



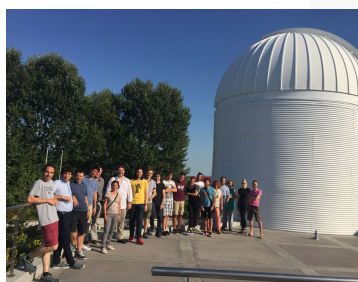
iMuSciCA

Interactive Music Science Collaborative Activities

Playing music, a smarter way to learn Math and Science

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Press kit
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EDITORIALS



Everyone wants to understand the world and asks questions about it. It starts when you look to the landscape, it starts when you are little.

Math and Science are the key to the understanding the world, leading to a big adventure.

There is a lot of beauty in Math and Science but people do not usually know it. As if these subjects should be dry and annoying. But they are not, they are captivating for those who can see their beauty. Now the question is: Who can see it? Do people know there is a lot of Art in Science and there is a lot of Science in Art?

STEAM education shows how related Math, Science and Art are.

With iMuSciCA we want to go deeper by using the Music.

Because Music is one of a few special form of Art connected with Time, expanding beyond Time. And Time is also a very important part of dimension of physics and maths.

They are deeply connected. iMuSciCA is going to use modern tools to give the key to explore the world and to develop the skills students must acquired for their future.

Renaat Frans

Lecturer of Physics and Teacher Education of Physics at University College Leuven-Limbourg



As a musician, I played music all my life. I understand Science and Maths are related to who I am: they explain who I am and I can't communicate it without them. They are a mean of communicating like Art, like Music.

But Science, Math and Art are too untied in education. That is why **we need to develop the possibility of expanding education with the Arts.**

This is the next step in education and a true challenge for the whole Europe.

STEAM education which includes Art is not just a way of thinking. Indeed, it is the first step to a long road that ends to an education that responds to the challenges of today's and tomorrow's world. We need to take this step. iMuSciCA will achieve this step.

With iMuSciCA, we try to develop an environment in which virtual instruments, virtual objects, mathematics, geometry and music concept coexist. Many activities can be done, new things can be created. It's challenging every day.

We strongly believe iMuSciCA is the solution for preparing our future.

Petros Stergiopoulos

Music teacher and concert artist (Conservatory of Athens, Diploma in Flute Performance)

THE CONCEPT

iMuSciCA* is a solution based on an innovative educational approach that **marries Science and Art** and addresses secondary school students.

The purpose of the solution is to design and implement a suite of software tools and services on top of **new enabling technologies** embedded on a workbench that will deliver interactive music activities.

iMuSciCA intends to support mastery of core academic content on STEM subjects (Physics, Geometry, Mathematics, and Technology/Engineering), and **to develop students' creativity and deeper learning skills through their engagement in music activities.**



Few words about STEAM education

The educational movement of STEAM is about bringing Arts at the heart of the academic curriculum in order to cultivate creative skills of young people, alongside with the knowledge and skills they acquire in STEM fields (Science, Technology, Engineering and Mathematics).

New demands raised by the global economic environment and the industry for innovation, adaptability, and flexibility highlight the need for cross-disciplinarily connected skills in the educational process, such as creativity, critical thinking, innovation and risk taking, which are expected to foster innovation and economic growth.

* iMuSciCA stands for Interactive Music Science Collaborative Activities.



iMuSciCA is a Research and Innovation Action funded under the European Union's Horizon 2020 Programme. iMuSciCA's Project Number is 731861. Europe is contributing €2.673.745,00.

iMuSciCA STEAM Pedagogy

iMuSciCA presents an interdisciplinary STEAM pedagogy that connects different disciplines with each other on an inquiry and collaborative manner. It brings new pedagogical methodologies in the classroom, with the use of state of the art educational technology tools.

