

Overview of the iMuSciCA project

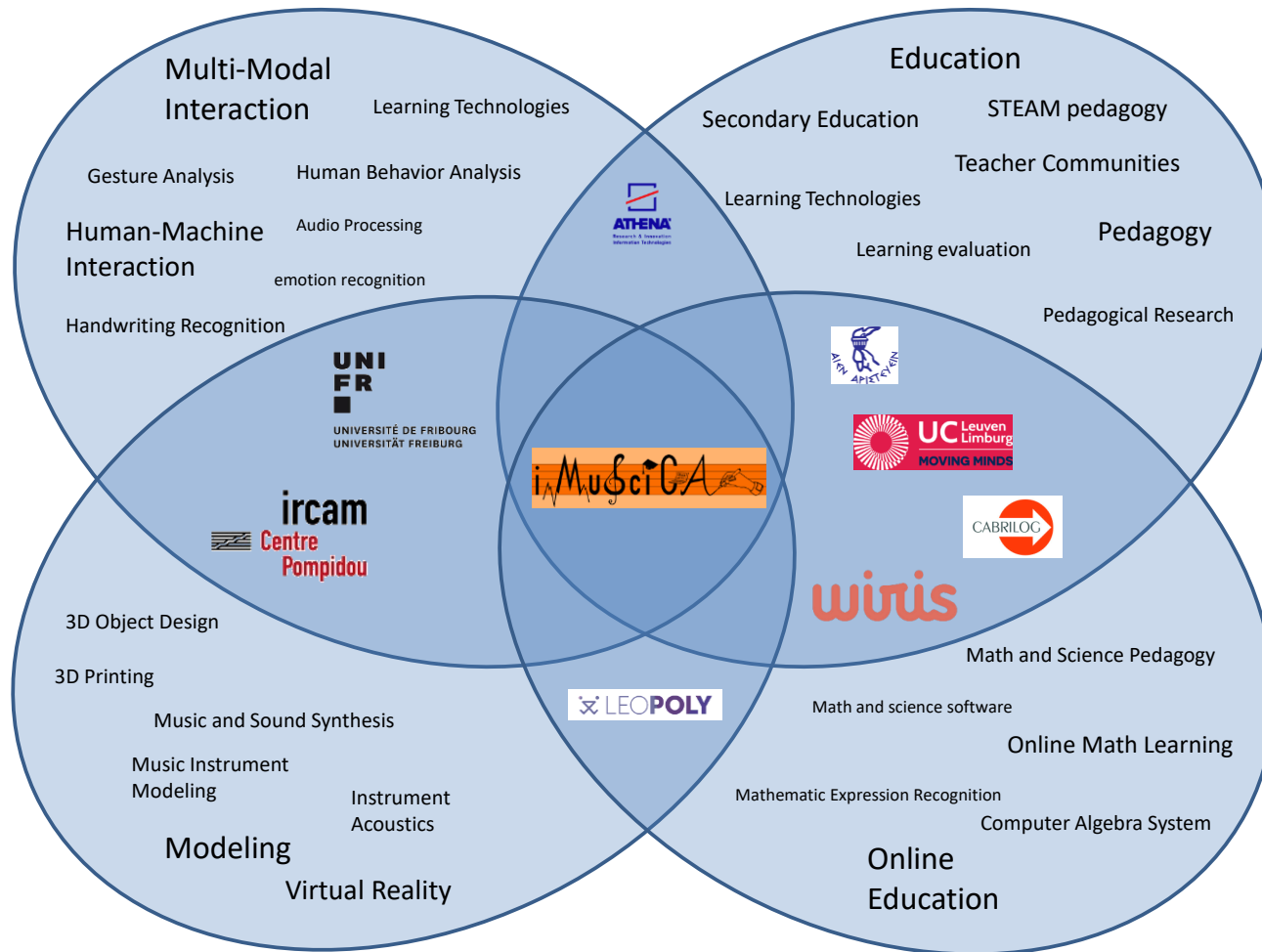
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iMuSciCA partners introduction



The educational movement of STEAM

- Cross-disciplinarily connected skills in the educational process to promote **creativity, critical thinking, innovation, risk taking**
- Alongside with knowledge and skills in **Science, Technology, Engineering and Mathematics** (STEM) fields
- Bring **Arts (A)** at the heart of the academic curriculum

