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An environment to share in-service training on the net: An action-research about charge in primary and middle school

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Summary. — The net was one of the determining factors in a training of a group of 4 primary and middle school teachers (L. M. in Forni Di Sopra and C. D. F. in Villa Santina, P. C. in Tolmezzo and D. S. in Gemona, all places in the mountains of Friuli, in the Nord-East of Italy) in an action-research on the electric charge. It was developed through meetings with researchers in physics education and exchange and sharing of experiences and projects on the net, in an environment designed for teaching activities and under the guidance of a project tutor. The environment allowed to establish different kinds of relations: between teachers, between them and researchers, between classes. It offered to teachers (two in middle school and two in primary school) a place for discussions during the design of paths to be presented to their classes, to structure and share the products of their training both during and after it, to reflect on their training path.

PACS 01.50.-i – Educational aids.
PACS 01.50.F- – Audio and visual aids.

1. – Introduction

Mountains are an environment that can make use of ICT to overcome the isolation they are suffering. In the mountain region of Friuli Venezia Giulia named Carnia, (UD) since 2005 the network has enabled the development of an educational laboratory for the construction of educational paths for pupils and in service - training for teachers. The support of the Province of Udine and Euroleader made it possible to implement two projects from 2005 to 2007 ("Growing up in the network" "Experimenting on the network to grow up in the network") involving 11 schools about 600 students, 50 teachers of primary and middle school. Since 2007, the design and management of the platform

were completely taken by the network of schools that have made it an "area of communication and knowledge construction" in which technologies not only facilitate and amplify communication between users far apart, but also ensure that it presents itself as an artifact that changes the nature of the task and induces different cognitive processes (Agostinelli, 2003) for the design and the reflection on actions.

2. – Project structure

Educational effectiveness in the use of technology depends on how teachers use it in their everyday teaching, modifying the knowledge processing and representation. For this reason, teacher training was the first project activity, realized through practices of problem analysis and reflection supported by an expert. The perspective with which training was designed is therefore the enhancement of practice, of the implicit knowledge of teachers, of the need to activate reflective processes on action (Altet, 2003, 2006; Perrenoud, 2003; Shulman, 1987; Schon, 1983).

The specifically designed platform (at `http://www.sbilf.org:8080/sbilf`) is an image of an interpretation of the project by the various schools produced by the interaction between teachers, educational and computer experts. There are different areas for the work of pupils, for the different schools, for documentation of activities, for the newspaper produced online from all schools and for teacher training (see fig. 1).

The area of teacher training has five virtual classrooms in which different groups operate (see fig. 1): one of them is devoted to a research project joining primary school teachers and university researchers.

3. – The teacher training on physics

3˙1. *Project*. – Overcoming the scientific illiteracy of our society requires to start science education from the earliest school experiences, in vertical perspective (Euler, 2004). The professional training of primary school teachers implies a training on the use of subject related bases in different contexts, operational and playful. The construction of formal thinking through physics is a predominant axis (Michelini, 2004). The special attention to the scientific training requires to operate on two fronts: the revision by the teachers of their personal knowledge and the identification of teaching and research methods to help the students in developing an attitude of research and problem posing. The training activities carried out with the teachers on the web took place in a virtual classroom. The classroom offers several tools: for communication and collaborative work (forum, bulletin board, email, shared whiteboard), for documentation ("scricoll" for collaborative writing, "documents" to upload materials, MM), for reflection (the portfolio in the personal pages of each teacher is a tool for the selection of documents, a blog-journal); The tool "maps" can be used to personal or collective reifications.

The web environment supported a teacher training structured in three macro-steps, as follows:

a) Reflection before the working in class: it was carried out both as exploration of practice, reflection on personal subject knowledge and teaching, comparison with other empirical knowledge and as experimentation and elaboration of personal learning processes, construction of a research mode.

b) Reflections while working in class, that is carrying out an analysis of misconceptions, a design, a completion and a data collection.

