



Erasmus+ KA3 Forward-Looking Cooperation Projects | EACEA



Increasing young people's motivation to choose STEM careers through an Innovative  
Cross-disciplinary STE(A)M approach to education

## WP4 Mainstreaming and dissemination

### D4.7 Policy and advocacy recommendations

Lead by LLLP



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## 1. Foreword

The CHOICE Project intends to **innovate STEM education and contribute to the policy reform of STEM curricula** in European secondary schools by providing teachers and students with tools and resources promoting the STE(A)M approach, connecting STEM subjects with Arts and All the other disciplines. The aim is to **make STEM subjects more appealing and tangible for students**, and thus increase their interest in STEM fields. By stimulating the motivation of young people to pursue academic studies and professional careers in these fields, CHOICE contributes to the training of a **new generation of STEM experts** capable of tackling complex societal and environmental challenges.

The project's approach build on the **active participation of secondary school teachers and students**, and their collaboration with **external experts** from STEM-oriented HEIs (Higher Education Institutions) and businesses by engaging them in a **bottom-up co-creation process**, developing and testing innovative inter-disciplinary Open Education Resources (OERs) and Massive Open Online Courses (MOOC).

Finally, the project **strives to stimulate the reform of EU educational systems** by addressing policy-makers and key stakeholders, and involving them in a dialogue during round tables and an international Conference in Brussels, with the objective of proposing a set of national and EU-level policy recommendations.

The presented document **“Policy and advocacy recommendations”** was written by LLLP (Lifelong Learning Platform), and finalised with the active involvement of all project partners. The aim of the Recommendations is to **support the reform of the school curricula on regional, national and European level** by making the **shift from STEM teaching in silos to a more interdisciplinary and practice-oriented approach of STE(A)M education** as proposed in the CHOICE MOOC on STE(A)M education, and integrating this innovative digital-based instrument into school curricula.

The document summarises the recommendations that emerged through the **Stakeholders round-tables** held in all countries participating in the project (Italy, Cyprus, Greece, Spain, Belgium), the dialog with the contacts from the LLLP's network, and meetings held online to involve stakeholders from other EU countries and European-level actors in the field of education. The consultation of policy makers and key stakeholders in the round-tables leading to policy recommendations supporting the shift from STEM to STE(A)M education to reform school curricula is one of the key to mainstream of the CHOICE action, in line with the call's general objective **Empowering key stakeholders in developing and mainstreaming policy innovation**.



## 2. Stakeholder round-tables & development of policy recommendations

Nearly 100 representatives from **local authorities, school management, academia** as well as **businesses** operating in the **STEM field** were jointly consulted through a **series of round-tables** to boost joint discussion and **reflection on the outcomes of the project** and to collect **inputs for the development of policy recommendations**. The round-tables were arranged in a way to reach out to at least **16 representatives** per partner country while ensuring balanced presence of the **above-mentioned sectors**. Participants' profiles included university professors, educators, teachers and local policy makers in the field of education representing local government, and representatives of innovative enterprises, EU institutions and non-profit organisations.

The **main purpose** of the stakeholder round-tables was to gain inputs to develop **policy recommendations on how to integrate STE(A)M approaches into teaching activities**, reforming school curricula on regional, national as well as European levels.

**In order to achieve this, participants reflected on topics such as:**

- current policies and school curricula regarding STEM education,
- current teacher training/ approaches of teaching activities,
- current labour market needs,
- practical relevance of the developed MOOC on STE(A)M education,
- lessons learned from the piloting,
- impact evaluation on both students and teachers involved,
- young people's interests and motivation, etc.

The round tables with the stakeholders took place in the period **after the piloting**, thus including piloting results and lessons learned.

The good practice tool CHOICE@SCHOOL as well as the stakeholder round-tables and the subsequent policy recommendations will support the reform of the school curriculum through the approaches and contents proposed in the MOOC on STE(A)M education and the other project results.

For this reason, teachers, school management boards and policy-makers in the field of education, will all be involved in the mainstreaming process.

The detailed overview and results of the Stakeholder Round-tables organised in Italy, Cyprus, Greece, Spain, and Belgium are available in this document: "[Country Stakeholder Round-tables Result](#)".



