

# Formative Assessment *for mathematics* teaching and learning

Teacher Professional  
Development Research  
by Videoanalysis  
Methodologies

Edited by  
Federica Ferretti  
Paraskevi M. Chrysanthou  
Ira Vannini

**FrancoAngeli**

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Disegno di Aldo Spizzichino

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# 1. FAMT&L: a Teacher Professional Development Research

by *Giorgio Bolondi\**, *Ira Vannini\*\**

## 1. Origins of the FAMT&L Project

The FAMT&L Project was born out of a firm belief and a key question. Firstly, the firm belief that *formative assessment* is a potentially revolutionary element for the educational and teaching function of the school systems, because it based on the idea of a democratic school (equity and quality together). Specifically, formative assessment is based on the bloomian belief (Bloom, 1972) that all students can learn basic skills in each topic and can do it excellently.

Later, the key question arises of how it is possible to accompany and support teachers in acquiring actual assessment skills; or rather: how to orient their practices towards formative assessment? This question involved a group of educational and mathematics researchers from five European countries (Cyprus, France, Italy, Holland and Switzerland), who have defined a research project that has involved, as protagonists, schools and teachers.

Within educational research, the research question on teachers' professionalism is accompanied by a broad and complex debate, which also calls on disciplinary experts and all those concerned with teachers training processes (pre-service and in-service). The key question is what are the most effective contexts and strategies to support the change of the teachers; a change towards:

- pedagogically founded and scientifically validated knowledge;
- skills and beliefs consistent with a school ideal of equity and the quality of learning outcomes of students.

\* Free University of Bozen.

\*\* Alma Mater Studiorum Università di Bologna.

Chapter 1: Giorgio Bolondi; Chapters 2 and others: Ira Vannini.

In this sense, the international debate refers to the concept of *Teacher Change* (Floden, 2002; Guskey, 2002), a line of research devoted to exploring the processes of change (or resistance to change) that teachers put in practice during the teacher education or teacher training and staff development paths.

The FAMT&L research group shared the great importance of this theoretical framework and focused on the teachers change in the assessment skills; and specifically:

- What does it mean to support teachers in training processes oriented towards authentic practices of formative assessment in classroom?
- What are the most effective training strategies? What strategies allow a real change in the teachers' beliefs and in the teachers' practices?
- Which training tools allow to foster the teachers' reflective thinking (considered as a fundamental characteristic of teacher professionalism)?

These questions have become the central idea around which the group of researchers and teachers worked for three years; the partnership has been particularly profitable, especially because it has exploited the specific skills of:

- educational researchers, experts in the field of assessment and evaluation processes and empirical research on teachers;
- researchers in mathematics teaching, a field of advanced studies on the strategies of teacher training (D'Amore, 2009; English, Bartolini, *et al.* 2008), and which put the focus of attention on the urgency of teacher professionalism in mathematics teaching;
- school teachers associated with the Project, who had already considered and worked on the formative assessment in classroom and were available to give oneself a challenge in their teaching and assessment skills.

The research path has been structured in a complex way and (as will be described in the subsequent chapters) has followed several phases, each closely linked to the others:

- the analysis of the training needs of the teachers through sample surveys (in each of the five countries) on teacher' beliefs and through the video observation in classroom;
- the development of a specific observation tool for the videoanalysis of classroom assessment practices;
- the design, implementation and monitoring of pilot training courses for the use of formative assessment, supported by the videoanalysis technique.

During each design phase, the style of work was characterized by the comparison and collaboration between researchers and teachers; the group worked on the logic of sharing theoretical-value choices, objectives

and methodologies, complementarity of skills, professional growth of all actors.

In this perspective, the path can be considered a true “Teacher Professional Development Research” (in Italian language: Ricerca-Formazione, R-F).

## **2. An international path of “Teacher Professional Development Research” (R-F)**

The term “Ricerca-Formazione (R-F)” is used in the Italian educational debate, although it has not acquired a shared definition among the various scientific currents. At international level, there is no real literal translation. The conceptual translation in English language could be “Teacher Professional Development Research”.

