Formative Assessment *for* mathematics teaching and learning

Teacher Professional Development Research by Videoanalysis Methodologies

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6. From beliefs to practices: the video-analysis methodologies to observe the formative assessment in classroom

by *Stefania Lovece*, Ira Vannini**

1. In classroom practices and teachers' reflective thinking

OCSE-Pisa international data from the last 15 years – but recently also the Talis survey (OECD Talis, 2014; Vieluf, 2012) – have shown how the use of more or less innovative teaching and coherent formative assessing practices is mostly determined by the teacher variable, more than by the geographic or organizational variables of the school.

This is especially true for Italy, where both the analysis of the students' learning outcomes and the statements made by the teachers themselves, show considerable differences within a same schools (between different classes and, then, different teachers).

This tendency to individualism and self-centeredness of the teachers is often accompanied by strong deficiencies in collective and democratic work among teachers.

In this perspective acting on system variables that aim at changing the culture of school evaluation is still extremely important, both in Italy and abroad. At the same time it is as much essential that we focus on the teachers' practices in the classroom.

Ever since the 80s and 90s, studies on *teacher change* have highlighted how changing educational practices is a key factor in changing the beliefs teachers have. On the other hand, teacher training paths that aim at changing practices by only working on beliefs often appears to be counterproductive (Guskey, 2002).

Therefore, in order to encourage the teachers' reflective thinking, their capacity for self-assessment and critical analysis, it is necessary to start from their individual practices.

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It is a question of encouraging teachers to commit to change, to exercise their reflective thinking (Dewey, 1910) and to evaluate (and if necessary modify) their actions as they would evaluate a scientific hypothesis.

2. Observing practices as a fundamental tool

From this theoretical-methodological perspective, the observation is a fundamental tool to help in-training teachers to 'start from practice' (Danielson, 2007). Observation draws attention to empirical data made of 'actions and behaviour' in an actual framework. In this way teachers are able to compare the beliefs they have with empirical data and use them to formulate and reformulate new beliefs.

Data that emerges from systematic observation has the potential to allow the observed subjects to distance themselves from their actions and to be able to think critically about them. Data, if it is collected diachronically, also allows subjects to take note of the progress made in time and to make a diagnosis, serving as a starting-point for projects for change.

Obviously, knowing the observations' objects and criteria is a fundamental condition to get teachers to be actively involved in a virtuous training cycle. We speak for a training cycle in which the teachers themselves can analyse their own practices and the practices of others teachers, changing their point of view and modifying their 'routinely practices'.

In terms of changing beliefs, observation becomes even more significant when it puts teachers in a participative position (Danielson, 2012). This happens, for instance, in peer observation: teachers take turns in being the observer and the observed (Bell, Mladenovic, 2008), watching themselves from the outside and watching from the outside the practices of others. The goal is to activate their reflective thinking, their ability for collective discussion and for making democratic decisions (House, Howe, 2003) that aim at planning better ways to act in a teaching-learning environment.

3. Video analysis to enhance the classroom observation

The use of video-analysis for teacher training (Ferretti & Vannini, 2017) goes hand in hand with in classroom systematic observation and with the observation of teacher behaviour especially.

Many studies still show the effectiveness of the *microteaching* (Calvani *et al.*, 2011) and, more generally, of the teacher observation with consequent video-analysis to promote change and improving of teachers'

professionalism (Rossi *et al.*, 2015), namely with math teachers (Casabianca *et al.*, 2013; Walkowiak *et al.*, 2014).

These strategies create a strong connection between theory and practice and they allow in-training teachers to change their point of view and to observe themselves in video sequences (Altet, Charlier, Paquay, Perrenoud, 2006).

These methodologies that enhance our observational skills through the use of video are currently largely used abroad: the American and the British research (Guernsey, Ochshorn, 2011) highlight the need to use observation to make teachers more and more aware of their actions when teaching. Other experiences have been made by some American professional associations (such as the New Teacher Project, the New America Foundation and Teach Stone) which are developing systematic tools to observe the behaviour of teachers in classroom.

More specifically, Santagata's studies (Santagata, 2010; Santagata *et al.* 2010; 2011) regarding the use of video-analysis are a very important reference for teacher training. For teachers, the careful observation of students during their learning process and of how teachers behave in relation to that, are key elements to exercise their analytical skills and reflective thinking.

Moving in the direction of creating opportunities for shared analysis and discussion about specific events that happen in the classroom are the American 'Video Clubs' (van Es & Sherin, 2010) and 'Lesson Studies' (Lewis &Takahashi, 2013) which are the result of Japanese studies and work towards using observational data collected during classes to discuss and collectively re-plan – between observed and observer – the teaching-learning processes.

The research carried out in French speaking countries is also of great interest. This research mainly focuses on the teachers' self-assessment processes (cf.. Laveault *et al.*, 2009; Paquay *et al.*, 2010), on studies about teaching practices (Altet, 2003; 2006; 2012) and, more specifically, on "action analysis" (Durand, Filliettaz, 2009).

It is qualitative research that analyses "activated" teaching (Iobbi, Magnoler, 2015) in order to identify its key elements and draw from them opportunities for teachers to use their reflective thinking and enhance the self-evaluation and critical skills of teachers. In all of this, videos are a tool of great value to foster the teacher in his thinking about the action through different methodological approaches (Theureau, 2006; Vinatier, 2009).

The connecting suggestion of these different strands of research – research stemmed from different cultural backgrounds and different theoretical and methodological framework – is to encourage the

development of teacher professionalism helping teachers themselves to use their analytical thinking on their practices and the practices of others.

