



NEXT STEP O2

NEXT STEP SCENARIO

Enabled Educational Scenario



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Short Description:

In Da Vinci's manuscripts we find a wealth of notes related to the life of the great artist and researcher. Among them, a small pentagram sketch (small music staff) with a series of music notation stands out. The musical notation in which the sketch is written follows the Renaissance style of musical-writing which, in terms of its notational features, continues to evolve until its consolidation later in the Baroque era.

Da Vinci's own handwriting is governed by mirroring. His writings are read from right to left. However, this peculiarity of his writing is also a characteristic feature of many musical compositions that were already applied by musicians both before his time and up to the present day. In this particular note we see how Da Vinci's mirror writing "converses" with Music as a tool of musical composition.

In the end, students produce a short video of their work inspired by symmetries in their own environment. The soundtrack of the video is based on the presented principles of symmetry.



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1. Introduction

Main aim

The NEXT STEP project is proposing a whole school approach to science learning. Building on previous successful European open schooling and STE(Arts)M initiatives, the project will bring about the NEXT STEP in education by providing a roadmap for the transformation of school classrooms into open and creative learning spaces. NEXT STEP methodological approach exceeds the state of the art regarding existing creative approaches and STEAM initiatives. In this framework the NEXT STEP project will design and set in operation the STEAM IDEAS' Square, an innovative learning environment which will be the nucleus of the school's activities. NEXT STEP will demonstrate how these environments a) can offer opportunities for deeper learning of STEAM, b) can improve the innovation and creative capacities of learners, c) can support the new role of teacher as a coach of the learning process, d) can facilitate effective cooperation with external stakeholders and e) can inspire policy-makers, school heads and school staff to imagine the schools of tomorrow.

Vision of the Project

The NEXT STEP vision for a creative and innovative school is the development of the creative and innovative classroom of tomorrow, the STEAM IDEAS' Square, in which education relies on an interdisciplinary, arts-based methodology within an entrepreneurship and design thinking framework.

STEAM IDEAS' Square - (SIS) which will be the main core of the school's creative and innovative activities will have two substances: digital and physical. In its premises and via its digital tools in-school interaction between STEM and other disciplines schoolteachers and among all the relative stakeholders (students, educators, parents, artists, scientists, local community authorities, industrial stakeholders, and policy makers) will be established with purpose to run complex and exciting real-life educational world projects. Teams of students (from the same or different classes) can also work and cooperate under SIS umbrella.

By connecting curious minds and specialists and lead them to think "out of the box" will help to speed up the flow of ideas to **transform the school and its classrooms to** a unique creative space for educational innovation and STEAM education.

Through collaboration and the appropriate pedagogies will be established prototyping, pedagogical innovation, creativity (along with distance learning opportunities) and well-being at school.

In addition, the capacity to work with external organizations so as to explore how such partnerships and networks can be built through a long-term strategy-based on trust and common objectives they contribute to key competence development.

A way to implement and use the ideas of NEXT STEP project is through developing a series of scenarios of use that are in line with the proposed approach and involve schools in a series of creative and innovative activities for the improvement of the local cities, settlements, and communities' physical and built-up environments, while engaging key stakeholders (experts, researchers, local communities, businesses etc.) in the process. Different scenarios about different school typologies will be created and these with the help of the right Strategies will help schools to evolve

One of these scenarios that is suitable for a STARTER school (according to our typology) is the one presented later in this document.



2. Essential Features of the STEAM IDEAS' Square

The development of key competences is further facilitated by the provision of context from other disciplines and can:

- a. offer opportunities for deeper learning of STEAM,
- b. improve the innovation and creative capacities of learners,
- c. support the new role as a coach of the learning process,
- d. facilitate the effective cooperation with external stakeholders and
- e. inspire policy makers, school heads and school staff to imagine the schools of tomorrow.

All the above in total in the context of a functional NEXT STEP STEAM IDEAS' square will drive to overcome the organizational and technical barriers and to integration of creative and innovative culture in every day school practices and to aggregate and create projects and activities customized to the specific needs of schools.

