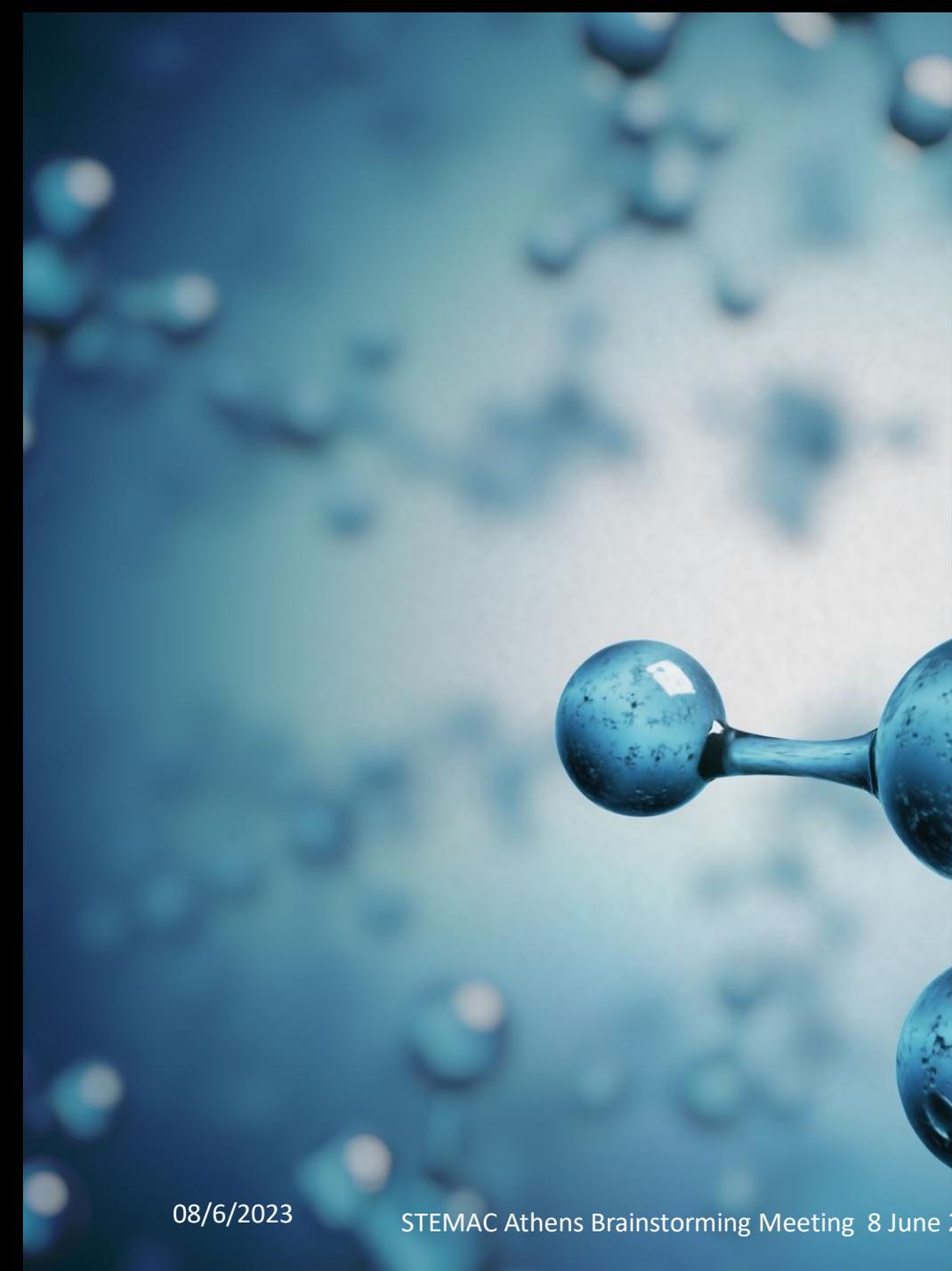# The STEMAC: definition, Vision, Strategy, Sustainability, Research & Implementations

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STEM in STEAM or STEMAC?

