

The STE(A)M Education European Roadmap

Seminar: How to Equip Teachers and Educators for STE(A)M Teaching and Learning

Moderator:

Evita Tasiopoulou , Project and Pedagogical Manager, *European Schoolnet*

<https://theseer.scientix.eu>

The work presented in this document has received funding from the European Union's Horizon Europe programme project the SEER (Grant agreement: 101058569), coordinated by European Schoolnet (EUN). The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein. The SEER is supported by Scientix, the community for science education in Europe, an initiative of European Schoolnet.

The SEER – overview



- Duration: 3-year Horizon Europe project – started in September 2022
- Funded by: The European Commission’s Horizon Europe Programme
- Partners: 5 Consortium partners from Italy, Cyprus, Greece, Netherlands, Germany
- Coordinated by: European Schoolnet



OBJECTIVES of the SEER

Providing a **set of Roadmaps** to help education stakeholders mainstream STE(A)M Education in Europe

Contribute **recommendations for policy improvements**

Help stakeholders **navigate** the current STE(A)M educational resources

Nurture **Education/ Industry collaboration**

Showcase and understand **good practice** in STE(A)M teaching

Our definition:



STE(A)M

"A" for "ALL"

- At least **TWO STEM SUBJECTS** combined with **ONE NON-STEM SUBJECT** (or more)
- Non-STEM can include *Arts, Humanities* and other subjects (e.g., sports)

Chemistry, Physics, Biology

Social Sciences, Arts, Literature

The SEER findings (1)

Surveying Teachers to Understand Their Needs on STE(A)M Education

Natalia Spyropoulou
Researcher and Project Manager

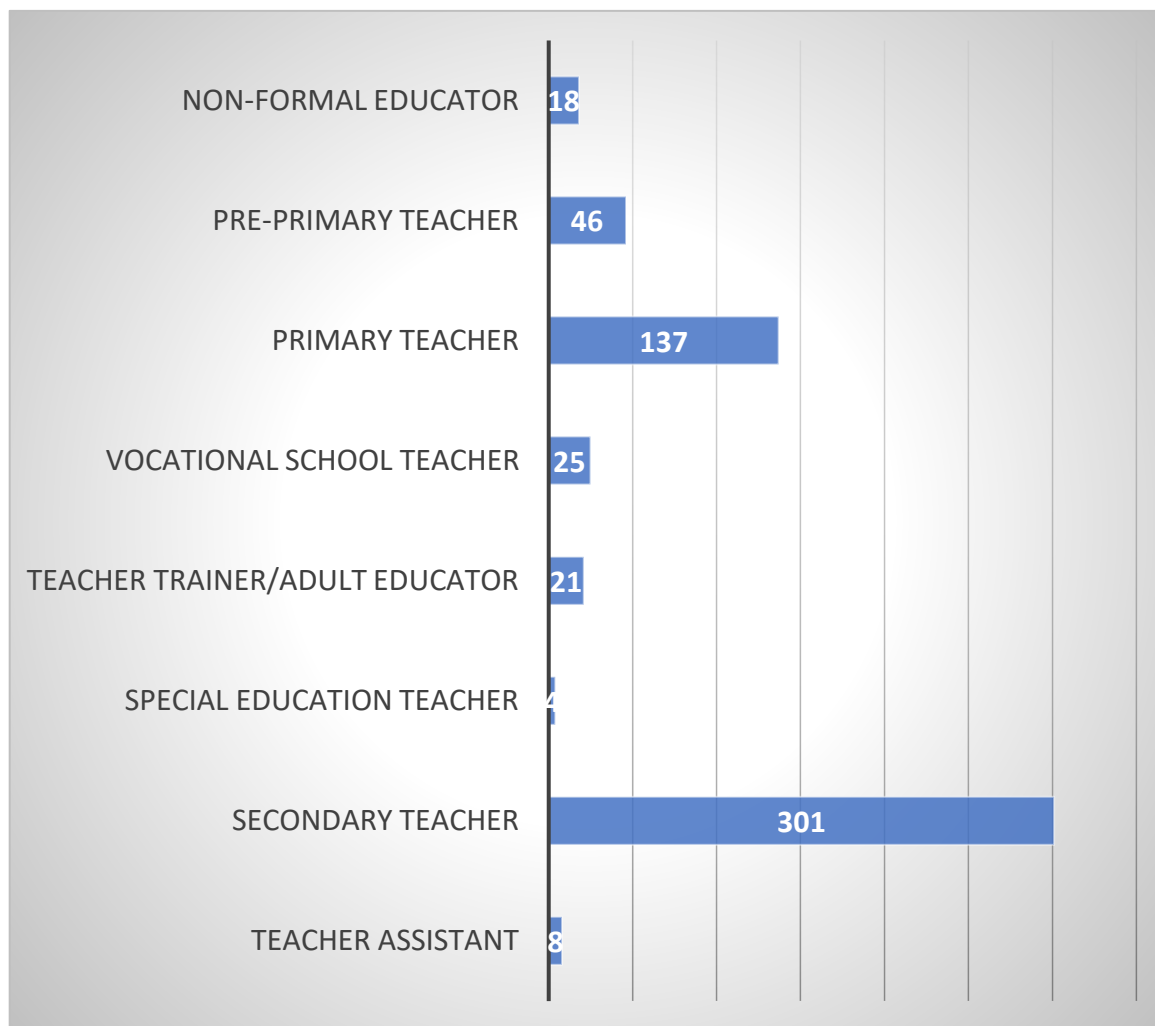
DAISSy Research Group, Hellenic Open University, Hellas