Deeper Learning Competences, as **defined in the Recommendation of the European Parliament and of the Council of 18 December 2006 on Key Competences for Lifelong Learning (2006/962/EC)** as described by the Hewlett Foundation model (Pellegrino & Hilton, 2013) can be adopted in order to define the exact indicators needed to measure the efficiency of the project's objectives. A selection of certain deeper learning competences that correspond to a range of ages wider than the high school students (which is the main target group of the deeper-learning competences model) can be classified in the following three groups (Frans & Andreotti, 2018):

Group A: Cognitive competencies

- (1) Mastering rigorous academic content - A1
- (2) Thinking critically - A2

Group B: Interpersonal competencies

- (3) Working collaboratively - B3
- (4) Communicating effectively - B4

Group C: Intrapersonal competencies

- (5) Learning to learn (C5)
- (6) Developing academic mindsets - C6

As defined in the Recommendation of the European Parliament and of the Council of 18 December 2006 on Key Competences for Lifelong Learning (2006/962/EC):

F1) Literacy competence (GA1)

F2) Multilingual competence

F3) F3M.Mathematical competence and F3S. competence in science, F3T. technology and F3E.engineering, F3MS, F3ST, (STEM=F3)

F4) Digital competence - F4

F5) F5P.Personal, F5S.social and F5L.learning to learn competence (C5)

F6) Civic competence

F7) Entrepreneurship competence

F8) F8C. Cultural awareness and F8E.expression competence

We use the Competences as Features taxonomy from the European Parliament and the Council's recommendation in our scenario.



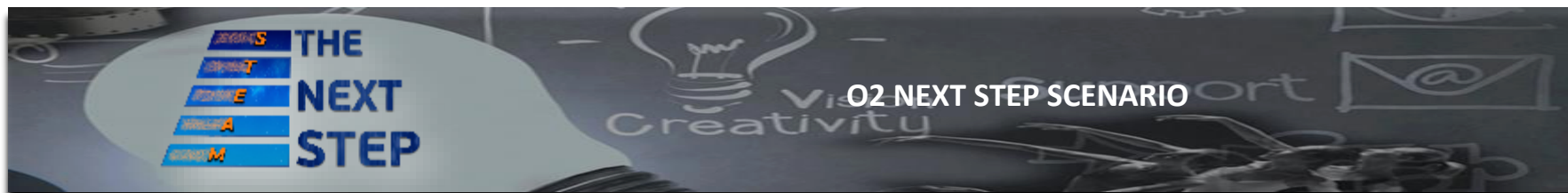
3. NEXT STEP Scenario Identification

(Da Vinci in score)

3.1. Scenario of Use in a General education-lower secondary School .

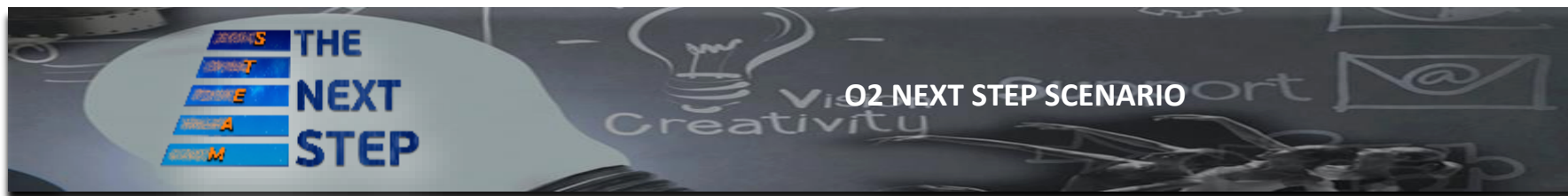
Da Vinci's own handwriting is governed by mirroring. His writings are read from right to left. However, this peculiarity of his writing is also a characteristic feature of many musical compositions that were already applied by musicians both before his time and up to the present day. In this particular note we see how Da Vinci's mirror writing "converses" with Music as a tool of musical composition.

In the end, students produce a short video of their work inspired by symmetries in their own environment. The soundtrack of the video is based on the presented principles of symmetry.