The term R-F refers to a not well defined concept within the scientific debate in education; it can be traced back to different research traditions. First of all, the R-F refers its origin to the participating research (Mantovani, 1998) and to the more structured model of the Action-Research (Lewin, 1946), where the key elements are the sharing of researchers and actors and their commitment to change and social action. In the second instance, the concept of R-F was used in the current called Formative Educational Evaluation (Becchi, Bondioli, 1994; Bondioli, Ferrari, 2004) that considers the evaluation (of the contexts, curricula, programs) as an opportunity for self-assessment of actors actively involved in the processes and for their professional growth. Furthermore, in several cases, R-F is also considered as a process of individual professional growth (eg through autobiographical analysis tools).

Within the CRESPI Center (Center of educational research on teacher professionalism <http://crespi.edu.unibo.it/>) of the Alma Mater Studiorum Università di Bologna, a theoretical idea of R-F has been discussed and defined starting from empirical research experiences carried out by CRESPI researchers in the field of teacher professionalism. The path of the FAMT&L Project can be related to this idea of R-F.

CRESPI considers the R-F as a real empirical research that is carried out in the field of teacher professionalism in order to promote its development. It is a research that takes place within school institutions, strongly anchored to the context, where researchers and teachers share research itineraries but above all the goals of institutional change. Rather than a methodological choice (each R-F is careful to guarantee the validity and reliability of the collected data by adopting specific validation

procedures depending on the designs – qualitative, quantitative or mixed – that are applied) is a stance of researchers towards the school context and its teachers.

Those who engage in an R-F aim at effectively affecting the professional development of the teachers involved and, at the same time, of the school context. Research is carried out following deliberate decisions in the group: preferably an interdisciplinary community of researchers in collaboration with teachers, which discusses and clarifies the framework of educational and political-social values of reference.

«In the CRESPI Center (CRESPI Academic Group, 2016; <http://crespi.edu.unibo.it/centro>), the following methodological characteristics can be considered both as binding principles for researchers in the field of R-F and open questions in search of answers.

1. Render explicit the aims of the research in terms of the professional learning and development of the teachers involved together with the procedures for documentation and evaluation of the outcomes and impacts.
2. Define the composition of the TPDR group in terms of researcher/s and teachers, clarify their roles and negotiate and specify objects and objectives, values and methodological choices.
3. Delineate and maintain a clear focus on the specificity of the institutional and non-institutional contexts in which the research is carried out through constant analysis of the constraints and the resources present and which are crucial in all phases of the research.
4. Systematically discuss ways of experimenting and gathering data during the research, so as to enhance the development of a scientific approach to educational praxis on the part of teachers, and of evaluating and documenting products and processes within the specific contexts involved and the professional development promoted.
5. Maintain emphasis on the outcomes achieved by and for the school in terms of educational innovation, teaching praxis and professional development».

Below is discussed each R-F characteristic in function of how it was addressed within the FAMT&L Project.

### *2.1. To clarify the aims of the research in terms of professional development, document and monitor them*

International framework of the FAMT&L Project has strongly contributed to the creation of a work style of sharing objectives, monitoring

and documentation. During the three-year of work, the R-F group had the purpose of promoting the development of teacher professionalism in the field of assessment practices. The main aim of the Project – after a phase of careful analysis of training needs and planning of tools and procedures – was to implement specific training pathways to change the beliefs and assessment practices of secondary school teachers by making them more and more adherent to the concept of Formative Assessment (see the Formative Assessment definition in FAMT&L group in the Chapter 2).

This goal has been the guiding principle of all phases of the Project, helping the R-F group to maintain common care on the development of teacher professionalism.

In addition, at each phase of the Project, the data collection was aimed at monitoring the processes in progress (analysis of teacher training needs through sample surveys, building and validation of tools for the observation and videoanalysis of practices, experimentation of training interventions by a pilot course in each country) and document – as transparently as possible – the results achieved. The purpose was to provide useful documentation not only to the R-F group, but as a point of reference to continue the research in other national and international contexts and to implement the pilot courses developed (training for Formative Assessment practices through methodologies of video analysis in classroom) on larger groups of teachers.

