

BLENDED MODALITY IN IMPLEMENTING AN EUROPEAN PROJECT ON CURRICULAR INNOVATION FOR RESEARCH-BASED IN SERVICE TEACHER TRAINING ON SUPERCONDUCTIVITY

Marisa Michelini, Rossana Viola, *Research Unit in Physics Education of the University of Udine, Italy*

Abstract

Teacher formation requires the integration of different models, metacultural, experiential and situated, to realize a professionalism based on PCK: in the framework of EU MOSEM Project we carried out a research-based formation for teachers with different modalities.

Blended modality, dedicated to the discussion on some aspects related to disciplinary and conceptual knots, aims to work implementation and to transform a proposal according to the personal style and classroom context.

Problem Solving activities play a fundamental role in reflection and new elaboration: teachers carried out original proposal with respect to those proposed by the project.

1. Introduction

Teacher formation requires the integration of different models, metacultural, experiential and situated, to realize a professionalism based on PCK. For this reason, in the framework of EU MOSEM Project, we carried out a research-based formation with different modalities for 40 teachers of 21 schools of 18 cities in 7 Italian regions.

MOSEM Project (Minds-On Experimental Equipment kits in Superconductivity and ElectroMagnetism for the continuing vocational training of Upper Secondary School Physics Teachers) is a Project within the Program Leonardo da Vinci of the European Union aimed to promote curricular innovation in physics, using research results of SUPERCOMET and SUPERCOMET2 Projects.

Several materials have been developed: a Teacher Guide, On-line Computer applications (<http://online.supercomet.no>), Low and High-tech Hands-On Minds-On experiments on electromagnetism and superconductivity, 13 different didactic methodologies for a personal involvement of the student in the object of study, different learning paths with different approaches and angles of attack.



Figure 1: Logo of MOSEM Project

Teacher Seminar are carried out in the period December 2008 - June 2009 in seven seats (Figure. 2: in brackets the number of teacher involved). Each seat has a local responsible, who manages the seminar and leads that group of teachers, and a researcher of the Research Unit in Physics Education of University of Udine who participated to the activities of the seminars via web or in presence.

2. Types of teacher seminars in Italy

4 types of teacher seminars have been carried out, with different length and engagement:

1- One day intensive workshop with group work on experiments on electromagnetism and superconductivity. Teachers carried out trials in classroom and, at the end, they encountered the group of researchers to discuss and analyze results.

2- Four days training course on didactic proposals, experiments and multimedia materials of the MOSEM Project

3- Annual training and action-research course on didactic proposals, experiments and multimedia materials of the MOSEM Project with a case study of a teacher of a class of 5th year of Scientific Lyceum.

4- In the framework of the Project “Lauree Scientifiche”, URDF leads 15 Italian research groups of as many universities and has activated, at a national level, **a teacher training institutional course** (Corso di Perfezionamento IDIFO2 - Innovazione Didattica in Fisica e Orientamento 2 - of 15 CTS) on modern physics organized in 6 thematic areas. One of them is dedicated to superconductivity, offering to the teacher the possibility of one year of situated training and action-research in the framework of MOSEM.

- Besides, at the seminars carried out in Latina took part teachers and students of two classes of the 2nd year of an ITIS school and a class of the 4th year of a Liceo Tecnologico too.

