers to integrated implementation. There is limited structured guidance or incentives for combining funds across these instruments at the implementation level. National authorities and stakeholders often struggle with complex regulatory environments, differing eligibility criteria, and administrative burdens associated with multi-fund programming. A key challenge is thus to orchestrate this portfolio of EU programmes and to ensure that good practices are transferred across these instruments, in conjunction with a systematic approach to monitoring and evaluation.

To address this, the report suggests several ways forward:

- **Strategic coordination**. Consider developing a framework for combining EU funds in STEM education strategies, ensuring coherence between national operational programmes (e.g. ESIF), research and innovation efforts (e.g. Horizon Europe), and educational cooperation (e.g. Erasmus+).
- **Targeted guidance and support**. The European Commission could provide practical guidance and technical assistance −potentially via the Technical Support Instrument (TSI) −to support Member States and local actors in designing and managing multi-fund initiatives to specifically support STEM education in schools.
- **Thematic calls and joint programming**. Consider launching pilot actions or joint funding calls that explicitly invite or require coordination between programmes, particularly for themes such as school infrastructure modernisation, teacher training, and inclusive STEM education.

By fostering stronger synergies among EU programmes and embedding them in a strategic policy mix, the EU can enable a more holistic and sustainable transformation of STEM education. This integrated approach is not only critical for addressing the current skills gap, but also for supporting inclusive and place-based innovation ecosystems that connect schools, communities, and industries in the context of the twin green and digital transitions.

7.2. Role of STEM competence frameworks

Competence frameworks are a tool used by education policy makers and stakeholders to define sets of relevant competences for a given sector or profile. Usually, competences entail knowledge, skills, and attitudes to be acquired during education and training programmes. The Council Recommendation of 22 May 2018 on key competences for lifelong learning provides the core definitions for competences and their relation to knowledge, skills, and attitudes (Table 22) used in subsequent EU initiatives. The European Qualifications Framework (EQF) applies a similar approach but uses the term ‘responsibility and autonomy” instead of ‘attitudes’ (Table 23). Defining a STEM competence framework based on these existing frameworks is critical for aligning STEM interventions with EU-level initiatives such as the European Classification of Skills, Competences and Occupations (ESCO)[158] and thus EU-level skills intelligence and facilitates curriculum development.

[158] https://esco.ec.europa.eu/en.

Table 22 Definition of competences in the Council Recommendation of 22 May 2018 on key competences for lifelong learning

Competences are defined as a combination of knowledge, skills and attitudes, where: a. knowledge is composed of the facts and figures, concepts, ideas and theories which are already established and support the understanding of a certain area or subject; b. skills are defined as the ability and capacity to carry out processes and use the existing knowledge to achieve results; c. attitudes describe the disposition and mind-sets to act or react to ideas, persons or situations.

Source: Council Recommendation on key competences for lifelong learning[159]

Table 23 Terminology related to competences in the European Qualifications Framework

'competence' means the proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development **'**knowledge' means the outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study. In the context of the EQF, knowledge is described as theoretical and/or factual; **'**skills' means the ability to apply knowledge and use know-how to complete tasks and solve problems. In the context of the EQF, skills are described as cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments); **'**responsibility and autonomy' means the ability of the learner to apply knowledge and skills autonomously and with responsibility;

Source: Council Recommendation on the European Qualifications Framework for lifelong learning[160]

As highlighted in Chapter 4.2, the Council Recommendation of 22 May 2018 on key competences for lifelong learning defines knowledge, skills and attitudes in

[159] Council Recommendation of 22 May 2018 on key competences for lifelong learning ((2018/C 189/01), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=oj:JOC_2018_189_R_0001

[160] Council Recommendation of 22 May 2017 on the European Qualifications Framework for lifelong learning and repealing the recommendation of the European Parliament and of the Council of 23 April 2008 on the establishment of the European Qualifications Framework for lifelong learning (2017/C 189/03), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=oj:JOC_2017_189_R_0003

mathematics, science, technology and engineering as one of the eight key competences for lifelong learning.[161] Based on this seminal framework, European initiatives have developed competence frameworks for digital competences of citizens (DigComp),[162] digital competences for educators (DigCompEdu) [163], as well sustainability (GreenComp),[164] entrepreneurship (EntrComp)[165], and the acquisition of personal, social, and learning to learn competences (LifeComp).[166]

Competence frameworks in STEM education

Several EU funded projects have also engaged in developing or refining competence frameworks, or elements thereof, for specific target groups in STEM education. This concerns the competences to be acquired by students through school education, as well as the competences required from teachers to teach (integrated) STEM courses.

The **STEMkey** project has built on the Council Recommendation of 22 May 2018 on key competences for lifelong learning and discussed it further in the context of STEM teacher training. It distinguishes between mathematical competences, and science, technology, and engineering competences, as well as digital competences. Based on this separation, the project has provided examples of educational practices supportive of STEM education and discussed transversal skills such as critical thinking, creativity and innovation, as well as assessment methods for STEM learning.[167]

The **ATS STEM** project has created the "ATS STEM Conceptual Framework" which intends to support integrated STEM learning outcomes.[168] This framework includes information on the following dimensions:

- Core STEM competences

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[161] Directorate-General for Education, Youth, Sport and Culture (European Commission), *Key Competences for Lifelong Learning* (Publications Office of the European Union, 2019), https://data.europa.eu/doi/10.2766/569540.