Survey aims

To explore :

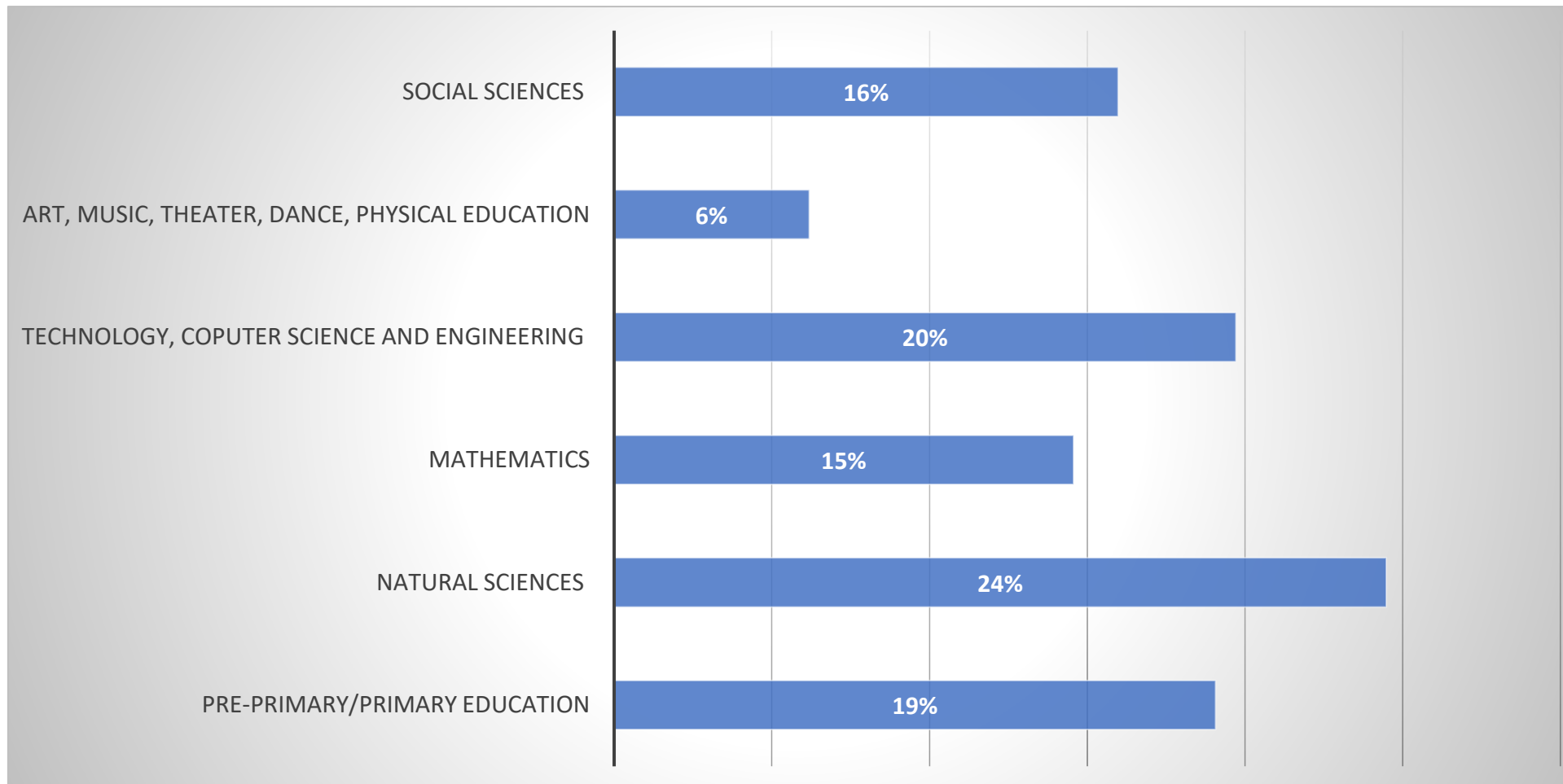
- investigate the attitudes (e.g. desire to apply STE(A)M education, motivation, collaboration) educators toward STE(A)M education and how these attitudes shape their individual needs,
- the needs for preparation/development, for implementation and for coordination of STE(A)M education programs, including the necessity for collaborative efforts and professional growth of educators
- determine the needs of policymakers regarding educational policies so as to enhance STE(A)M education
- Identify educators' needs for support and collaboration from industry and other organizations to enhance STE(A)M education.