### 3. Policy recommendations

Based on the round-table consultations, a set of **policy recommendations** has been designed as a series of suggestions on how to effectively implement the MOOC on STE(A)M education into existing school curricula on different levels (**regional, national, European**). The round tables with the stakeholders furthermore promoted STE(A)M approaches in teacher training as well as encouraged schools and companies to enter into contact with each other, thus creating a more comprehensive experience of STEM education for students.

Through the project results and the use of the outcomes achieved in each project phase, CHOICE can be an inspiring example of how to promote, advance and ensure quality within the STE(A)M educational approach of teaching to promote STEM education.

With that at the core of this paper, it is strongly suggested to take into account:

#### Local level

- **Embed the STE(A)M approach within STEM teaching.** Experience-based and inquiry-based learning are an enormous asset for students. Teachers, pedagogists and educators agree that this multi- and interdisciplinary way of teaching and learning should be introduced as early as possible (pre-school, primary education), while not neglecting its importance in the higher years in order to demonstrate the interconnection of disciplines, the real-life application of theoretical knowledge and present possible academic and career opportunities, which are rarely confined to one subject only. An important element of this action requires STE(A)M learning to be developed in an entertaining way that would increase students' interest and motivation, which is acknowledged to have a positive impact on their academic achievement.
- **Provide adequate time, resources and environments for teachers' training.**
  - Initial teacher training and continuous professional development should be mandatory to update teaching methodologies and approaches as well as their subject-related expertise with the STE(A)M education tenets. This also requires ensuring teachers have up-to-date competences to work with digital tools or use innovative resources and methodologies.
  - The time dedicated to training should be also rewarded as time spent working to avoid having teachers mainly do professional training in their free time which can result in demotivation and eventually lead to burn-out in the long term.
- **Promote the [CHOICE MOOC](#)** as a useful tool in STEM education innovation since it provides teachers with both – a training (Module 0) as well as ready-to-use educational resources, including step-by-step guidance for teachers helping them to prepare and take STE(A)M-based lesson, facilitating hugely the whole process.
- **Promote an interdisciplinary approach and stronger collaboration between teachers of different scientific subjects.** Teachers within one education institution should collaborate to develop a cross-disciplinary STEM project and implement it within the available teaching time



in the corresponding subjects, coordinating and implementing STEM education through an interdisciplinary approach. Measures to facilitate this include the unloading of the school curricula to provide opportunities for teachers to propose interdisciplinary topics and activities as well as the development of STEM-related teaching units and provision of guidance to teachers on how to implement it.

- **Promote school leadership** that motivates, reassures and provides the resources to ensure that teachers can overcome barriers and are encouraged to pursue successful STEM initiatives.
- **Invite local-level institutions and authorities** to get to know the field of STEM education and initiatives, so as to bridge the gap between education and training stakeholders and higher level authorities.
- **Implement a reward system for teachers who perform additional STEM-related work.** Participation in European-funded projects and professional development training related to STEM education is primarily voluntary across the EU and the teachers who participate in their own free time do not have their experiences adequately recognised and are insufficiently financially remunerated. This represents a huge untapped potential, with teachers having the skills to initiate STEM initiatives, but lacking adequately recognised experiences, and making educational institutions ill-equipped to collate data on existing skills of their educators and adequately plan coordinated STEM activities.
- **Support and share local initiatives.** Valuable local-level STEM education initiatives are put in place without sufficient visibility. Local initiatives should be supported and shared through more campaign and advocacy work, so as to promote their visibility and encourage learning from one another.
- **Ensure context-based teaching.** In the absence of teaching in context, maths and sciences may be too abstract or theoretical, which tends to diminish the attractiveness of the topics for learners while also preparing them inadequately for the interconnections between school subjects and their practical application.
- **Acknowledge students' participation in decision-making about the educational programmes and curricula development.** School students should be listened to and have the right to fully influence their daily school life in every aspect, including the teaching of STEM disciplines. School students are the ultimate target groups, therefore, understanding what motivates them and which format they are most drawn to is the way to involve more students in STEM education and careers. They must not only be heard in matters concerning them, but acknowledged as equal partners and experts when it comes to governing the schools. Participation of school students in education also needs to be addressed in a broader perspective. School students should be involved in decision-making in educational institutions.<sup>1</sup> The [co-creation approach](#) applied in the development of CHOICE Open Educational Resources could be a successful example of such students' involvement.