This way active, discovery-based, and more engaging learning can be facilitated, **with opportunities for collaboration, co-creation and collective knowledge building.**

The iMuSciCA STEAM pedagogy will address different disciplines such as music, science/maths and engineering/technology. The STEAM pedagogy will let children play, discover and design within those disciplines.

iMuSciCA STEAM pedagogy looks at concepts and transfers knowledge from different discipline viewpoints.

STEAM works on the transfer of concepts and skills from one content area to another, as it looks at the same concept in different ways and from different viewpoints.

For example, proportional reasoning is usually learnt in mathematics with numbers and geometrical figures, while the concept of frequency of a sound played by a string provides a new field of experience of proportional reasoning.

THE CONCEPT

iMuSciCA STEAM pedagogy broadens traditional Inquiry Based Science Education

The iMuSciCA STEAM pedagogy will **let students experience the interplay of the STEAM-fields** by looking the same concepts through the discipline 'glasses' of music, science/math and the engineering/technology.

In iMuSciCA, the traditional Inquiry Based Science Education (IBSE) phases are broadened so as to let room to activities usually not incorporated in science inquiry like for instance the making/design phase which can occur both in engineering/technology and music.

iMuSciCA intends to deepen learning of STEAM subjects

The inclusion of concepts or practices from other subjects in iMuSciCA is intended **to deepen the learning and the understanding of the targeted STEAM subjects.**



Deeper learning includes:

- (i) mastery of core academic content,
- (ii) critical thinking and problem-solving,
- (iii) working collaboratively in groups,
- (iv) communicating clearly and effectively,
- (v) learning how to learn, and
- (vi) develop academic mindsets.



iMuSciCA focuses on the following objectives:

- Develop and explore original and innovative enabling technologies to ease the incorporation of open co-creation tools in music activities in order to support STEM learning, providing evidence of the positive impact of art and science interaction on creativity and innovation,
- Develop a set of practical activities to give learners the opportunity:
 - to explore different phenomena/laws of physics, geometry, mathematics and technology through creative music activities,
 - to examine these phenomena from various viewpoints,
 - to increase integration among various curriculum subjects contributing to innovative cross-disciplinary educational approaches,
- Encourage students to engage in innovative interactive music activities with advanced multimodal interfaces that enable them to discover new ways to look at science, that is, with the support of creative and artistic interventions, raising their interest in science and technology,
- Enable teachers to design meaningful and engaging project-based, problem-based STEAM learning activities, produce rewarding and self-fulfilling teaching materials by acquiring and integrating innovative and stimulating educational technologies in their teaching practice,
- Provide teachers with a coherent and rigorous set of lesson plans for STEAM learning.

