A2.1 Report on regional initiatives, best practices to STEM education

Introduction - Situation in EU: a general view on STEM

The strategic framework for European cooperation in education and training (ET 2020)[1] is a forum which allows Member States to exchange best practices and to learn from each other. The ET 2020 framework provides opportunities to build best practices in education policy, gather and disseminate knowledge, and advance educational policy reforms at the national and regional levels.

The framework is based on the lifelong learning approach. It therefore addresses outcomes from early childhood to adult vocational and higher education, and is designed to cover learning in all contexts: formal, non-formal and informal.

ET 2020 pursues the following four common EU objectives:

- Make lifelong learning and mobility a reality
- Improve the quality and efficiency of education and training
- Promote equity, social cohesion, and active citizenship
- Enhance creativity and innovation, including entrepreneurship, at all levels of education and training

Background Information

Among the benchmarks set at European level by 2020, EU Member States agreed on reducing the proportion of underachieving 15 year-olds, with a goal of reducing their share to less than 15% by 2020. This still remains a challenge. According to the Education and Training Monitor 2019[2] (the annual report on Member States' progress towards achieving the ET 2020 objectives and benchmarks), across the EU the share of pupils who fail to complete basic tasks is around 20% (19.7% in reading, 22.2% in maths and 20.6% in science). Compared to the previous PISA round, conducted in 2012, in 2015 the proportion of underachievers at EU level increased by 1.9 points in reading and 4 points in science, while remaining overall stable in maths. Between 2012 and 2015, the EU actually moved further away from meeting its objective.

When it comes to STEM, some student profiles are more in need than others of specific programmes and attention by schools and policy makers. For example, if the goal is to boost young people's engagement in science, then emphasis should be put on girls, in order to improve gender equality in scientific fields (science, engineering, technology and mathematics).

[1] https://ec.europa.eu/education/policies/european-policy-cooperation/et2020-framework_en
[2] https://ec.europa.eu/education/sites/education/files/document-library-docs/volume-1-2019-education-and-training-monitor.pdf

EU policy and civil society position

In the *EC Communication - School development and excellent teaching for a great start in life*[3] (2017), acknowledging that "*schools play a pivotal role in life-long learning, and therefore action is needed to improve the quality and performance of school education*", and identifying as top priority the development of better and more inclusive school, at EU level actions are taken in order to "*support improvements in school level education in science, technologies, engineering and maths (STEM) by promoting best practice in developing links and cooperation of higher education, research, businesses with schools at EU level and effectively addressing gender gaps and stereotypes in STEM, using Erasmus+*". Although it is not explicit, at EU level a step forward is foreseen, considering that "*science, technologies, engineering and mathematics (STEM) education is more effective when linked to economic, environmental and social challenges or to arts and design, demonstrating its relevance for daily life*".

For the Lifelong Learning Platform, it is important to be aware of the vast potential that synergies between education and culture can have, not only from an economic perspective - given the contribution that creative skills and industries make to the economy - but also and more importantly from a social perspective - given the benefits that learning about and through culture has for more inclusive societies[4]. Regarding STEM, it is paramount to recognise the equal value of cultural and arts education by mainstreaming STEAM: the focus on STEM is restrictive to the wider purpose of education and neglects the importance and relevance of social science and humanities; a more holistic approach to education and lifelong learning lies in partnerships and flexible pathways that go beyond a single education level and particular field of study[5].

Current and future jobs and societal challenges require and will increasingly demand a broad range of transferable skills, such as teamwork, intercultural competences, empathy, creativity, problem-solving and independent non-linear thinking. Cultural and arts education, particularly conducive to developing such skills, thus has a pivotal role to play. Yet, the emphasis on STEM in current policy discourse refutes the importance of these competences in supporting learners' ability to adapt to change: STEAM (A for Arts) is a more relevant paradigm. However, mainstreaming this approach into curricula is not enough by itself - it must be accompanied by a rethink of how the skills in question can be embedded into a holistic educational approach encompassing personal development and of how these skills are evaluated. Current assessment methods are still largely rooted in a linear, summative approach which incentivises "teaching for the test" which appears as a contradiction to an educational approach aiming to better match learners' needs through appropriate assessment of the "soft" skills that they are expected to acquire.

[3] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52017DC0248&from=EN
[4] http://lllplatform.eu/lll/wp-content/uploads/2015/09/Joint-position-paper_Building-synergies-education-and-culture.pdf
[5] http://lllplatform.eu/lll/wp-content/uploads/2017/09/Statement-schools-and-higher-education-initiatives.pdf

A 21st century vision for science for society - *Science Education for Responsible Citizenship*[6]

The publication "*is aimed primarily at science education policy makers. It identifies the main issues involved in helping citizens to access scientific debate; it provides guidance on how industry can contribute to science education; and it proposes a new framework for all types of science education from formal, to non-formal and informal approaches*."

Regarding STE(A)M, a key objective is that *science education should focus on competences with an emphasis on learning through science and shifting from STEM to STEAM by linking science with other subjects and disciplines*. In this sense, inter-disciplinarity (STEAM rather than STEM) can contribute to our understanding and knowledge of scientific principles and solve societal challenges.

Science or STEM has to be linked with all other subjects or disciplines at all levels of education: it means incorporating the knowledge and the methods and approaches of more than one disciplinary context to enable new ways of thinking and identifying solutions to problems that fall outside the boundaries of just one discipline. This requires new ways of working and strengthening links and interaction between formal, non-formal and informal science education. The shift from STEM to STEAM means that the A includes ALL other disciplines.

"Making connections between STEM and all other disciplines – what is often referred to as STEAM – pushes beyond the boundaries of science to embrace the creative potential of linking the arts, scientific inquiry and innovation. Innovative new ideas and creative solutions often emerge at the interface between disciplines and involve different societal actors. Innovation is linked, directly or indirectly, to human experience, needs and problems. This can occur through engaging with the arts – playing or listening to music, dancing, experiencing or creating art, watching and creating video or film, or being involved in designing and making".

Among the actions identified at EU level that could support the shift from STEM to STEAM, it can be mentioned:

- The support to arts-based initiatives with a STEAM focus, e.g. film, media, visual arts, etc. to develop resources promoting science learning, positive views of science and scientific culture;
- The development of a portal with information on "good practices" in STEAM, targeted at encouraging collaboration between enterprise and business (including SMEs), arts and design organisations and educational institutions at all levels for more contextualized contents.

Good practices and ongoing European projects, resources, initiatives related to STE(A)M

EASSH

[6] https://op.europa.eu/en/publication-detail/-/publication/a1d14fa0-8dbe-11e5-b8b7-01aa75ed71a1/language-en

The European Alliance for Social Sciences and Humanities (EASSH) is a membership organisation made up of scientific networks, associations, disciplinary groups and universities.

The main purposes of EASSH are to promote learning and research in the social sciences and humanities (SSH) as a resource for Europe and the world, and to engage with policymakers and research funders in support of the social sciences and humanities.[7]

Science on Stage Europe - The European Platform for Science Teachers[8]

Science on Stage Europe is a network for STEM teachers focusing on the exchange of best practice teaching ideas. The ultimate goal is to improve STEM teaching by supporting educators in their professional development and growth. By spreading innovative teaching concepts among Europe's science teachers we enable more students to gain the affordable skills they need for a challenging future and encourage them to consider a career in science, ICT or engineering.

[7] http://www.eassh.eu/

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

References

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