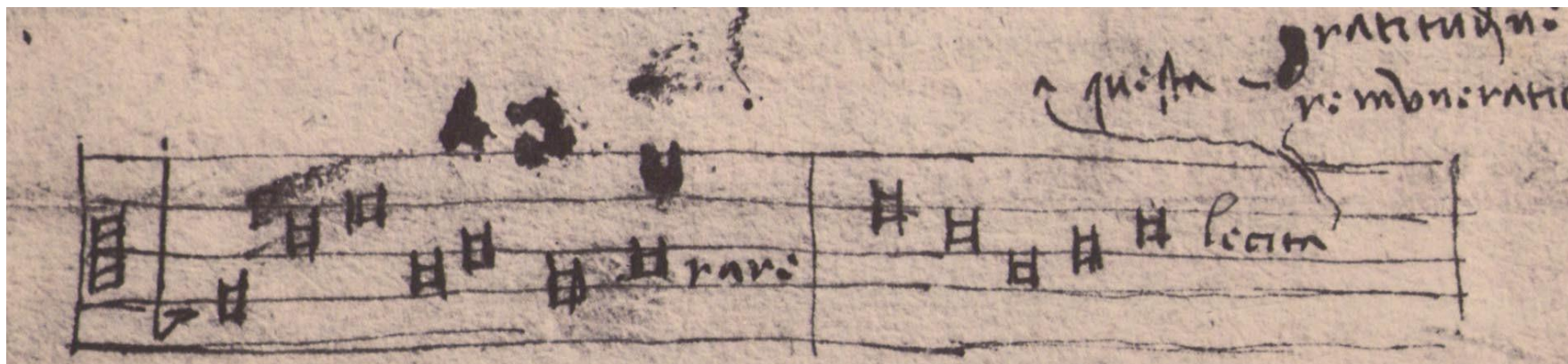


3.2 Scenario Identification Card

Category	Description
Title	<i>Da Vinci in score</i>
Teaching theme/problem	<i>Reflections in Music and in Geometrical Symmetries</i>
Keywords	<i>Geometry, Music,</i>
Language	<i>English and Greek</i>
Thematic classification	STEAM oriented Education
Learning/Teaching main objectives:	<i>S (Sound Acoustics) T (online use of audio tools) E (virtual instruments construction) A (Music, Motives, music notation) M (Geometry – Symmetries)</i>
Suggested age group	<i>14-17</i>
Estimated level of difficulty	<i>Medium - Difficult</i>
Material and technical infrastructure needed	<i>STEAM IDEAS' Square place, ICT school infrastructure, 1-1 laptops/tablets/iPads. Musical Instruments (physical or electronic), Drawing material, Online Audio tools. Mirrors</i>
School - Stakeholders Synergies	<i>Local authorities</i>
Typical intervention time	1-10 school hours
Teaching level	<i>Gymnasium and Lyceum or Junior High School or High School</i>
Level of interactivity	<i>High</i>
Type of interactivity	<i>Physical, Digital, Educational field trips, Sosial Events</i>
Authors, Publisher name	<i>Petros Stergiopoulos</i>
Copyright -CC	<i>Here we can express the CC level of our scenario (you can see more about CC here)</i>



3.3 Scenario Identification Image



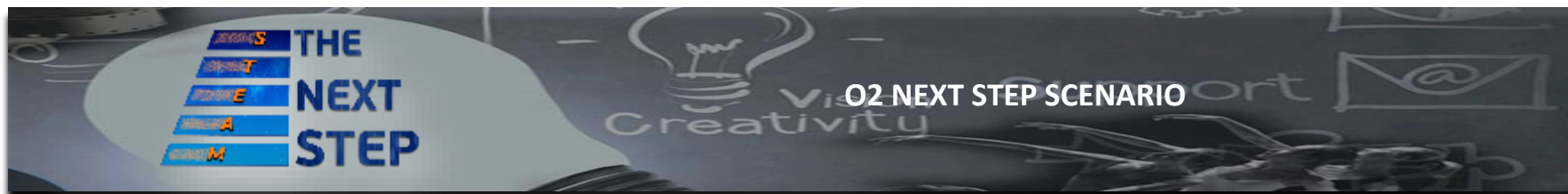
Before you start fill in the following tables, please read what it is expected to include in its one of the 4 steps:



The **FEEL**-phase addresses real-world challenges, and invites students (and teachers) to actively engage towards building their own future. This is done by encouraging students to take and share control in the collective creative process, where they understand the rules and make decisions in consideration of them. The safe, small-world society of the classroom, is a good place for students to become being active agents in their own learning. This may in turn inspire an engagement in the larger-world society. In both cases, the engagement is based on empathy towards others, both people and planet (and all those who reside here).

