D3.1.x STEAM summer school

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# Introduction / Demonstrator Identity

## Subject Domain

STEAM summer school — create the next generation of science communicators in Malta

## Type of Activity

International activity. Training teachers and communicators.

## Duration

* 10-day summer schools for training
* Long term implementation of selected activity

## Setting (formal / informal learning)

The training happens in a formal setting: mix of lectures and practical. The activities shared among participants and activities carried out can be of either form.

## Effective Learning Environment

* Communities of practice (web-based/physical)
* Arts-based
* Experimentation (Science laboratories and eScience applications)
* Communication of scientific ideas to audience

# Rational of the Activity / Educational Approach

## Challenge

We would like to bridge the gap between research and education. We bring together and train researchers, and educators. Each category had its own challenge:

* Researchers — they are not necessarily good science communicators, or they do not know how to work in a classroom, or explain things in a simple way.
* Educators — they might not be aware of the latest research, or best ways to bring science into classroom.

STEAM aims at empowering them with various tools available in science communication.

## Added Value

STEAM is a 10-day intensive summer school in science communication. We introduce an innovative form of education that includes Arts into the classical STEM (Science, Technology, Engineering, and Mathematics). Interactive experiments and informal learning with the use of creativity and arts are the key ingredients of our approach. Our ultimate goals are to improve science awareness and develop informed opinions, increase student uptake of STEM careers for high-level jobs, stimulate the socio-economic wellbeing of partner countries, and enhance the transferable skills of current researchers.

The STEAM team has a wide range of science communication expertise that is part of the programme:

* Dialogue and Discourse — theory and practice of science communication
* Managing and Monitoring — how to organise and manage large events and festivals for the public and for schools
* Create and Act —international examples of collaborations between scientists and artists in festivals and theatres
* Media and Journalism —how to write, edit, and create video to effectively communicate science
* Online and Social — how to use online and social media in the most powerful way
* Advocate and Influence — strategies to lobby, work with policy makers, and make your voice heard
* Present and Moderate — how to speak in public and moderate a discussion

# Learning Objectives

## Domain specific objectives

The main objective of STEAM is to create the next generation of science communicators. STEAM summer school is open to all motivated students and researchers interested in science communication, including teachers, science communication practitioners, science journalists, and established researchers.

This summer school offers participants:

* An introduction to all aspects of science communication with no previous knowledge required
* The possibility to experiment with different ways to engage various public groups with scientific research
* A sneak preview into a science communication career
* An opportunity to improve transferable skills and career development (part of Continuous Professional Development)
* Access to educational materials and already established practices
* Large network for international cooperation and knowledge exchange

## General skills objectives

Skills:

* Learn how to include Arts into the classical STEM (Science, Technology, Engineering, and Mathematics)
* Learn how to use interactive experiments and informal learning with the use of creativity and arts
* Science writing
* Public speaking
* Science journalism
* Theory and practice of science communication
* Social media, blogging
* Science and theater
* Manage and monitor large events for schools

Ultimate goals are:

* to improve science awareness and develop informed opinions
* increase student uptake of STEM careers for high-level jobs
* stimulate the socio-economic wellbeing of Malta
* enhance the transferable skills of current researchers

# Demonstrator characteristics and Needs of Students

## Aim of the demonstrator

The aim of the summer school is to train the next generation of science communicators and share best practice in an international setting. We want to empower researchers and educators in the use of formal and informal science teaching with the use of creativity.

## Student needs addressed

Participants to the summer school will be exposed to the latest theory and practice. After a morning of lectures, it will follow an afternoon of practicals where they will be able to work on their own and in groups on specific activities and skills. There will be time to discuss and exchange opinions, share practice and professional experience.