[162] DigComp https://joint-research-centre.ec.europa.eu/scientific-activities-z/education-and-training/digital-transformation-education/digital-competence-framework-citizens-digcomp_en .

[163] DigCompEdu, https://joint-research-centre.ec.europa.eu/digcompedu/digcompedu-framework_en.

[164] GreenComp, https://publications.jrc.ec.europa.eu/repository/handle/JRC128040

[165] EntrComp, https://joint-research-centre.ec.europa.eu/entrecomp-entrepreneurship-competence-framework_en

[166] LifeComp, https://joint-research-centre.ec.europa.eu/lifecomp_en.

[167] Matija Bašić and others, 'Developing Key Competences in STEM Education' (Teaching standard STEM topics with a key competence approach (STEMkey) 2023),https://bwsyncandshare.kit.edu/s/qfJKFeSf7nE2eoy.

[168] Deirdre Butler and others, 'Towards the ATS STEM Conceptual Framework' (Zenodo 2020),https://zenodo.org/record/3673559.

- STEM learning design principles
- Key features of formative assessment tasks
- Key features of digital assessment tools

The ATS STEM definition of key competences followed a literature review and synthesis of relevant documents. This analysis resulted in a set of core STEM competences for students:

- Problem-solving
- Innovation and creativity
- Communication
- Critical thinking
- Meta-cognitive skills
- Collaboration
- Self-regulation
- Disciplinary competences

The framework also supports teachers by providing suggestions for learning design principles. These principles support an integrated STEM approach by emphasising "problem solving design and approaches, disciplinary and interdisciplinary knowledge, engineering design and practices, appropriate use and application of technology, use of real-world contexts, [and] appropriate pedagogical practices".[169]

As such, the ATS STEM framework is intended to foster the integration of different STEM subjects and new teaching methods. As the framework highlights, this follows the recognition that "integrated STEM requires the application of knowledge and practices from various STEM disciplines to solve complex and transdisciplinary problems".[170] Such integration is useful for developing skills and knowledge "both within the disciplines and across disciplines. Students' knowledge in individual disciplines must be supported."[171] Knowledge in these individual disciplines is seen as critical for more integrated approaches since "connecting ideas across disciplines is challenging when students have little or no understanding of the relevant ideas in the individual disciplines".[172] While not providing detailed suggestions for competences under the heading 'disciplinary competences', the ATS STEM report refers to definitions based on the 2018

[169] Ibid., p. 17.

[170] Ibid., p. 18.

[171] Ibid., p. 18.

[172] Ibid., p. 18.

Council Recommendation on key competences for lifelong learning, as well as their integration through real-life challenges in the classroom.

Another project, **CHOICE,** suggests key interventions in STEM curricula to improve STEM teaching, including the promotion of transversal competences for both students and teachers. The interventions do not form a comprehensive competence framework but provide "macro areas" for educational reform. These macro areas include: Connecting STEM and art; experiential projects; stronger focus on language in science and math lessons; technology in social sciences; and sports in STEM education.[173] The document provides a summary of competences required in these intervention areas, learning objectives, and methods to apply them in a classroom setting.

Moving further towards a STEAM approach, the **STEAMonEDU** project has developed a competence framework (STEAMCompEdu) targeted at STEAM teachers in school education. This competence framework, validated through a survey with 300 participants, distinguishes between five high-level dimensions (titled 'perspectives') to teach integrated STEAM competences (see Table 24).[174]

Table 24: Structure of STEAMCompEdu

Perspective	Areas	Number of competences ("statements")
1. Educator as teacher/transmitter/implementer of the educational process	1.1 Pedagogy	3
	1.2 Content knowledge	2
	1.3 Education	3
	1.4 Content and tools	2
	1.5 Feedback and assessment	3
	1.6 Learner empowerment	3
2. Educator as learning facilitator and creator of curricula, designing and producing educational content	2.1 Course (curriculum/activity) design	3
	2.2 Curriculum development	2
	2.3 Learner development	2
3. Educator as supporter and manager coordinating procedures and outputs	3.1 Educational Procedure Management	2
	3.2 Resource management	3

[173] Cecilie La Monica Grus, 'CHOICE – increasing young people's motivation to choose STEM careers through an innovative cross-disciplinary STE(A)M approach to education' (2022) https://library.iated.org/view/LAMONICAGRUS2022CHO.

[174] Natalia Spyropoulou and Achilles Kameas, 'STE(A)M Educator Competence Framework and Profile' (2021), https://steamonedu.eu/wp-content/uploads/2022/01/D8.2-STEAM-educator-competence-framework-and-profile.pdf.

Perspective	Areas	Number of competences ("statements")
4. Educator as community member networking with the educational environment	4.1 Community building	3
	4.2 Application of policies	2
5. Educator as professional developing and upskilling	5.1 Transferable skills	2
	5.2 Digital skills	3
	5.3 Professional development	3

Source: Spyropoulou and Kameas (2024)[175]

The result of the STEAMonEDU project is a formal competence framework which comprises in-depth information based on ESCO educator profiles. It includes essential knowledges, skills, and competences, as well as optional knowledge, skills, and competences for teachers at pre-school, primary, and secondary school level.[176] In addition, it also addresses the competences required for teaching information and communication technologies.