Both teachers and students *can* and *will* influence the process and the final output. No matter what the main scientific topic is, the aim is to adapt it to today's challenges, encouraging students to explore good solutions.





Imagination is a powerful tool! It may seem to be an under-estimated talent in the school-system. But where would we be, if we didn't imagine the impossible? There would be no inventions! No innovation! And little exploration. The **IMAGINE**-phase is about exploring possibilities, celebrating them.

This is the phase where students engage each other with new ideas through collective brainstorming-sessions, with ideas building upon ideas, gradually moving from a quantity of ideas to a quality idea through a collective process. It is about the willingness to take risks in finding the best solution (in a safe environment), immersing themselves into the unpredictable process of creativity. Instead of taking and sharing control, this phase is about a willingness to loose part of the control in the name of progression in the creative process. It can be rather scary to enter the

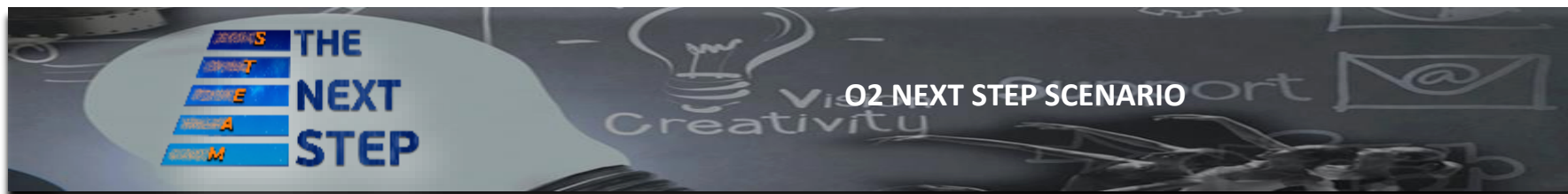
chaos that creativity is closely related to. Being open to new ideas that emerge can be a challenge both for students and teachers, especially if the sense of ownership to one idea is strong. Which is why the emphasis on a circular, collective process of developing ideas is so important: By breaking down the creative process of writing a story into smaller parts (or composing a piece of music, or creating steps in a choreography), and circling it from group to group, lots of ideas are shared. Each group has influence and can share ideas in each of the stories. This way, when one story is chosen at the end, there are no losers, and everyone is a winner, because everyone has contributed to all of the stories!



In this phase, **CREATE**, students will need to develop and to apply their solutions, what they have imagine in the previous phase. The ideas can vary widely depending on the type of activity and the solutions they seek and the level of the problem students are trying to solve. They have to implement their ideas, interact with external stakeholders to ask for support and guidance and also be creative to find solution while they are implementing. It is very important to note that the proposed solutions have to be based on scientific evidences and research results (coming as input from the Feel Phase). Students have to be engaged in experimentations and data analysis to provide optimum solutions. Close cooperation with the local communities in necessary.



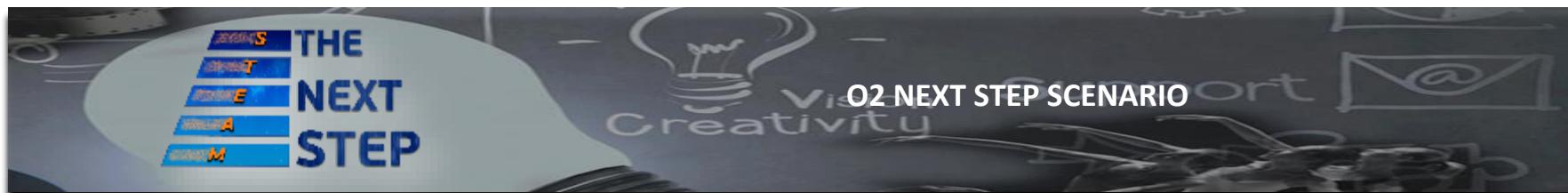
Young people have to be interested in societal challenges and find creative solutions. According to the Open Schools to Open Societies project results (<https://www.openschools.eu/>) nowadays schools work as ecosystems (Sotiriou et al. 2017), which not only produce knowledge but also link this knowledge to real world and real needs. Moreover, collaboration between formal, nonformal and informal educational providers, enterprises, industries and civil



society should be enhanced to ensure relevant and meaningful engagement of all societal actors with science.