<sup>1</sup> [OBESSU Position Paper Democratic participation of School Students Adopted at the General Assembly 27th – 28th 2013, Haapsalu](#)

- **Connect students with mentors from various professions.** This allows learners to visualise their potential professional pathways while seeing how STEM is implemented in various companies. **Strengthening the connection between youth and schools, and small and medium-sized enterprises (SMEs)** has the potential to open new avenues for learners to understand the value of STEM. Field visits such as those organised within the CHOICE project may be a possible way to help students gain a more complex idea of a variety of STEM professions and the experience opened a new perspective of their **future career paths**.

### Regional/National level

- **Develop Common frameworks for STEM education, building upon existing ones such as the [CHOICE project's STEM curriculum framework](#), establishing common:**
  - Approaches
  - Objectives
  - Guides for training and adoption of good practices
  - Channels of communication and exchange of experiences
  - Evaluation practices and indicators of competence
- **Boost collaboration between schools and other educational stakeholders.** Continuous communication and exchange among schools, other educational institutions, universities, research centres, labour market actors, and policy makers at all levels is needed to find meaning and value throughout learning routes, which can be better done if those are more interdisciplinary and linked to surrounding communities. Learning is no longer limited to the classroom and STEM collaborations rely on the expertise of a diverse range of stakeholders providing students with highly specific knowledge and also practical competences and insights. At the same time, continuous **collaboration with universities** can better guide learners in accessing tertiary education, and further pursue STEM subjects in this context. Where the unemployment rate is particularly high, STEM learning can contribute to promoting the possibility of meaningful employment in the area. Students need to be able to imagine the accessible future professions in the field of STEM (in their own region/country), have an idea of what they can do with STEM subjects and why it is important to study them.
- **Address the gender gaps in STEM education.** It is very important that girls and women are equally encouraged to pursue STEM education as their male counterparts. More role models of successful women working in STEM should be highlighted while taking steps that **make STEM education more intersectional**.
- **Secure strategic and long-term investment in STEM education. To achieve a real change there is a need to plan well in advance, moving towards strategic and long-term investment.** Empirical evidence shows that when investment in STEM education policies is made at primary and secondary level, the outcomes experienced over a period of 8 years can be a greater participation of learners in STEM subjects at tertiary level, and an increase of the participation of women in STEM-based tertiary education and employment is observed. Starting from a precise political vision going back to top down creating the proper situation



where every teacher can feel supported, sharing best practices because they are also very helpful to avoid mistakes.<sup>2</sup>

- **Shift the focus from accumulating content knowledge to providing a more holistic education with connections to society and the job market.** The school curriculum has to be structured around a model of learning that does not only promote knowledge transmission. The focus should fall on the needs of the students', also from a socio-emotional perspective. Teachers and educators must focus on the structure of the activities, not in terms of the execution but in terms of conceptual understanding within a context, a scenario, or a real case so that they can practise these skills in context. Learning that fosters connections across different competencies and skills, while incorporating other fields, beyond employment policies crossing over to community and social impact.
- **Strengthen a continuous communication and exchange loop among learning, innovation, labour market to foster the identification of opportunities for social change.** Identify current and especially future labour market needs and communicate regularly with schools to enable curricular updates and ensure an adaptation to the learners' holistic development of STE(A)M competences, stimulating their curiosity and desire to learn, which can certainly have positive spillovers also with regards to employability. There is a need for **practical application and possible occupational opportunities** to be promoted through teaching STEM in the larger context (economical, societal, environmental etc.). Such practices can be supported through [Living Labs](#). These exist in different EU countries and extending them to secondary school students – supporting thus their entrepreneurial skills, showing the connection to the practice and giving a clearer vision of a future career ideally in the territory - can greatly benefit the promotion of STE(A)M education.
- **Involvement of the private sector.** The private sector can be incentivised to finance to engage in collaboration with schools and the education sector, under clear guidelines and supervisory regulations from national authorities and on the condition that their participation does not hamper academic freedom, does not promote the commercialisation and marketisation of learning and does not widen accessibility gaps for learners. The support and the investment from private industry could be provided through supplying training materials, tools or, assisting education institutions with covering the costs for STEM educational material so as to not only fall on education institutions and families. It's relevant for all areas of education to have the right equipment and tools to teach properly, but this is particularly true for STEM education because of the applied and practical side of it. Becoming even more crucial in the time of the COVID-19 pandemic, The situation is even more complicated in the light of the recent covid-19 pandemic. Since this collaboration with companies is important and can be beneficial for both students and companies, it should be incentivised to work with school, teachers and students to support STEM competences development.



