EUROPEAN POLICYBRIEF

Time for Bold Choices

Education — and digital education in particular — has much to gain from embracing STEAM approaches. Drawing on Road-STEAMer's preliminary results, this document outlines the main tenets of a STEAM framework, provides practical examples of what works well, and suggests key elements to incorporate into the ongoing review of the EU's Digital Education Action Plan.

August 2024

Introduction

We live in an era marked by profound changes: from the accelerating threat of the climate emergency to unprecedented technological developments that were once the domain of science fiction. Only a highly educated workforce and a mindset shift can harness such disruptive forces and shape future innovation. In this context, especially in Europe, there are calls for investing in education and upskilling to feed what has been called the "talent pipeline"[1] in critical areas such as information technology and engineering or, more broadly, in STEM (Science, Technology, Engineering and Mathematics) disciplines to be able to keep up with the competition of extra-European companies.[2] The persistent underrepresentation of women and marginalised groups in these fields of education and employment is, at the same time, a significant challenge that requires structural action, in order to increase representation, reduce bias in science and provide more diverse role models for future generations. A "STEM Education Strategic Plan" to address the lack of qualified STEM teachers and to attract girls and women into these disciplines is part of Ursula von der Leyen's political guidelines for her second term as President of the European

[1] For an in-depth critique of the "leaky pipeline" metaphor and a suggestion to move towards the concept of "hostile obstacle course" see Unterfrauner, E., Fabian, C. M., Yeomans,L., Voulgari, I., Sotiriou, M., Sotiropoulos, D., Cherouvis, S., Koulouris, P., Bresciani, S. (2023) SocioEconomic Context and Relevant Needs, Deliverable 2.1, Road-STEAMer - Developing a STEAM Roadmap for Science Education in Horizon Europe, https://www.road-steamer.eu/wp-content/uploads/2024/01/D2.1-Socio-economiccontext-and-relevant-needs.pdf

[2] See for instance DigitalEurope (2024), THE EU'S CRITICAL TECH GAP. Rethinking Economic Security to put Europe back on the map, July 2024 https://cdn.digitaleurope.org/uploads/2024/07/DIGITALEUROPE-CRITICAL-TECHNOLOGIES-REPORT-FINAL_JULY_WEB.pdf

Commission in 2024.[3] And even before that, the Digital Education Action Plan 2021-2027 (DEAP) outlined actions aimed at improving women's participation in STEM.[4] Occasionally, these calls also refer to "STE(A)M", that is, the incorporation of the arts and - more broadly - of creative approaches into STEM.

Drawing on groundbreaking educational research, and looking specifically at the intersection of secondary and tertiary education, **Road-STEAMer argues that it is time for bolder choices.** If business-as-usual is no longer viable, we should rule out education-as-usual, too. Education should move beyond disciplinary boundaries and strive for "future-making", i.e. the ability to "respond resourcefully and creatively to ongoing changes" instead of simply passing on skills and knowledge.[5] The importance of fostering creativity is such that the most recent PISA assessment now includes a measure of creative thinking on which future-facing countries, such as South Korea and Singapore, with which the EU is in competition, scored highly.[6] This is why the arts and creative approaches in general should not have an ancillary role to STEM disciplines, but should be promoted in their own right as an integral element of transdisciplinary and innovative educational approaches.[7] In other words, the "A" in STEAM should not be an "add on", a bait to attract more students into STEM, particularly from underrepresented genders and backgrounds, without other changes. Rather, it should be looked at as a strategy towards tackling societal challenges that require both analytical and creative thinking. Furthermore, equity and inclusivity work both ways – they engage learners from underrepresented groups, but in doing so, they also produce knowledge and capabilities grounded on a wider range of perspectives and worldviews.[8] STEAM has the potential not only to improve education, but to change science and research – connecting us with new ways to solve enduring problems.