## *2.2. Define the composition of the R-F group, clarify the roles and negotiate objectives, values and methodological choices*

As has been said, the R-F group was formed by the researchers together with a group of teachers from the five European countries participating in FAMT&L Project. The initial choices were elaborated and discussed in the academic group; from time to time, the goals and objects of the project were brought within the group of teachers to be deepened, rediscovered, further enriched. The ways of sharing within the group were different depending on the different work phases:

- during the initial phases of training needs analysis, teachers were involved in discussion on the results of surveys (regarding both teacher's beliefs data and practices observed in classroom). Within the several associated schools of the five European countries, and during meeting group, the researchers presented the beliefs and practices data to the teachers, and their first interpretations. Along with the

teachers' groups, critical data interpretation was further analysed in specific school contexts; the data from the observations were analysed together with the same teachers video-recorded and fostering their self-evaluation processes;

- in an explorative phase, the R-F group designed the videoanalysis tools and the curriculum of the pilot courses; in this time, the teachers have been actively involved. Initially, the grid for observing classroom practices was elaborated by the researchers from the Formation Assessment construct; subsequently this grid has been subjected to various try out in each country, through video analysis in the classrooms of the associated schools. Each country has suggested changes and improvements, up to the revision presented here which still constitutes a hypothesis tool open to further improvements (possibly through further discussions with teachers in new school contexts). The design of the pilot courses and the procedures to accompany the teacher's reflexivity has been different: in this case, the researchers group proceeded independently from reference literature and specific academic experiences in the field of teacher training;
- in the pilot phase, teachers were involved in a continuous process of monitoring and evaluating courses, both through systematic tools and through more qualitative procedures such as focus groups and interviews. These procedures have allowed teachers to take part as a protagonist in courses, to reflect critically on the knowledge and skills they were gaining and on the training methodologies adopted. During this time, also the video analysis grid was further subjected to the screening of teachers.

As it can be seen, the R-F group has not provided roles of parity between researchers and teachers, but of complementarity and constant exchange between academics and school actors: processes and results have been constantly analysed, questioned and re-designed between them. In roles negotiation, teachers were considered the earliest recipients of the project's results, the researchers were considered the first responsible for such results.

This negotiation was initially shared with the leaders of the associated schools of the countries involved.

### *2.3. Analysing the institutional constraints and resources of the R-F contexts*

As mentioned in the previous point, the associated schools have been largely involved in all phases of the Project. This involvement has led,



from the very beginning of the Project, a commitment of researchers to enter within the institutional contexts of the associated schools of the five countries. In fact, each school context has brought with it important resources, but also constraints that each country has had to take into account in the various phases of the R-F.

At the beginning of the project, it was necessary to identify the teachers of each school and this required an early access by researchers into schools and a good negotiation with school leaders.

It is important to note that each school had already experience in the field of assessment teachers' skills and was therefore sensitive to the subject; however, in some schools the teachers were able to choose for them to participate in the project; in others the leader was instructed to indicate the teachers. This involved, in each of the five countries, an initial work for the constitution of the group and a progressive integration of the teachers within the R-F group. The care of relationships has been important in all five European countries, in the awareness that the socio-cultural context is a key element in order to carry out the effective R-F processes.

The most important institutional constraints have been met on the front of privacy, and at different levels.

First, during the surveys on teacher's beliefs and student's beliefs. In these two occasions, the schools in the various countries have proposed their specific regulations to allow data collection, both among teachers, but especially among students who are not yet of age.

Subsequently, the most important constraint was placed during class video-recording. On the one hand, classroom video tutorials involved collecting images related to students as well. In compliance with the national privacy laws, they have been signed with family liberators; however, in Holland – despite all the formal reassurances – it was not possible to enter in the classroom with a camcorder.