At this step, students should develop the needed approach in order to communicate their results into the local, national or international community. Students, facilitated from their teachers, should communicate with the rest of the schools but also outside the school. They should inform the community for their results and how these could contribute to any possible issue that the community is facing.







O2 NEXT STEP SCENARIO

3.4 Title of Project

(Da Vinci in score)

Feel Step

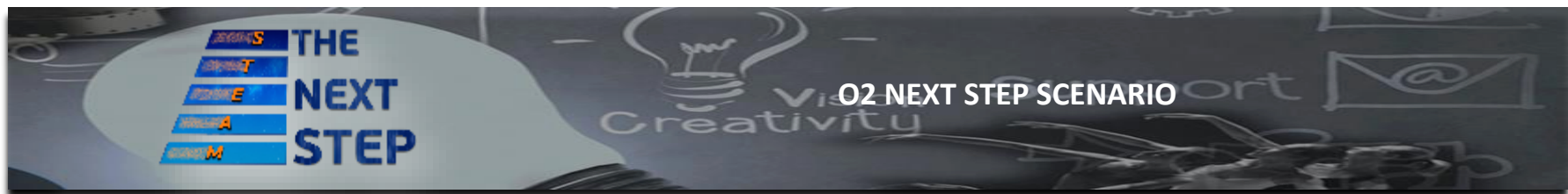
				
Act #	Description of activities, strategies, methods, means, resources and synergies		Learning goals Learning outcomes - Features	STEAM Disciplines Place and Estimated Duration
A1	<p><i>Music</i> Teacher</p> <p><i>Science (Math)</i> Teacher</p>	<p>Actions – <i>Present symmetries in nature (e.g. in flowers, etc).</i></p> <p>Educational Method <i>Teachers help students understand symmetries not only in nature. Teacher triggers in-classroom discussion</i></p> <p>Tools - Support material related to our world : https://youtu.be/sMg4XJG2XyY – Support material related to music: https://youtu.be/YOqBTojB1Ag</p>	<p><i>This activity introduces the idea of symmetries in Nature and in the world around us. The concept is connected to the Arts .</i></p>	<p>S, A</p> 
	Students	<p>Actions – <i>Students imagine the world of symmetry in Architecture and the Arts. Students take photos or draw sketches of outdoors examples of symmetry. With the help of their teacher, musically aware students produce elements of symmetry with their instruments</i></p> <p>Tools – Students can watch the following videos related to Da Vinci https://youtu.be/N9wGwUCav8M https://youtu.be/tBdEr2-C-U4</p>		
STEAM Ideas' Square (SIS)	<p>Schoolteachers (musicians, mathematician) collaborate on arranging the video- editing of the students'</p>			<p>Time: 1-2 hs</p>







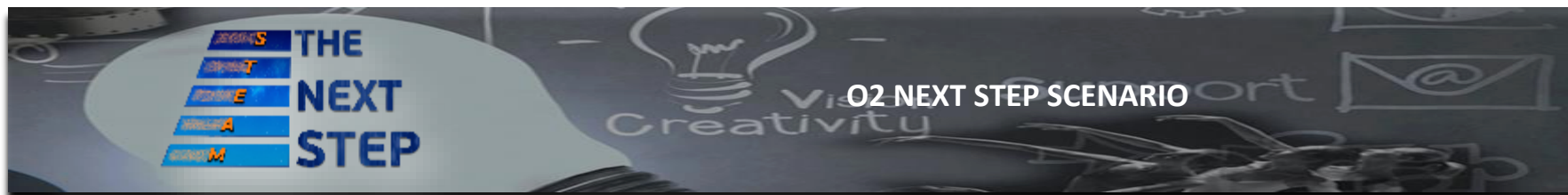
<p>Operation - School Community Synergies</p>	<p>work.</p>	
<p>School- Stakeholders Synergies</p>		