Against this backdrop, the upcoming **review of the Digital Education Action Plan 2021-2027 (DEAP)** offers a unique opportunity to apply the transformative potential of STEAM education. While the original action plan already refers to STEAM in its Action 13, it appears that the inclusion of the "A" of arts and creativity is merely instrumental, as a way to make STEM disciplines more appealing to learners, and especially to women in Europe who are chronically underrepresented in these fields. We argue, instead, that bolder STEAM approaches could be particularly well-suited to transform digital education, supporting younger generations in navigating an increasingly digital and technological world. Indeed, STEAM can resonate very well with the enmeshing of scientific, artistic and technological processes that exist in digital tech, for instance in the industries of video games, app development, music, virtual reality and edutainment, wearable technologies, generative AI and many more. By fostering holistic learning, STEAM can support the development of the technical capability of using and developing digital technologies, as well as creative problem-solving and a broader understanding of complex and interdisciplinary real-world challenges at hand. While STEAM is much more than a way to improve digital education, the digital world is uniquely positioned to benefit from it, in Europe and beyond.

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[3] Von der Leyen, Ursula (2024), EUROPE'S CHOICE - Political Guidelines For The Next European Commission 2024−2029, https://commission.europa.eu/document/download/e6cd4328-673c-4e7a-8683-f63ffb2cf648_en?filename=Political%20Guidelines%202024-2029_EN.pdf

[4] European Commission (2020), COM(2020) 624 final, Communication From the Commission to the European Parliament, the Council, the European Economic and Social Committee and The Committee of the Regions, Digital Education Action Plan 2021-2027 *Resetting education and training for the digital age*, https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52020DC0624

[5] Colucci-Gray, L., & Burnard, P. (2019). (Re-) Configuring STEAM in Future-Making Education. In *Why science and art creativities matter* (pp. 1-13). Brill.

[6] https://www.oecd-ilibrary.org/education/pisa-2022-results-volume-iii_765ee8c2-en

[7] For a comprehensive analysis of the limitations of a narrow view of STEAM, refer to Pirrie, A. (2019). Where Science Ends, Art Begins?: Critical Perspectives on the Development of STEAM in the New Climatic Regime. In *Why science and art creativities matter* (pp. 19-34). Brill.

[8] See for instance Díaz-García, C., González-Moreno, A., & Jose Sáez-Martínez, F. (2013). Gender diversity within R&D teams: Its impact on radicalness of innovation. Innovation, 15(2), 149–160. https://doi.org/10.5172/impp.2013.15.2.149

STEAM Policies in Europe

The concept of STEAM, though never unequivocally defined, has been part of educational research for around two decades, but it appears to be still rather niche in policy, and almost exclusively presented instrumentally as a way to attract more students to STEM. A review of educational policies across continental Europe revealed that "STEM" remains the preferred or default term in many policy texts, even when promoting approaches that could reasonably be classified as STEAM following the criteria set out by Road-STEAMer. This could give the impression that STEAM is only a buzzword signifying STEM by a different name, while we maintain it is a fundamentally different concept that requires moving beyond disciplines to equip learners with a more holistic understanding of complex societal challenges. Our project's mapping shows that Europe is generally found to be lacking in mainstreaming STEAM education. A few countries like Belgium, France, Malta and Finland appear to have adopted policies that promote STE(A)M oriented education, although the prevalent framing and focus remains around STEM.[9] An analysis of the policy gaps led by the Road-STEAMer project reveals that the potential of STEAM remains under-exploited, and limited to some narrow aspects.[10] Nevertheless, considering the potential that STEAM education offers for tackling some of society's wicked problems, it is important and possible to identify some opportunities to incorporate STEAM (in its fuller and more holistic sense) into existing policy frameworks - of which the review of the DEAP is a notable example.

STEAM in Road-STEAMer

Before delving further into how digital education can benefit from adopting a STEAM approach, it is important to define STEAM. While there is not – and there cannot be – a single definition and blueprint for STEAM, the conceptual evaluation framework developed as part of the Road-STEAMer project can offer useful pointers on what digital education should aim for when integrating STEAM. The key criteria adopted by the Road-STEAMer project, and which we recommend guiding future digital education, are:

- **Collaboration**: This criterion encompasses students' teamwork, connection and dialogue among educators, and meaningful exchange with stakeholders within the school and with external actors. In STEAM practices, teachers are not top-down lecturers, but facilitators, advisors, counsellors, and guides.
- **Disciplinary inter-relationships**: There cannot be STEAM if disciplines work in silos, but the degree of inter- or trans-disciplinarity can vary, from making connections between different subjects, to encouraging knowledge transfer across disciplines with a focus on problem-solving and use of technology. It is important that all disciplines carry an equal value, as oftentimes the integration of the arts could be seen as a mere instrument to bring interest to other (implicitly more important) disciplines[11].
- **Thinking-Making-Doing**: This criterion highlights the interconnectedness of thinking, making, and doing within STEAM practices, contributing to a holistic and dynamic learning experience.