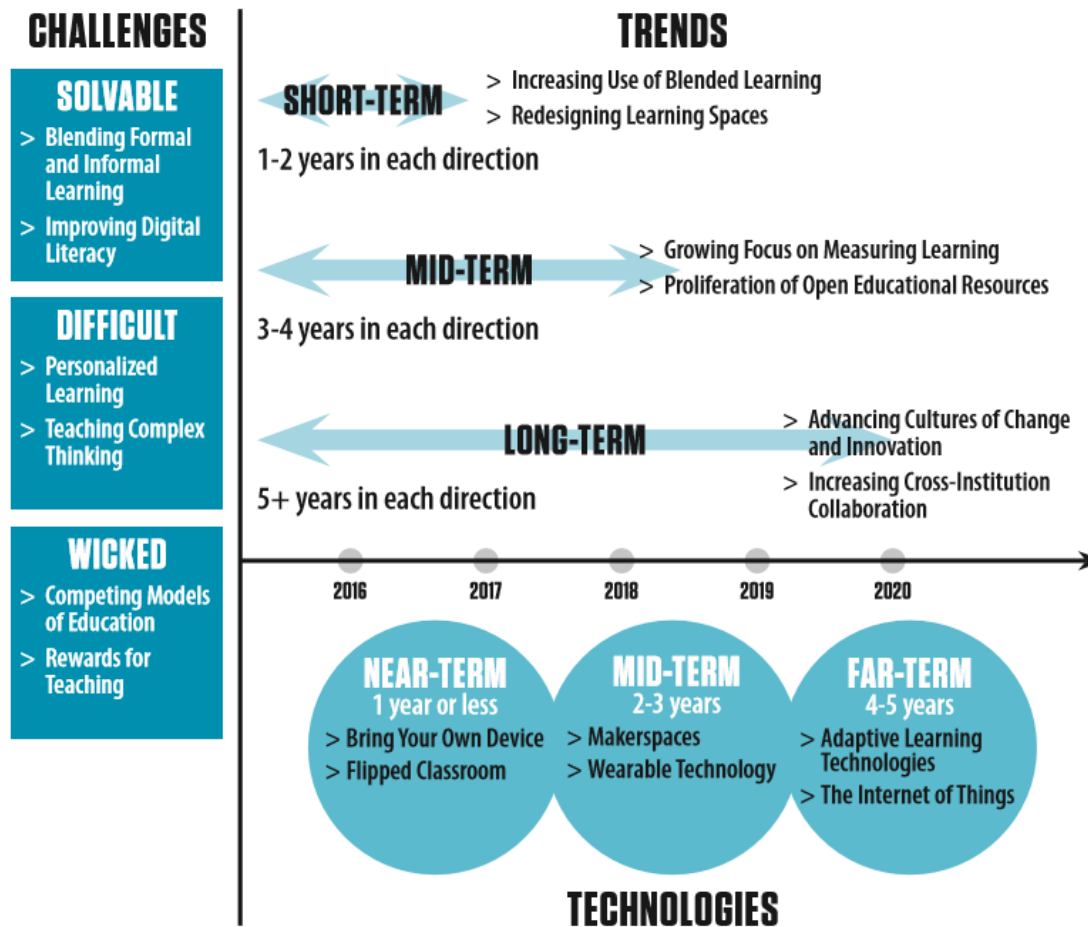
STEM + A = STEAM



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Inspired by trends, challenges and technologies



Source: New Media Consortium (NMC) Horizon Report 2015

iMuSciCA

interactive **M**usic **S**cience **C**ollaborative **A**ctivities

- New pedagogical methodologies and innovative educational technology tools to support **active, discovery-based, personalized, and more engaging learning**
- Provide students and teachers with opportunities for **collaboration, co-creation and collective knowledge building**
- Design and implement a suite of **software tools and services** on top of **new enabling technologies** integrated on a platform that will deliver **interactive music activities for teaching/learning STEM**