On the other hand, the video has created resistances in the same teachers involved in the R-F group, dictated by fears and lack of self-efficacy. It was therefore necessary to identify specific solutions within each institutional context: almost always the researchers increased the reflection meetings with the teachers in order to deepen the meaning of what was being done and to design together the assessment events to be filmed, while always guaranteeing the authenticity of the teachers' actions.

The analysis of constraints and institutional resources has been the subject of constant debate within the R-F group in order to identify the most sustainable solutions and to fully exploit all the theoretical and practical skills available within school contexts.

#### *2.4. Evaluating and documenting products and processes: a systematically dialogue on the gathering data in the R-F group*

Each phase of the project was developed through a specific research design: a survey of teachers' beliefs and a systematic observation survey during the early stages of the project; a qualitative-exploratory investigation for the development of video analysis tools; a pre- or quasi-experimental design to monitor the results achieved with the pilot courses. In each of these research moments, the R-F group has systematically documented the processes implemented: conversation and discussion among researchers, dialogue with teachers, decision-making, implementation of different procedures. This documentation has been facilitated by the fact that, within a European project, the research team is constantly urged to document using a variety of tools: minutes of meetings, e-mails between participants, drafting of reports in progress, to the specific documentation within the project's dedicated website ([www.famt-l.eu/it/](http://www.famt-l.eu/it/)). This involves a constant dialogue within the group and a constant exchange of information.

The documentation of the results was achieved thanks both to research reports and to various publications in scientific journal that the researchers were writing during the project.

What is to be noted, as a weakness, is the lack of in-depth after-sales analysis on the produced documentation. Whether the choices on *what* and *how* to document were the result of shared analysis within the R-F group; they have missed moments to go back to the documents and reflect critically in a re-design perspective. This in-depth analysis was done only at the end of the Project, especially for the preparation of the final conference and, above all, in order to imagine possible exploitation phases of the research and the ways to maintain (after the end of the project) the tools (in particular, the web repository).

#### *2.5. Maintain emphasis on the outcomes achieved by and for the school in terms of educational innovation and professional development*

The FAMT&L project, since its starting as a Comenius Project proposal, has consistently been geared towards identifying hypotheses and solutions for teacher training and their growth in terms of professionalism. Specifically, as has been said, the Project has always been geared towards changing teachers' beliefs and formative assessment practices. As we

will see in the subsequent chapters, the R-F group's work was based on a key idea: student learning assessment is a major issue in school systems across Europe; teacher skills are often lacking and the assessment practices are often used for selective purposes rather than *for* learning. This is particularly true in secondary schools and, specifically, in those school levels for students aged 11 to 16 who are at the end of compulsory education. It is in these levels that the highest rates of school dispersion are recorded and a strong demotivation to students learning. International educational research, especially since the '90s (see references in the Chapter 2, shows that good formative assessment practices in classroom are largely effective to improve the students' learning, to stimulate their self-assessment and their motivation for learning. Formative assessment, at the same time, enables the implementation of different teaching methodologies and leads the teacher to self-evaluate and to reflect critically on his educational choices. Result is a growth of teacher professional skills: curriculum designing, using of good teaching methodologies, measuring and assessment, managing formative feedback.

From these considerations, the FAMT&L group has defined the main objective of the Project: to identify pathways and training arrangements to improve teachers' assessment skills. The relapse of the Project on the professionalism of teachers had to be tangible, both in terms of effective change in the beliefs and practices of teachers involved in the R-F group, as well as in modelling pathways and training methodologies to be reopened within wider contexts.

The results of the pilot courses, as can be seen in the following chapters, are encouraging: significant changes have been observed during pilot courses. Additionally, teachers in the 5 R-F groups are currently continuing to collaborate with university researchers and have been involved as trainers for new groups of teachers.

Curricula designed for pilot courses – their training structure, video analysis methodologies, video materials, and tools for teacher reflexivity – are also a major result in terms of innovation in the programs for in-service teacher training. Now, we have to continue the exploration of our research hypothesis in wider contexts.

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