[9] Roinioti E., & Karpouzis, K.(2024), Policy Context for STEAM, Deliverable 3.1, Road-STEAMer - Developing a STEAM Roadmap for Science Education in Horizon Europe, https://www.road-steamer.eu/wp-content/uploads/2024/04/RoadSTEAMer-3.1-Policy-Context-for-STEAM.pdf
[10] For a more comprehensive analysis, please refer to Koulouris et al. (2024), "Analysis of policy gaps for STEAM" Deliverable D3.2, Road-STEAMer - Developing a STEAM Roadmap for Science Education in Horizon Europe https://www.road-steamer.eu/wp-content/uploads/2024/08/Analysis-of-Policy-Gaps-for-STEAM.pdf
[11] Cherouvis, S., & Loveno Garofalo, G. (2024), Report on real-life use-cases, **Deliverable D4.3,** Road-STEAMer - Developing a STEAM Roadmap for Science Education in Horizon Europe. https://www.road-steamer.eu/wp-content/uploads/2024/07/RoadSTEAMer-D4.3-Report-on-real-life-use-cases.pdf

- **Creativity**: This is a fundamental component of STEAM activities, associated with innovation and the generation of novel ideas and outcomes, it is also linked to playfulness. Creativity can be simultaneously a process and a product of STEAM practices, as these encourage creative thinking. In activities featuring digital technologies and design, creativity is not limited to the thinking aspect but extends to doing.
- **Real-world Connection:** This means anchoring learning in real-world contexts, often tackling contemporary and complex issues like climate change and civic engagement. Problem-solving and inquiry-based learning can provide a sense of authenticity and purpose, empower learners to see themselves as change-makers, and foster entrepreneurship.
- **Inclusion/Personalisation/Empowerment:** A central tenet is designing activities in which all participants, regardless of confidence levels, can fully engage. STEAM provides a context for young people to develop their identities and see STEAM as a domain "for them." The emphasis on personalization and empowerment contributes to a more inclusive and engaged learning environment.

Additionally, we recognise **"Equity"** as an underlying value that should permeate all STEAM practices and transcend all other core criteria. It emphasises fairness and inclusivity in the design, processes, and outcomes of STEAM education.

The above criteria constitute the backbone of Road-STEAMer's evaluation framework, which has been adopted to assess the landscape of STEAM practices. It is essential to note that for a practice to be considered an effective example of STEAM it is not essential that all criteria are fully expressed – indeed, it is expected that different educational approaches or goals can foster certain criteria more than others.[12]

Applying STEAM to digital education

Our analysis of actual STEAM practices has brought to light some excellent examples of STEAM education involving digital education and systemic approaches that transcend disciplinary silos in order to tackle grand challenges.[13]

The OCEANS connections project aims to innovate and extend best practice in the teaching of Ocean Literacy through the use of creative pedagogies and digital technologies that can help engage pupils and extend their understanding of concepts that are challenging to experience directly. The project, implemented across different European countries, is focused on student-centred problem-based learning, the use of innovative materials, and dialogic and creative approaches to using AR/VR technologies.

The LeDS project – Learning Digital Skills through Arts and Performance delivers a holistic learning journey for students by blending their artistic abilities with crucial technological, social and emotional skills. The project, rolled out in Portugal and Greece, aims to develop an innovative STEAM approach to demonstrate how the Arts can be used as a beginning, middle, and end of an activity focused on digital skills and where all the disciplines are seamlessly integrated.