- **STEAM and STEMAC** are both variations of the STEM acronym, with additional letters added to include other areas of study.

- **STEAM** stands for Science, Technology, Engineering, Arts, and Mathematics (This approach incorporates arts into the traditional STEM curriculum)

- **STEMAC** stands for Science, Technology, Engineering, Mathematics, Arts, and Culture. (This approach expands on the STEAM model by including cultural studies. By including cultural studies in the STEM curriculum, STEMAC aims to produce graduates who are more globally aware, culturally sensitive, and able to adapt to diverse environments that bridge the Humanities with Natural Sciences.

What, Who, Why

- At the EASA an Expert Group was formed entitled: SCIENCE TECHNOLOGY ENGINEERING MATHEMATICS in ARTS and CULTURE (STEM-AC). This is an official Roadmap Policy for STEM in Arts & Culture. We believe that we need more clarification about the interdisciplinary scope of STEM in Education and this ties with previous successful Expert Groups (Education, Research, Innovation, ERI & Digitalization, AI, and Societal Impact) as methodology and applications of the different classes and disciplines of our Academy.

- (www.euro-acad.eu)
  08/6/2023

Our motto in EASA is: *STEMAC in Education, in Society, in Research & Innovation*

The aim

- We plan the establishment of the European network for STEMAC, and to prepare a European Conference **in Delphi** on the subject.

- The **Athens meeting** is one of several to follow in other EU hubs of STEM.

- Today invited experts from Greece on education + research related to the topic (representatives of schools, faculties and education structures, and scientific bodies) are presenting their implementation of STEM/STEAM and STEMAC, and participate in a brainstorm workshop.

- The participants will exchange views on good practices regarding STEMAC (STEM in Arts + Culture) for all three levels of **education-initiate Collaboration (Funding, Research, Innovation, Education, Sustainability SDG Goals).**
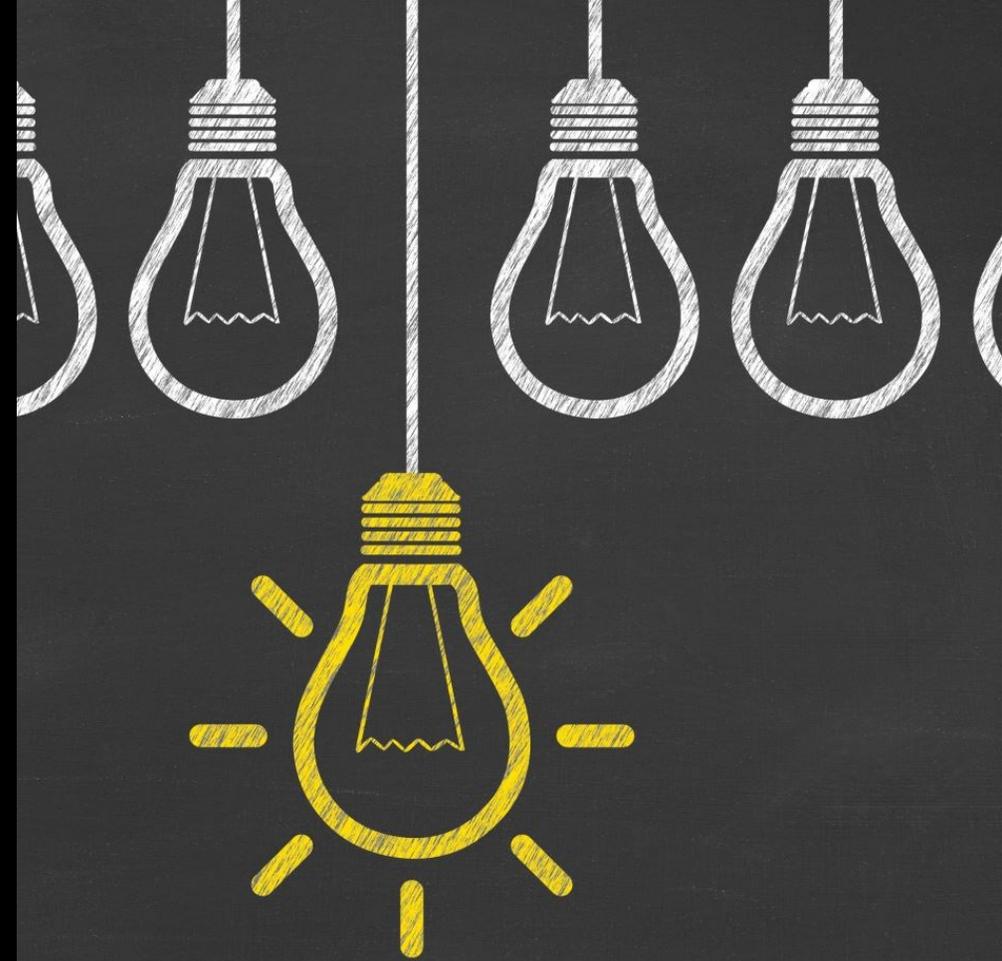
STRATEGY For STEM in ARTS + CULTURE

