To answer these questions another investigation has been undertaken:

a) A chapter of a textbook about energy was presented to a group of science teachers and they were asked to indicate incorrect or unclear phrases. Only very few teachers identified the wrong phrases, whereas the majority described the incorrect sentences as unclear.

b) In the workshops devoted to problem solving some erroneous problems were given to the groups of physics teachers. Again, only very few of them indicated errors in the formulated problems, while the others tried in vain to solve them and blamed themselves for this lack of success.

c) The same teachers appreciated the everyday language in formulations of problems, however they did not notice that the lack of precision can be a source of misunderstanding.

d) During the workshop devoted to evaluation of four textbooks, junior high school teachers formulated many very deep and useful remarks and comments, but not related to the correctness of the scientific content. Those errors were not noticed.

e) To a big group of science teachers (more than 100 persons) of elementary schools the passage from Aristotle “Physics” (Book 7, 241b, about the causes of movement) was presented as part of some textbook. Teachers were asked to comment it, to say whether they agree or disagree with the presented opinion. No single person disagreed. They considered the text to be correct. (It is another story, how this fact should be taken into account in teachers and students education).

**Conclusion**

Since the teachers are those who eventually make the choice of the textbooks, their opinions are decisive for how the optimal textbook should look like. It was their pressure that caused changes of the style of old textbooks to the more attractive present ones. However, it is alarming that the physical content is not correct in too many cases. In our opinion the ministerial referees are to be blamed for that. The teachers expect absolute correctness of the textbooks approved by the Ministry of Education and our authorities should ensure it.

Another conclusion from our investigation is the following:

Good textbooks can be written by a team consisting of teachers and scientists. If it is written only by teachers then they must very carefully checked by scientists. Reviewers should do their work properly.

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**RESEARCH GRANT FOR IN-SERVICE TEACHER FORMATION: PILOT EXPERIENCE IN UNIVERSITY OF UDINE**

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**Problems in the formation of in-service teachers in Italy**

In-service formation of teachers in Italy has a particular character, because it is part of a context of professional self-training of the teachers’ school activity (Luzzatto, 1999; Pugliese et al., 1999; Dutto, 2001; Bonetta et al. 2002; Dutto et al., 2003).

In fact, until 1999 the initial university formation of teachers hadn’t been started, even though it was foreseen by a law dating back to 1990 (L 341/90). The institutional experiences previously made in this field have been useful references for its set up, also when they had a disciplinary or experimental character (Bandiera et al., 1996; Bonetta et al., 2002; Loria et al., 1978; 1980; 1981).

Our teachers of nursery school and elementary school had a minimum pedagogical formation and a weak cultural and disciplinary formation at a secondary school level. The small amount of apprenticeship foreseen in their secondary formation has always given a modest professional contribution.
Secondary teachers have usually obtained a degree after at least four years at university, which has given them a good non-targeted disciplinary formation, but they haven’t received professional formation. All teachers have been employed through procedures which have ascertained mainly their cultural preparation and sometimes their transmission capacities. During the trial year they always had complete and direct responsibility of the classes in which they taught. They have therefore formed their professionality and learnt to teach in class through direct experience (Luzzatto, 1999; Dutto, 2001).

A negligible contribution respect to the teachers in service, but able to create a point of view and a context of reference, comes from the scientific sector, thanks to the consolidated sensitivity of the academic world of these disciplinary areas for the formation of teachers and didactic research (1). Studies and research conducted on the needs of initial and in-service formation of secondary teachers of scientific subjects (Michelini, 1997; Pugliese et al., 1999) have evidenced formative needs of methodological character and disciplinary didactics, which add to those of other European teachers regarding the up-dating of the disciplinary contents, and innovative and emblematic curricular proposals. The formative proposal for in-service teachers cannot have the same general and basic character of the one for first formation students (pre-service teacher formation) (2), who are offered the occasion to operate in a formative context a synthesis between didactical competences and those of the teaching profession (Michelini 2001; Bonetta et al. 2002; Michelini et al., 2003). In-service teachers need to be able to face specific educative and formative problems, such as – for example – the nature and role of interaction between the subjects involved in the formation and the organization of didactic activity, the managing of curricula, of the learning processes, of the methods of didactic innovation and of the overcoming of conceptual knots (Michelini e Schiavi, 2001).

Our teachers have often had the chance to develop, through experience, a useful sensitivity for the choice of strategies and methods. The intuitive dimension, not rarely extraordinary, often remains their only reference for educative and didactic choices, compared to proposals, which come from class didactic tradition, from scolastic publishing, from dispersed and differentiated forms of in-service training, mostly disorienting because of their disomogeneity in nature, contents, methods, duration, and offerers. The tendency to reproduce traditional didactic styles, proposed by text books, experienced by the teacher during his or her formative route or observed in older teachers (Eraut, 1994) is the behaviour most commonly encountered in teachers, who think about the teaching profession in static terms (Buchberger et al., 2001) and think it is necessary to adapt their intervention to a consolidated praxis (Day et al., 1990).