The Global Game Jam NEXT is a global virtual event intended for young creators aged 12-17. The goal is to come together and create a game (often a video game, but it can also be a board game or card game). The event, organised by university researchers with the participation of experts from the game industry, takes place over two weeks, with the first dedicated to game design and game

[12] Please refer to Chappell, K. and Hetherington, L. (2023). Road-STEAMer Research Framework (criteria), Deliverable 4.1. Road-STEAMer - Developing a STEAM Roadmap for Science Education in Horizon Europe. https://www.road-steamer.eu/wp-content/uploads/2024/01/D4.1_Research-Framework.pdf and Yeomans, L et al. (2023) Road-STEAMer Conceptual Framework, Deliverable 2.2, Road-STEAMer - Developing a STEAM Roadmap for Science Education in Horizon Europe https://www.road-steamer.eu/wp-content/uploads/2024/02/RoadSTEAMer-D2.2-Concpetual-Framework.pdf

[13] For more details on the framework and on the assessment of practices, please refer to Juillard, S. & Aguirre, C. (2024), Report on Lessons Learnt, Deliverable D4.4, Road-STEAMer - Developing a STEAM Roadmap for Science Education in Horizon Europe. https://www.road-steamer.eu/wp-content/uploads/2024/08/D4.4-Report-on-Lessons-Learnt.pdf

development workshops, and the second to prototyping and testing the games in small groups following a specific theme. The young participants are also supported by mentors from game studios. The brief time span encourages creative thinking and innovative experimental games.

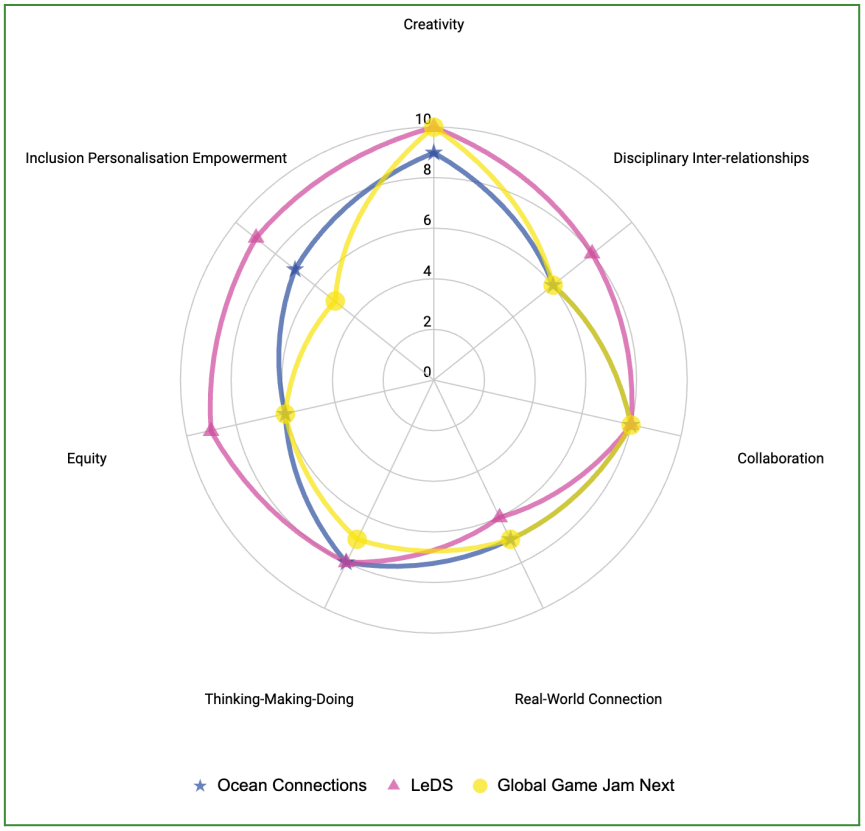

Figure 1: Spider diagrams of three digital and STEAM practices, comparing their scores across the six STEAM criteria and the underlying value of equity.

The three examples presented above provide some real-world examples of how STEAM approaches can foster the development of digital skills. While these are all very effective STEAM practices, they are different from each other. This is very clear when looking at the diagram in Figure 1 above, which compares the effectiveness of each practice against the six STEAM criteria plus the underlying value of equity. The three practices examined meet all of the criteria, albeit to different extents. Interestingly, they all score very highly in *creativity* and in *collaboration*, while performing differently against other criteria, particularly *inclusion / personalisation / empowerment.* This is because STEAM is not - and should not be - a blueprint, and therefore, there can be multiple embodiments of it, all effective in different ways. Crucially, these examples demonstrate the potential for STEAM in enhancing digital education.