Imagine Step

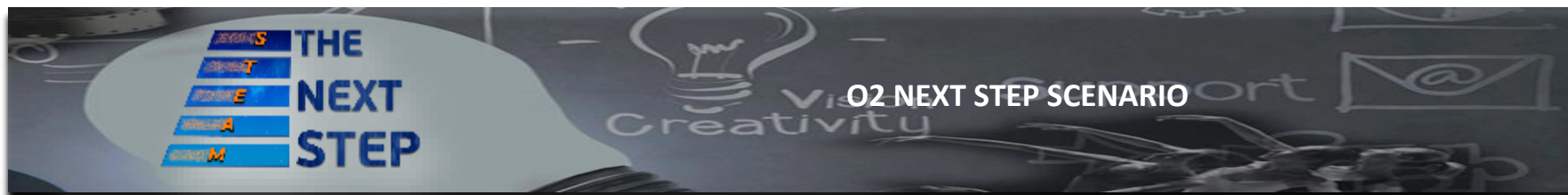
					
Act #	Description of activities, strategies, methods, means, resources and synergies		Learning goals	STEAM Disciplines Place and Estimated Duration	
			Learning outcomes - Features		
Ax	<p><i>Music Teacher</i></p> <p><i>Science (Math) Teacher</i></p>	<p>Actions - . Teacher introduces and analyze the images of Da Vinci’s writings and notation in straight and reverse order (Curriculum: Staff/Notation/Clef/Measure, Renaissance). Writes on board with his non-writing hand and encourages student to experiment with the same manner.</p> <p>They help students reproduce Da Vinci’s notation using physical instruments or on-line audio tools. They introduce the same idea in drawings or construction.</p> <p>Teacher introduces Symmetries in Geometry</p> <p>Tools - Da Vinci Image 1 , Da Vinci Image 2 Examples : https://episteamousiki.athenarc.gr/wp-content/uploads/2022/07/Da-Vinci-La-Re-Mi.mp4</p>	<p>Educational Method</p> <p><i>Inquiry method</i></p>	<p><i>Here you should describe the learning goals of this activity.</i></p> <ul style="list-style-type: none"> • To learn about Da Vincis’ manuscripts and the way of writing • To understand symmetry in written language, Arts, Physics 	<p>S,A,M.</p> 



	<p>Students</p>	<p>Actions – Students produce copies of both the straight and the reverse version of the manuscript notation. <i>Inspired by painting they paint images or shapes that look symmetrical</i></p> <p>Tools – <i>Students use iMuSciCA Sonification environment in the workbench platform: iMuSciCA Workbench</i></p> <p><i>Students' questionnaire: http://connect.ea.gr/symmetries-quest/</i></p>	<p><i>Students must be capable to describe the types of symmetries and identify examples in nature and the Arts.</i></p> <p>A1, A2, B3</p>	<p>In classroom 2 hrs</p>
<p>(SIS) - School Community Synergies</p>	<p>Teachers collaborate to adapt their curricula in order to support teaching symmetries in both disciplines.</p>			<p>At SIS, Time: 2 hrs</p>
<p>School-Stakeholders Synergies</p>				



Create Step

				
Act #	Description of activities, strategies, methods, means, resources and synergies		Learning goals	STEAM Disciplines Place and Estimated Duration
			Learning outcomes - Features	
Ax	Music Teacher Science (Math) Teacher Or Technology teacher	Actions - Teacher analyzes the Da Vinci-manuscript and its harmonic background. Define the appropriate chords that accompany the phrase in straight and reverse order. Encourages students to take pictures and videos of their performances on virtual or physical instruments. Asks students to find the similarities between the audio recordings with the images or sketches taken from the previous step. Encourages students to create their own musical motives based on Da Vinci's example to match existing or new images created. Show ways to create the storyline of a short video.	Educational Method <i>Guided Discovery</i>	M, A, E. 
	Students	Tools - Screen Recording tools, Audio recording tools, Video editing tools, Online audio tools.	Actions – Students form groups. They create symmetries in Music using Sonification tool: Environment 7 of workbench . They identify the acoustic properties of virtual instruments to construct the chords that accompany Da Vinci's melody. The use of physical instruments is encouraged too.	• To create symmetries using online audio and visualization tools. • To create symmetries using combinations of visual and musical means.