1. **Collaboration and Establishing Partnerships** (between STEM professionals, artists, and cultural institutions can help bridge the gap between these fields)

2. **Curriculum Development** (should include hands-on activities that engage learners in real-world problem-solving and allow them to explore and experiment with different technologies)

3. **Creating opportunities for experiential learning**. (project-based learning, can help students develop practical skills, knowledge, and expertise)

4. **Integration of Technology** (3D scanning and printing technology etc)

5. **Teacher Training** (professional development opportunities to learn new teaching methods, technologies, and strategies)

6. **Evaluation and feedback** (Regular evaluation and feedback can help improve the quality of STEMAC)

7. **Providing access to resources** (such as technology, equipment, and materials can help students and teachers/tutors in delivering effective STEMAC education)

8. **Community Engagement** (through public events, workshops, and exhibitions can raise awareness of the benefits of STEM)

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Emerging STEM-AC in pedagogics

- It introduces students and educators to an attractive approach with increased learning output in classroom on **Arts & Cultural Heritage**

- The current status and potential of this field initiates a further step to encompass **Culture**, as well (Liritzis 2018). This is the STEMAC (Science, Technology, Engineering, Mathematics for Arts & Culture), novel, and, surely integrated rapprochement, which reinforces the fragmentary bridges and sort of lack of coherence, between natural sciences and engineering & technology, with, and, for humanities (art / culture).

Definition of terms

- The **Arts** could include: Musical Arts & Sounds, Performing Arts, Language Arts, Visual Arts, Social Arts, Ecological Arts & Architecture.

- The **Culture** encompasses the *tangible* (material culture e.g. cultural heritage, cultural property) and *intangible culture* (e.g. religion, traditions, singing, mythology, literature et.c)

- From the **Exact Sciences** STEM encompasses natural sciences and engineering & technology, with all sub-fields.