Focusing on the details, paying attention to what one is doing inside the classroom (a place that is traditionally not open to outside observers, whether they are human observers or video cameras) is what allows teachers in training to really notice what they are doing, rethink about it and distance themselves from it so that they can then be able to criticise it.

In summary, the research on video-analysis (in classroom) highlights how this methodology – if it is integral part of intentional training pathways:

- promotes the reflective thinking of teachers and better responds to their training needs (Meyer, 2012; Ertmer, Conklin, Lewandowski, 2002; Plakhotnik, 2001; Mottet, 1997);
- allows teachers to identify strategies for self-improvement (more than what the analysis of the students' learning outcomes itself does) (Meyer, 2012; Ertmer, Conklin, Lewandowski, 2002; Plakhotnik, 2001; Mottet, 1997).

4. Video analysis and Formative Assessment

Concerning classroom assessment practices, international research (Harbor *et al.*, 2015) highlights the importance of analysing teacher attitudes in the use of formative assessment.

Video analysis urges teachers to "see" what is happening in the classroom, and in particular to focus on teacher assessment behaviours that have a positive impact on learning outcomes. Specifically, three types of core teacher behaviour related to *formative assessment* and teaching individualization are highlighted: how it involves students, using questions that create opportunities for students to intervene and respond (Kern & Clemens, 2007); how to use the modelling behaviour; how it communicates formative feedback.

In this sense, video analysis follows a very similar method to that the one used in the research experience FAMT&L: the aim is to draw the in training teachers' attention to the details of those behaviours that are more related to educational effectiveness.

Being able to describe these behaviours, to see the details and to re-think them in an improved way, are very valuable training opportunities for teachers. Research carried out by Kane *et al.* (2011) has attempted to explore the connections between teaching practices and student performance. It is precisely from these studies that emerges the need for specific observational procedures to focus on the actions that teachers take

in the classroom, in particular on assessment practices. This is important both in the early phase of collecting information on students' learning, and in the specific phase in which the teacher is engaged in giving *formative feedback* to the students.

Observation in the classroom aims to detect the assessment strategies used by teachers during the teaching-learning process:

- how to communicate assessment objectives and criteria to the students;
- how to present and deliver assessment tests;
- how to collect information about the students' achievements in the classroom;
- how to correct assessment tests and errors;
- how to communicate feedback to the students.

The experience in the schools shows that FA is not a natural habit of the teachers and there is a need to improve the teacher practices on FA. To do this, it is essential to have in-depth knowledge of what happens in the classes during the assessment moments in order to identify "good" and "bad" practices and thus design effective teacher training and staff development courses. Therefore, the FAMT&L Project has acted in this perspective: the analysis of the specifics of teacher assessment behaviours and the use of video recording in the classroom have been the key tool for designing professional development pathways and to produce a real change teacher.

5. Pilot course for FAMT&L project: a common training model for all Countries

In line with the theoretical and methodological studies briefly described so far, in the FAMT&L project one of the main goals achieved was the design of a model course for mathematics teachers in which the use of video and observations in the classroom could be the main method to promote reflective activity that could generate change in teaching practices.

A model course that could adapt to the different designs of the partner countries – differences dictated by different timings, different trainees' selection modes, different certifications, etc. – did not prevent the specific courses to be characterized by some common features.

It has thereby been possible both to preserve each country's specificities, and to have a similar architecture for monitoring the training programs using common survey tools in order to allow evaluation and comparison. The main characteristic of these courses was the use of video in the training sessions for teachers in service, following guidelines from the scientific and theoretical framework. In particular, the use of video has

been incorporated as an opportunity for reflection and discussion on the construction of beliefs and on formative assessment practices.

A further important aspect is the traceability of the change in these beliefs and practices in the perspective of improving teaching in an innovative way.

Regarding the content of the course, the training program provides general knowledge on teaching design and assessment and more specific knowledge of mathematics teaching with particular attention to summative and formative assessment and therefore to "for" learning assessment. This is because we thought that a correct use of FA methods and techniques is a key element to make teaching math more effective and innovative.

To develop a training course that could enhance the reflective activity of teachers as a potential key to change in future teaching practices, some learning activities have been suggested trying to combine theoretical content and teaching methods based on experiences geared towards elaborative and reflective action supported by the competent intervention of university teachers, supervisors, tutors or critical friends (experienced teachers and already partially trained on the subject who participated in the course). The suggested activities of communication, analysis, discussion and reflection centred on issues related to the design of assessment practices, the development of data collection tools, the provision of concrete experiences and practices, the documentation of the path, have been tested through a number of stimuli and reflections/discussions shared in presence and at a distance with the tools and materials on an e-learning platform.

Some of these activities are described below.

- In-depth study of the themes presented in class, in which the main theoretical and methodological references on the assessment and teaching of mathematics have been discussed, investigating in particular the theme of methodologies and tools to be used.
- Observation activities during which videos from the web repository that have previously been analysed are shown or short videos are systematically analysed using the shared observation grid (or selected parts of the grid) previously used for analysing the collected videos.
- Reflection on one's own evaluation practices in the direction of planning a new evaluation strategy in which, after dealing with the issues and the various evaluation models, teachers participating in the course are required to plan the activity they will eventually lead in future.
- Sharing of the analysis and the activities planned in order to collectively reflect and gain greater awareness through the feedback and reflection of others.