Promoting STEAM: Conditions and Requirements

There are numerous factors that can contribute to (or hinder, when lacking) the mainstreaming of STEAM, and potentially also of digital education, in educational practice, in areas ranging from the curriculum, teachers' influence, school climate, culture, organisation and leadership, and teacher support and professional development. These conditions have been explored in depth in deliverable D2.3 "Analysis of conditions and requirements", and are briefly summarised in this paragraph.[14]

Updating educational curricula to explicitly incorporate STEAM is certainly the most important area from a policy perspective, and one of the elements that was most often found lacking in our analysis. Typically, curricula are established at national level, and include core subjects, learning

[14] Koulouris P., Stergiopoulos P. and Liakopoulos V. (2024), "Analysis of conditions and requirements" - Deliverable 2.3, Road-STEAMer - Developing a STEAM Roadmap for Science Education in Horizon Europe. https://www.road-steamer.eu/wp-content/uploads/2024/04/RoadSTEAMer-D2.3-Analysis-of-conditions-and-requirements-for-STEAM.pdf

objectives, and assessment guidelines. What is in the curriculum - and in the assessments - inevitably ends up being prioritised over what has not been explicitly incorporated into it. Very structured curricula can reinforce disciplinary boundaries and therefore, be less conducive to STEAM and innovation more in general. It is therefore paramount to create room for STEAM by allowing flexibility in educational curricula, letting educators experiment with different learning pathways and approaches, integrating artistic literacy as well as scientific and digital literacy. Crucially, assessments should also change, moving away from standardised tests, towards more holistic learning assessments that better capture the breadth and depth of students' achievements, reflecting the multiplicity and complexity of STEAM and of the world more in general.

Recognising teachers' influence. Educators have a crucial influence on learners and learning environments. This is particularly true in STEAM, where there is no blueprint or rigid structure, and the very initiative to adopt innovative practices often rests upon the individual teacher's experiences, resourcefulness, understandings and attitudes towards teaching and learning. At the same time, it is important to recognise that attitudes and motivation are often grounded in previous experiences (successes or failures) with innovation, and whether or not one feels valued and trusted to make pedagogical decisions, and can therefore change with the context. Attention to teacher support and related accreditation and recognition schemes therefore becomes vital. At the same time, including the educators' community in the policy-making processes and therefore striving for more participatory approaches in policy decision-making in this context seems an important way forward.

School climate, culture, organisation and leadership. This is effectively the soil in which teachers (and learners) can flourish, or may grow constrained. All other factors being equal, STEAM practices are more likely to be adopted in schools whose leadership actively encourages innovation, provides positive examples that can reinforce teachers' attitude and openness to experiment, and embraces the possibility of failure as a part of learning. Again, such openness can in turn be favoured by curricula and regulations that foster autonomy rather than adherence to centralised schedules and programmes, and promote flexible educational ecosystems. A very important element from Road-STEAMer's perspective is also the possibility to embrace open schooling approaches involving the whole community around the school, offering more and varied opportunities for STEAM. A fundamental step for schools is also the availability of (flexible) resources enabling access to materials, technology, and external support and expertise.

Teacher's professional development. This is where, again, policy action can make a significant difference. Effective STEAM requires that, at a minimum, teachers are aware of this possibility and have the instruments to set up activities that meet the STEAM criteria. This is of particular relevance in the digital domain, where educators need to be confident in the use of certain technologies, or have access to expert support, before attempting to incorporate them into learning activities. It is therefore of critical importance that STEAM approaches and digital technologies are part of both initial teacher training and continuous professional development. In this context, programmes like Erasmus+ can effectively complement and supplement training opportunities offered by national governments, accelerating the spread of STEAM and digital best practices, and providing inspirational examples through international collaboration and staff exchanges.

As we argue that STEAM approaches can be particularly helpful in promoting better digital education outcomes, these same conditions and requirements that have been identified for STEAM education are likely to be of relevance in the framework of the DEAP review.