The **SpicE Academy** project**,** one of the recently funded Teacher Academies, has built on these results and developed a "STEAM Educator Competence Framework and profile(s) for Special Needs".[177] Here, the focus is on a previously underserved target group, that is educators and teachers working with students with mild disabilities. This framework extends STEAMCompEdu with special education elements across five dimensions (**Table** 25).

Table 25 Dimensions of the STEAM Educator Competence Framework and profile(s) for Special Needs

Dimensions of the STEAM Educator Competence Framework and profile(s) for Special Needs
• **„Educator as a teacher-trainer-tutor**": includes all the required educators' competences during the implementation of an educational procedure.
• "**Educator as a learning designer and creator**": includes all the required educators' competences related to planning, preparing and developing of STE(A)M related learning processes.
• "**Educator as an orchestrator**": includes all the required educators' competences related to managing and orchestrating resources and participants.

[175] Spyropoulou N and Kameas A, 'Augmenting the Impact of STEAM Education by Developing a Competence Framework for STEAM Educators for Effective Teaching and Learning' (2024) 14 Education Sciences 25 https://www.mdpi.com/2227-7102/14/1/25

[176] Essential knowledge, skills, and competences refer to those "usually relevant for an occupation, independent of the work context, employer, or country" whereas optional knowledge, skills, and competences mean those "depending on the employer, working context tor country".

[177] Sakellaropoulou G, Spyropoulou N and Kameas A, 'DEV2.2 STEAM Educator Competence Framework and Profile(s) for Special Needs' (Special Education STEAM Academy (SpicE) 2023), https://spiceacademy.eu/wp-content/uploads/2023/10/D2.2-final.pdf.

Dimensions of the STEAM Educator Competence Framework and profile(s) for Special Needs
• "**Educator as a community member**": includes all the required educators' competences related to interacting and engaging with different communities and to applying policies.
• "**Educator as a professional**": includes all the required educators' competences related to their professional development along with the transferable and digital skills needed during STE(A)M-related activities.

Source: Sakellaropoulou, Spyropoulou, and Kameas *(2023)*178

Based on the framework, SpicE Academy proposes various occupational profiles, again aligned with ESCO definitions, including STEAM learning support teacher and STEAM special education primary school teachers.

Value of competence frameworks for STEM education

Competence frameworks have a value both for supporting teachers and for designing education programmes for learners. They also aid standardisation, which is critical for improving skills intelligence.

- For teachers, such frameworks typically support "self-assessment and professional development in various areas and disciplines."[179] Through the systematic mapping, they "detail the competences that an educator should have in a specific educational context, including the knowledge and skills that are aligned with such abilities."[180] Thus, they support the design of teacher professional development both at pre-service and in-service stages, as well as for teachers at different levels of school education including educators in ECEC.
- Competence frameworks are also instrumental in designing education programmes. By providing a structured outline of the necessary skills and knowledge required in various occupations or sectors, they ensure alignment with industry standards and labour market needs. They facilitate the establishment of clear learning outcomes and aid in quality assurance. As a result, competence frameworks ensure that students are equipped with the skills needed for successful careers.
- In addition, developing a standardised and clear definitions of skills and occupations across various sectors in the ESCO classification would also be essential for effective skills monitoring, offering. Alignment with ESCO ensures consistency and comparability, facilitating data collection and analysis, enabling informed decision-making and policy development to address current and future skills needs.

[178] Ibid.

[179] Ibid., p. 26-28.

[180] Ibid.

During the interviews conducted for this study, the role of competence frameworks was largely positively assessed, as well as the notion of an EU competence framework for STEM. Nonetheless, interviewees also asked questions related to the scope of an EU level STEM competence framework. This includes the specific target group (e.g. teachers vs. students) as well as the question how broad the scope should be, e.g. the extent to which disciplinary competences should be described in a STEM competence framework, or whether a STEM competence framework should concentrate on the integrated competences acquired through STEM education. The frameworks outlined in this section all focus on the transversal skills that cut across competences in individual subjects, both for teachers and students. Therefore, alignment with existing disciplinary competence frameworks should be a point of attention when developing an EU framework for STEM competences.

8. Conclusions

The analysis presented in this report shows a wide selection of EU initiatives and funding programmes supporting STEM education.

Looking at EU policy initiatives, several attempts have been made to counter STEM education challenges, among them improving achievement in mathematics and science following stagnating and decreasing PISA results. Key initiatives include the European Education Area and the European Skills Agenda, and recently the Union of Skills and the STEM Education Strategic Plan. The promotion of gender and diversity in STEM fields, especially in higher education, research and innovation, is also an objective of the European Research Area.

Across these initiatives, there is a trend to conceptualise STEM not through the individual subjects but through the lens of integrated STEM and STEAM education. Some recent policy initiatives appear to see STEAM approaches as a means to foster interest and motivation in STEM fields. However, beyond the Council Recommendation of 22 May 2018 on key competences for lifelong learning, which include definitions of STEM competences, there is no EU-level definition of STEAM competences apart from short descriptions and references in different policy documents. The 2025 policy brief tries to systematise the discussions around the definitions and concepts such as STEM, integrated STEM and STEAM education. It highlights the integration of STEM disciplines with arts, social sciences and humanities paired with innovative learning and teaching approaches and transversal skills.[181] However, the policy brief does not yet define specific knowledge, skills and attitudes for integrated STEM or STEAM education, beyond the definitions provided in the Council Recommendation of 22 May 2018 on key competences for lifelong learning.