Survey participation



- More than 560 teachers from 29 countries
- The majority work in public schools/organizations
- Most of the participants teach at secondary and primary education level

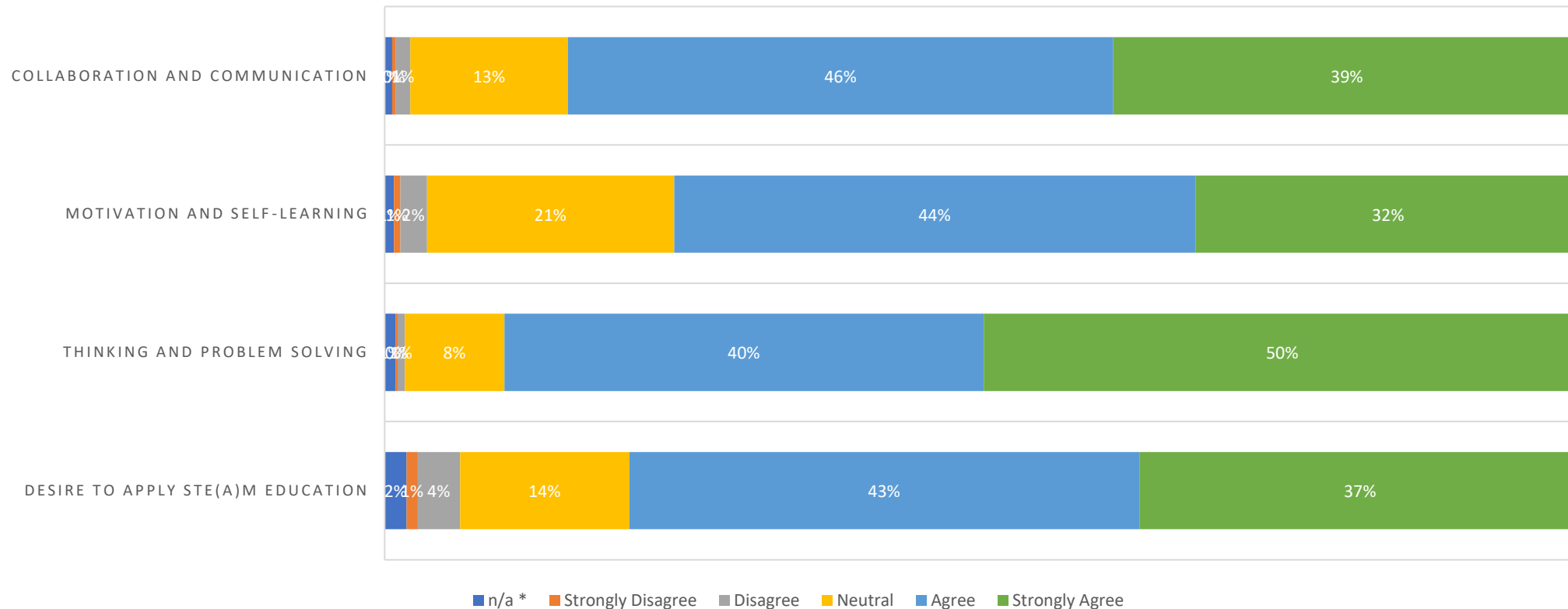
Educators' subject or area of expertise



Teachers attitudes to STEAM Education

Teachers' attitudes

- High Desire to Apply STE(A)M Education
- There is a lower confidence level regarding the availability of tools to implement STEAM education effectively.
- Strong Emphasis on the benefits of STEAM education (creativity, critical thinking etc.)
- Notable neutral responses on how STEAM education considers individual differences among students



**Educators Perceived Needs for
preparation/development, for
implementation and for the coordination
of STE(A)M education programs**

Highly-rated needs

1. Resource and Support Needs:

- **Financial Support:** High need for funding.
- **Educational Resources:** Selection and preparation of resources, including innovative technology.
- **Time Management:** Sufficient time for preparation and collaboration.

2. Curriculum and Instruction:

- **STE(A)M Curriculum:** Establishment of ethos/culture, understanding of principles and content knowledge.
- **Instructional Design:** Strategies and disciplinary content understanding.

3. Professional Collaboration and Community Involvement:

- **Teacher Collaboration:** More time and opportunities for collaboration.
- **Community Engagement:** Involving other schools, educational institutions, industry, local community, and parents.

4. Classroom and Instructional Management:

- **Class Size and Instructional Time:** Need for manageable class sizes and more instructional time.