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iMuSciCA objectives

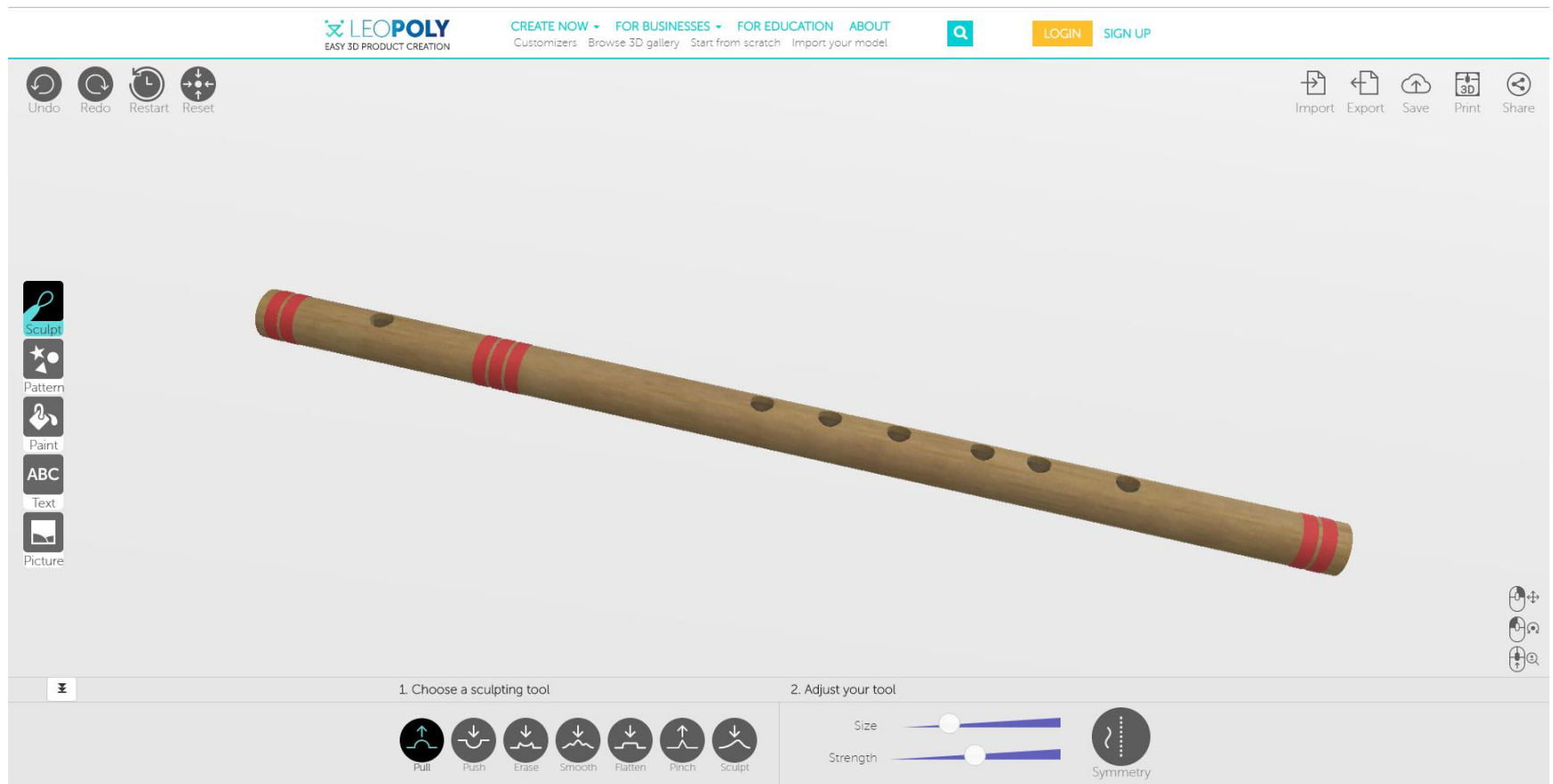
- Develop and explore **original and innovative enabling technologies** to facilitate open co-creation tools incorporated in music activities to support STEM learning
- Develop a **workbench of music activities** to give learners the opportunity to discover phenomena/laws of **physics, geometry, mathematics and technology**
- Encourage students to engage in innovative interactive music activities with **advanced multimodal interfaces** to discover new ways to look at **science and technology** to support **creative and artistic interventions**
- Enable teachers to design engaging **project/problem based STEAM learning activities**

iMuSciCA main outcomes

- **Workbench of Music Activities** containing methodological and advocacy tools of advanced enabling technologies to assist learners in developing co-creative processes for STEAM learning
- **Cross-disciplinary lesson plans** for secondary education to teach physics, geometry, mathematics and technology **combined with creative music activities**
- Professional development **material for teachers and educators** for adopting innovative STEAM teaching methodology

iMuSciCA enabling technologies

Virtual 3D environments to design personalized musical instruments using geometric forms and tools