By themselves, all these activities, however, are not sufficient to give life to the experience of change in the evaluation practices of the teachers concerned and therefore it is particularly important that they are accompanied and supported by instruments and trainer serving as guidance and orientation. Recent research has shown the critical role of tutoring or mentoring to stimulate learning *from* experience and *in* the experience highlighting how professional performance improves when teachers are listened by a mentor that gives them the ability to create connection points with their own experience (Filliettaz, 2014).

In this sense it is also important to emphasize the use of strategies and methods drawn from research experiences that show how the video recording of educational practices becomes even more incisive if intertwined with opportunities for reflection and dialogue urged by questions-stimulus introduced by a researcher/facilitator or by tools such as drills and tasks with questions stimulation or learning diaries that guide the subject to a metacognitive level (Santagata, Zannoni, Stigler, 2007).

6. The use of video for teacher training between theory and practice

The methodological and operational implications for teacher training have allowed us to better identify ways to use videos on assessment practices in the training paths we have proposed and in particular to use videos as stimuli to conceptualize and reflect on the teachers' own practices. Additionally, we have found especially important to use video sequencing to allow us to identify more accurately the actions put into practice by teachers during their classroom lessons.

The videos used were obtained the phase of the project in which we investigated teachers' beliefs and assessment practices (see chapter 4).

The correlation between the research on conceptions of teachers' beliefs and the first phase of observational research has allowed us to understand what types of wrong beliefs teachers had on formative assessment in the classroom. What has emerged is a common tendency to use traditional practices of summative assessment and difficulties in perceiving formative assessment as a useful tool for improving teaching and learning.

Difficulties to understand the effectiveness of formative assessment were also found during a first analysis of the first videos examined. Many of the natural situations of math teaching in the classroom confirmed the results of the first phase of research (the questionnaires), as they have

highlighted the use of evaluation mainly aimed at "measuring" learning and assessing them in a summative way by using not-rigorous methods of collecting information about learning and not accompanied by a correct use of feedback.

Clearly, to get more detailed information for our research, we had to build a tool for the observation and analysis that we could use both to analyse recorded videos in the classroom and to categorize and store video sequences to be used in future training courses. The tool has been defined with reference to guidelines derived from international literature and experiences of in-service training. This tool has been useful in gathering several indicators on good and bad mathematics teacher training practices (e.g. their habits in gathering information on student learning; the error correction process and the use of feedback to support learning) (Lovece, Michael-Chrysanthou *et al*., 2016).

First of all, we started to consider what the literature on docimology defines as the classic phases of a proper evaluation process. This is merely to refer to specific technical and procedural guidelines which, if they refer more specifically to the summary (objective and most scientific) assessment procedures, can also be considered valid for the practice of formative assessment. The stages of this process we refer in particular are (Gattullo, 1967):

1. the *definition of the object*, as the pupil performance manifest following the teaching action, described and identified in terms of indicators "capable of providing detectable data on learning and its outcomes" (Tornar, 2001, p. 147);
2. *measurement*, that is the assessment, detection of data capable of providing information on the level of learning achieved by a pupil. This phase must necessarily have the *validity* requirements (when the object identifies with what is actually measured) and *reliability* (when the information it provides is responsive to the actual status of the measured object and therefore the measurement is repeatable remotely time or other subjects with constant results);
3. the *assessment*, that is the expression of a judgment on data and information obtained through a particular language and on the basis of a specific.

They are also taken into account the theoretical and methodological guidelines for measurement practices in a way more properly formative as, for example, the systematic use of the on-going evaluation of the progress of the students, the communication of the training feedback, the error analysis, etc.

6.1. *The grid: a tool for video analysis*

The tool created starting from these theoretical-methodological references has therefore been used to provide each video with metadata that allowed categorization and sequential descriptive analysis (to observe correlations) that helped to define the classroom assessment practice profiles.

Therefore, the grid used has been structured on different levels. On the first level we find the data that "identify" the video files which allow for first storage: the video identification code; Nation; Language; Type: audio/video (length, format); Creation date; Author; Class and school level; Number of students in class.

On the next level, we have used categories which have allowed us to better study the qualitative analysis as we considered the many variables in play in such a specific and complex process as assessment.

From an environmental perspective (Bronfenbrenner, 1979) this observation grid allowed us to collect several indicators on the evaluation practices of math teachers and to group them into five macro-categories:

1. math content (content and skills that are the subject of teaching);
2. assessment time (before, during or after a specific learning activity);
3. assessment setting (with all the students in classroom, with student groups or with each single student);
4. type of tools used to collect data on student skills (written tests, oral exams, behavioural observation, …);
5. stage of formative assessment (presentation of the assessment activity, information gathering, error correction, feedback).

In the first category we consider the information about the mathematical content that is the subject of each lesson/situation. Taking into account the complexity of the teaching-learning process, the activities in this category obviously cannot be considered only as content in mathematical knowledge (mathematical objects) but we had to expand our horizon to take into account the skills and competences the students bring to the learning process. So we adopted a two-dimensional content/capacity schema based on the OECD-Pisa approach (OECD-Pisa, 2013) as shown in Table 3.1.

Other categories have been elaborated starting from the consideration that, as has been said, a good assessment strategy must necessarily refer to an equally rigorous measurement phase. Only in this way, the assessment can be defined strictly scientifically, and flexibly adaptable to the operational choices that the teacher adopts for a successful process of teaching/learning.

Tab. 1 - OECD-Pisa Approach/Capacity Schema (OECD-Pisa, 2013)

Contents	**Skills**
Numbers	Communication
Spaces and shape	Mathematization
Uncertainty and data	Representation
Relationships and Functions	Reasoning and argumentation
	To devise strategies for solving problems
	Use symbolic, formal and technical language and operations
	Use math tools

In particular, thanks to the collaboration with the teachers, we considered the importance of implementing choices that would ensure the widest and most adequate framework of reliable and accurate information on achieving specific learning objectives.