THE CONCEPT

iMuSciCA STEAM pedagogy develops teams of teachers with different backgrounds

The iMuSciCA use case

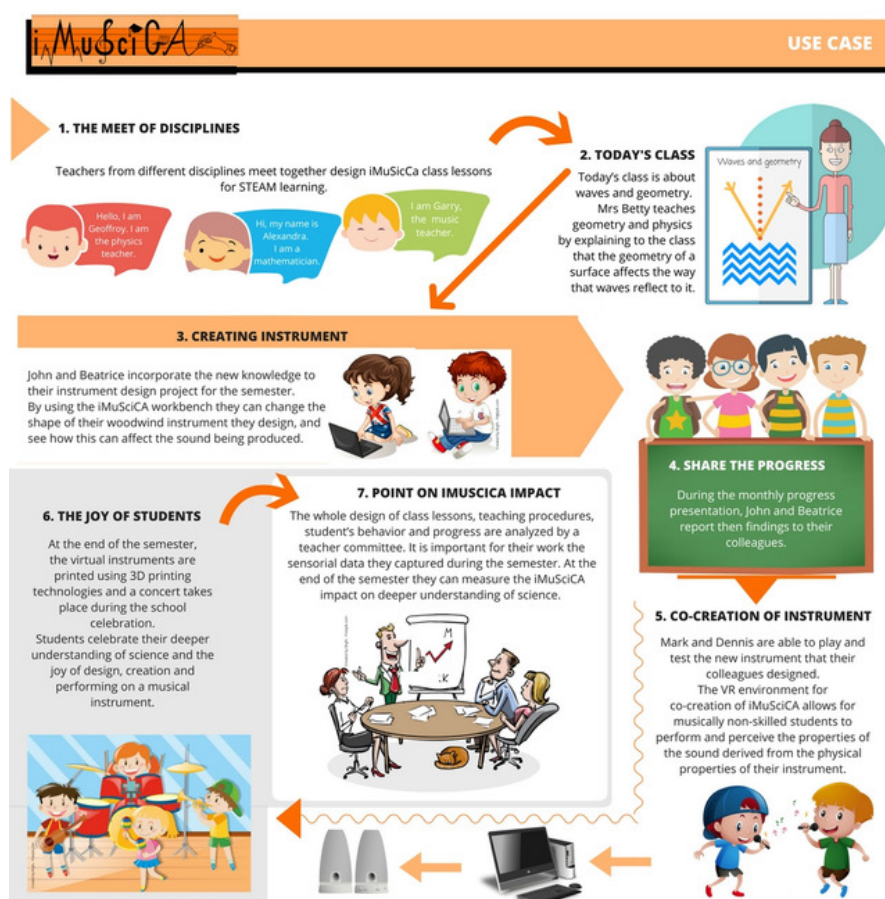
The nature of STEAM as an interdisciplinary subject, reflects exactly what we see in the real world, outside the classroom. In the real STE(A)M world in research institutes, innovative companies etc., people from different backgrounds collaborate together in interdisciplinary teams, to understand or design a new 'whole'.

Bringing STEAM to classroom requires a team of teachers **from different backgrounds**.

The iMuSciCA STEAM pedagogy reflects the **interdisciplinary nature** of the STE(A)M world on a double dimension:

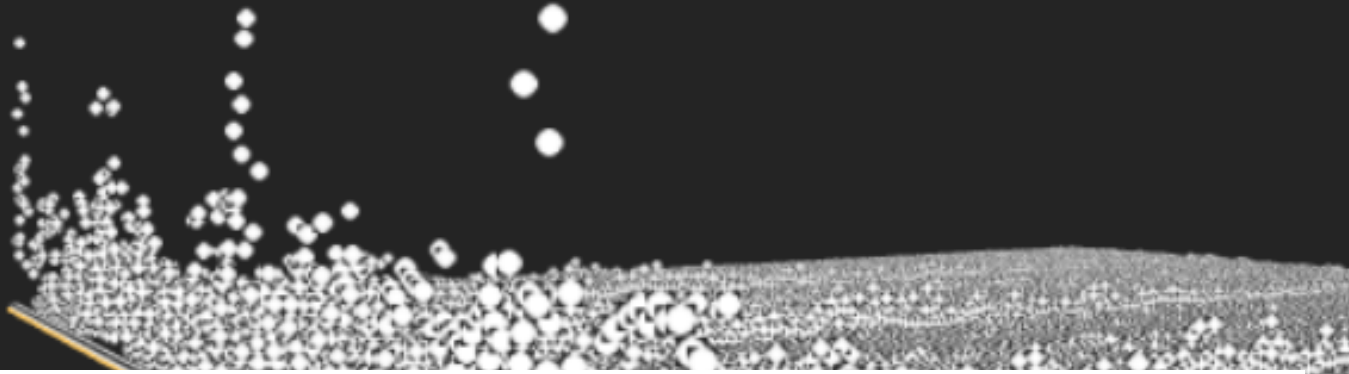
(a) it will connect concepts and skills from different disciplines in order to look better to a whole

(b) it recommends that teachers with different backgrounds (music, science/math, engineering) work together to bring this STEAM pedagogy to the classroom.