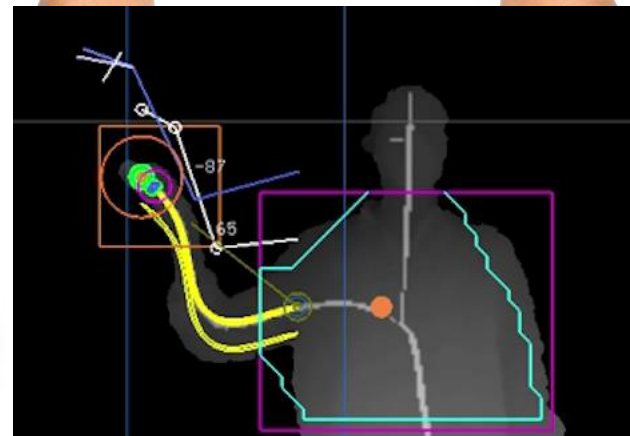
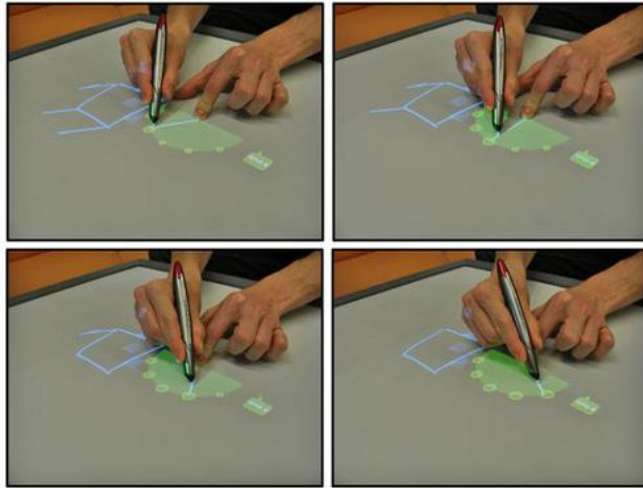
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Computer generated sound produced by varying the design parameters of musical instruments with interpretations of the related physics and mathematics