Some of the most recent studies coming from some national didactic research groups (3) regarding models and the set-up of actions, instruments and methods for the re-qualification of the teaching profession in schools and didactic innovation have evidenced a need of formation, which cannot be satisfied with theoretic notions (Anderson, 1995). Contextualized experiences are indispensable. The situated dimension, of contextualized analysis, of experimentation, of implementation in context of didactic proposals, allows in particular the development of the reflection in professional practice, which constitutes a necessary condition to learn and master innovation (Woolnough, 2000; 1999).

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1 Apart from the pedagogical area, even today the university disciplinary groups which foresee scientific disciplinary sectors for education and didactics (SSD) are only those of maths and physics.

2 Also in the pre-service teacher training it is discussed whether a general approach to the subjects of the area appointed to the teaching profession (A1) is preferable, rather than a specific, experimental and professional one, as well as their scarce link-up with disciplinary didactics (A2) (Bonetta et al., 2002; Michelini et al., this volume).

3 Within the Scientific Disciplinary Area of Physical Sciences various coordinated at a national level research projects have been carried out for the formation of teachers. Two recent Projects of National Relevance (PRIN) for the biennium 1999-00 and 2001-03, coordinated by P Guidoni, with the title Spiegare e Capire in Fisica (SeCif) e Formazione in Fisica del Cittadino (FFC) have involved the universities of Bologna, Milano, Napoli, Palermo, Pavia, Torino, Udine.
The continuous formation of teachers must be integrated in didactic research for the new teaching profession composed by an articulate complex of disciplinary, technical, pedagogical, social and organizational competences (Michelini, 2001; Michelini et al., 2002). Research confirms itself as the most effective instrument for the involvement of the teacher in his or her formation and for a formation integrated with the didactic commitment of the teacher.

Teachers do not have research within their competences, and therefore they need to be trained in it, for example through experiences of collaboration with professionals in educative and didactic research. An important condition for the joining of research and professional practice regards the character of the topics treated: it can’t be a research on discipline, but on its didactics and on the methodological and educative problems, in which there is a mixture of pure, applied and action research.

The Pilot Project Research Grant for Teachers (RGT) Borse di Ricerca per Insegnanti (BRI) launched in 1999 and brought into action in 2000 by the Ministry’s Board of Directors for the Formation of teachers (MIUR) has promoted teachers’ research, with the tutoring of an expert, for the qualification of in-service teachers (Dutto, 2001).

The national Pilot Project Research Grant for Teachers (RGT) carried out in Udine

The national Pilot Project RGT was created to study the modalities to attribute to in-service teachers an active role in professional development, through research activities based on class work. It has not been rigidly defined a priori, so as to receive the contribution of the local scientific responsible of the 4 sites involved for a total of 40 grants. Managing and research styles, modalities of support and consultancy have compared various institutions: the Provveditorato of Pescara, the Regional Institutes for Educational Research Experimentation and Training (RIER-ET) Istituti Regionali di Ricerca Sperimentazione ed Aggiornamento Educativo (IRRSAE) in Bologna and Torino, the University of Udine.

Three strong constraints characterize RGT in a precise way: a) the grants are for the teacher; the expert has a separate contribution for the advice given; b) the experts are chosen locally and are responsible for the quality of the research; c) the topic of every research concerns problematics of the teacher in his or her class work.

With a specific convention stipulated in december 1999 the Ministerium of University, Instruction and Research (MIUR) assigned to the University of Udine the task of handing out 15 research grants. The University of Udine has singled out a scientific responsible, a reference structure for the management of the RGT program and has nominated a Scientific Committee (CS) for the management of the project, formed by 20 experts for the scientific supervision of the researches (4). For the assignment of the grants it called a public examination, involving a discussion on the research proposals after a preliminary selection of the projects. The examination is reserved for teachers, employed in-service full time in the schools of the 4 provinces (5) for a research of the duration of one academic year, based on didactic activity and class interaction, aiming also at growing the mastering of the teacher’s didactic action regarding the teaching discipline.

The CS played the role of judging committee of the 80 projects presented. It then had the task of coordinating all the activities of the project and guaranteeing scientificity and support to the research work of the teachers. Each member of the CS also had the responsibility of paying attention to a specific field within the foreseen 15 in 4 areas:

A - Fields 1 – 3 – 4: Music, History, Modern languages;


5 Udine, Pordenone, Gorizia and Treviso
The coordinating of the research was carried out with the three following modalities: 1) a programm of monthly meetings, organized by the scientific responsible; 2) a telematic forum reserved for the community of researches and experts; 3) a personalized support for the teacher-researcher from the relative expert.