- **Feedback and Assessment:** Methods for effective feedback and assessment.

5. Professional Development:

- **Training and Examples:** Effective lesson plans, discipline-specific training, and use of emerging technologies.
- **Classroom Management:** Organization and management of STE(A)M programs, inclusion and diversity.
- **Active Learning:** Techniques for student-centered education and integrating arts into STEM.
- **Self-Reflective Practices:** Strategies for student self-evaluation and motivation.

Open-ended responses

1. Infrastructure and Resources

- **Modern Facilities:** Highlighting the lack of adequate facilities crucial for effective STEAM education.
- **Infrastructure Development:** Emphasizing the importance of suitable learning environments and dedicated STEAM labs.
- **Funding:** Strong call for increased financial support to enhance resource availability.

2. Curriculum and Assessment

- **Innovative Assessment Methods:** Suggesting a shift towards project-based and peer assessments to better evaluate student skills.
- **Regular Updates and Feedback:** Need for continuous curriculum reviews and feedback mechanisms.

3. Cultural and Systemic Changes

- **Change Management:** Overcoming resistance to change among educators and fostering a culture of continuous improvement.
- **Cultural and Systemic Shifts:** Calls for a cultural shift within educational systems and reducing bureaucracy.
- **Public Awareness:** Enhancing awareness of the benefits of STEAM education to gather broader support.

4. Inclusivity and Accessibility

- **Inclusivity and Accessibility:** Ensuring STEAM education is inclusive and accessible to all students.