- → **Particular focus in the past heritage**

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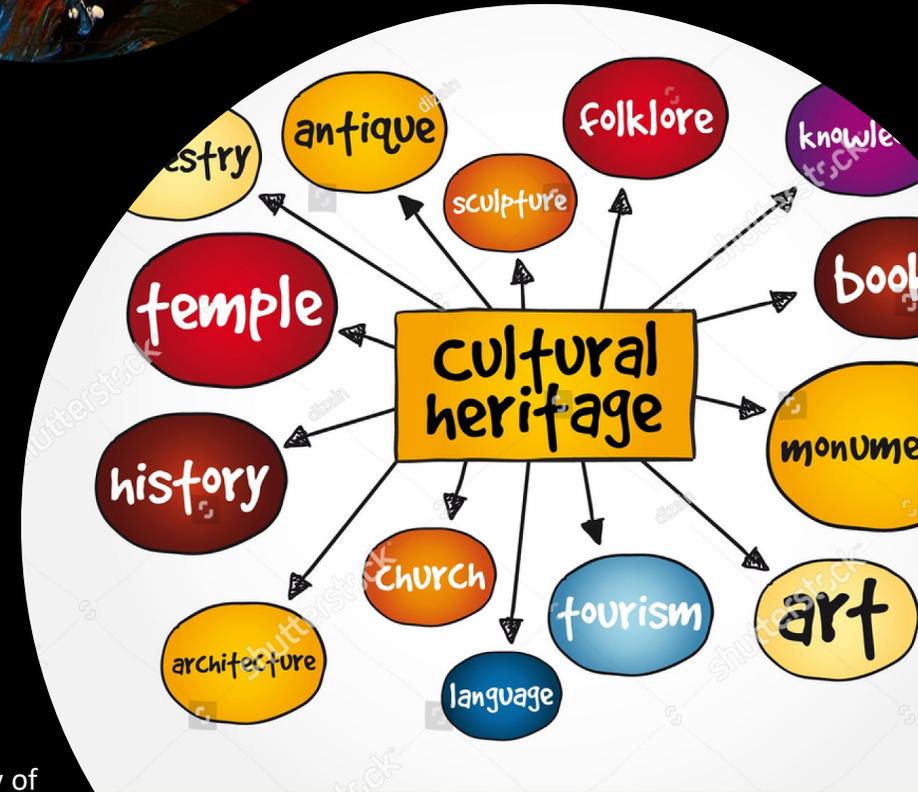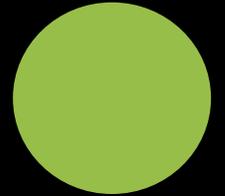
STEMAC, a new development for Cultural Heritage. An Example

- **Cyber-archaeometry** which is the digital IT process of simulation, restructuring and management of archaeometric processes from the field of natural sciences in relation to material culture, investigated variously (dating, prospection, analysis, technology, provenance, archaeoastronomy, etc.), either as optimum recruited image or as targeted research quest

- Rejoin arts and cultural heritage with STEM, any **holistic approach** to understanding *cultural change* must also include consideration of changes in the *environment* in which a society exists.

- Examples done:*e.g. Delphi Sanctuary reconstruction, learning virtual PL Microscope with avatars, by Volonakis P (Rhodes, UAEGEAN, PhD: Informatics technologies & Virtual reality in archaeological and archaeometric education"*

