**Participatory Workshop 2: Dialogues about Critical Thinking and Self-Reflection**

**Goal:**

Acquire concepts about critical thinking and self-reflection in science.

**Specific Objectives:**

1.- To know that scientific research is a social practice, rooted in our culture and history

2.- To know some of the criteria of reliability of scientific claims

3.- To generate the scientific content of the PERSEIA:

- Find reliable information about the selected topic.

- Describe in a few lines the scientific content they want to address in their “PERSEIA sketch”

**PERSEIAs guidelines (T2.1) followed**

EW3.- Ethics. Ethical standards followed by the scientific community. Deviations to the norm.

**Description of the PW:**

**2.1-Warming Activity (15’)**

Play a couple of warm up activities. Select activities that are simple games that involve movement and an interaction between different stakeholders, as all of them should participate in the warm up (students, ECR, teachers and facilitators).

Radiation game warm up (5’):

Pupils, ECR’s, teachers and trainers stand in a circle in a large uncluttered space and each (anonymously) number two members of the group 1 and 2. The trainer now explains that 1 is a highly dangerous radioactive source and 2 is a protective lead shield. The aim of each person in the group being to place their nominated lead shield between themselves and their nominated radioactive source.

Student’s homework review and explanation of current PW goal (10’)

Catch-up what it was worked in the previous PW by asking each SWG what was the scientific topic they selected, why, and if they have thought about concrete questions they want to address.

Brief introduction about the goal of the PW.

**2.2-Participatory Activity (60’)**

At the start of the activity, around the classroom, lay out three different ‘stations’ featuring some newspapers headlines and a question.

Students are put into SWG and work their way round the different stations as a carousel.

In each station, students will be invited to read the newspaper headlines and decide whether they should trust the claim made or not, and why.

In each station one adult (teacher – SciCom – ECR) will be in charge to maintain students focused on the discussion.

As long as there are more groups than stations, some stations will have to be replicated.

Each SWG will be provided with a worksheet (PW2\_Station\_Questions) that will assist them to record their responses and reflexions of each station.

**In the case of Sp and Fr:** catch-up what it was worked in the previous PW by asking each SWG what was the scientific topic they selected, why, and if they have thought about concrete questions they want to address.

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| --- |
| *Station 1: Who is making the claim?* |
| * Research by CocaCola and Pepsico show that sugar is not harmful for health. |
|  |
| *Station 2: What is the evidence for the claim?* |
| * Example where headline comes from press release and does not accurately communicate what the scientists have found. * Chocolate cures depression study. Data have no reproducibility. |
|  |
| *Station 3: How does the claim fit with established science?* |
| * Example of headline about scientific ‘discovery’ from a well-respected University, that rejects fundamental scientific knowledge established, and with data that have not been scrutiny.   If necessary, the adult will assist the students with some clues in order to promote the discussion between the students. For example, in Station 1 the info may not be trustworthy because there may be a conflict of interest with the research funders. |

Students should record their responses in the provided worksheet.

Once the students have visited each station, they should come together for a whole group discussion. Addressing each station in turn, ask students to feedback on whether they trusted the claim or not, and why. There should be room for disagreement in this discussion, for example, one researcher giving evidence that conflicts with a body of established research does not necessarily mean that they are wrong, just that we might need further evidence before committing to belief in it.

Now hand out the pre-prepared checklist (Ellie H to provide) and explain that each item on the checklist relates to one of the stations they have just explored.

Criteria that give reliability to a scientific piece of news:

1. Related to station 3: In press releases, the information may be not accurately described. Always read to the original source or related press releases.
2. Related to station 2: Science is a practice from a whole community, not from individuals.
   1. The information comes from Universities or research groups
   2. The information contains references to peer reviewed articles. Explain here to students what means “peer-reviewed journals” and “reproducible data”.
3. Related to station 1: Some scientific studies may be manipulated due to conflicts of interests. The one that gain reputation with the study is the same that give the funding?

Ask students whether they can think of any other criteria that might be important in considering whether a source of information is trustworthy.

Ask students what our response should be if a source fails on one of the criteria (e.g. Coca-cola funded research in to sugar) – should we no longer trust the research? Does it mean that the research is definitely wrong?

Finally, ask the students if a source passes every item on the checklist, should we believe it? (There is no correct answer to this – we just want the students to think about where the boundaries of certainty are in relation to scientific evidence)

Timing: Students spend 10 minutes on each station, discussing as a group and taking notes individually. Spend 30 minutes (depending on number of stations) on the stations and then come together and spend 30 minutes to feedback on findings (get feedback on a station at a time from each group).

**2.3-Development of Students PERSEIA (30’)**

Define the scientific content of the PERSEIA sketch:

*5’:* The exercise described below is exemplified on the board with the research topic of ECR. Thus, students will see the steps quickly and schematically before they start to work on the SWG.

*10 to 15’:* Each SWG, with the help of teachers, ECRs and SciCom, will set 3 to 5 questions about the scientific topic selected. It could be formulated as questions, even as hypotheses but also as simple sentences.

*It would be important that students find their three questions in class, and that SciCom takes note about it. It will be used in order to let SciCom, ECRs and teachers to search information about the topics selected by the students, in order to assist them during the OI and in the next PW.*

*10 to 15’:* The students will think about what information they lack to give a full answer. Take into account the following considerations:

* Think about how much information I want to give. Establish how deep I want to get.
* Think about what previous knowledge does my audience have and start from there (nor more but neither less)
* Use Critical Thinking skills learned in the stations of the previous activity.

Students will complete this activity at home.

**2.4-Homework proposal (15’)**

Each SWG will be asked to find out some information about their topic/question answering the 3 questions raised before in their SWG and following the pre-prepared checklist.

Students should be asked to print it off, or upload it to the online system (if one is being used in the country in question).

ECR/SciCom will assist students in order to follow the checklist correctly and to find good references (that they can understand! be careful with scientific papers…) using Social Networks.

CSC must define with the students which social network they prefer\*. Some proposals are:

- Create a WhatsApp group (which will be eliminated at the end of the participatory process)

- Create a private Facebook group (which will be eliminated at the end of the participatory process)

- Create your own hashtag for twitter / instagram

- Any other proposal from the students

\* In Those case studies where the legislation is very restrictive in this regard, OI through SN will not be posed, and the assistance of teachers will be needed.

**RRI learning dimension topics faced:**

Basic cognitive aspects of the scientific topic

Attitudes and perceptions of science: sense of collaboration in the construction of science

Learning to learn (reflective thinking)

Ethical issues (science as social practice)

Creative and critical thinking: Making decisions about the reliability of scientific information, posing critical questions about a topic

**Students’ transversal competences worked:**

Learning to learn: Know some of the criteria of reliability

Social and civic competences (critical and creative thinking; sense of collaboration in the construction of science)