

## Report on the Activity (2005-2011)

The Centre “*matematita*” (an Interuniversity Research Centre for Informal Communication and Learning of Mathematics; the title comes from a play on the words *matematica*, mathematics, and *matita*, pencil) was founded in the first months of 2005; the Universities connected with the Centre are the four universities of Milan, Milan Bicocca, Pisa and Trento.

The **research themes** investigated by the Centre in the past six years can be divided into two main classes, one regarding the contents and the other regarding the methods of the communication.

As regards to the **contents**, the research aimed initially at pinpointing some themes which could be particularly suitable for an informal communication, and at analysing the problems related to the communication of some of the key concepts in the chosen subjects.

The themes which have been more analysed have been *topology*, *4-dimensional geometry*, *visualization*, *minimax problems* and the use of *mathematical models* in different contexts (see, for example, [3b3], [3b4], [3b6], [3b8], [5b1], [5b2], [5b10], [5b21], [5b36], [5b83]).

As regards to the **methods** of communication, our research touched different areas, such as the use of *images* and *models* in the communication, the use of *playing* in learning/teaching processes, and the *workshop technique* as a strategy in order to encourage an active way of learning.

As for the use of *images* and *models* in the communication (see [3e1]), the problem has been tackled from different points of view:

- a historical one, with the starting of an investigation about the use which has been done of models and images in research activities and in the written production, in particular in some moments and/or situations which still have some influence on the present (with particular attention towards the Italian algebraic geometers after Unity and, among these, towards the figure of Luigi Cremona): see, for example, [5b65]);
- a theoretical one (aimed at studying the way in which images and models contribute to the creation of an abstract concept, both for static images and for moving images, for video or interactive animations, for concrete 3d models, or for abstract models of real situations): see, for example, [3b21],[5b7]);
- a methodological one (aimed at studying the risks related to the use of different types of images and/or models and the way to avoid such risks): see, for example, [3b13], [3b22]).

As for the other two themes (*games* and *workshops*), both located in the theoretical framing of PBL (Problem Based Learning), the main objective of the research was that of finding the best strategies in order to stimulate an active attitude in learning and, at the same time, investigating which are the characteristics making a problem suitable to be treated in a workshop environment (see [3b12], [3b15],[5b8],[5b30], [5b61]).

An element intrinsically characterizing this kind of research – thus present also in the activity of the Centre – is that it has necessarily to be accompanied by an activity of concrete experimentation: thus, just from the beginning, the Centre has been engaged not only in the research activity but also

in building and testing (prototypes of) materials suitable for communication (books, exhibitions, workshops, websites, cd, ecc).

As for some of the themes which have been studied (particularly *topology*, *4-dimensional geometry* and *minimax problems*), this experimentation found concrete realizations in workshops, or conferences, or exhibitions, aiming at finding suitable ways for the informal communication of some key concepts. (see [1], [2a], [2b], [2c], [2e], [3a2]).

Of course, one of the main targets of these experimentations are (and continue to be) schools, students and teachers at various levels. Their attention and their demands had the effect that a significant part of the activity of the Centre has been more and more directed to the world of school (see [2], but also [3c], [3f], [4-7], [4-8]). In particular, an entire area related to in-service teacher training has been initiated (see [2d]).

The opportunity and necessity of measuring with analysis and experimentations already carried through in the last years by mathematicians of this area led us, on a different side, to meet some researchers in history of mathematics who are dealing with this kind of problems; in particular this brought first to the collaboration in the PRIN project 2006 with title “*The birth of the Italian Mathematics school. Publication of electronic archives and correspondences*” and in a second moment to the collaboration in the direction of the historical series “*Materials for the construction of the biographies of Italian mathematicians from the Unity*” (see [3d]).

All these activities allowed also to start an intense activity of formation of young people at different levels: students of the mathematics degree, students of PHD schools or masters in communication, or schools for future teachers, secondary school teachers, or generally people working in the area of scientific communication.

As regards to the international relations, the Centre had from the very beginning good collaborative relationships with the Portuguese association “Atractor” (a non-profit association with aims at popularizing mathematics, involving universities of Porto, Lisbon and Coimbra) which, among other things, produced in 2001 and runs now two more copies of the exhibition *Symmetry playing with mirrors* in Portugal.

This collaboration achieved in these last six years some positive results on different sides: for example, the translation respectively from Portuguese to Italian of the DVD [3e8] and from Italian to Portuguese of the website [3e1], the joint supervision of a student in a Ph.D. Portuguese program in science communication, besides of course visits and participation to events (see [5b42], [5b79]). Since 2010 a new fruitful collaboration was opened with the Freie Universität in Berlin, which, after keeping for some months the exhibition *Symmetry playing with mirrors*, and getting from the Centre the authorization to build a permanent copy, is now working for its concrete building.

Again, on the side of International relations, we mention that, in the spring of 2010, prof. Maria Dedò was appointed in the rpa (Raising Public Awareness) committee of the European Mathematical Society. The task of this committee is to build a European website aimed at the popularization of mathematics, and at the interchange of information between mathematicians working in this sector.

## Attached files

(If you click on the number you can see the corresponding attached file)

### 1. Expository events

- a. *Symmetry, playing with mirrors*
- b. *Matetrentino*
- c. *Transparent mathematics*
- d. Participation to the Science Festival in Genova
- e. Participation to *BergamoScienza*
- f. Other events

### 2. Activities directed to schools

- a. Workshops and workshop kits
- b. Games on line
- c. Participation to the *bottega del matematico*
- d. In service teacher training
- e. *Math.en.Jeans*

### 3. Editorial activity: books, papers, multimedia

- a. Books
- b. Papers
- c. Direction of the series *Quaderno a Quadretti*
- d. Direction of the series *Materials for the construction of the biographies of Italian mathematicians from the Unity*
- e. Multimedia
- f. Journal *XlaTangente*

### 4. Websites

### 5. Meeting and conferences

- a. Meetings by the Centre
- b. Conferences, debates, round tables

### 6. Various (consulences, prizes, performances, others)

- a. Consulence activity
- b. Teaching activity (besides the institutional one)
- c. Prizes
- d. Other

### 7. People belonging to the various research Unities