Policy Implications and Recommendations

Following from the evidence presented in the analysis of conditions and requirements summarised above, we recommend that the review of the DEAP considers the following improvements:

- **Fully and consistently embrace the transformative potential of STEAM (action 13)**, instead of considering it as an instrument to bring women into STEM, especially in action 13. Additionally, the action could be expanded to foster better inclusivity, not just across the gender spectrum but also to incorporate race, disability and class (and other identity lines) in an intersectional approach. It is also important to go beyond headcount (% of women or of other groups), towards proper representation, where a wider variety of perspectives can actually lead to innovative and inclusive solutions.
- **Include STEAM (rather than STEM) in Erasmus+ work programme priorities (action 13)**, with specific parameters to ensure this encompasses disciplinary interrelationships, collaboration, real-world connections, thinking-making-doing, creativity, inclusion-personalisation-empowerment and equity.
- **Integrate disciplinary inter-relationships such as interdisciplinarity in guidance related to teaching informatics (action 10)**, to avoid creating yet another disciplinary silo.
- **Openly incorporate STEAM into the European Digital Education Content Framework (action 3),** recognising that some of the existing elements already are complementary to STEAM (e.g. engaging/ playful digital contents, personalisation, collaboration and interoperability among higher education settings).
- **Incorporate STEAM into the European Digital Education Hub**, for instance by highlighting among its resources a set of successful digital practices that also meet STEAM criteria, ensure mentorship and working groups explicitly cover STEAM approaches for digital education.

While conceived primarily for the European Union's DEAP, the above recommendations could also be taken on board at national level when improving the provision of digital education, and more broadly in wider future educational reform.

Research Parameters

The overall aim of the Road-STEAMer project is to develop a roadmap for STEAM education in Horizon Europe and, more broadly, in educational policy across the continent. Road-STEAMer is developing guidance on how to integrate approaches involving creative thinking and applied arts, enabling integrated science learning approaches and stronger connections between different school education levels, higher education, informal and non-formal science education, as well as the world of business. The core approaches adopted by the consortium emphasise:

- collaboration and co-creation with the stakeholder communities, science education, research, innovation and creativity;
- a bottom-up approach emphasising educational practice and practitioners' agency;
- a specific focus on ways to leverage the power of STEAM approaches, as manifested through exemplary cases and best practices.

Road-STEAMer triangulates findings emerging from the stakeholder engagement and the analysis of the STEAM practices with the knowledge produced from the analysis of the current educational policies, contexts and frameworks. Expected outcomes of the project include better knowledge on policy deficiencies and better understanding of needs; identification of synergies between secondary and tertiary school education, and between education and the world of business; contribution to future policy actions; raising awareness among students and citizens of the opportunities within areas such as green and digital transitions.

While the first year of the project focused on laying the foundations of the work, mainly by analysing literature on STEAM education and validating initial findings and concepts[15], the second year (ending in August 2024) has revolved around analysis of policies and of real-life use-cases, exploring the necessary conditions for STEAM to succeed through collaboration and engagement with practitioners. The consortium has also started the synthesis of project results upon which the roadmap will be based. This policy brief, which constitutes Deliverable 7.5, reviews and takes stock of the preliminary results of the project.

Sustainability and Legacy

The first version of the Road-STEAMer roadmap is expected in early spring 2025, with the final one due by August 2025 which aims to provide suggestions for monitoring STEAM policies and implementation as well as making recommendations for policy, to gain detailed evidence of impact and the contextual conditions under which the STEAM approach is most effective to tackle Europe's more pressing needs.

In May 2025, the project will also release a toolbox, mainly aimed at stakeholders in the formal and non-formal education sector, which will collect all project results, experiences, findings and recommendations and transform them in a user-friendly format aimed at practitioner use. A third and final policy brief is also due to be published in August 2025.

