

In Campania, Calabria, Puglia and Sicily 1125 secondary school science teachers have been educated from Italian Ministry of Education and INDIRE (National Institute for Information, Innovation and Educational Research), which could rely on European structural funds (PON funds). The educational scientific syllabus has been split in 4 different disciplinary thematic units (reading the environment, earth and universe, transformations, energy and its transformations) and 3 transversal units (history of science, education to sustainable development, learning evaluation).

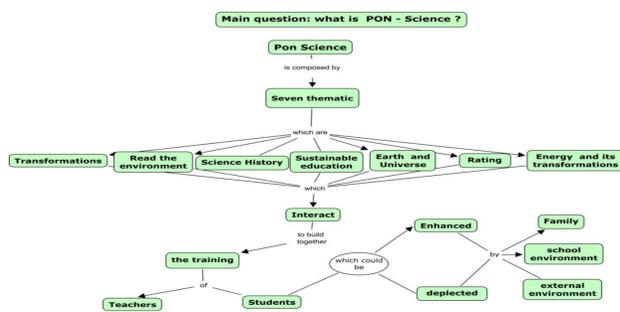


Figure 1: Map of European project educational units.

1. Introduction

If we want the students to build up a real scientific competence, we need to let them the necessary amount of time for continuous and repetitive meta-cognitive reflections, developed through the use of concept maps with CmapTools (J.D. Novak), realized in collaboration with their classmates both in primary and secondary school.

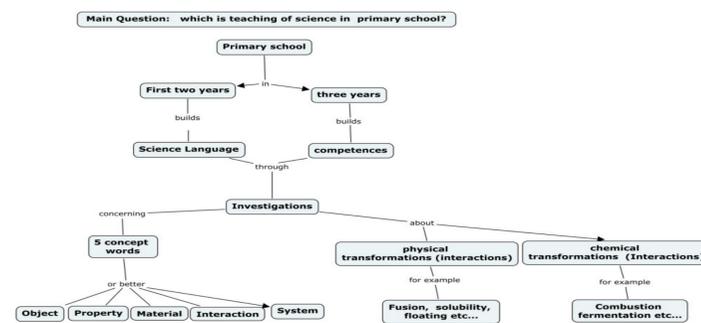


Figure 2: Map of scientific teaching in primary school.

2 Learning environment design :

Teacher designs and manages science learning in a workshop-like didactic, using cheap and common materials, procedures and contexts in order to put students in a position to “learning by doing”. The European Scientific Educational Program recommends a wide use of investigations and CMaps in every Italian school grade.

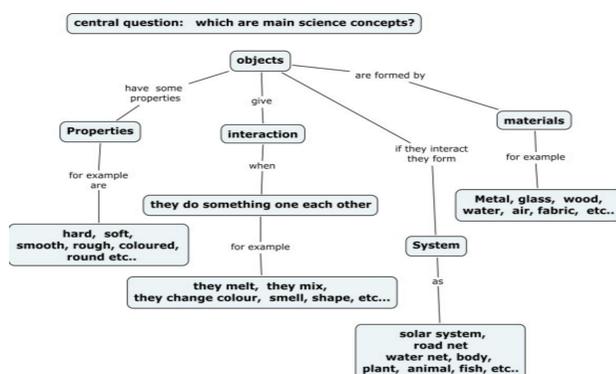


Figure 3-4: Maps regarding the key-concepts of “objects” and “materials”.

3. Learning laboratory

The construction of a basic scientific language always starts from a simple question (or a game), which students are asked to answer after investigating throughout building their own concept maps. This didactic strategy stimulates their curiosity and develops long lasting scientific attitudes. Classroom investigations start with physical objects manipulation, which are thought to help students to realise that the correct scientific language is built thanks to a linking of consecutive investigative processes. Investigating on objects and their properties

3.1 Investigating on chalks to discover their properties



Figure 5: Use of chalks and discovery of their properties.

3.1.1 Kids discover that different chalks are made of the same material, but differently coloured, the teacher defines the name of the ideas developed during the activity, putting the meaning into evidence



Figure 6



Figure 7

3.1.2 Investigations allow to apply the formerly “invented” concepts and to start exploring new ones. This kind of activities promote the oral, written and iconic language development, ensuring the communication and linguistic ability strengthening

4 Construction of concept maps

The teacher’s role is essential, since he/she is required to establish the adequate atmosphere, encouraging kids in order to strengthen and address procedures and strategies. Students build their own concept map and connections are described and narrated. Different maps come out, allowing to evaluate the knowledges that learning activity has yield in everyone.



Figure 8 : Children explaining the map

1. Objects
2. Chalks...
- 3...are made of:
- 4...are solid, coloured and cilindric
- 5...dusty material
6. Interaction
7. Water takes chalks' color
8. Water is a liquid
9. Water melts chalks

4.1 Concept maps, built in cooperative groups both in primary and secondary school, play an important social role, since the educative context becomes location of dialogue, comparison, debate and sharing of meanings.



Figure 9—10

Group maps in primary school are realised in a wide space with movable sheets and labels, in order to facilitate the research of logical and coherent solutions and explanations. Some examples of group maps are reported below.



Figure 11 : Object-Property-Material” map

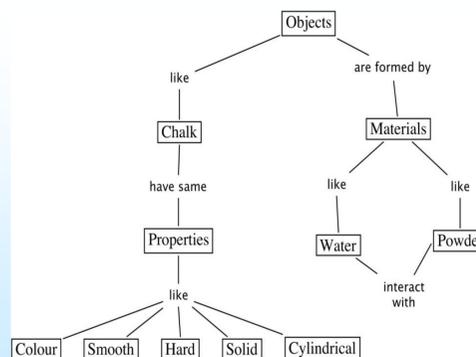


Figure 12: Map realized with software “Cmap”

5. Conclusion

PON project has been founded by European Union and has enrolled about 4000 schools in four different regions (Calabria, Puglia, Campania, Sicilia), promoting formation seminars for teacher aimed at improving the teaching and education of sciences, math and Italian language.

The project also recommends the wide use of investigations and concept maps in every school grade, useful to evaluate the improvement of the conceptual structure of both single and group of students. Since the map can be compared to a filter through which students observe the real world, it can also be used as an evaluation tool.

EUROPEAN PROJECT OF SCIENTIFIC EDUCATION

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