In the grid, the second category (*time*) was set to identify the moment the formative evaluation activities are carried out over the time of the whole lesson (for example before, during or after a teacher's explanation).

The *setting* category (third) considers the context of training evaluation. This is necessary since categories, time and space/context (which also take into account the predisposition of the class group) are variables that can affect the teaching process and, if pedagogically planned and suitably adapted to the specific teaching-learning situation, they can play a very positive role in facilitating the process.

The next category, the one that considers *tools*, is equally important. It is also through the use of appropriate tools and techniques for detecting, processing and analysing the information that can be obtained, which can best integrate evaluation practices into strategies and didactic paths promoted (Domenici, 2003, pp. 34-37). This involves a strong focus on the validity and reliability of the information to be taken into consideration, as the teacher should be able to express a reasoned and documented assessment of the pupils' performance (Tornar, 2001, p. 161).

Docimology studies have produced several classifications of test and assessment techniques that can be used in the different contexts and moments of a training path. There are also numerous studies demonstrating the validity and limitations of the most commonly used tests in teaching practice (Vertecchi, 2003).

The variety of tests available is very wide and often the choice of the tool and its construction is very difficult for the teacher. This also because it is very much dependent on the purpose for which an instrument

is used and from the moment when an assessment is made. In the grid, instruments have been classified into types of tests, distinguishing between scripts and oral, individual or group, and structured or not. All those situations in which a teacher implements an assessment process, even though this practice does not follow the formal process, is based on spontaneous or unexpected observations with non-systematic or informal interactions.

Finally, the last category of the grid is the most interesting and most characteristic because it collects a wide range of behaviours and actions that can be considered as indicators to be observed in the various *phases of the assessment practice.* It is also the most complex category, because it collects actions and behaviours (predominantly of teachers) implemented at different moments of the assessment phase.

For this category, reference was also made to the methodological indications from docimology studies, foreseeing phases of which should be a good assessment practice. For a systematic and rigorous assessment methodology, it is necessary to follow a series of indications to try to reduce the risk of subjectivity. At the same time, it is necessary to ensure, as much as possible "formative" assessment that ensure a useful feedback to adapt teaching and learning strategies with their aim. A proper "way" to activate a correct evaluation is the one that distinguishes the phases of (Domenici, 2003; Vannini, 2009):

- presentation of the test, in particular by sharing with the class of correction and/or assessment criteria;
- the administration of the test, which requires special arrangements depending on the type of test used, for example written or oral;
- feedback, that is, returning the results obtained by the student.

For each of these phases, therefore, in grid construction, we tried to identify all observable actions that could be considered as indicators of good or bad assessment practices. For example, at the stage of the presentation of the test, the teacher should clearly communicate when the pupils will go and share the goals, the contents, the methods of testing, the criteria for correcting it and assessing it.

In the administration phase, however, actions may differ according to the type of test used. For example, particular attention should be paid to the distribution of a written test, providing explanations on how to run the test or compilation of the distributed module and strategies used to ensure that there is no interference in individual work (for example, to avoid some copied from class mates). In the case of oral tests, the operating instructions are different, depending on whether they are individual, group or paired, and depending on the mode and timing for example to answer a question.

In the recording phase, the detectable and observable activities are few and differ according to the type of test performed. For example, if the teacher decides to assess a student through direct observation, he or she can decide whether to use more or less structured grids or a freer and narrative recording mode.

The feedback phase is also quite articulated and includes all the actions through which the teacher can give information on the result achieved and aimed at allowing each pupil to be aware, for example, of the type of error committed. Even at this phase, actions may also be differentiated depending on whether it is a written test or an oral test or even a test involving peer evaluation.

In this chapter, unfortunately it is not possible to describe in detail all the actions that can be detected by observing the videos recorded in the class. To see the indicators, refer to the overview of the analysis grid in the appendix.

Here we limit ourselves to specifying that for each phase of a valuation practice, the grid has created subcategories containing the individual indicators. For example, during the administration and feedback phases the actions were grouped into subcategories referring to the use of different types of tests (written and oral). Researchers, moreover, have never considered the grid as "complete" and "definitive" as observable and measurable actions as indicators of an assessment practice may be much more numerous.

It should be noted that grid construction work was perhaps one of the longest and most complex of the research carried out by the researchers throughout the FAMT & L project. Much support at this phase was given by teachers who actively collaborated on research. They helped us during different training and sharing moments that allowed us to observe the teaching practices more closely.

Using the analysis grid tool, the research team was able to conduct a systematic observation study on a large sample of video sequences of teachers gathered in the five partner countries involved.

The collected videos consist of real classroom situations recorded while implementing assessment practices such as giving a test or a task to students; conducting a written, oral or practical test; reflecting on the mistakes that have been made in a test; correcting an assigned task (in a group, individually or in pairs); the teacher's answers during work on an individual exercise, and so on.

From "long" videos, some short video sequences have been obtained that have become the main training tool for the pilot course.

7. Collecting videos in a web repository

The videos collected and analysed using the grid we described also required the researchers to design and build a virtual environment so that they could be stored and categorized. For this reason, a web repository has been designed, according to the common model described (see paragraphs 3 and 5 and chapter 7) to be used during the teacher training paths.