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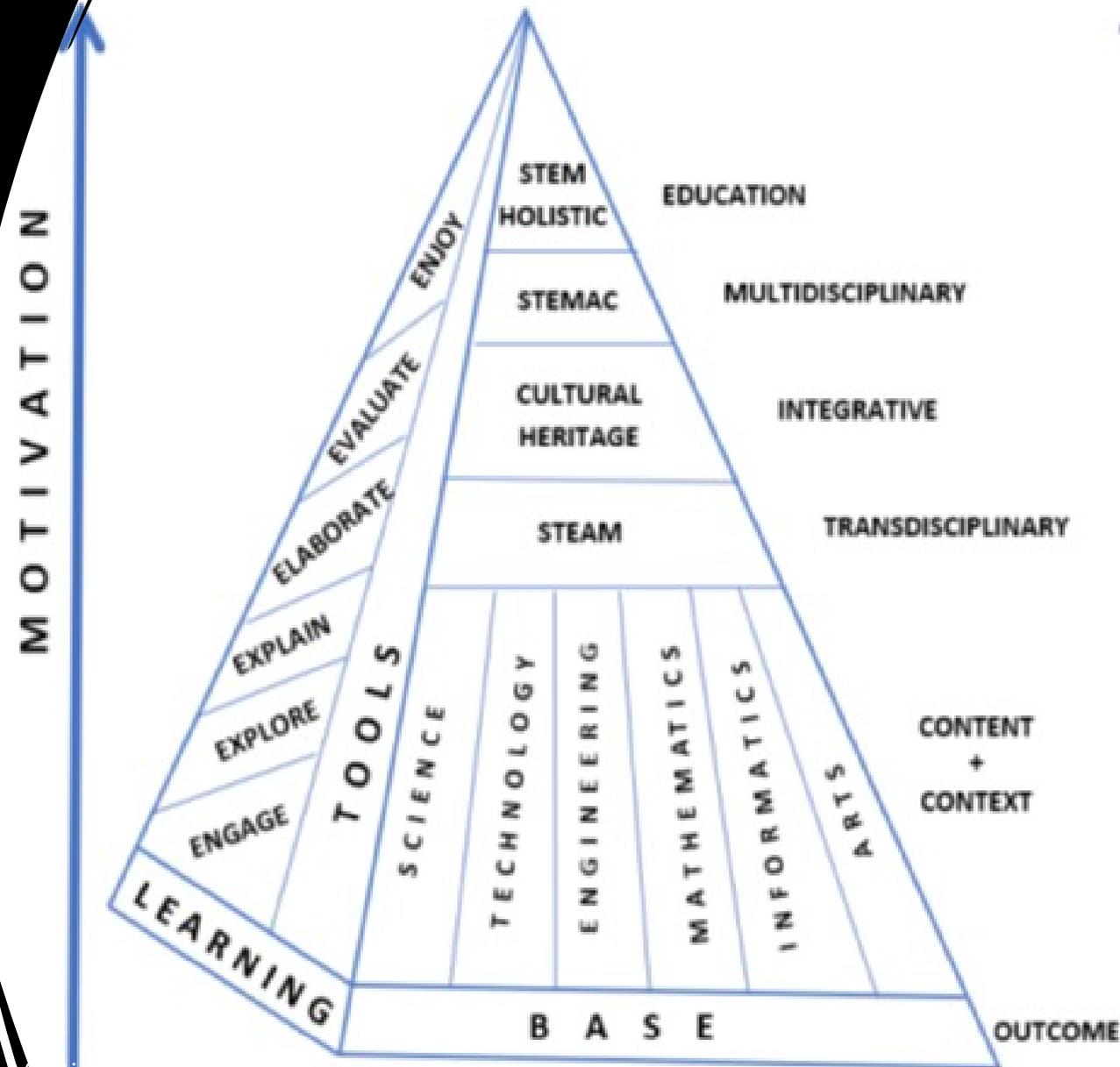
STEMAC: Some Concrete ideas for the three educational levels

- Using software from computer sciences and maths (PHP progammes-Hypertext Preprocessor, online games, Java script programming, and other algorithms and software) one can start working with STEMAC and on various archaeological, anthropological, artistic subjects, monuments, tangible and intangible cultural heritage issues.

- Develop **STEMAC for primary, Secondary and Higher educational** (and Long Life Learning) levels. For example: *archaeoastronomy* (astronomy impact to ancient cultures, rituals, celebrations, religious events, sundial devices etc), cyber-archaeometry, cyber-archaeology, *3D reconstruction of artifacts/ monuments, Virtual tours, Ancient music/theaters, Virtual Labs (for dating, provenance, spectroscopy analysis, optical microscopy analysis, Obsidian diffusion dating, image analysis by fractals, complexity in cultural/archaeological materials, Geogebra in cultural heritage issues* etc.

- Along with STEM for learning basic sciences in primary-secondary and higher education, these developments-training are performed as **interdisciplinary** subjects with history, arts, humanities.

VISION + SUSTAINABILITY

1. **To integrate the fields STEM+A+C in a way that fosters creativity, innovation, and critical thinking**. This aim fits the EASA task force on this subject comprising of active members of EASA working on these interdisciplinary fields.

2. **New technologies, tools, and techniques** that can be applied in the arts and culture industries.

3. **Arts and culture sectors can offer new avenues for scientists, engineers,** and mathematicians to explore and express their work in a more accessible and engaging way

4. Promote **diversity and inclusivity** in both fields (Arts+Culture via STEM)

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THE HUMAN VALUE -CONCLUSION

- EASA promotes the STEMAC.

- Both (Education and Cultural Heritage/Art) are promoting sustainability and development to every country, as well as the much-needed Understanding between peoples.

- Peace and mutual understanding presuppose comprehension, and STEM in ARTS+CULTURES can achieve this vision.

  - Arts + Cultures with STEM are linking the Worlds!!!