Across EU programmes, identifying STEM-related projects and their effects remains a challenge. While the Erasmus+ Projects Results Platform offers a flagging mechanism for STEM-focused actions, project information for other programmes is more scattered and time-consuming to process and analyse. This complicates the monitoring of the overall European programme portfolio related to STEM education. Such challenges also exist for the systematic and long-term monitoring of the effects of STEM-related interventions on their beneficiaries, that is students and/or teachers.

European networks are very active in STEM education. They convene education-system stakeholders, such as ministries of education, schools, teachers, non-formal learning providers, higher education institutions for teacher education, and national STEM platforms. These offer various benefits to the STEM education

[181] Mazzeo OG, 'STEM and STEAM Education, and Disciplinary Integration: A Guide to Informed Policy Action' (2025). https://publications.jrc.ec.europa.eu/repository/handle/JRC141438.

landscape in Europe by offering structure and spaces for the engagement of key stakeholders, and by hosting communities of practice. They create crucial links between different levels, e.g. while disseminating EU level insights and experiences to the regional or local stage. In return, they also organise feedback into EU and national policy from these communities.

The analysis shows several challenges and gaps related to the policy mix at EU level. This includes the lack of a consistent monitoring and evaluation as a foundation for better programming and coordination across instruments. Concerning the spectrum of activities funded by EU programmes, a wide range of issues are indeed covered. However, gaps persist in addressing concerning transitions between education levels, as well as insufficient research into STEM interventions and their effectiveness. In addition, EU programmes supporting education operate in a system which is a Member State competence. Therefore, ensuring that lessons learned from, especially those derived from EU projects, are being translated into national, regional or local policy and supported with adequate funding is an ongoing challenge, not only for the STEM education sector. Similar can be said for the attractiveness of STEM career. The appeal of the sector to students, including girls, is a societal challenge that cannot be solely solved by STEM education interventions.

Against these gaps and challenges, the identified needs point towards more consistent definitions of STEM education, for example acknowledging the growing attention given to STEAM. This is linked with the possibility to establish an EU competence framework for STEM education. Such a tool was welcomed by interviewed stakeholders, with only the caveat that the exact scope should be well-defined to support students and teachers. Finally, the analysis points to the need of improving the monitoring at programme and project level, as well as the evaluation of actual effects of interventions in the long-term, to permit evidence-based policy, as well as governance approaches that allow an orchestration across EU funding programmes.

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10. Annex I TIMMS data

TIMSS 4th grade (SCIENCE)					
Country	2007	2011	2015	2019	2023
Austria	526	532		522	
Belgium		509	512	501	488
Bulgaria			536	521	530
Croatia		516	533	524	
Cyprus			481	511	487
Czech Republic	515	536	534	534	526
Denmark	517	528	527	522	522
Estonia					
Finland		570	554	555	542
France			488	485	484
Germany	528	528	528	518	515
Greece					
Hungary	536	534	542	529	524
Ireland		516	529	528	532
Italy	535	524	516	510	511
Latvia				542	526
Lithuania	514	515	528	538	537
Luxembourg					
Malta		446		496	
Netherlands	523	531	517	518	517
Poland			547	531	550
Portugal		522	508	504	511
Romania		505			526

TIMSS 4th grade (MATH)					
Country	2007	2011	2015	2019	2023
Austria	505	508		539	
Belgium		549	546	532	521
Bulgaria			524	515	530
Croatia		490	502	509	
Cyprus			523	532	516
Czech Republic	486	511	528	533	530
Denmark	523	537	539	525	524
Estonia					
Finland		545	535	532	529
France			487	488	488
Germany	525	528	522	521	524
Greece					
Hungary	510	515	529	523	520
Ireland		527	547	548	546
Italy	507	508	507	515	513
Latvia				546	534
Lithuania	530	534	535	542	561
Luxembourg					
Malta		496		509	
Netherlands	535	540	530	538	537
Poland			535	520	546
Portugal		532	541	525	517
Romania		482			542

TIMSS 4th grade (SCIENCE)					
Slovakia	526	532	520	521	521
Slovenia	518	520	543		526
Spain		505	518	511	504
Sweden	525	533	540	537	533
EU Average	**524**	**521**	**525**	**521**	**520**

TIMSS 4th grade (MATH)					
Slovakia	496	507	498	510	515
Slovenia	502	513	520		514
Spain		482	505	502	498
Sweden	503	504	519	521	530
EU Average	**511**	**516**	**524**	**524**	**525**

Source: Technopolis Group based on TIMSS 2023

TIMSS 8th grade (SCIENCE)					
Country	**2007**	**2011**	**2015**	**2019**	**2023**
Austria					
Belgium					
Bulgaria					
Croatia					
Cyprus	452			484	464
Czech Republic	539				527
Denmark					
Estonia					
Finland		552		543	531
France				489	496
Germany					
Greece					
Hungary	539	522	527	530	522
Ireland			530	523	525
Italy	495	501	499	500	501
Latvia					
Lithuania	519	514	519	534	519
Luxembourg					
Malta	457		481		501