Connection of iMuSciCA STEAM pedagogy with curricula in three European countries

Joining science, technology, engineering, mathematics and art is far from evident also from the curriculum point of view. That is why we investigate the possibilities in the current curriculum to introduce the iMuSciCA STEAM pedagogy in France, Greece and Belgium.



THE SOLUTION

The iMuSciCA workbench

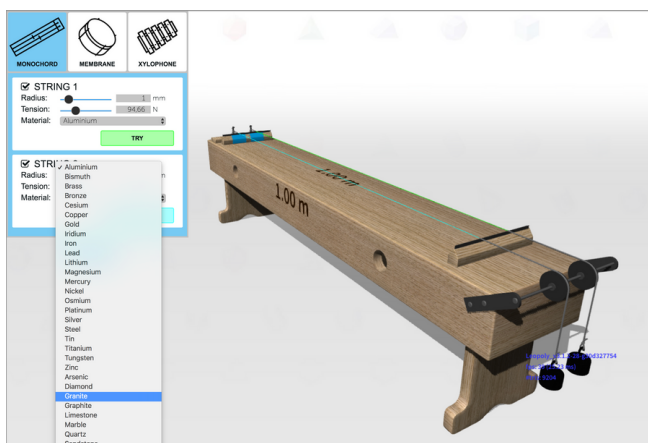
The workbench is the place where students can perform STEAM related activities according to the iMuSciCA pedagogical framework.

The iMuSciCA workbench includes a number of activity environments and tools that explore original and innovative enabling technologies. Indeed, iMuSciCA workbench activity environments are built on top of advanced core enabling technologies.

The activity environments, categorized according to the different STEAM domains of music, science/maths and engineering/technology, are:

3D Music Instrument Design

In this environment the user is able to design 3D models of virtual music instruments and adjust its design parameters for producing computer generated sound with interpretations of the related physics and mathematics.

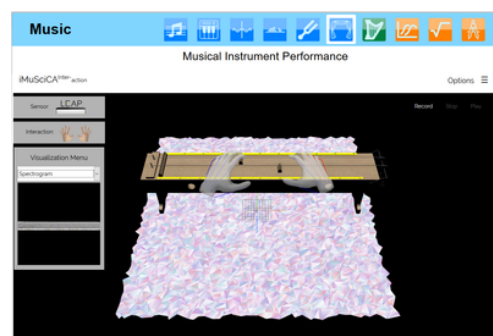


Innovative educational technologies include:

- Virtual 3D environments with gesture and pen-enabled interaction to design personalized music instruments using geometric forms and tools,
- Computer generated sound produced by varying the design parameters of music instruments with interpretations of the related physics and mathematics,
- Gesture and pen-enabled multimodal interaction of learners with the virtual 3D music instrument for co-creation and music performance,
- Interactive STEM authoring and learning environments with advanced tools for the creation and presentation of lesson plans,
- 3D printing technology for realizing the physical music instrument as an actual/tangible physical object.

Music Instrument Performance

This environment integrates the advanced interaction sensors of Leap motion and Kinect in order to allow students to use gestures with their hands or their body/arms to interact with virtual music instruments.





THE CONSORTIUM

Who is behind iMuSciCA?

iMuSciCA is an European project started in January, 2017 with the combination of stakeholders from the academic and private sectors:



Athena Research and Innovation Centre is a scientific research and technological organization, functioning under the auspices of the General Secretariat for Research and Technology (Ministry of Education).

Athena RC acts as project co-ordinator and is involved in the development of multimodal gesture and VR interaction with the virtual music instrument and sound and music analysis algorithms to be integrated in the iMuSciCA STEAM learning environment.



UC Limburg brings with its research unit Art of Teaching educational expertise to the project consortium on subject matter teaching. It has performed numerous national and international projects dealing with interdisciplinary education of music, the sciences as well as on the integration with technology.



Ellinogermaniki Agogi is an educational organization of private law, officially recognized by the state.

Established in 1995, the Research and Development Department of EA provides the test bed for research applications for the design, development and implementation of the research activities in education.