Using the video analysis grid has therefore allowed a meta-dating of every short video sequence and a video recording system that facilitated their archiving. This archiving system has also been designed in a way that finding specific materials in the repository would be easy so that they could be integrated into "pilot" courses aimed at promoting the correct use of FA as a tool to improve math teaching.

In the design phase of the repository, the partners had thought of a virtual environment that could contain many useful teaching objects and tools and have some specific characteristics. The repository needed to:

- contain various types of teaching tools and research tools used and produced during the project;
- have at least one tool that could be used for exchanges of information and communication (e.g. a blog);
- be administered by all partners; for this reason English has been chosen as the official language, but it is possible to upload materials and content in all the languages of the different partners;
- be organized in different sections based on criteria defined together by the partners (e.g. nationality, topics, age, etc.).

Lastly, all the materials had to be easily accessible, usable (e.g. to facilitate searching for different materials) and had to remain available (e.g. for teachers from different countries) beyond the end of the project.

To design and implement this kind of environment, researchers have looked at different solutions and followed different stages of product development, which in the final version has taken on features slightly different from the ones initially planned.

First of all, many different digital materials and training assessment tools designed and used as a methodological resource for planning and conducting teacher training courses have been uploaded to a specific e-learning platform made available by French partners (e-Space Platform). This platform has become the support for partner courses that they wanted to adopt and is available for the courses that will be implemented in the future. The materials that can be uploaded are several: training content, assessment tools (such as charts, schemas, etc.), videos (educational situations recordings), movie extracts with text comments or related activities, specific tools for formative assessment, learning objects created

and used for teacher training, reference bibliographies, link lists and web sites, glossaries, project documentation file (draft, reports, alerts, meeting records, articles etc.).

Instead, the videos analysed were uploaded to the web repository that has features and functions described in the next section.

The FAMT&L web repository: features and functions

The main language is English but the website is organized in 5 sections, one for each partner's language: Italian (for UNIBO and SUPSI), French (for UCP), Dutch (for Netherlands' Hogeschool Inholland) and Greek (for UCY).

FAMT&L web repository hosts two different type of contents: Training and Context Unit.

The *Training Unit* is a set of information related to a video analysed with the analysis grid. It shows a situation in classroom and the related analysis.

It also displays a set of further data: last modified data, related video, documents that explain and expand the situation.

Training unit are searchable in home page through facets system that allow to select a number of filter like partner or abilities and so on.

A group of training unit that describes a more complex problem or situation are grouped in a Context unit.

Context Unit is the second form of content type. It spokes about context in which one or more training unit are developed, group them together and show more data about it.

Some example of data is: short description of the media, creation date, school level target, training unit collected, language and country.

Context unit are listed in Context unit page.

Over the core (training unit and context unit), web repository exposes some static page in which the whole project in presented and explained.

The repository is divided in a *front office*, in which everyone registered to the site can explore, search and navigate units, contents, page and a back office in which certain role can manage units and contents. The *back office* allows adding, editing and removing every type of content through dedicated forms.

On the top of the web site there is an edit menu from which each partner can manage its contents but it is necessary to have an administration role that permits to edit all the contents without property limitations (in the repo are defined, at the moment, the follow roles: register user, editor and administrator, each of which has specific permission and abilities to read/write certain type of content).

All the repositories are translated into four languages: English, Dutch, Italian, Greek, and French. So each type content is submitted in one or more of these languages.

Regarding the site interface, the home page contains a brief introduction to FAMT&L project and some link to search video:

- by Context or Training Unit (tab under the logo);
- by the 5 languages in which partners had uploaded files;
- by author of the uploading (the 5 Partners);
- by some section of the analysis grid (Contents, capabilities, time of assessment, tools or tasks to assess the students).

In the first page it's also possible explore directly among the list of video uploaded.

The screen of the single unit (see Figure 3), however, is characterized by having, at the top, the video's identification name (named according to the shared criteria that allows immediately to understand provenance, grade, school, recording year).

In the left part of the screen is the video frame and below a brief description of what it contains. In some cases you can also find materials used by the teacher for the assessment (correction grids, forms to be filled, observation grid).

On the right side of the screen there are all indicators of the analysis grid observable in the video: the individual actions that the teacher and the pupils do at different stages of an assessment process.