TIMSS 8th grade (MATH)					
Country	**2007**	**2011**	**2015**	**2019**	**2023**
Austria					
Belgium					
Bulgaria					
Croatia					
Cyprus	465			501	494
Czech Republic	504				518
Denmark					
Estonia					
Finland		514		509	504
France				483	479
Germany					
Greece					
Hungary	517	505	514	517	506
Ireland			523	524	522
Italy	480	498	494	497	501
Latvia					
Lithuania	506	502	511	520	514
Luxembourg					
Malta	488		494		499

TIMSS 8th grade (SCIENCE)						TIMSS 8th grade (MATH)					
Netherlands						**Netherlands**					
Poland						**Poland**					
Portugal				519	506	**Portugal**				500	475
Romania	462	465		470	466	**Romania**	461	458		479	496
Slovakia						**Slovakia**					
Slovenia	538	543	551			**Slovenia**	501	505	516		
Spain						**Spain**					
Sweden	511	509	522	521	521	**Sweden**	491	484	501	503	517
EU Average	**501**	**515**	**518**	**511**	**507**	**EU Average**	**490**	**495**	**508**	**503**	**502**

Source: Technopolis Group based on TIMSS 2023

11. Annex II List of interviews

Organisation	Date
European School Head Association (ESHA)	18.11.2024
Lifelong Learning Platform	08.11.2024
Association for Teacher Education in Europe (ATEE)	15.11.2024
DG Research and Innovation (RTD) D4 – Democracy, equality & culture	18.11.2024
European Centre for the Development of Vocational Training (CEDEFOP)	28.11.2024
DG Justice and Consumers (JUST) D3 – Gender Equality	21.11.2024
DG Education, Youth, Sport and Culture (EAC) A4 – Evidence-Based Policy and Evaluation	14.11.2024
DG Education, Youth, Sport and Culture (EAC) B1 – Higher Education	22.11.2024

Source: Technopolis Group

12. Annex III Horizon Europe and Horizon 2020 Projects

Horizon Europe

ID	Title	Start Date	End Date	Master Call
101044361	UNEQUAL EDucation: The Role of Educational Constraints in Shaping Inequalities	2022-09-01	2027-08-31	ERC-2021-COG
101058507	SENSE. The New European Roadmap to STEAM Education	2022-09-01	2025-08-31	HORIZON-WIDERA-2021-ERA-01
101058569	The STE(A)M Education European Roadmap	2022-09-01	2025-08-31	HORIZON-WIDERA-2021-ERA-01
101059900	Innovative Education for the BioEconomy	2022-11-01	2025-04-30	HORIZON-CL6-2021-GOVERNANCE-01
101060152	Science, technology and research for ethical engagement translate in society	2022-05-21	2024-05-20	HORIZON-MSCA-2022-CITIZENS-01
101060398	Researchers for Humanity 2022 −2023	2022-04-01	2023-11-30	HORIZON-MSCA-2022-CITIZENS-01
101060913	Cyprus ON a missioN to Engage, inspire and Connect with ciTizens through the European Researchers' Night	2022-04-01	2024-03-31	HORIZON-MSCA-2022-CITIZENS-01
101060963	Humanities Rock! Human(e) to Animals – Science Covers Every Being!	2022-04-11	2023-12-10	HORIZON-MSCA-2022-CITIZENS-01
101061075	Researchers' impact in everyday Life	2022-05-02	2024-05-01	HORIZON-MSCA-2022-CITIZENS-01
101061155	Constructing learning outcomes in Europe: a multi-level analysis of (under)achievement in the life course (CLEAR)	2022-10-01	2025-09-30	HORIZON-CL2-2021-TRANSFORMATIONS-01

ID	Title	Start Date	End Date	Master Call
101061187	Science, Environment, Art, Research	2022-04-01	2024-03-31	HORIZON-MSCA-2022-CITIZENS-01
101061288	Policies and practices based on scientific research for reducing underachievement and early school leaving in Europe	2022-11-01	2025-10-31	HORIZON-CL2-2021-TRANSFORMATIONS-01
101061325	Researchers in Action for Inclusion in Science and Education	2022-05-01	2024-04-30	HORIZON-MSCA-2022-CITIZENS-01
101061343	Researchers and citizens: facing together the European challenges	2022-05-01	2024-04-30	HORIZON-MSCA-2022-CITIZENS-01
101061356	Road to Friday of Science and Art	2022-05-01	2023-12-31	HORIZON-MSCA-2022-CITIZENS-01
101061595	Reconnect science with the blue society	2022-05-01	2023-10-31	HORIZON-MSCA-2022-CITIZENS-01
101061630	EDUcation about ClimATE change and polar science	2022-06-01	2023-05-31	HORIZON-MSCA-2022-CITIZENS-01
101061631	Science on the move − from lab to streets & school	2022-05-01	2024-04-30	HORIZON-MSCA-2022-CITIZENS-01
101061684	Montenight 2022 and 2023 – shaping future	2022-04-01	2024-03-31	HORIZON-MSCA-2022-CITIZENS-01
101061707	Science Multiverse − meet the heroes of the research cosmos	2022-04-01	2024-03-31	HORIZON-MSCA-2022-CITIZENS-01
101061755	Science building the future	2022-04-01	2024-01-31	HORIZON-MSCA-2022-CITIZENS-01
101064061	PhysIcs departmeNts' CuLture, strUcture and genDer inEquality	2023-04-03	2025-04-02	HORIZON-MSCA-2021-PF-01
101066847	Problem-based learning trajectories in discrete mathematics education	2022-09-01	2024-08-31	HORIZON-MSCA-2021-PF-01
101079237	Enhancing Research on the Integration of Formal Educational Programmes and Workplace Learning	2023-01-01	2025-12-31	HORIZON-WIDERA-2021-ACCESS-03

