

## **Massimo Esposito: The Science OOC “Measurement and modelling in Science”**

Massimo Esposito explains that the P&PBL (Project & Problem-based Learning) is the methodology used in designing the Science OOC, with a sort of overturning of the traditional didactics, from practice to theory: this is one of the reasons why the sciences have been united in a single subject. The traditional Science teaching model doesn't stimulate curiosity towards natural events and the phenomenology observed in reality. The main objective is to give teachers the necessary support to organize, manage and improve experimental activities by using in particular materials and instrumentation available in daily life (daily-life laboratory). The approach to reality is scientific but without the use of the traditional laboratory instruments, in the belief that it is more useful to make an experiment with everyday materials, in an everyday context, with an experiential approach to reality.

The OOC will be organized in four modules (M): each module, described in terms of prerequisites and output competences, will contain didactic units (DUs) or lessons about one or more of the topics defined by the SMART work group: *Methods in Science, Chemical and Physical Systems, Living organism, Earth Science*.

### **MODULES**

#### **1) *Methods in Science***

- Deductive scientific reasoning
- Measuring and uncertainty
- Modelling and data fitting

#### **2) *Optics (Travelling labs)***

- Reflection law
- Refraction law
- Imaging and lenses
- Diffraction
- Interference

#### **3) *Seismo box***

- Water in sands:
- Capillarity and adhesion forces
- Earthquake:
- Resonances
- Energy storage and relaxation

#### **4) *Energy in Science***

- Mechanics
- Battery
- Food
- Photosynthesis
- Photovoltaic cell

Each module will propose a didactic path, sometimes also interdisciplinary, in order to guide the learner through the different features of the involved subjects. The DUs can also be used singularly to build one's own original didactic path.

Each DU will be accompanied by some **activity sheets**, which will be the guide to carry out experimental activities based on quantitative observation of phenomena, through the steps of experimental method: observation, hypothesis and experimental testing.

Each sheet will contain the implementation technical details, rigorous interpretation models of the studied phenomenon, several examples of experimental data analysis and a guide to discussion and testing.

Moreover, for each sheet the teacher community who is going to use the OOC will have a dedicated forum available for the discussion in order to highlight the experiment critical and positive aspects, suggest alternative solutions, updates, improvements and propose discussions on the experiment contents and thematic analysis.

Finally, an anonymous assessment section will allow to get a rating of the proposed activities in terms of clarity, feasibility and effectiveness in order to select and update topics and contents of the didactic modules.

The materials have been published on the platform since October and the experimentation with the classes is going to start in December; in the course of the next meeting in February, it will be possible to get a first feedback by the schools. The production of material will be going on during next months.

A sample Module/DU about Optics/Reflection is then shown and illustrated in detail for the public. The reflection law is presented as a result of a deductive reasoning based on symmetry reason, motivated by observation.

Searching, reasoning and discussing represent the creative, fascinating part of the scientific method. Thanks to this overturned approach (from observation to hypothesis to verification), it is also possible to meet the expectations of students with different cognitive styles and intelligences.