Researches were carried out by the researching teachers at the school institution he/she belonged to, under the guide and monitoring of the scientific responsible and of the experts. The first phase of each research of the winners of the grants consisted in the compiler and the expert revising the proposal so to better oriented it in a perspective of research. Half way through the research an intermediary report was produced by the researching teachers, who also drew up an ample final research report according to a reference grid at the end of the academic year of the grant’s fruition.

During the research phase some initiatives were carried out by the teachers in order to increase familiarity with the research activities:
1. a programm of meetings for each tematic area, in which every teacher-researcher explained the research work to his or her colleagues and discussed it, with the support of the relative expert;
2. an initiative called “the mirror”, consisting in a form of reflection through the mediation of a referee: we wrote what we could see in the single research projects and we gave it to those interested, telling them “if we were to talk about your project, this is what we would say “; this caused an extraordinary discussion, which really made teachers move from a state of non reflective activism to a state of re-analysis of their work and of research in literature for the bibliographical references of the problems faced;
3. seminar on specific research in education with external experts;
4. the discussion in a telematic forum for the explanation of each personal representation regarding the following problems: a) nature and characteristics of the research in education and didactic; b) contribution that the class work gives to didactic research; c) fall backs of didactic research in class work; d) type of didactic research proposed in the presented project and explanation of the research problems focused on; e) contribution of research towards the teacher formation: context and/or situated teacher education.

Reflections on the experimented research process
In the organization given in Udine, researches were carried out with a certain coordination, which allowed to costitute a research community, even if the areas, fields and topics of research were different. The formation activity therefore didn’t reduce itself to the situation in which the teacher works on his/her own in class and consults the expert now and then: the entire community of experts and researches met periodically to discuss the problems which emerged from all the researches. They exchanged materials through the telematic site and general problems were discussed in the forum.

The research provided a great quantity of indications on various levels:
- Problems concerning educative research.
- Nature and carrying out of researches based on the reflection in practitioner research.
- Collaboration between expert and teacher for researches contextualized in the scholastic praxis.
- Formation of teachers in building a mentality and using methodologies focused on research.
- Management of a research community with common problems and different topics.
- Contribution of research in the formation of in-service teachers.

We singled out some knots which need to be sorted out in order to build a new teaching profession based on research and innovation:
- The prevalence of the proposal for good practice on the proposal for research,
- The prevalence of action on reflection,
- The prevalence of production on analysis and the controlling of processes,
- The tendency of teachers to carry out link-ups, integrations and broadenings, instead of a selection of aspects and problems,
- The operative and productive dimension often focused on scholars, reserving a role of pure mediation to the teacher.

The research proposals of curricular character take on a character of projection of didactic activities, with the testing of methodologies and materials, ignoring the problematic dimension of the purpose of the research.

The following aspects are mostly absent in the research plans:
- The presentation of culturally innovative set-ups,
- The discussion of conceptual knots,
- The analysis of specific learning difficulties,
- The discussion of strategies proposed by didactic research,
- The explanation of didactic experimentation protocols.

The controlling and the evaluation of the processes, in particular, hardly ever are at the centre of attention in proposals of didactic class activities.

The aspects capable of improving the teaching profession and/or the impact that reflection has on professional practice in the teacher’s work are hardly ever discussed.

We made these observations known to the teachers, receiving opposing reactions: shutting down in front of a criticism taken personally (few), or great open-mindedness and interest in studying in depth the observations.

**Concluding remarks**

The grants were considered by all the teachers an important occasion. The research projects refer mostly to school activities which have previously given satisfaction and gratification to the teachers.

The teachers tend to set themselves objectives which are too big for the time and research possibilities given. They consider an academic year as a period which is too short for the research and they point out that the work of research and, at the same time, school service, is difficult to manage.

Distances create obstacles to interaction and it seems necessary to study the modalities of interaction from a distance. The forum is useful, but it is used nearly exclusively to give answers, and not much to ask questions.

The schools don’t understand the potentialities of the researches and the efforts of the researching teachers: it is therefore necessary to study specific ways of involving the schools.

The methodological support and the coordination of the project are essential for the teacher’s research work, who also needs to confront himself/herself with the research models.

The following have been important elements for the quality and the success of the initiative:
- a public examination and a public selection of the researches
- a preliminar and motivated involvement of experts for each topic of research
- a technical scientific committee, which acts as a guarantor of the quality of the research
- a coordination of the research which singles out and deals with the common problems of the research
- an evaluation committee which follows and “measures” the work
- a precise organization of tasks and deadlines in the research.

The telematic Forum has revealed itself a strong instrument for interaction, which is not able to activate itself spontaneously and therefore needs to be supported with a precise organization of long-distance communications.

There are various articles which document the pilot project and the researches (Burba et al., 2001; Michelini et al., 2001; 2003; Dutto et al., 2003), a book in italian reports a detailed presentation of the experience, its evaluation and its outcomes, even through brief articles written by each researching teacher in collaboration with the relative expert (Michelini eds, 2003).
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