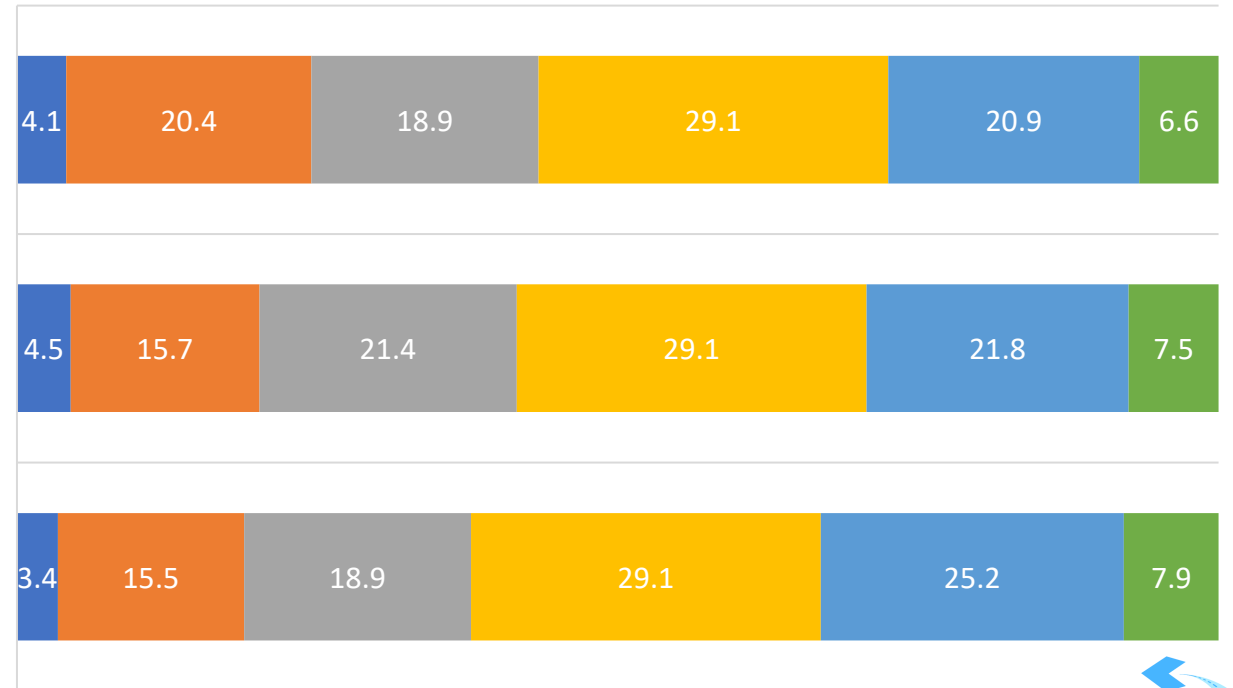
Educators needs from policy makers

Current engagement - How does your school/ organization facilitate professional communication and collaboration opportunities related to STE(A)M education?

COLLABORATIVE PARTICIPATION WITHIN TEAMS OF EDUCATORS WITH INTERDEPENDENCE AMONG EDUCATORS IN THEIR LESSON PLANNING AND DELIVERY, BUT WITH A SHARED RESPONSIBILITY FOR ACHIEVING DESIRED STE(A)M EDUCATION LEARNING OUTCOMES.

EXCHANGE OF IDEAS/GOOD PRACTICES WITH OTHER EDUCATORS ABOUT STE(A)M EDUCATION

COLLABORATION WITH OTHER EDUCATORS IN STE(A)M PROJECTS IMPLEMENTATION



■ n/a ■ Not at all ■ Slightly ■ Moderately ■ Very much ■ Completely

Needs for the development and implementation of STE(A)M education programs

High Priority Needs:

- **STE(A)M lesson plans and educational activities** (56.8% recognize a great need).
- **STE(A)M education content, instructional strategies, and guidelines** (56.6% perceive a great need).
- **Establish a comprehensive STE(A)M curriculum** (54% identify a great need).

Significant Needs:

- **Identify effective ways to integrate all subjects into STE(A)M education** (52.5% recognize a great need).
- **Establishment of STE(A)M assessment criteria** (51.1% see a great need).

Needs for organizational changes at school level to support STE(A)M education programs

High Perceived Needs:

- **Ensuring Adequate Infrastructure:** 68.9% of educators see a great need for this, indicating the highest perceived necessity.
- **Providing Time for Teachers to Collaborate:** 63.8% recognize a great need for collaboration time to design and manage STE(A)M programs.
- **Limiting the Number of Students in a STE(A)M Classroom:** 60% see a great need for smaller class sizes.
- **Allocating Sufficient Time for Implementation:** 60.4% perceive a great need for adequate time during the educational procedure.