<sup>2</sup> Data on the [evolution graduates in MST \(Maths, Science & Technology\) in higher education in the Flemish community in Belgium](#)

- **Invest in Education and Training to promote STEM learning.** Secure an appropriate level of funding for infrastructure to support implementing digital tools, along with time and funding for teacher training which should be part of the Education Ministries and school's strategic plan. Such investment strategies should also equip the schools with digital devices and Wi-Fi connections, as well as to provide teachers and students with the relevant training on how to use the digital devices and digital tools.

## European level

- **Invest in Education and Training to promote STEM learning.** Link the [European Semester](#) and [Recovery and Resilience Facility recommendations](#) with an appropriate level of funding for infrastructure to support implementing digital tools, along with time and funding for teacher training. Upscale the promotion of the available EU sources for funding, training and mobility opportunities for schools, teachers and students is needed. This implies a better facilitation of access for schools (also in rural areas, disadvantaged neighbours etc.) to funding. Many schools do not have the necessary resources (mainly human resources and skills) to apply for funding, enrol in various programmes or maintain and administer their participation on European projects.
- **Overcome the current fragmentation in STEM education policy, research and practices.** Collate the different Erasmus+ projects currently working on developing EU-wide frameworks on the implementation of STE(A)M education in order to develop an EU endorsed framework to facilitate the linkages between policy, research, and practices. In this sense, policymakers can [make use of the CHOICE project's STEM curriculum framework](#) as an essential resource for the EU-endorsed framework. At the same time, there is a need to establish a coordination point within school inspectorates/administration at local level on the STEM topics
- **Encourage equal access to STEM education in schools across the EU.** There are significant differences in investment, policies and methodological frameworks in schools in different European countries with regard to the teaching of STEM education. An insufficient number of member states have implemented context learning to the extent that is needed and the EU should more systematically monitor this situation and support Member States to learn from each other on how they can boost access.
- **Ensure that education systems keep up with the pace of technology development.** Education systems must prepare the youth for the future, equipping them to address the existing challenges but also to embrace the changing future jobs. Hence, the EU needs to provide countries with additional research on the impact of digital tools on educational outcomes showing their effectiveness in supporting educational outcomes for pupils and how their use can be sustained. The EU should also provide training to stakeholders on how to adapt their national curricula so that schools have a framework upon which teachers and school leaders can develop schemes of work. Funding for the creation of jobs at the national or EU level will encourage collaboration amongst EU members to facilitate opportunities for sharing good practice.





- **Better promote and improve the existing platform to collect all EU STEM/STE(A)M projects to achieve collective and sustainable impact.** It will be useful to collect all the available resources and tools (theoretical knowledge as well as practical activities) in a common space so that the work developed can be sustainable and impactful, following the example of the [Education for Climate Coalition](#). Often the educational resources realised with European funds are open source, but at the end of the project, the online platform created for this purpose is no longer accessible due to lack of funds. The [STEM coalition](#) as well as other existing platforms (such as the [European School Education Platform](#)) are a step in this direction, but the information gathered in these platforms still appears to be too fragmented, and unfortunately none of them represents a comprehensive framework for STEM learning at school.
- **Develop Europe-wide pedagogies and instruments to meet the real needs of learners and teachers in STEM,** as well as of higher education institutions and the labour market, as the [CHOICE MOOC](#): a tool for STE(A)M teaching giving access to teachers and learners to a wide range of educational learning material.
- **Encourage the multilingual nature of the learning material.** The available resources concerning the teaching of STEM disciplines are often in English, and not all teachers are able to appropriate them or have the time to translate them into their own language. The translation of the teaching units is a practical matter that needs to be addressed through EU funding: available resources should be translated in all EU official languages.