Project Identity

Project name	Developing a STEAM Roadmap for Science Education in Horizon Europe (Road-STEAMer)
Coordinator	The Lisbon Council for Economic Competitiveness asbl, Brussels, Belgium, info@lisboncouncil.net
Consortium	• Association Européenne des Expositions Scientifiques, Techniques et Industrielles (ECSITE), Brussels, Belgium • Centrum Nauki Kopernik, Warsaw, Poland • National Center Junior Academy of Sciences of Ukraine, NC JASU, Kiev, Ukraine • Association TRACES Théories et Réflexions sur l'Apprendre, la Communication et l'Éducation Scientifiques, Paris, France • Ellinikh Enosh Dhmosiografon Episthmhs, Syggrafeon Episthmhs Kai Eikoinoniologon Episthmhs Astiki Etaireia (Science View), Nea Ionia, Greece • Ellinogermaniki Agogi Scholi Panagea Savva AE, Pallini, Greece • Engineering - Ingegneria Informatica S.P.A., Rome, Italy • European School Heads Association (ESHA), Utrecht, Netherlands • Panteio Panepistimio Koinonikon Kaipolitikon Epistimon, Kallithea, Greece • Politecnico di Milano, Milan, Italy • Università ta' Malta, Msida, Malta • Zentrum für Soziale Innovation (ZSI), Vienna, Austria

[15] See Chappell, K., and Hetherington, L. (2023) Research Framework, Deliverable 4.1 Road-STEAMer - Developing a STEAM Roadmap for Science Education in Horizon Europe, https://www.road-steamer.eu/wpcontent/uploads/2024/01/D4.1_Research-Framework.pdf; Unterfrauner, E., Fabian, C. M., Yeomans,L., Voulgari, I., Sotiriou, M., Sotiropoulos, D., Cherouvis, S., Koulouris, P., Bresciani, S. (2023) SocioEconomic Context and Relevant Needs, Deliverable 2.1, Road-STEAMer - Developing a STEAM Roadmap for Science Education in Horizon Europe, https://www.road-steamer.eu/wp-content/uploads/2024/01/D2.1-Socio-economiccontext-and-relevant-needs.pdf and Yeomans, L., Chappell, K., Hetherington, L., Bresciani, S., Unterfrauner, E., Fabian, C., Koulouris, P. (2023) Road-STEAMer Conceptual Framework, Deliverable 2.2, Road-STEAMer - Developing a STEAM Roadmap for Science Education in Horizon Europe https://www.road-steamer.eu/wpcontent/uploads/2024/02/RoadSTEAMer-D2.2-Concpetual-Framework.pdf

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BUDGET	EU contribution: 1 660 625 €.
WEBSITE	www.road-steamer.eu
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FURTHER READING	Koulouris, P., Stergiopoulos, P. and Liakopoulos, V. (2024), "Analysis of conditions and requirements" - **Deliverable 2.3,** Road-STEAMer - Developing a STEAM Roadmap for Science Education in Horizon Europe. https://www.road-steamer.eu/wp-content/uploads/2024/04/RoadSTEAMer-D2.3-Analysis-of-conditions-and-requirements-for-STEAM.pdf Juillard, S. & Aguirre, C. (2024), Report on Lessons Learnt, **Deliverable D4.4**, Road-STEAMer - Developing a STEAM Roadmap for Science Education in Horizon Europe. https://www.road-steamer.eu/wp-content/uploads/2024/08/D4.4-Report-on-Lessons-Learnt.pdf Cherouvis, S., & Loveno Garofalo, G. (2024), Report on real-life use-cases, **Deliverable D4.3,** Road-STEAMer - Developing a STEAM Roadmap for Science Education in Horizon Europe. https://www.road-steamer.eu/wp-content/uploads/2024/07/RoadSTEAMer-D4.3-Report-on-real-life-use-cases.pdf Roinioti E., & Karpouzis, K.(2024), Policy Context for STEAM, **Deliverable 3.1**, Road-STEAMer - Developing a STEAM Roadmap for Science Education in Horizon Europe, https://www.road-steamer.eu/wp-content/uploads/2024/04/RoadSTEAMer-3.1-Policy-Context-for-STEAM.pdf Koulouris, P., Liakopoulos, V. and Stergiopoulos, P. (2024), "Analysis of policy gaps for STEAM" **Deliverable D3.2,** Road-STEAMer - Developing a STEAM Roadmap for Science Education in Horizon Europe https://www.road-steamer.eu/wp-content/uploads/2024/08/D3.2-Analysis-of-Policy-Gaps-for-STEAM.pdf

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