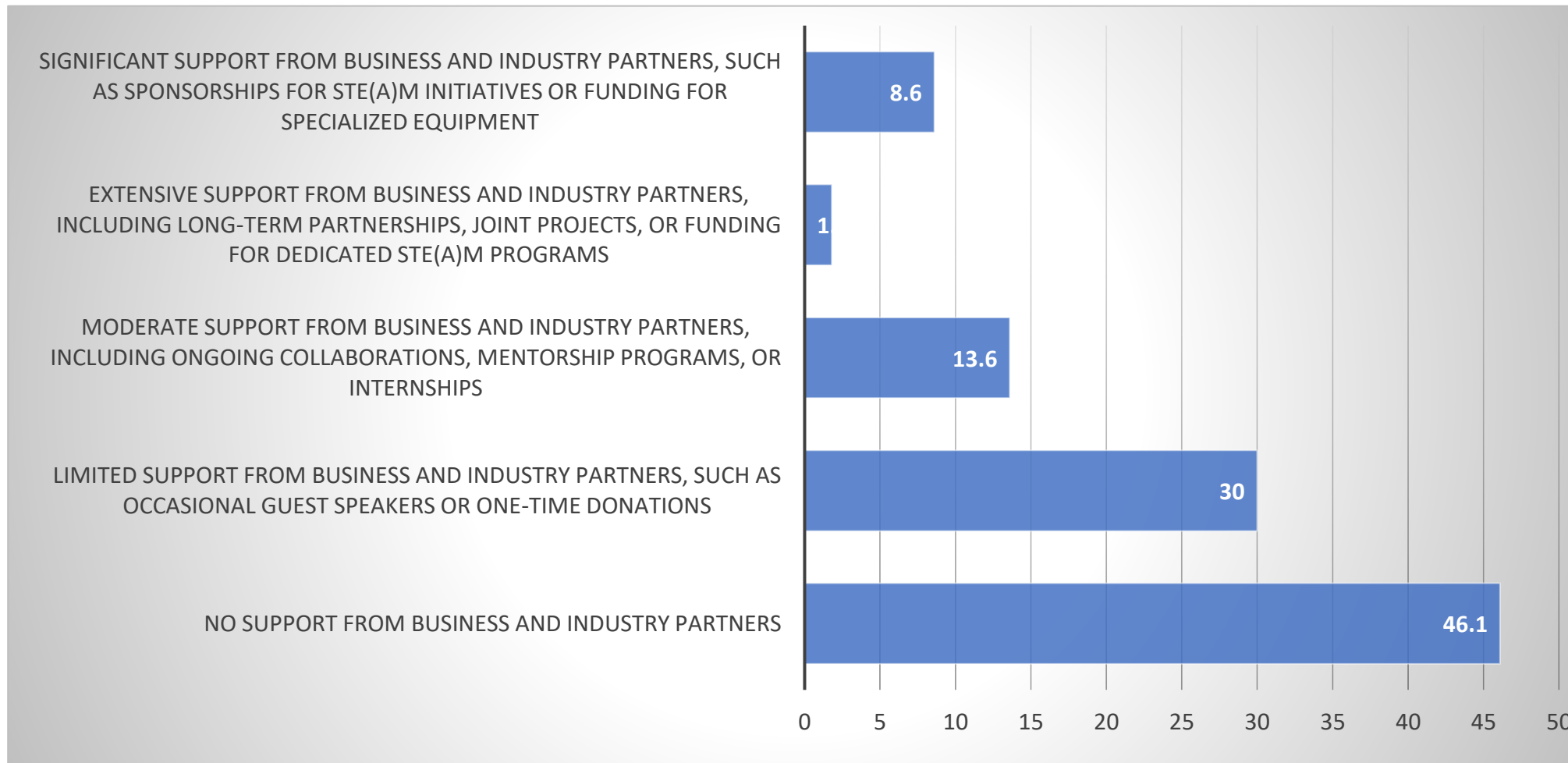
Moderate to High Needs:

- **Implementing Co-Teaching in Interdisciplinary Projects:** 53% of educators identify a great need for co-teaching methods.
- **Incorporating Cross-Disciplinary Activities:** 49.5% see a great need for cross-disciplinary activities within single lessons.