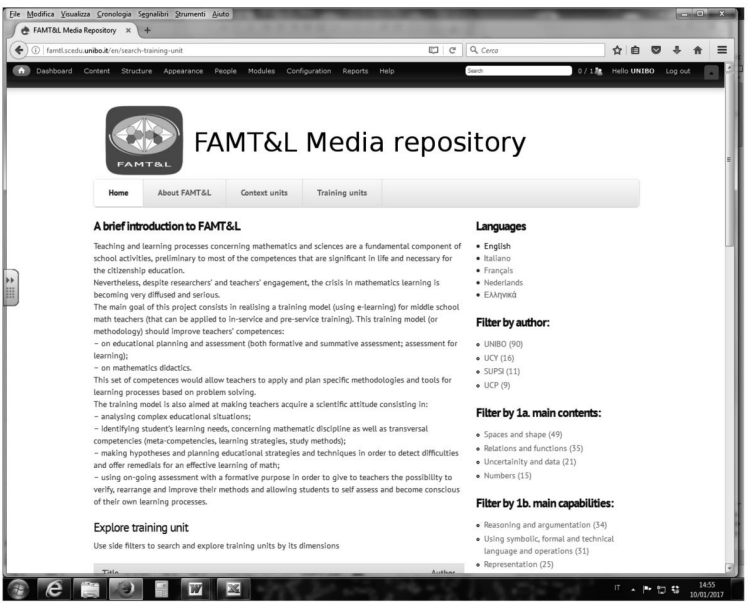

Fig. 1 - Homepage screenshot

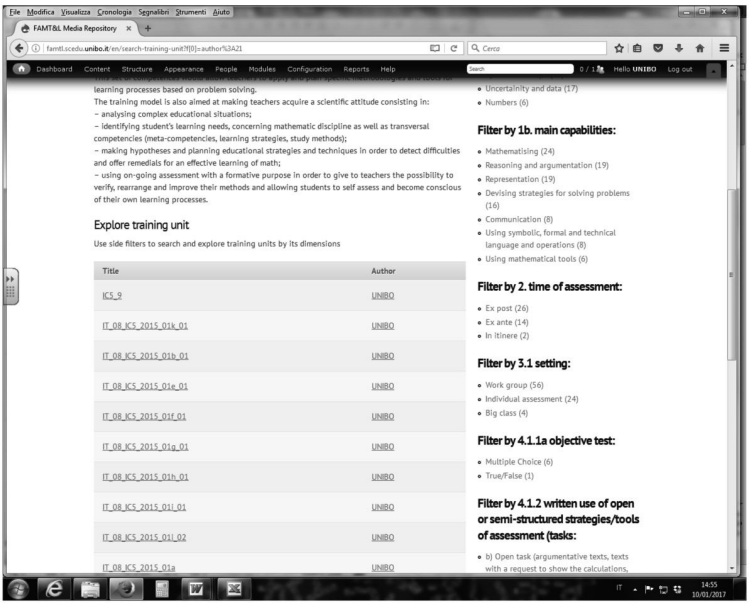

Fig. 2 - Homepage (second part) screenshot

Fig. 3 - Screenshot of a Training unit

Following there are also other information grid that allow to understand what content and what skills are object of the specific assessment practice.

The important repository functionality is the possibility to select through the individual voices of the grid all Training Units that contain videos in which the same indicators were identified. This, for example, is useful for searching, by a teacher, starting from the mathematical content or skill to be assessed.

8. How to use of videos collected during teacher training

In our research project we considered the international scientific debate (Perrenoud, 2002; Anderson, 2004; Darling-Hammond & Bransford, 2007; Koster & Dengerink, 2008) on teachers' professionalism. In particular we know that teacher training has to be considered a strategic factor to improve the national educational systems (see Mumby *et al.*, 2002; Richardson & Placier, 2002; Darling-Hammond, 2006; Darling-Hammond *et al.*, 2007; Coggi, 2014).

A good part of the scientific debate about teachers' formation activities seems to focus on the relationship between theory and praxis, between knowledge and competences, i.e. by the research of how to form the teachers in such a way to get that the information they gain will really develop into new behaviours and competences that will enter into play in their everyday teaching practices.

In this line of thought, it is particularly relevant the concept of *recurrence* between theory and praxis, meaning an alternation between distinct (but at the same time interrelated) steps in a specific learning process (Atelet, 2003) which are able to translate theoretic knowledge and methodology into an *action* and also, at the same time, reflection on the action itself, a reflection that, in turn, becomes new knowledge, and so forth. There are several different contributes to this debate, based on interdisciplinary studies (in Pedagogy, Psychology, in Neuroscience).

Many of those studies seem to validate the idea that a fundamental step for the professionalization of teachers is the identification of the most suitable ways to *conceptualize* their explicit practices in teaching (Rossi, 2014) by means of recursive processes, integrated and interdependent among them (Seidel & Stürmer, 2014), as are observation, comprehension, anticipation or prediction (Rivoltella, 2014) of what happens and can happen after a specific action.

From here several indications stem about the most effective methodologies to promote the co-presence of theory and praxis in the formation of teachers (both in-service or pre-service). Among these, there

are many techniques that can be based on the use of specific support tools, as, in particular, the videos.

Usually the formative activities which are based on the use of videos are defined "*video education*", an expression which covers an ample range of teaching experiences, starting with the first movies in the last century, to the use of television and analogue supports (VHS) and then to digital (CD/DVD) and ICT ones (PC and multimedia) to end up with the Internet and the so-called Web 2.0 (O'Reilly, 2005).

The presence of videos in formation activities for teachers is more and more common, with several modalities in there use (Masats & Dooly, 2011):

- as both an object and a tool for observation and analysis, to show a subject to the teachers (we speak of *video-viewing*, in this case);
- as an example or display, when the video shows the practices and the behaviour of experienced teachers in specific situations (*video modelling*);
- as a record of the teachers themselves, which is shared with the others, making it an occasion of comparison and debate with colleagues or with a trainer (*video coaching*).

These modalities yield several implications. The videos' content can be quite different: a teacher record her/him-self, use recording of colleagues or other experts, focus on specific didactic practices or behaviours, attitudes, interactions. Moreover, the videos can be presented as an example of everyday teaching activity (Carbonneau and Hétu, 2006; Clarke *et al.*, 2008), or as a "best practice" which rarely could be directly observed (Seago, 2004), or as a specific experience or experimentation (Santagata & Guarino, 2011). Also the length of the proposed video sequences can vary, from very short excerpts to longer and complex sequences.

Several studies, anyway, confirm the effectiveness of video-based interventions in the training of teachers: videos become a tool which is able to integrate and support, via the visual activity, the direct observation and the learning of good teaching practices of which, otherwise, there could only be a description, oral or written (Santagata, Zannoni, Stigler, 2007).