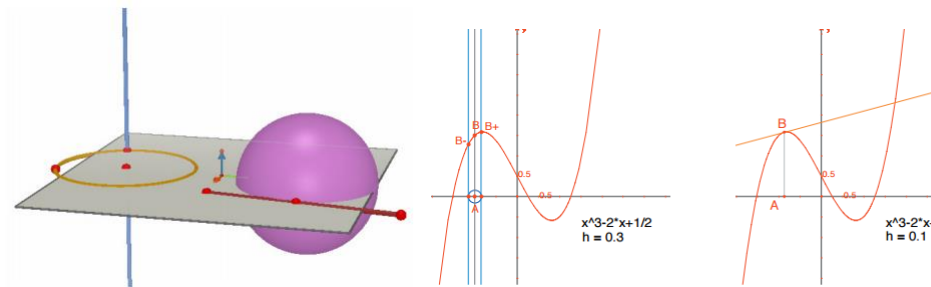
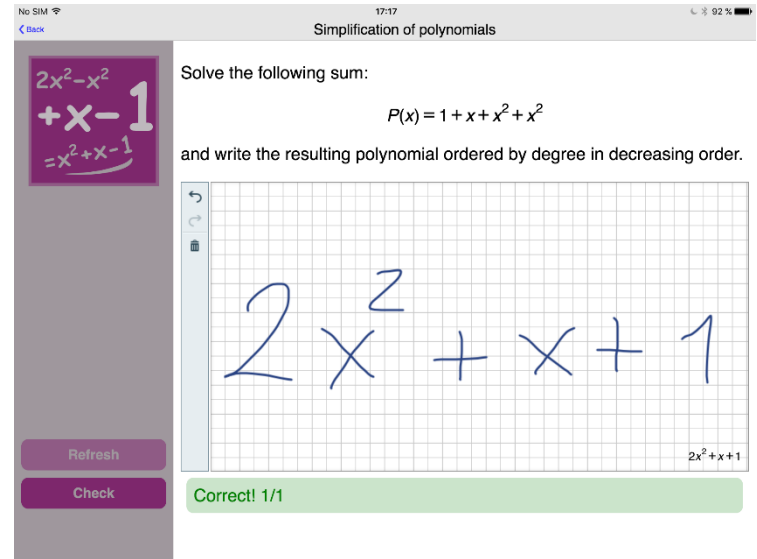
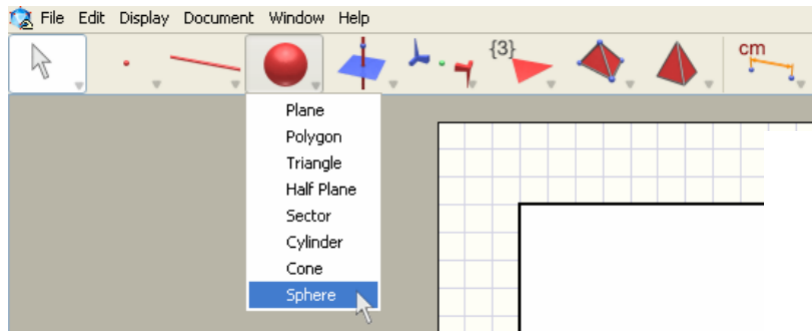
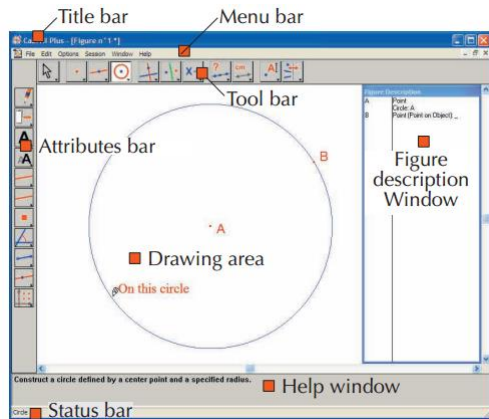
iMuSciCA enabling technologies

Gesture and pen-enabled multimodal interaction of the learners with the virtual 3D musical instrument for co-creation and music performance



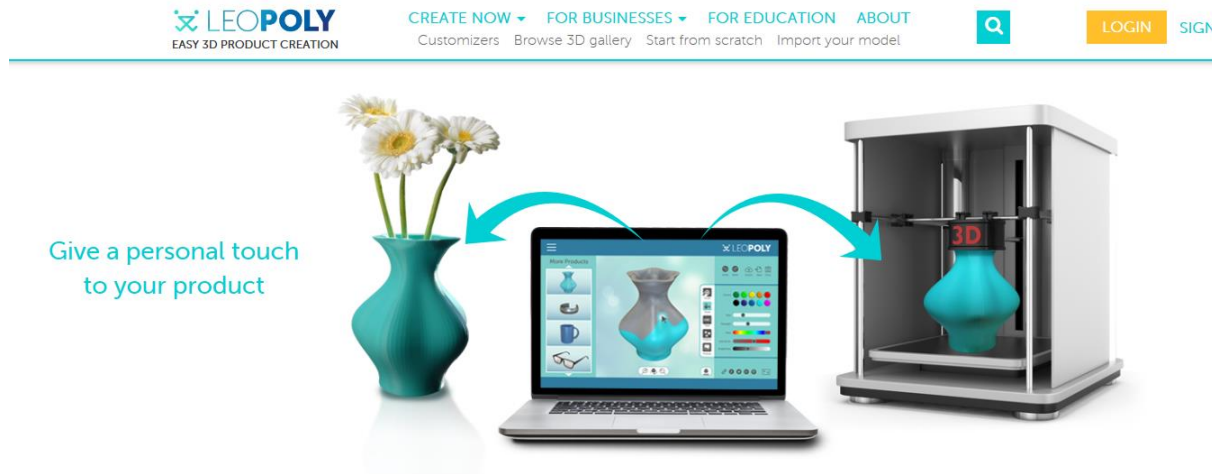
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Interactive STEM authoring and learning environments with advanced tools for the creation and presentation of lesson plans