Educators needs from organization/industries

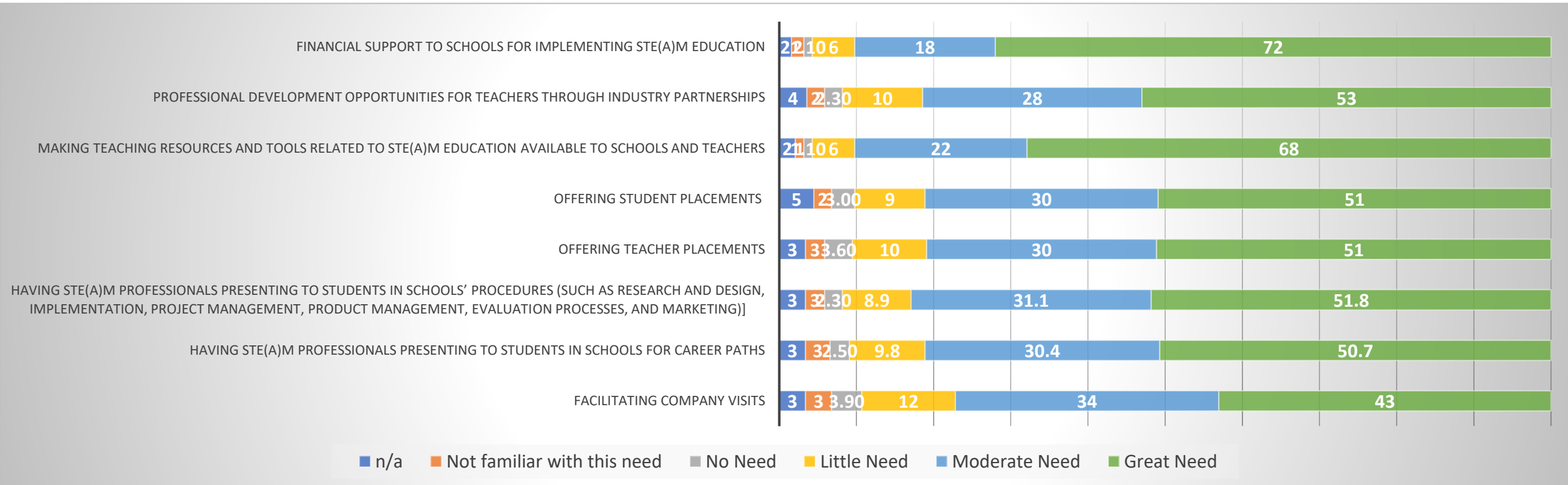
Current engagement with industry

To what extent do business and industry partners support STE(A)M education in your school/ organization



Needs from industry

- The primary industry need identified is financial support, closely followed by the provision of teaching resources and tools to schools and educators and professional development
- Company Visits and Career Presentations: There is **varied interest** in facilitating company visits and career path presentations.
 - Technology and computer science teachers demand these activities more than other educators
- Similarly, technology and engineering teachers, followed by art teachers, show a greater interest in professional development through partnership internships.
- Social Science Teachers: Social science teachers indicate significantly less need for financial support than educators in other fields.





The SEER

STE(A)M EDUCATION
EUROPEAN ROADMAP

Thank you!!

nspirop@eap.gr

The SEER findings (2)

Mapping of European STE(A)M CPD Offerings for Teachers and Educators

Oliver Straser

Assistant Director, Head of Research and Design

International Centre for STEM Education (ICSE)
University of Education Freiburg

Content

1. Objectives and expected outcomes
2. **Part 1:** What is STE(A)M-Education?
3. **Part 2:** Trends in international STE(A)M Initiatives
4. **Part 3:** STEM and STE(A)M Education on a national Level

Objectives and Expected Outcomes

Objective: Understand the European STE(A)M-Educational landscape.