ID	Title	Start Date	End Date	Master Call
101086320	Connected Labs for Empowering Versatile Engagement in Radical Food System Transformation	2023-01-01	2026-12-31	HORIZON-CL6-2022-GOVERNANCE-01
101094158	Assessment and implementation of Agriculture and Life Science Universities' first Gender Equality Plans in widening countries	2023-01-01	2025-12-31	HORIZON-WIDERA-2022-ERA-01
101103353	Contributions to the in-service education of primary school teachers from their engagement in mathematics landscapes of investigation	2024-03-01	2025-02-28	HORIZON-MSCA-2022-PF-01
101112707	Literacy Boost through an Operational Educational Ecosystem of Societal Actors on Soil Health	2023-06-01	2026-05-31	HORIZON-MISS-2022-SOIL-01
101113001	Promoting ocean and water literacy in school communities	2023-06-01	2026-05-31	HORIZON-MISS-2022-OCEAN-01
101129146	Enhancing Efficiency and Effectiveness in Education	2024-01-01	2028-01-31	HORIZON-CL2-2023-TRANSFORMATIONS-01
101130969	Women Entrepreneurs for STEM	2024-01-01	2027-12-31	HORIZON-MSCA-2022-SE-01
101131090	Reassembling politics across children's cultures to scale intersectional pedagogies	2024-01-01	2027-12-31	HORIZON-MSCA-2022-SE-01
101131843	ST(R)E(A)M IT/streaming girls and women into STEAM education, innovation and research	2024-01-01	2026-12-31	HORIZON-WIDERA-2023-ERA-01
101132339	Strategies for achieving equity and inclusion in education, training and learning in democratic Europe	2024-02-01	2027-01-31	HORIZON-CL2-2023-TRANSFORMATIONS-01
101132474	Mapping of Longitudinal data of Inequalities in Education	2024-03-01	2028-02-29	HORIZON-CL2-2023-TRANSFORMATIONS-01

ID	Title	Start Date	End Date	Master Call
101132586	Early identification and remediation of literacy, numeracy, and social-emotional difficulties in kindergarten: an examination of the efficacy of a multi-tiered system of support (MTSS)	2024-01-01	2027-12-31	HORIZON-CL2-2023-TRANSFORMATIONS-01
101132652	European coordination network and activities to embrace a sustainable and inclusive STEAM educational system: the blend of artistic and creative approaches in STEM education, research & innovation	2024-01-01	2026-12-31	HORIZON-CL2-2023-HERITAGE-01
101150769	Spatial skills and mathematics, towards a causal understanding of mechanisms	2024-10-01	2026-09-30	HORIZON-MSCA-2023-PF-01
101160964	MISSION POSSIBLE: researchers on board for an inclusive and sustainable future	2024-04-01	2026-03-31	HORIZON-MSCA-2023-CITIZENS-01
101162110	Researchers and citizen creating together a better future	2024-05-01	2026-04-30	HORIZON-MSCA-2023-CITIZENS-01
101162134	Pomeranian Researchers Night: European Challenges and Missions Closer to the Citizens	2024-04-01	2026-03-31	HORIZON-MSCA-2023-CITIZENS-01
101162161	Science Odyssey: Research Missions Under Starry Skies	2024-04-01	2026-03-31	HORIZON-MSCA-2023-CITIZENS-01
101162172	Get Connected	2024-05-01	2026-04-30	HORIZON-MSCA-2023-CITIZENS-01
101162176	Science in the City	2024-07-01	2026-06-30	HORIZON-MSCA-2023-CITIZENS-01
101162225	Humanities Rock! Research: Shaping the Future of Humanity	2024-05-01	2025-12-31	HORIZON-MSCA-2023-CITIZENS-01
101162229	Meet research to connect science and society	2024-04-01	2026-03-31	HORIZON-MSCA-2023-CITIZENS-01
101162248	ORE4CITIZENS: bringing offshore renewable energy to society	2024-04-01	2026-03-31	HORIZON-MSCA-2023-CITIZENS-01