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Deployment of **3D printing technology** for realizing the physical musical instrument as a tangible physical object



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Use Case Scenario

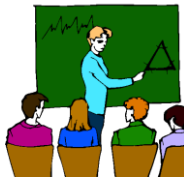


John & Beatrice
iMuSciCA students

Interactive Music Science Collaborative Activities



3D printing of the instrument for the concert



Alexandra is teaching geometry and waves



John and Beatrice incorporate new knowledge in their instrument design



They explain their 3D instrument to their class mates



Co-creative design, visualisation, and testing of 3D instruments that sound



Logo Design & sketches by Andrin Hubacher



At the end of the semester, a concert is taking place where students celebrate their deeper learning



Teachers design iMuSciCA class lessons for STEAM learning



Garry gives individual feedback to Beatrice



Teachers exchange knowledge from different subjects



Alexandra discusses the learning outcomes with John



Garry & Alexandra
iMuSciCA teachers

Team Teaching for STEAM Education



Teachers committee measures the impact of iMuSciCA on deeper learning and refines lesson for next year

Every year a new stage is organized. In each stage an instrument will be designed with the final goal of playing a concert. However, the three iterations differ in their level of deeper concepts to be taught.

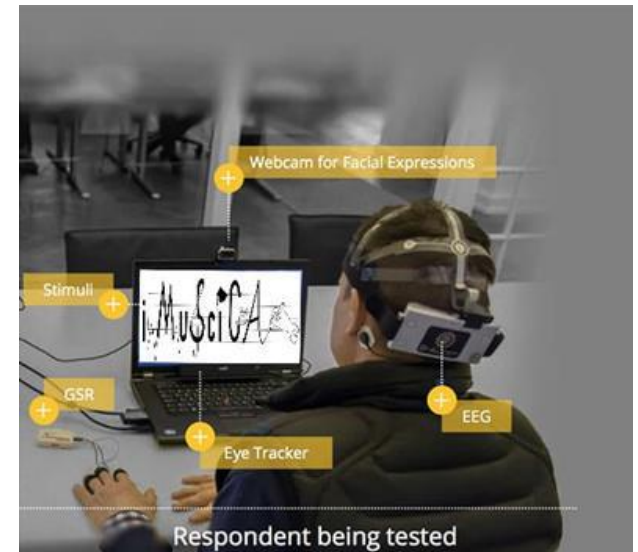
1. Sound & tone generation, 3D instrument design
2. Timbre & harmonics, deeper mathematics & physics
3. Consonance & dissonance, solid knowledge and understanding in a variety of curriculum subjects (physics, mathematics, geometry, informatics, engineering, technology, music, design, and history of arts.