In the last years the didactic technique of *microteaching* has gained much credit; actually it is a technique that dates back to the experiences in the '60-'70's by K. Romney and D. Allen at Stanford University. Allen himself defines (1975) microteaching as a technique which consists mainly in having the trainee teacher to present to a small group of students a short time teaching session, focused on a specific subject. The short session is monitored from trainers which use video recording as main tool. This will allow the supervisors of the microteaching session to show to the trainees, via the analysis of the teaching sequence, which abilities will help them to solve the problem in their teaching practice end the errors they can do

in their activities. Such an analysis can promote and facilitate a reflexion on what is done in the class, which contributes to an improvement of the teaching practices. This attention to the reflexivity as an attitude of the teachers to analyse and think over about their own practices, is essential to get an educational success (Dewey, 1961), and is what allows us to speak of the teachers as *reflexive professionals* (Schön, 2006; Damiano, 2007), and of a professional knowledge of their own (Calvani, Bonaiuti, Andreocci, 2011).

Thus it is impossible not to see how effective the use of videos can be in the formation of teachers, but it is also important that this use take place within a well-structured formation proposal, characterized by:

- a clear and thought over choice of the learning objectives that one wants to achieve with the trainees teachers (Blomberg *et al.*, 2013; Seidel *et al.*, 2011; Rossi, 2015);
- the production or selection of the videos best suited to the defined objectives;
- a good support and guide to the vision, comprehension and analysis of the video;
- elaborating suitable tools for evaluation, appropriate to the objectives (Calvani *et al.*, 2014).

Following these ideas, the FAMT&L project elaborated a pilot model of a course for mathematics teachers that integrated and use the analysis of videos made in class with teachers involved in the project with different modalities, but all oriented to the achievement of specific formative targets.

As we have already said, the idea that guided the recording-analysis of the videos was to be able to use the analysed video-sequences as part of training courses for in service teachers that can acquire specific skills in the use of formative assessment as an element that improves the quality of teaching.

In line with the debate on teacher training, the observation of teaching practices by themselves would allow changes in their behaviour and encourage processes of reconsideration on assessment and teaching.

In fact, the pilot course that has been developed was centred to use the video sequences analysed in order to promote critical thinking of teachers in training.

The model of the course had been tested and its efficiency verified with small group of mathematics teachers in the several partner countries, so that it can be proposed as a model to be adopted also in other activities, both for in-service or pre-service teachers.

In the following chapter we can see the more detailed description of these course and the main results we obtained.

References

Anderson, L.W. (2004). *Increasing teacher effectiveness* (second edition). Paris: UNESCO-IIEP.

Atelet, M. (2003). *La ricerca sulle pratiche di insegnamento.* Brescia: La Scuola.

Blomberg, G., Renkl, A., Gamoran Sherin, M., Borko, H., and Seidel T. (2013). Five research based heuristic for using video in pre-service teacher education. *Journal for educational research online*, 5, 1, 90-114.

Bronfenbrenner, U. (1979). *The Ecology of Human Development*. Massachusetts, USA: Harvard University Press.

Bronfenbrenner, U. (1986). Ecology of the family as a context for human development: Research perspectives. *Developmental psychology*, 22(6), 723.

Calvani, A., Bonaiuti, G., and Andreocci, B. (2011), Il microteaching rinascerà a nuova vita? Video annotazione e sviluppo della riflessività del docente. *Italian Journal of Educational Research*, 4, 6, 29-42.

Calvani, A., Menichetti, L., Micheletti, S., and Moricca, C. (2014). Innovare la formazione: il ruolo della videoeducazione per lo sviluppo dei nuovi educatori. *Italian Journal of Educational research*, 7, 13, 69-84.

Carbonneau, M., and Hétu, J.C. (2006). *Formazione pratica degli insegnanti e nascita di un'intelligenza professionale*. In M. Altet, E. Charlier, L Paquay, and P. Perrenoud (Eds.), *Formare gli insegnanti professionisti. Quali strategie? Quali competenze?*, 77-95, Roma: Armando.

Clarke, D.J., Mesiti, C., O'Keefe, C., Xu, L.H., Jablonka, E., Mok, I.A.C., Shimizu, Y. (2008), Addressing the challenge of legitimate international comparisons of classroom practice. *International Journal of Educational Research*, 46, 5, 280-293.

Coggi, C. (2014). *Verso un'Università delle Competenze*. In A.M. Notti (Ed.), *A scuola di valutazione*. Lecce: Pensa Multimedia.

Damiano, E. (Ed.). (2007). *Il mentore. Manuale di tirocinio per insegnanti in formazione*. Milano: FrancoAngeli.

Darling-Hammond, L. (2006), Constructing 21st-Century Teacher Education. *Journal of Teacher Education*, 57, 3, 300-314.

Darling-Hammond, L., and Bransford, J. (Eds.) (2007). *Preparing Teachers for a Changing World: What Teachers Should Learn and Be Able to Do.* New York: John Wiley and Sons.

Dewey, J. (1949). *Democrazia e educazione.* Firenze: La Nuova Italia.

Dewey, J. (1961). *Come pensiamo: una riformulazione del rapporto fra il pensiero riflessivo e l'educazione* (tr. it. A. Guccione). Firenze: La Nuova Italia.

Domenici, G. (2003). *Manuale della valutazione scolastica*. Bari: Laterza.

Filliettaz, L. (2014). «C'est chacun son tour»: la mise en visibilité de la structuration praxéologique de l'interaction en contexte d'éducation et de formation. *Cahiers de l'Institut de Linguistique et des Sciences du Langage*, 41, 71-136.