# Learning Activities & Effective Learning Environments

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Science topic:  Science communication, science journalism, social media, management of science festivals,  Class information  Year Group: mixed group from different backgrounds. Science undergraduate, young researchers, educators, science practitioners, science journalists  Age range: above 18 yr  Sex: both  Pupil Ability: eg (The scenario allows space for pupils of various abilities to participate) | | | Materials and Resources  *What do you need? (eg.*printed questionnaires, teleconference, etc.)  **Lecture room with projector, equipment for webstreaming, and space for practical sessions .**  **Audiovisual material for social media and online engagement**  *Where will the learning take place? On site or off site? In several spaces? (e.g. science laboratory, drama space etc), or one?*  Classroom/lecture hall for the theoretical part of the lecture. Tables and chairs will be moved around when practical sessions are run to allow group work.  *Health and Safety implications?*  None  *Technology?*  Projector, audiovisual equipment to live stream (Video cameras, Internet, etc.)  *Teacher support?*  Each day one topic is dealt with and one lecturer is responsible of both theoretical and practical part. | | | | |
| Prior pupil knowledge  Basic knowledge of science | | | | | | | |
| Individual session project objectives *(What do you want pupils to know and understand by the end of the lesson?)*  During this scenario, students will learn different aspects of science communication:   * Dialogue and Discourse — theory and practice of science communication * Managing and Monitoring — how to organise and manage large events and festivals for the public and for schools * Create and Act — international examples of collaborations between scientists and artists in festivals and theatres * Media and Journalism —how to write, edit, and create video to effectively communicate science * Online and Social — how to use online and social media in the most powerful way * Advocate and Influence — strategies to lobby, work with policy makers, and make your voice heard * Present and Moderate — how to speak in public and moderate a discussion | | | | | | | |
| Assessment  **The practical session will work as a self assessment tool. Participants will be encouraged to put into practice what learned.** | | **Differentiation**  *How can the activities be adapted to the needs of individual pupils?*  Lecture format and practical can be adapted on specific cases. | | **Key Concepts and Terminology**  **Science terminology: very basic science terminology and knowledge is needed**  **Arts terminology: nothing specific** | | | |
| Session Objectives:  During this scenario, students will learn all aspects of science communication. | | | | | | | |
| Learning activities in terms of CREATIONS Approach | | | | | | | |
| **IBSE Activity** | **Interaction with CREATIONs Features** | | | | **Student** | **Teacher** | **Potential arts activity** |
| **Phase 1:**  **QUESTION:** students investigate a scientifically oriented question | Students pose, select, or are given a scientifically oriented question to investigate. *Balance and navigation* through *dialogue* aids teachers and students in creatively navigating educational tensions, including between open and structured approaches to IBSE. Questions may arise through *dialogue* between students’ scientific knowledge and the scientific knowledge of professional scientists and science educators, or through *dialogue* with different ways of knowledge inspired by *interdisciplinarity* and personal, embodied learning. *Ethics and trusteeship* is an important consideration in experimental design and collaborative work, as well as in the initial choice of question. | | | | Listen and learn science communication theoretical background;  Pose questions;  Practice personally what learned in the theory;  Engage with fellow participants, network and share experience. | Lecturers will use challenging questions, presentations, examples, and the web (images, videos) to keep all participants interested. | Arts are included in the process depending on the activity. |
| **Phase 2:**  **EVIDENCE:** students give priority to evidence | Students determine or are guided to evidence/data, which may come from *individual, collaborative and communal activity* such as practical work, or from sources such as data from professional scientific activity or from other contexts. *Risk, immersion and play* is crucial in *empowering* pupils to generate, question and discuss evidence. | | | | During study case sessions students can exchange experience; create an international network of collaborators; learn from their fellows other forms of science communication. | Lecturers acts as facilitators/contributors of the process by connecting people. |  |
| **Phase 3:**  **ANALYSE:** students analyse evidence | Students analyse evidence, using *dialogue* with each other and the teacher to support their developing understanding. | | | | Participants analyse the practical work done. They perform, show, illustrate the work done in the practical session. Analyse difference among work groups, and identify strong points and weaknesses | Lecturers acts as facilitators/contributors of the process. | Lecturers will encourage the inclusion of arts at any stage. |
| **Phase 4:**  **EXPLAIN:** students formulate an explanation based on evidence | Students use evidence they have generated and analysed to consider *possibilities* for explanations that are original to them. They use argumentation and *dialogue* to decide on the relative merits of the explanations they formulate, *playing* with ideas. | | | | Participants explain and re-elaborate what they worked on considering also other outcomes. | Lecturers acts as facilitators/contributors of the process. |  |
| **Phase 5:**  **CONNECT:** students connect explanations to scientific knowledge | Students connect their explanations with scientific knowledge, using *different ways of thinking and knowing* (‘knowing that’, ‘knowing how’, and ‘knowing this’) to relate their ideas to both disciplinary knowledge and to *interdisciplinary* knowledge to understand the origin of their ideas and reflect on the strength of their evidence and explanations in relation to the original question. | | | | Participants connect what learned to their own experience, knowledge, and reality. Participants will come up with local strategies for their own reality based on what discussed. | .  Lecturers facilitate the connection process by know better the background of each student, and take part of the discussion. | **Use the multi disciplinarity among participants to include Arts in all activities.** |
| **Phase 6:**  **COMMUNICATE:** students communicate and justify explanation | Communication of *possibilities*, ideas and justifications through *dialogue* with other students, with science educators, and with professional scientists offer students the chance to test their new thinking and experience and be *immersed* in a key part of the scientific process. Such communication is crucial to an *ethical* approach to working scientifically. | | | | Share with others possible ideas of collaborations, new features, interconnections, best practice. | Lecturers take part of the discussion. | **Use the multi disciplinarity among participants to include Arts in all activities.** |
| **Phase 7:**  **REFLECT:** students reflect on the inquiry process and their learning | *Individual, collaborative and community-based* reflective *activity for change* both consolidates learning and enables students and teachers to balance educational tensions such as that between open-ended inquiry learning and the curriculum and assessment requirements of education. | | | | Discussion and reflections at the end of each practical session and at the end of the summer school will be stimulated. | Lecturers guide/facilitate open, informal discussion |  |

# Additional Information

# Assessment

Pre- and post- evaluation of the summer school will be conducted. The aim is to test learning gains on the specific topics dealt with. Data regarding gender, profession, seniority, will also be collected.

# Possible Extension

# References