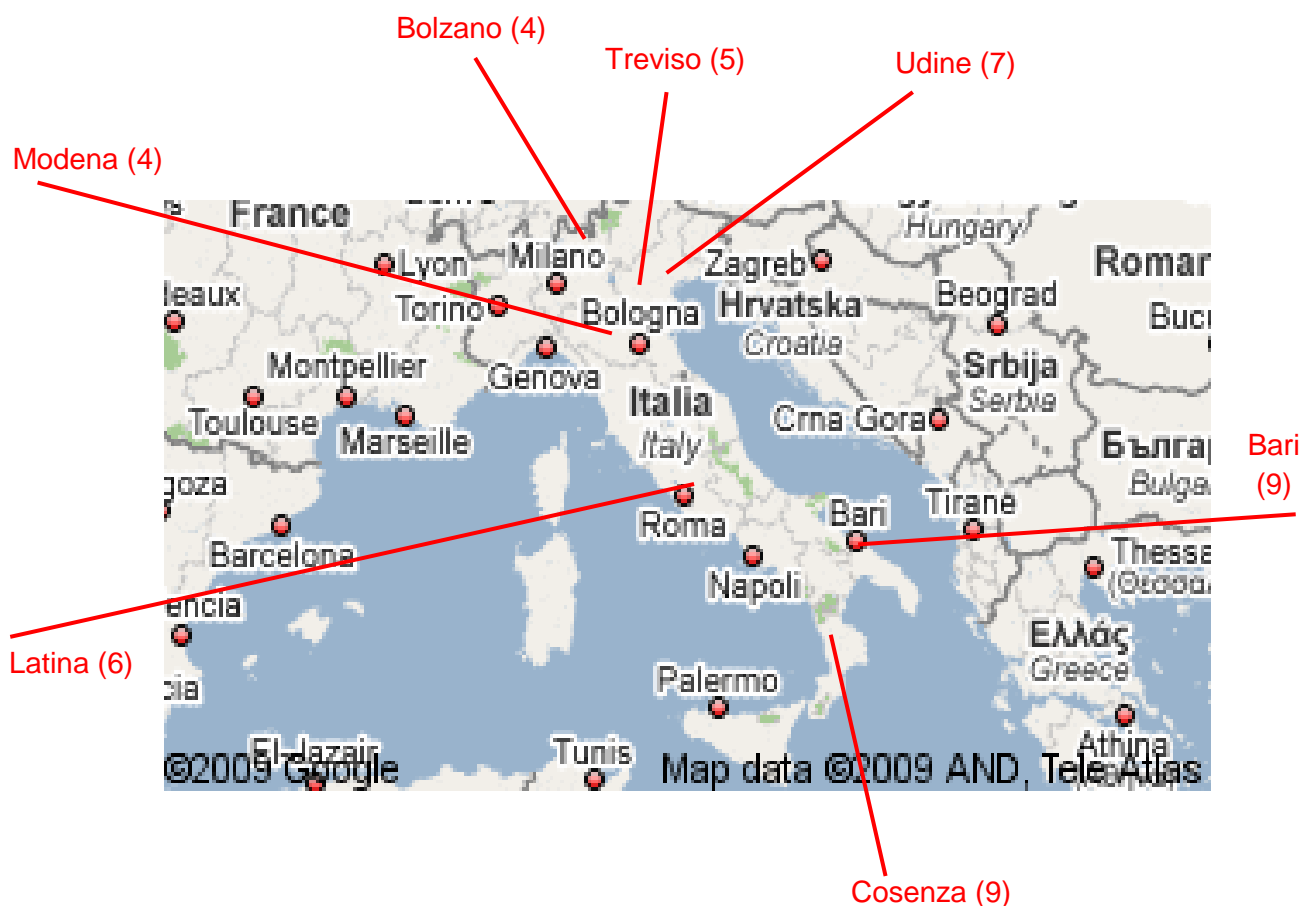


Figure 2: Teacher Seminars carried out in Italy; in brackets the number of teacher involved

Quality development of IN-Service teacher formation requires integration of 3 models:

Metacultural Model. It is based on: a) case studies of educational proposals, b) involving critical discussion of cultural and didactic elements of an innovative proposal, c) leaving to teacher the programming and the preparation of educational materials for the students

Experiential Model in which the teacher carries out directly the same activity that is proposed to the students

Situated Model: a) Based on teachers’ learning through the reflection on his work experience in the classroom, b) Represents the growth coming from his professionalism and c) Offers the basics for an innovation emerging from the schools’ needs.

The reflection on the professional experience in a research dimension, as action-research, is one of the ways in which to recover the informal learning produced by acquired experience.

3. Activities and materials

The types of seminars carried out are different but they have some common elements:

1. Trying out low and high tech experiments not only to know them but also to decide and plan how to use them in a didactic path with students.

- 2. Having operative proposals based, for example, on PPS or Artefacts in which teachers follow the learning path in detail, feeling the knots that student will encounter:** Induction in electromagnetic and superconductive phenomena; Problem Solving activity for determining and understanding those aspects of levitation explainable with electromagnetic induction
- 3. Taking part to a PCK activity in which faced learning knots are explicated starting from the research and teachers are asked to think at how to face the problems with their students:** a) PCK activity on electromagnetism and superconductivity; b) Lab on an artefact and relative PCK activity: the case of a wind turbine in a jar.
- 4. 13 methods/strategies of cooperative learning that teachers experiment personally in different activities.**
- 5. Phenomenology of superconductivity** (overview of: what is a superconductor and its electric and magnetic characteristics, microscopic explanation of superconductivity (BCS theory), applications of superconductors, different types of superconductors, T_c , I_c , H_c , History of superconductivity and Nobel prizes) **for a reflection and an analysis on how to pass from the phenomenological observation to a representation of superconductive transition and pinning effect**
- 6. Having some examples of didactic paths experimented: analysis of didactic paths** carried out during SUPERCOMET Projects.
- 7. Planning a didactic path:** a) from learning knots and learning difficulties to research questions and path. An example of a path on electromagnetic induction. Monitoring and reporting trials: evaluation. b) an activity based on a reflection about some learning knots with "Expert" approach.
- 8. Trying out multimedia materials: On-line Computer Applications not only to know them but also to decide and plan how to use them in a didactic path with students and discuss the utility of multimedia laboratory in comparison with the real one.**
- 9. Modelling activity** on electromagnetic induction using Coach, VnR and Excel

4. Blended modality

Experimenter teacher confronts with other teachers of his country, those of the other countries and with the researchers of his university, in presence and on a web environment. Blended modality, dedicated to the discussion of some aspects related to disciplinary and conceptual knots, shows the need of teachers to focus the reflection for didactic planning on educational proposals already oriented to work implementation to discuss in depth conceptual knots and to transform a proposal according to the personal style and classroom context.

Problem Solving activities play a fundamental role in reflection and new elaboration: in fact teachers carried out original proposal with respect to those proposed by the project, as emerges from a comparison with a previous experimentation (SUPERCOMET2 Project), where teacher planning was focused on a simply reorganization of the materials done by the project.

In-service teacher formation requires long time and different modalities. Conducted experience highlights the importance of blended modality focused on content and pedagogic issues, research-based in terms of materials and modalities.

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