Primary Goal:

- Comprehensive Analysis of STE(A)M Projects and Initiatives
- Identification of Emerging Trends in STE(A)M Educational Research

Further Questions:

- Investigate correlations between results and historical developments.
- Explore connections with European education policies.
- Examine alignment with EU funding programs (FPx, Horizon, Erasmus).

Trends in European STE(A)M Initiatives

What did we do?

- Integrated findings from multiple meta-analyses to identify prevailing trends in STE(A)M educational research.
- Conducted an in-depth qualitative analysis of 770 STE(A)M initiatives

Trends in European STE(A)M Initiatives

Main results (Part 1):

- Over 70% of main target groups are teachers or students.
- Over 50% of outputs are open-access teaching and learning materials for secondary education.
- Open access does not guarantee easy accessibility; finding materials is challenging without known titles or acronyms.
- Descriptions of project outputs and target groups often lack accuracy
Lack of sustainability: More than 25% of all outputs are no longer available!

Trends in European STE(A)M Initiatives

Main results (Part 2):

- We see a clear rise in integrated STEM/STE(A)M approaches, even though the vocabulary is rarely used
- Integrated STEM/STE(A)M is almost every time connected to real-life problems (and is much more likely to contain IBL, DBL, PBL)
- Most popular topics are sustainability and environmental issues, digitalisation, gender diversity, STEM careers
- Diversity (without gender diversity) as well as inclusion and special education are rarely addressed in STE(A)M projects
- (Impact) Research is rarely the case, there is usually no quality assessment . Expected impact often stems from theoretical assumptions or common sense

STEM and STE(A)M Education on a national Level

- **Goal:** Identify national Trends in STEM education and policies and contrast these with the result from the mapping analysis.
- **Research Questions**
 - What is the actual status of STEM Education in the country
 - Are there national STEM initiatives and are there aims?
 - What is the relevance of European initiatives on the national level
- **Participating countries:**



STEM and STE(A)M Education on a national Level

Conclusions

- STEM and/or STE(A)M are hot topics in almost each country
- STE(A)M is less dominant
- Implementation depends on the country, but a systematic approach is rare.-> GAP
- European STE(A)M initiatives are assumed to highly contribute to national STEM education
- There is little to no evidence that European initiatives impact STEM education
- Trends of national and international STEM initiatives overlap (to a certain degree)



The SEER

STE(A)M EDUCATION
EUROPEAN ROADMAP

Thank you!

Open discussion

1. Share your examples of impactful/preferred/best practice STE(A)M courses for educators (pre-service and in-service)
2. In your opinion, what constitutes best practice for STE(A)M training(s)? What key elements a STE(A)M course for educators should include?
3. Looking back on the discussion today, what is your experience of STE(A)M training and CPD? Are courses easy to access and engaging?
4. Have you enrolled in teacher academies in the past? Is it possible to use them as part of CPD in your country, or are teachers expected to use them on their own time?

>>> Use the Padlet to record your thoughts and contribute to the Roadmap



[https://padlet.com/eunacademy/
the-seer-seminar-s-live-feedback-
from-the-audience-2024-
42y8ayee29ecgttp](https://padlet.com/eunacademy/the-seer-seminar-s-live-feedback-from-the-audience-2024-42y8ayee29ecgttp)

ROUNDTABLE ERASMUS + Teacher Academies

- [SpicE](#), Achilles Kameas, *Hellenic Open University*
- [ICSE Academy/proSTEM](#), Maria Evagorou, *Pädagogische Hochschule Freiburg*
- [STEAME-ACADEMY](#), Gregory Makrides, *Uniwersytet Pedagogiczny Im Komisji Edukacji Narodowej W Krakowie*

The SEER

STE(A)M EDUCATION EUROPEAN ROADMAP



The SEER receives funding from the European Union's Horizon Europe programme project The SEER (Grant agreement: 101058569) coordinated by European Schoolnet (EUN). The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein. The SEER is supported by Scientix, the community for science education in Europe, an initiative of European Schoolnet.