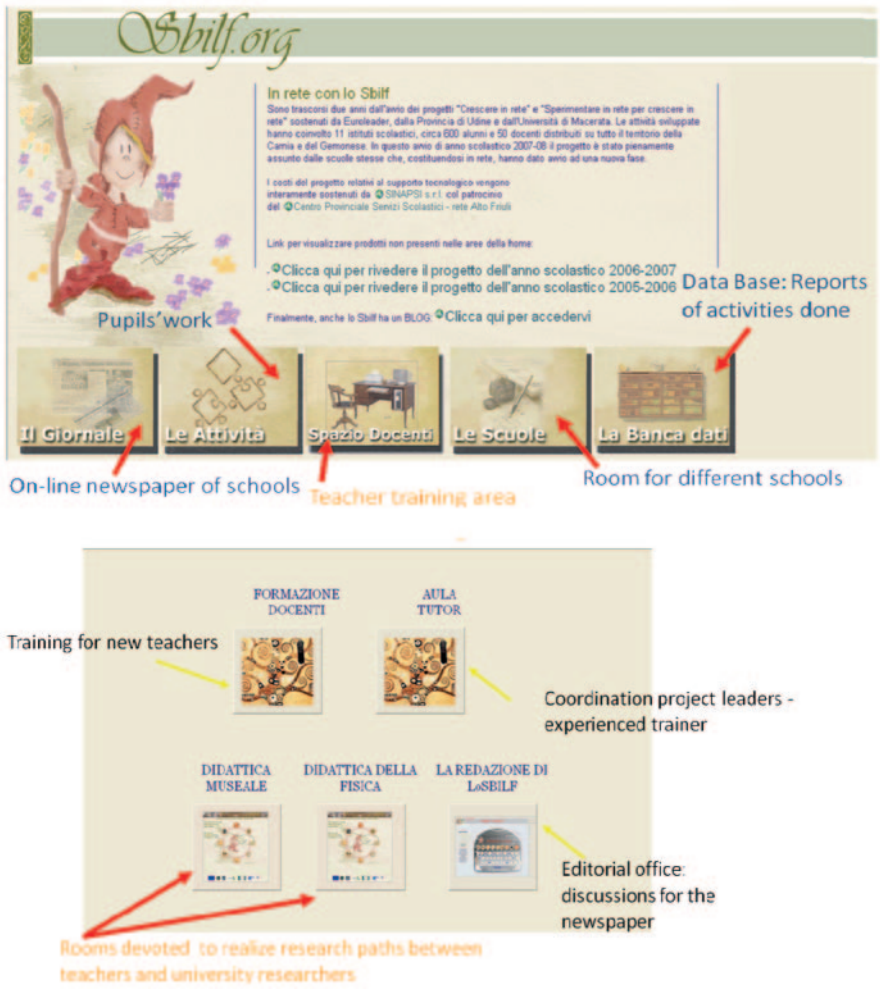

Fig. 1. – The structure of the platform at `http://www.sbilf.org:8080/sbilf` and the area devoted to teacher training (bottom).

c) Reflection after the classroom work, with an identification of the difference between the projected and acted activities, a construction of a personal modeling, an identification of new ways for reflection, problem posing, representation.

3˙2. *Activity*. – After a meeting between teachers and researchers the subject of the training was chosen as electrostatics. Teachers filled a questionnaire about the main learning difficulties as a starting point for a first discussion about research findings in this field (Furió, 1999, 2004, Guruswamy, 1997, Galili, 1995, Harrington, 1999); as a second step, experimental suggestions and teaching strategies were proposed as tools to construct effective understanding by pupils. The proposed path was an exploration of simple electrical phenomena (pulling of sticky tape, rubbing of straws ...) to recognize a change in the state of systems following a preparation, so that systems are

Fig. 2. – Some experiments in the path experienced by teachers.

charged/activated; the acquired property has a dual nature, and systems interact attracting or repelling each other according to the concordance or discordance between these properties. The proposed exploration of ways of charging (by pulling, by rubbing, by contact, by induction) was aimed to recognize that the charging process is an activation, is due to something that is in the material before charging, entities preserving themselves and mobile (see fig. 2).

Four teachers with the support of researchers projected and carried out teaching activities for their classes, according to a schema of action-research to gain capabilities both in constructing learning paths and in evaluating their effectiveness. Teachers organized simple experimental activities adapted to their classes, developed worksheets for pupils exploiting the teaching strategies gained from research to guide and to check the learning of children. The involved classes were a II, a IV and a V of primary school and two III middle school classes.

3˙3. *Role of the web environment during the activity.* – Classroom activities for about a month were documented with photos and videos; a sharing of paths was created on the web-environment with pictures, texts produced by teachers and pupils, audio recorded, using the special tool MM (multi-media) for reconstruction of every educational activity in episodes with iconic textual, audio languages (see fig. 3): an exchange of reflection in real time was possible between teachers and experts on the basis of this documentation. It is also a starting point for future reflections by people involved in the project, teachers, pupils, researchers. The structure of the path consisting of several mono-conceptual activities was suitable for a transfer within the network without loss of teaching power, on the contrary, the network provided the path with a super-structure, enhancing its strengths.

4. – Conclusions

The web-environment designed according to the professional needs of teachers allowed to establish different kinds of relationships: between teachers, between them and researchers, between classes: experiences shared on the net become knowledge for pupils living in different places, making distances an insignificant factor for information exchange. The environment offered to teachers involved in the project a place for discussions during the design of paths to be presented to their classes, to structure and share the products of their training both during and after it, to reflect on their training path: it can be utilized every time a need arises, and is transformed in a permanent training tool. The designed path and the MM tool met to offer a gain in pupils' building of concepts, enhancing also the educational power of the proposed activities.

Fig. 3. – Structure of the MM tool: steps of the experience and opening of one step containing a poster built by 11 years pupils (top) and a step showing class activities (bottom); teacher: LM.

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