The fundamental principle of IRCAM is to encourage productive interaction among scientific research, technological developments, and contemporary music production.

Since its establishment in 1977, this initiative has provided the foundation for the institute's activities. Ircam is primarily involved in the development of the virtual music instrument modeling and real-time sound synthesis algorithms to be integrated in the iMuSciCA STEAM learning environment.



THE CONSORTIUM

Who is behind iMuSciCA?



Leopoly makes it easy to design, customize and produce 3D objects and everyday products by combining the hottest technologies (3D printing, virtual reality, 3D scanning) with their easy to use apps.

Leopoly encourages 21st century makers and newcomers from the fields of education who want to jump into the 3D printing and 3D design ecosystem, browse among thousands of digital objects and customize or create their own one within seconds.



Cabrilog is a global leader on the international marketplace for digital education, offering interactive educational materials for the learning and teaching of mathematics. Cabri maths solutions have been deployed by more than twenty Ministries of Education and has been embedded in Texas Instruments calculators since 1992.

The role of Cabrilog is to contribute to the development of the interactive STEM learning and teaching environment by providing mathematics exploration tools and lesson plan authoring tools.



WIRIS is a mathematical software company based in Barcelona, Spain. The company was founded by teachers and former students from the Technical University of Catalonia (Barcelona Tech).

WIRIS offers advanced calculation and presentation tools for mathematics education with emphasis on Internet technology solutions. WIRIS is involved on the overall architecture of iMuSciCA and in the development of the project workbench, giving their experience as an industrial partner specialized in digital education market for maths.



UNIVERSITÉ DE FRIBOURG
UNIVERSITÄT FREIBURG

The University of Fribourg was founded in 1889. The University of Fribourg is active in many research fields dealing with multimedia engineering and data analysis.

The DIVA group (Document, Image and Voice Analysis) of UNIFRI joins the consortium as an international key player in handwriting analysis and an international expert in multimodal human-computer interaction, gesture recognition, and mathematical expression recognition. Specialized experts on fundamental research in core enabling technologies contribute to the project together with experienced researchers who participated in previous European and national research projects.

NEXT EVENTS & CONTACTS

iMuSciCA Pilot Testing

iMuSciCA will hold pilot testing in schools from three European countries

iMuSciCA will hold pilot testing in secondary schools with the participation of teachers and students from three European countries (Belgium, France and Greece) aiming at:

- Technical usability and acceptance: learning environment works in different devices; main actors know about its functionalities and how to operate it.
- Pedagogical fit and value: learning environment is useful; brings the STEAM inquiry-based pedagogy into the classroom, increases opportunities for collaboration, co-creation and collective knowledge building.
- Learning fit and value: learning environment personalizes learning process motivates to learn more; helps to achieve deeper learning competencies.

iMuSciCA Summer School

iMuSciCA Summer School 2018 is planned to offer teachers a “hands-on” training experience upon the iMuSciCA Workbench. The workbench is the place where students can perform STEAM related activities according to the iMuSciCA pedagogical framework. The iMuSciCA workbench also involves advanced music analysis and visualizations tools and includes a number of activity environments and tools that explore original and innovative enabling technologies.



To know more about iMuSciCA Summer School 2018, please visit us at <http://imuscica.ea.gr/>

Contact

Are you interested with iMuSciCA for your schools or to distribute it ?
Feel free to contact us and ask for opportunities:

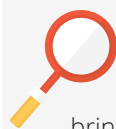
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IMUSCICA IN A FEW WORDS

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As a STEAM-oriented solution, iMuSciCA aims to design and implement a suite of software tools and services on top of new enabling technologies (such as interactive pen on touchpad, 3D object design and printing, multimodal interfaces) integrated on a platform that will deliver interactive music activities for teaching/learning STEM.

With this solution, the consortium plans to support mastery of core academic content on STEM subjects, alongside with the development of creativity and deeper learning skills through secondary school students' engagement in music activities.

Contact

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