NEXT STEP O2

NEXT STEP SCENARIO

Enabled School Educational Scenario

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Contents

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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 of 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 for the proposed scenario with the title: *Scientific processes to art making.*

3.1. *Educational Scenario in a Starter School - General description.*

In our classes we look for the most innovative and inventive ways of working. Science and Art share links that expand further beyond our historical connections with people such as Leonardo Da Vinci. In today's classroom we are very focused on offering our students the opportunities to engage with cutting edge techniques and process in order to make their learning more impactful.

Problem solving is a key skill that we try to instil in our cohort of students. Alongside this, we are very aware of processes that we undertake that could be better managed in terms of health and safety. Acids and substances that could cause harm are used in both Science and Art. For this project we aim to engage students of science and art classes in St. Louis Secondary School in an exploration of how acid free etching may be possible. This will involve science and a number of variables being key to the creative process associated with the creation of a work of art.

We aim to experiment with how salt water and electricity could replace acid in the etching process and to what extend the active agents can etch into the surface of a metal (copper) plate.

We seek to encourage the students to work in groups for this experimental process with each member of the group taking charge of a different element of the 'experiment'. Students have basic video skills and we hope to help them advance these by engaging in a video editing workshop. We aim to have each group document the process by videoing stages as a roadmap for other learners/ educators.

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3.2 Scenario Identification Card

Category	Description
Teaching theme/problem	Through various activities students will get an understanding of how science processes can aid the development of a work of art, through the use of salt and electricity.
Keywords	Speed, forces, etch/ etching, copper, plate, battery
Language	English
Thematic classification	
Suggested age group	12-14
Estimated level of difficulty	Moderate
Material and technical infrastructure needed	Workshops can be easily set up and facilitated using equipment and resources readily available in the classrooms, laptops, ICT available in the school. Workshop with Create Schools will enable students to develop digital video editing competencies.
Stakeholders Synergies	
Typical interaction time	6-8 weeks
Organizational structure	
Teaching level	*Lower secondary school*
Level of interactivity	*Complex/ advanced*
Type of interactivity	*Team work and experimentation with techniques and processes.*
Conducting Frame	
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4. Main Project - MP: Create an artwork through the process of salt water (electricity) etching.

Act #	Description of activities, strategies, methods, means, resources and synergies			Learning goals and outcomes Feautures/Competences	STEAM Fields
A1	**Science teacher**	Shows videos, presentations and pictures of an electricity charged water bath. Discusses the scientific processes occurring through charging water with electricity, in terms of speed, force and salt content in the water.	**Educational Method** Introduction to the theme and Socratic questioning	• To introduce students to the concepts of electrodes and the conducting of electricity. • To encourage students to engage with discovery based learning through experimentation. • To engage in class based discussions and questioning surrounding salt water vs sugar water baths. Interrogate the effectiveness of sugar compared with salt water solution. Share their thoughts and ideas on the process. Begin the process of taking an idea from process to realisation.	
		Tools: IWB,P, https://www.youtube.com/watch?v=ODbgKXFED5o https://www.youtube.com/watch?v=f0QEQRB8GJs Worksheet on the effectiveness of electricity in water depending on quantity of salt.			

	Students	Answering questions posed by their teacher, note-taking. Using prior knowledge to contribute to class discussion. **Tools**: notebook, worksheet.		**In classroom duration** **45m**
A2	**Science teacher**	Guide students in creating their own electricity charged water bath. Encourage students to define the variables of the process. Assist with equipment set up. **Educational Method** Inquiry **Tools:** IWB, P., Battery, basin, clamps, copper wire, water.	• To encourage group work and a sense of peer learning though a hands on workshop. • To develop a sense of student leadership through ensuring all team members have a task or role associated with the in-class engagement. • To develop a critical eye by visually and scientifically (through using various apparatus) determining the most effective levels of salt in the water and time needed to reach a full charge of electricity in the water bath.	**In classroom Duration** **2 x 1 hour classes.**
	Students	Engage with the scientific process by following the predetermined steps. Visually draw conclusions from the effects of electricity on the salt water. Determine an appropriate level of salt content in the water. **Tools:** Battery, basin, clamps, copper wire, water.		
	(SIS) School Community synergies	During A1, A2 and after A1, A2, the science teacher will collaborate with the art teacher to create worksheets, and a workspace for students to gather together and engage in the process towards a creative outcome. Timeslots for engaging with this creative initiative will be determined and classes will join together on two occasions (working in the STEAM Ideas' Square).		
	School-Stakeholders Synergies	Teachers may link in with Create Schools in order to start thinking about documenting this creative scientific process.		