ID	Title	Start Date	End Date	Master Call
101162282	Metamorphosis	2024-06-01	2026-05-31	HORIZON-MSCA-2023-CITIZENS-01
101162386	Tunisian Well-Being through Inclusive SciencE	2024-04-01	2025-10-31	HORIZON-MSCA-2023-CITIZENS-01
101162393	SCIENCE4FUTURE: Festival der Wissenschaft Kiel Region 2024/2025	2024-03-01	2025-12-31	HORIZON-MSCA-2023-CITIZENS-01
101162413	Physics for all	2024-04-01	2026-03-31	HORIZON-MSCA-2023-CITIZENS-01
101162498	Imagine, Innovate, Impact (i3)	2024-04-01	2026-03-31	HORIZON-MSCA-2023-CITIZENS-01
101162504	Scientists from various fields work together for the sustainable development of our planet	2024-05-06	2026-05-05	HORIZON-MSCA-2023-CITIZENS-01
101162512	Science building the future	2024-04-01	2026-01-31	HORIZON-MSCA-2023-CITIZENS-01
101162542	When scentist go under the oceans	2024-03-01	2026-02-28	HORIZON-MSCA-2023-CITIZENS-01
101162628	The science for stronger societies (Science&Future)	2024-04-15	2026-04-14	HORIZON-MSCA-2023-CITIZENS-01
101162638	The European Researchers' Night in Bosnia and Herzegovina 2024-2025	2024-05-01	2025-12-31	HORIZON-MSCA-2023-CITIZENS-01
101187961	Gender Equality Plans for INclusivity: Engines of Change	2025-01-01	2027-12-31	HORIZON-WIDERA-2024-ERA-01

Source: Technopolis Group based on Cordis

Horizon 2020

ID	Title	Start Date	End Date	Master Call
961665	AI-enabled robotics platform Robo Wunderkind	2020-09-01	2022-08-31	H2020-EIC-SMEInst-2018-2020
956124	Spatial thinking in STEM learning: Training a new generation of researchers to increase enrolment and gender balance in STEM learning by addressing deficits in spatial ability among children in Europe	2021-01-01	2024-12-31	H2020-MSCA-ITN-2020
952470	Addressing Attractiveness of Science Career Awareness	2020-10-01	2024-09-30	H2020-WIDESPREAD-2018-2020
873134	The CALIPER project: Linking research and innovation for gender equality	2020-01-01	2023-12-31	H2020-SwafS-2018-2020
873072	Leading Towards Sustainable Gender Equality Plans in research performing organisations	2020-01-01	2023-12-31	H2020-SwafS-2018-2020
872841	Future-oriented Science EDucation to enhance Responsibility and engagement in the society of Acceleration and uncertainty	2020-09-01	2023-08-31	H2020-SwafS-2018-2020
872814	Inclusive open schooling through engaging and future-oriented science	2020-09-01	2023-12-31	H2020-SwafS-2018-2020
872106	Make it Open	2020-10-01	2023-09-30	H2020-SwafS-2018-2020
872104	COMMUNITIES FOR SCIENCES (C4S) Towards promoting an inclusive approach in Science Education	2020-10-01	2023-11-30	H2020-SwafS-2018-2020
871794	Schools as Living Labs	2020-09-01	2023-08-31	H2020-SwafS-2018-2020
871155	Meaningful Open Schooling Connects Schools to Communities	2020-09-01	2023-08-31	H2020-SwafS-2018-2020

ID	Title	Start Date	End Date	Master Call
843951	The impact of disciplinary future self enriched electromagnetism course on pharmacy majors' achievement and affect in physics	2019-10-01	2022-01-31	H2020-MSCA-IF-2018
824630	Partnerships for pathways to Higher Education and science engagement in Regional Clusters of Open Schooling	2019-10-01	2022-09-30	H2020-SwafS-2018-2020
824581	Open Science Hub Network: Empowering Citizens through STEAM Education with Open Schooling	2019-10-01	2022-09-30	H2020-SwafS-2018-2020
824522	Science education for action and engagement towards sustainability	2019-09-01	2022-08-31	H2020-SwafS-2018-2020
824488	Rotatory role-playing and role-models to enhance the research integrity culture	2019-01-01	2022-06-30	H2020-SwafS-2018-2020
824466	Science in the City: Building Participatory Urban Learning Community Hubs through Research and Activation	2019-09-01	2022-12-31	H2020-SwafS-2018-2020
821871	Our Space our Future: making careers in the space industry an inspiring reality for all	2018-12-01	2022-05-31	H2020-SPACE-2018-2020
818879	REFRESH − Relate, Experience, Find Research Everywhere and SHare	2018-06-01	2020-01-31	H2020-MSCA-NIGHT-2018
788317	SySTEM 2020: Connecting Science Learning Outside the Classroom	2018-05-01	2021-06-30	H2020-SwafS-2016-17
788171	Pilot experiences for improving gender equality in research organisations	2018-05-01	2022-08-31	H2020-SwafS-2016-17

