THEORY AND PRACTICE: AN INTERNET PROJECT ABOUT SCIENCE AND TECHNOLOGY [1]

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In recent years, the Italian Ministry of Education and Research (MIUR) decided to support projects aimed at the diffusion of didactical innovations concerning education in Science (including Mathematics) and Technology, and enhancement of related education research in the school system. In the panel I briefly presented one of these Projects: the national SeT Project (1999-2002), i.e. a special national project for education in Science and Technology. The aims of the Project were the following:

- To set scientific and technologic education as a matter of general interest for the Italian school system, and involve research institutions dealing with science and technology in supporting school efforts towards innovating teaching in these areas.
- To implement materials and on-line services, and support actions for teachers.

Schools and research institutions were invited to apply for funding by presenting co-ordinated Projects. In particular, the proposed Projects had to be based on a strict co-operation between research institutions (that hold the scientific responsibility and co-ordination of the project) and schools involved in the Projects as partners for preparation of innovative didactic materials and related experimentation. More than 550 projects were presented; 27 of them were funded. This is a big number: hundreds of schools and dozens of scientific institutions took part in the implementation. The products are now available (in Italian only) in the website: http://www.bdp.it/set/area1_esperienzescuole/cm131/5.htm. Some research teams in Mathematics Education (from the universities of Genoa, Modena, Naples, Pavia, Pisa, Turin) engaged in the preparation of projects: indeed it was an occasion to move from the "research for innovation" perspective (see later) to a large scale diffusion of research results, in terms of materials for pre-service and in-service teachers' training at a national scale. In the panel, some features of the SeT Projects jointly elaborated by the research teams of Genoa, Modena and Pisa, have been presented.

[1] Abridged version of the paper *From Research in Mathematics Education to Teacher Training through Internet,* presented by Rossella Garuti in WG11: Inter-relating Theory and Practice in Mathematics Teacher Education

In research for innovation (Arzarello & Bartolini Bussi, 1998), investigations are characterised by the following elements:

- three components: the epistemological component, related to the analysis of the mathematical content; the cognitive component, related to the analysis of individual and social learning processes; the didactical component, related to the analysis of classroom teaching situations;
- an experimental counterpart for theoretical investigation, with a dialectic relationship between the evolution of the theoretical frameworks and the analyses of teaching experiments;
- the role of the teachers involved in the research teams as "teachers-researchers", i.e. as members of the teams who share main decisions concerning choice of research problems, planning and analysis of teaching experiments, evolution of theoretical frameworks.

The effort was to communicate these features through the proposal of Working Units. The two projects, quoted below, have published on line 27 Working Units, in part clustered into larger classes. The titles of the projects are the following:

Mathematics and science languages, and rationalisation of common phenomena and experiences (13 "Working units" mainly addressed to primary school – grades I to V) (Scientific Coordinator: Paolo Boero) [1].

Elementary mathematical modelling and the approach to theories in mathematics and science (14 "Working units" addressed to secondary school – grades VI to X) (Scientific coordinator: Maria Alessandra Mariotti) [2].

Each Working unit comes from a long term and wide experimental research activity (usually, different teachers experimented with it in their classrooms in different years, possibly with several changes). Each Working Unit consists of several pieces that can be linked from the unit home page:

I. A teaching sequence (covering about 20 hours of classroom work), organised according to some (from 2 to 5) didactic situations. Each didactic situation includes some tasks (from one to five). Didactic situations and tasks are accompanied by suggestions for the teacher, and protocols taken from teaching experiments concerning the teaching sequence. Most suggestions come from experiments involving ways of managing tasks in the classroom. Students' protocols concern excerpts of classroom discussions, individual solutions, and individual reports. Most protocols include a commentary; both comments and suggestions for teachers make reference to some key-words that carry the relevant theoretical aspects for motivation of educational choices and interpretation of students' behaviours.

II. A survey of the general motivations and aims of the teaching sequence, the links with national programs, the requirements (both on the students' and the teacher's side), the list of the relevant keywords (e. g. Classroom discussion orchestrated by the teacher; role of verbal language; argumentation) to understand the motivations of the teaching sequence and the analysis of classroom outcomes.

III. Some tools for effectiveness, on-line help, feedback: according to a classic, elementary schema of computer assisted instruction, in the 'Gymnasium' teachers try to answer questions, then they can check the answers proposed by the authors of the materials. Questions concern the interpretation of students' behaviours and difficulties, and how to intervene on these. Teachers are invited to interact with the authors through the Project Forum (if they do not agree with the answers, or would like to know more about criteria used to elaborate the answers).

To give an example we offer at the end of this account some figures from the homepage of a Working Unit and the cluster ('grappolo') it belongs to.

It is early to evaluate the impact of the Projects at the national scale. Interesting indications come on the side of the teacher-authors who are shown to have become experts in selecting and organising the materials and preparing them for web publication. Anyway we believe that we need to develop research about the use of new media (first of all, the internet) in teacher training.

Acknowledgements.

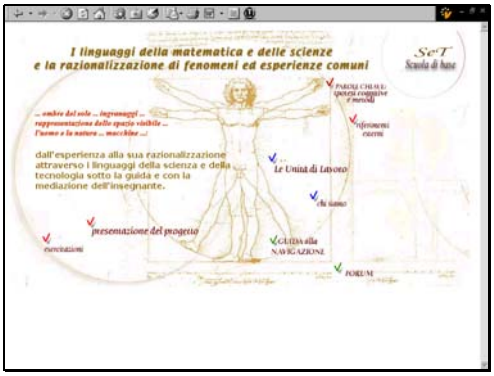
The scientific coordinators of the two projects: Paolo Boero and Maria Alessandra Mariotti.
The webmaster of the two projects: Aurora Rondini.
The dozens of teachers – researchers who have authored the Working Units.
Rossella Garuti for the help in preparing this presentation.

References

Arzarello, F. & Bartolini Bussi, M.G.: 1998, 'Italian Trends of Research in Mathematics Education: A National Case Study in the International Perspective', in J. Kilpatrick & A. Sierpinska (Eds.), *Mathematics Education as a Research Domain: A Search for Identity*, (pp. 243-262), Kluwer A. P., Dordrecht

[1] http://www5.indire.it:8080/set/set_linguaggi/linguaggi.htm

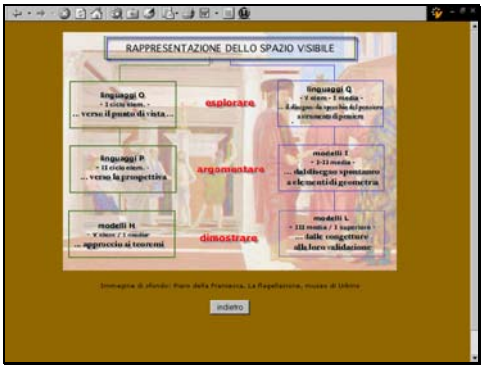
[2] http://www5.indire.it:8080/set/set_modelli/modellizzazione.htm



The project [1]

The Project [1]

The Working Unit O: ... towards 'point of view' ...



The cluster of the Working Unit O

In the Projects [1] and [2]:

The representation of visible space