CREATE

Act #	Description of activities, strategies, methods, means, resources and synergies			Learning goals and outcomes Feautures/Competences	STEAM Fields
A3	**Art teacher**	Guide students to create design for an artwork that will be etched into the copper plate using salt water and electricity. Demonstrates the process of preparing a copper plate for etching (plate into wax melting pot (time sensitive)).	**Educational Method** *Guided discovery*	• To learn about grounds in printmaking and how they protect a metal plate from the etching process. • To use a variety of different resources for creating artwork on a copper plate • To explore the best techniques to use when creating a drawing on top of the wax ground. • To understand the effects of heat metal when it is exposed to this source for prolonged durations. Student will become more **aware** of their surroundings and processes being engaged with. **Time management skills** will be developed.	T A **In classroom duration** **2 x 1 hour classes.**
		Tools: paper, pencils, copper, wax melting pot, wax, copper wire, plastic surface protector, gloves.			
	Students	Students will work individually to develop drawings that they intend on etching into their copper plate. Students will observe as the plates are placed in wax melting pot and appropriate amount of wax is applied (noting here the amount of time submerged in wax).			
		Tools: paper, pencils, copper, wax melting pot, wax, copper wire, plastic surface protector gloves.			
A4	**Art teacher**	Shows students how to draw onto the wax ground that has been applied to plate.	**Educational Method** *Guided discovery*		

		Provides a demonstration of the etching process.		**Critical thinking skills** will be advanced through the introduction to this form of printmaking (etching).
		Tools: IWB, P Worksheet on the process associated with preparing a plate for etching. **https://www.youtube.com/watch?v=8Jy-NjNjmOs** **https://www.snagmetalsmith.org/wp-content/uploads/2015/11/TechArticle_Nov_2015.pdf** https://pdf4pro.com/cdn/electro-etching-workshop-403e81.pdf		
	Students	Students will watch teacher as they show how to expose the plate. Students will draw onto the surface of the plate scraping away the wax to reveal desired sections of copper. Watch as a sample plate is etched and take note of the key steps to success (timing, thickness of line).		
		Tools: copybook, pages.		
	School Community Synergies	Art class teacher can collaborate with the greater school community to exhibit the artwork around the school and to inspire other students to be curious about how science can benefit their own creative process.		
	School-Stakeholders Synergies	The school, its teachers and students can share their knowledge about this innovative etching process with craftspeople in order to make their process more sustainable and safe.		

Act #	Description of activities, strategies, methods, means, resources and synergies			Learning goals and outcomes Feautures/Competences	STEAM Fields
A5	**Art teacher**	Assist students in the set-up of their water baths. Ensure all wires and clamps are connected properly. Provide measurement tools in order to use the correct amount of salt.	**Educational Method** *Active*	• To encourage divergent thinking and independent learners. • To follow a process from idea to realisation. • To document the process through scientific and visual means.	T A
		Tools: IWB, P, water, salt, copper plate, copper wire, basin, battery.			
	Students	Students will set up stations and work in groups of 5. Students will follow all predetermined steps in submerging their wax coated copper plate. Students will watch as the etching process begins and ensure all hands are kept out of the water.		Critical thinking skills will be developed though this engagement. Analysis of process and outcome will occur at this stage in the project. Team working skills will be encouraged throughout this activity.	**In classroom duration** **2 x 1 hour classes.**
		Tools: IWB, P, water, salt, copper plate, copper wire, basin, battery.			
A6	**Science teacher**	Evaluate the effectiveness of the etching by measuring the charge in the water and	**Educational Method** *Active*	• To critique the effects of the process in etching into the plate.	

		documenting the process through visual means. Use digital technology to document the creative/ scientific process.		• To determine how variables effected the end outcome. • To appreciate how scientific processes can aid the creation of an artwork.	
		Tools: IWBS, P, measurement tools, laptops, iPads, mobile phones/ devices.			
	Students	Students will use predetermined criteria to determine the effectiveness of the salt water etching process. Students will use digital technology to record the process. Students will use video editing software to make changes to their videos (cropping, voice overs, music, and subtitles).			**In class duration**
		Tools: IWBS, P, PCs/laptops			**2 x 1 hour classes.**
	School Community Synergies	All teachers involved in the projects will share produced music video via school social media channels			
	School-Stakeholders Synergies	Teachers will collaborate with appropriate stakeholder to have video shown at some local event during national or international science week, In Ireland this occurs in November.			

5. References

https://www.youtube.com/watch?v=8Jy-NjNjmOs

https://www.snagmetalsmith.org/wp-content/uploads/2015/11/TechArticle_Nov_2015.pdf

https://pdf4pro.com/cdn/electro-etching-workshop-403e81.pdf

https://www.youtube.com/watch?v=ODbgKXFED5o

https://www.youtube.com/watch?v=f0QEQRB8GJs

6. ANNEXES

6.1 ANNEX 1 – Worksheets

6.1.1. Main Project - Feel - Activity 1_Worksheet 1 - MP_F_A1_WS1

6.1.1. Main Project - Feel - Activity 2_Worksheet 1 - MP_F_A1_WS1

NEXT STEP Partnership

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SCIENCE VIEW

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