	<p>Use Video and editing tools to record and present their work according to the storyline.</p>	A1, B3, B4	
	<p>Tools -- Symmetries in Music using Sonification tool: Environment 7 of workbench . Examples: Image 1, Image 2, Image 3 Screen Recording tools, Audio recording tools, Video editing tools, Online audio tools.</p>		
(SIS) - School Community Synergies	Teachers refine the students' outcomes so as to form a presentable result.		At SIS, Time: 2 hs
School-Stakeholders Synergies	Teachers communicate with parents in order to support the work of the students by disseminating the "work in Progress" in social media.		At SIS, Time: 1h

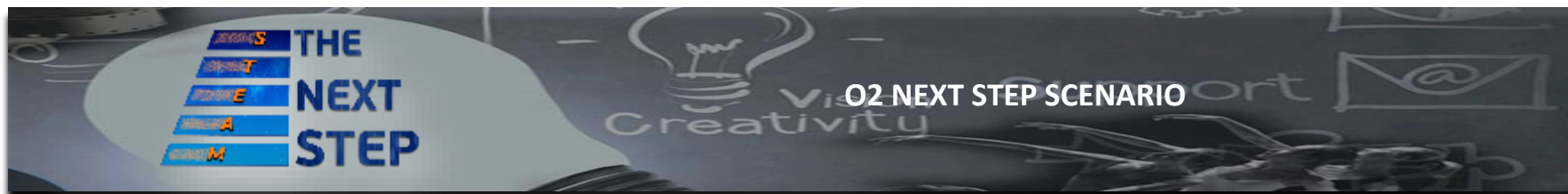
Share Step

				
Act #	Description of activities, strategies, methods, means, resources and synergies		Learning goals	STEAM Disciplines Place and Estimated Duration
			Learning outcomes- Features	
Ax	ICT Teacher And Music Teacher	Actions - Upload the video in the school blog. Show students how to write a description on the way the video was made. Divide in groups and gather the information needed	Educational Method <i>Performance and discussion</i>	T, A 
	Tools - (Online Social Media and School Blog if available)		<ul style="list-style-type: none"> • To present their creation in public • To reflect on their worj • 	
	Students	Actions - <i>Students work in enhancing the post with information on the “making of”.</i>		Students must be prepared to understand their role within a group. They reflect on the whole procedure. B3, B4, C6
	Tools – <i>Word processing tools. Blog tools</i>			
(SIS) - School Community Synergies	Teacher in collaboration with the parents arranges the dissemination through the social media.			At SIS, Time: 2 hs
School-Stakeholders Synergies	The school applies to further disseminating the video in official educational platforms. (A Greek example:			At SIS, Time: 1 hs



“Educational Television”, a TV program held at the official Parliament TV channel dedicated to school video educational projects.





4. Abbreviations, short terms, apps used in Scenario of Use

- SIS: STEAM IDEAS' Square
- Stakeholders: Parents, special scientists, external Educators, authorities, entrepreneurs,
- IWBS: Interactive White Board System, Video Projector and interactive whiteboard.
- P. Presentation (like a pptx created with Powerpoint).
- Tablets. Electronic devices for personal use, like Android tablets or iPads.
- Laptops. Either in a lab or in classroom
- PCs. Computers in a lab.
- qStopMotion: <http://qstopmotion.org/>

Competences

- F1. Literacy competence
- F2. Multilingual competence
- F3. F3M. Mathematical competence and F3S. competence in science, F3T. technology and F3E. engineering //or/ F3MS, F3ST , (STEM=F3)
- F4. Digital competence
- F5. F5P. Personal, F5S. social and F5L. learning to learn competence
- F6. Civic competence
- F7. Entrepreneurship competence
- F8. F8C. Cultural awareness and F8E. expression competence



NEXT STEP Partnership



Western Norway
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ELLINOGERMANIKI
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