Gattullo, M. (1967), *Didattica e docimologia. Misurazione e valutazione nella scuola*, Roma: Armando.

Harbour, K.E., Evanovich, L.L., Sweigart, C.A., Hughes, L.E. (2015). A Brief Review of Effective Teaching Practices That Maximize Student Engagement. *Preventing School Failure: Alternative Education for Children and Youth*, 59, 1.

Kane, T.J., Taylor E.S., Tyler J.H. & Wooten A.L. (2010). Identifying Effective Classroom Practices Using Student Achievement Data. *The Journal of Human Resources*, 46, 3, 587-613.

Kern, L., Clemens, N.H. (2007). Antecedent strategies to promote appropriate classroom behaviour. *Psychology in the Schools*, 44, 1, 65-75.

Koster, B., and Dengerink, J.J. (2008), Professional standards for teacher educators: How to deal with complexity ownership and function experience from the Netherlands. *European Journal of Teacher Education*, 3, 2, 135-149.

Lovece, S., Vannini, I., Michael-Chrysanthou, P., Gagatsis, A. (2016). *Methodologies and tools for the video analysis of formative assessment practices in the classroom (with students aged from 11 to 16*) – EAPRIL Conference, Luxembourg, 25-28 November 2015.

Masats, D., and Dooly, M. (2011). Rethinking the use of video in teacher education: a holistic approach. *Teacher and Teacher Education*, 27, 1151-1162.

Meyer, F. (2012). Les vidéos d'exemples de pratique pour susciter le changement. *Revue internationale de pédagogie de l'enseignement supérieur*, 28, 2, 1-19.

Michael-Chrysanthou, P., Gagatsis, A. (2015). Students' beliefs for formative assessment in Mathematics teaching and learning. In *EAPRIL Conference Proceedings 2014*, Issue 1, 178-193.

Mottet, G. (1997). *La vidéo, outil de construction des compétences professionelles des einsegnants*. In G. Mottet (Ed.), *La vidéo-formation. Autres regards, autres pratiques*. Paris: L'Harmanattan, 21-36.

Mumby, H., Russell, T., Martin, A.K. (2002). *Teachers' knowledge and how it develops*., in V. Richardson, edited by, *Handbook of research on teaching*. Fourth edition. Washington DC: American Educational Research Association.

O'Reilly, T. (2005). *What is web 2.0? Design patterns and business models for the next generation of software*. Text available at the website: www.oreilly.com/pub/a/web2/archive/what-is-web-20.html.

Perrenoud, P. (1999), *Dix nouvelles compétences pour enseigner.* Paris: ESF (tr. it. *Dieci competenze per insegnare*. Roma: Anicia, 2002).

Perrenoud, P. (2006). *Il lavoro sull'habitus nella formazione degli insegnanti. Analisi delle pratiche e presa di coscienza*. In M. Altet *et al.* (Eds.), *Formare gli insegnanti professionisti. Quali strategie? Quali competenze?* Roma: Armando, 175-200.

Perrenoud, P., Altet, M., Charlier, E. and Paquay, L. (2006). *Feconde incertezze o come formare degli insegnanti prima di avere tutte le risposte,* In M. Altet *et al.* (Eds.), *Formare gli insegnanti professionisti. Quali strategie? Quali competenze?* Roma: Armando, 229-242.

Richardson, V., and Placier, P. (2002). *Teacher change*. In V. Richardson (Ed.), *Handbook of research on teaching*, Fourth edition. Washington DC: American Educational Research Association.

Rivoltella, P.C. (2014). *La previsione*. Brescia: La Scuola.

Rossi, P.G. (2014). Le tecnologie digitali per la progettazione didattica. *Journal of Educational, Cultural Psychological Studies*, 113-133.
Rossi, P.G. *et al.* (2015). The use of video recorded classes to develop teacher professionalism: the experimentation of a curriculum. *Je-LKS – Journal of e-Learning and Knowledge Society*, 11, 2, 111-127.
Santagata, R., and Guarino, J. (2011). Using the video to teach future teachers to learn from teaching. *The internationa Journal of Mathematics Education*, 43, 1, 133-145.
Santagata, R., Zannoni, C., and Stigler, J.W. (2007). The role of lesson analysis in preservice teacher education: an empirical investigation of teacher learning from a virtual based field experience. *Journal of Mathematichs Teacher Education*, 10, 2, 123-140.
Schön, D.A. (1983), The reflective practitioner: how professionals think in action. New York: Basic Books (tr. it. *Il professionista riflessivo: per una nuova epistemologia della pratica professionale.* Bari: Dedalo, 2006).
Seago, N. (2004), *Using videos as an object of inquiry for mathematics teaching and learning.* In J. Brophy (Ed.), *Using video in teacher education* (pp. 259-286), Oxford, UK: Elsevier.
Seidel, T., and Stürmer, K. (2014). Modeling and Measuring the Structure of Professional Vision in Pre-service Teacher. *American Educational Research Journal*, 51, 4, 739-771.
Seidel, T., Stürmer, K., Blomberg, G., Kobarg, M., and Schwindt, K. (2011). Teacher learnign from analysis of videotaped classroom situations: Does it make a difference wether teachers observe their own teaching or that of others? *Teaching and Teacher Education*, 27, 2, 259-267.
Tornar, C. (2001). *Il processo didattico tra organizzazione e controllo.* Roma: Monolite Editrice.
Vannini, I. (2009). *La Qualità nella didattica*. Trento: Erickson.
Vertecchi, B. (2003). *Manuale della valutazione. Analisi degli apprendimenti e dei contesti*. Milano: FrancoAngeli.