Evaluation of deeper learning with iMuSciCA

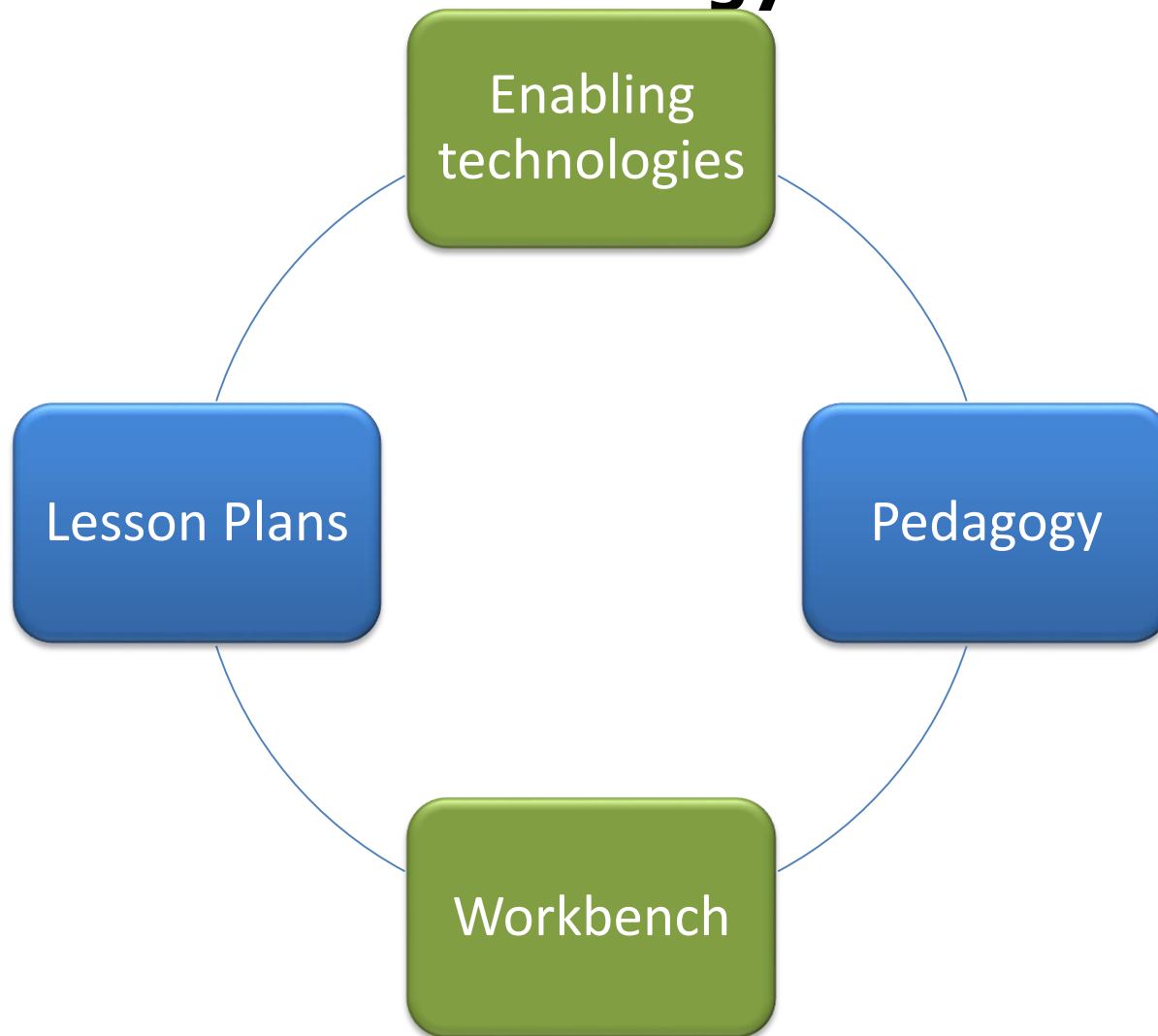
- How do we measure deeper learning?
- Formative evaluation
 - Pilots in Greece, Belgium and France (~30 students and ~6 teachers)
- Summative evaluation
 - Pilots in Greece, Belgium and France (~300 students and ~50 teachers)
- Qualitative and Quantitative methods and instruments
 - Surveys, questionnaires (teachers and learners)
 - Pre & post tests (learners)
 - Tracking learner's activity (mouse clicks, response times, frequency of hints, etc.)
 - Tracking learner's behaviour

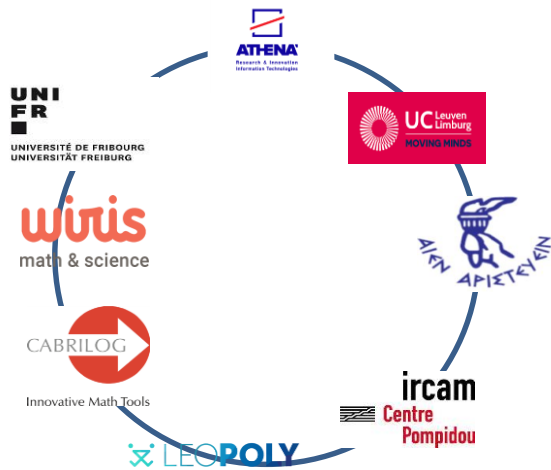
Advanced monitoring tools for tracking learner's behaviour

- Eye tracking
- Facial expressions analysis
- Galvanic Skin Response (GSR) sensors
- Electroencephalography (EEG)



Interaction between pedagogy and technology





Starting Date: January 1st, 2017

Duration: 30 months

Total EU Contribution: € 2.673.745,00

Project Number: 731861

<http://www.imuscica.eu>

Thank you!

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