ID	Title	Start Date	End Date	Master Call
787476	Learning science the fun and creative way: coding, making, and play as vehicles for informal science learning in the 21st century	2018-06-01	2021-11-30	H2020-SwafS-2016-17
781012	Go-Lab Goes Africa, Deploying Contextually Engaging Digital Science, Technology, Engineering and Mathematics Educative Content in Africa by Adapting the Proven Go-Lab Ecosystem to Local Needs	2018-01-01	2020-12-31	H2020-ICT-2016-2017
763594	Center for STEAM Education Research, Science Communication and Innovation	2017-09-01	2018-08-31	H2020-WIDESPREAD-2016-2017
741572	Open Schools for Open Societies	2017-04-01	2020-03-31	H2020-SwafS-2016-17
731872	Stories of Tomorrow − Students Visions on the Future of Space Exploration	2017-01-01	2019-07-31	H2020-ICT-2016-2017
731861	Interactive Music Science Collaborative Activities	2017-01-01	2019-06-30	H2020-ICT-2016-2017
731685	Next Generation Stakeholders and Next Level Ecosystem for ColLaborative Science Education with Online Labs	2017-01-01	2019-12-31	H2020-ICT-2016-2017
731345	Digital Fabrication and Maker Movement in Education: Making Computer-supported Artefacts from Scratch	2017-01-01	2018-12-31	H2020-ICT-2016-2017
730009	Scientix 3	2016-04-01	2019-09-30	H2020-IBA-SWFS-SCIENTIX-2016
727069	Inclusive Education and Social Support to Tackle Inequalities in Society	2017-01-01	2019-12-31	H2020-SC6-REV-INEQUAL-2016-2017
722935	Invitation to Researchers' Night 2016-2017 HEllas	2016-06-01	2017-11-30	H2020-MSCA-NIGHT-2016

ID	Title	Start Date	End Date	Master Call
710708	Using marine mammals for making science education and science careers attractive for young people	2016-09-01	2019-08-31	H2020-SEAC-2014-2015
710583	Exploiting Ubiquitous Computing, Mobile Computing and the Internet of Things to promote Science Education	2016-06-01	2019-05-31	H2020-SEAC-2014-2015
710577	Promotion of STEM education by key scientific challenges and their impact on our life and career perspectives	2016-05-01	2018-10-31	H2020-SEAC-2014-2015
710240	Edu-Arctic – Innovative educational program attracting young people to natural sciences and polar research	2016-05-01	2019-07-31	H2020-SEAC-2014-2015
709515	Science Technology Innovation Mathematics Engineering for the Young	2016-09-01	2021-03-31	H2020-SEAC-2014-2015
688503	Networked Labs for Training in Sciences and Technologies for Information and Communication	2016-03-01	2019-08-31	H2020-ICT-2015
687676	Breaking Educational Barriers with Contextualised, Pervasive and Gameful Learning (BEACONING)	2016-01-01	2019-04-30	H2020-ICT-2015
669074	Cross-Border Educational Innovation through Technology-Enhanced Research	2015-07-01	2020-09-30	H2020-WIDESPREAD-2014-2015
665972	Educational Robotics for STEM	2015-10-01	2018-09-30	H2020-SEAC-2014-2015
665917	CREATIONS − Developing an Engaging Science Classroom	2015-10-01	2018-11-30	H2020-SEAC-2014-2015
665868	Next Generation Science Challenges Using Digital and Social Media to Make Science Education and Careers Attractive for Young People	2015-09-01	2017-08-31	H2020-SEAC-2014-2015

ID	Title	Start Date	End Date	Master Call
665826	Participatory Engagement with Scientific and Technological Research through Performance	2015-11-01	2018-10-31	H2020-SEAC-2014-2015
665566	Hypatia	2015-08-01	2018-07-31	H2020-GERI-2014-2015
665100	Promoting Youth Scientific Career Awareness and it Attractiveness through Multi-stakeholder Co-operation	2015-08-01	2018-11-30	H2020-SEAC-2014-2015
640218	Youth for Space Challenge − ODYSSEUS II	2015-01-01	2017-12-31	H2020-COMPET-2014
638653	EU Space Awareness	2015-03-01	2018-02-28	H2020-COMPET-2014
101036505	A European competence framework for a low carbon economy and sustainability through education	2021-10-01	2025-12-31	H2020-LC-GD-2020
101036480	Smart Citizen Education for a greeN fuTure	2022-01-01	2024-12-31	H2020-LC-GD-2020
101036166	ReCoN-nect − The Green Deal: Research communication to CommuNities	2021-04-20	2022-05-19	H2020-MSCA-NIGHT-2020bis
101006482	Outdoor Science Education for a Sustainable Future	2021-09-01	2024-02-29	H2020-SwafS-2018-2020
101006468	Partnerships for science education	2021-09-01	2024-08-31	H2020-SwafS-2018-2020
101006396	Europe’s Regional Partnership for Gender Equality in the Digital Age	2021-01-01	2023-12-31	H2020-SwafS-2018-2020
101006349	Surrounded by Science: Learning paths towards science proficiency	2021-10-01	2024-09-30	H2020-SwafS-2018-2020

ID	Title	Start Date	End Date	Master Call
101006255	Multiplayers' partnerships to ensure meaningful engagement with science and research	2021-11-01	2024-10-31	H2020-SwafS-2018-2020
101006251	Science Engagement to Empower Disadvantaged adoleScents	2021-01-01	2022-12-31	H2020-SwafS-2018-2020
101006203	Opportunity Ecosystems Bridging the Gender Gap	2021-01-01	2022-12-31	H2020-SwafS-2018-2020
101005982	Creating Organisational Structures for Meaningful science education through Open Schooling for all	2022-01-01	2024-12-31	H2020-SwafS-2018-2020
101004633	Mentoring for School Improvement	2020-11-01	2023-02-28	H2020-SC6-TRANSFORMATIONS-2018-2019-2020
101000063	Scientix 4	2020-01-01	2023-03-31	H2020-IBA-SWFS-SCIENTIX-2020

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