FAMT&L

FORMATIVE ASSESSMENT IN MATHEMATICS FOR TEACHING AND LEARNING

Work Package 4 - *Planning and implementing pilot training courses*

Deliverable D4.3- Guidelines for mathematical teacher training on the promotion and proper use of formative assessment in mathematics

Start date of project: 01/12/2013 Duration: 36 months

Lead organisation for this deliverable: **SUPSI**

Deliverable number	D4.3		
Title	Guidelines for mathematical teacher training on the promotion and proper use of formative assessment in mathematics		
Type of outputs / products / results	Guide book		
Delivery date	M32 (….)	**Dissemination level**	**X** Public ☐ Restricted to other programme participants (including Commission services and project reviewers) ☐ Confidential, only for members of the consortium (including EACEA and Commission services and project reviewers)
Nature	☐ Report **X** Service / Product ☐ Demonstrator / Prototype ☐ Event ☐ Other		
Language versions	EN, IT, GR, FR, DU		
Target languages			

Description (limit 1000 characters)

The content, structure and design of the Guide Book for formative assessment in mathematics teaching are expected to be developed and agreed within the partnership. The aim is to describe a teacher training model that would foster a proper use of formative assessment (assessment for learning) in mathematics education in such a way that can be used in various school environments and age groups and encourage teachers' reflective and critical thinking about effective/ineffective teaching and assessment strategies. The Guide will be published in the 5 languages of the partner countries including English (in paper and electronic form) in such a way that it could be adapted for use via translation in other European countries and beyond. The Guide will have appropriate structure so that it can be used easily during a teaching training course.

Executive summary

This document is a guidebook for trainers who are interested in providing video-based training courses on formative assessment to encourage the use of such technique in the classroom. The aim is to describe a teacher training model that would foster a proper use of formative assessment (assessment for learning) in mathematics education in such a way that can be used in various school environments and age groups and encourage teachers' reflective and critical thinking about effective/ineffective teaching and assessment strategies.

The FAMT&L (Formative Assessment in Mathematics for Teaching and Learning) project has been funded under the Lifelong Learning program. This publication reflects the views only of the author(s), and the Commission cannot be held responsible for any use that may be made of the information contained therein.

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1. Foreword

This document is primarily intended for trainers who are interested in providing video-based training courses on formative assessment to encourage the use of such technique in the classroom.
The contents of the document were developed during our participation in the LLP - Comenius Project "FAMT&L, *Formative Assessment in Mathematics for Teaching and Learning"*[1], whose aim was to promote the use of formative assessment to increase the significance and incisiveness of teaching/learning processes with a focus on mathematics, which is considered to be one of the most complex subjects for students – all the more so for adolescent students.
The project lasted three years (December 2013 – December 2016) and was conducted by the following five institutions working in collaboration with partner schools:

- Alma Mater Studiorum University of Bologna (project co-ordinator) – Department of Education Studies and Department of Mathematics (Italy);
- University of Applied Sciences and Arts of Southern Switzerland – Department of Teaching and Learning (Switzerland);
- University of Cyprus – Department of Education (Cyprus);
- University of Cergy-Pontoise – University Institute of Teachers Training (France);
- Inholland University of Applied Sciences (Netherlands).

The main project stages were:

- conduct a study on the beliefs and practices of students and math teachers concerning assessment in the classroom, by administering and subsequently analysing a questionnaire (Bolondi et al., 2015; Dozio et al., 2015; Ferretti & Lovece, 2015; Paraskevi et al., 2014);
- plan and make videos and materials about situations where mathematics is taught/learned with a focus on formative assessment, in collaboration with partner schools;
- plan, make and implement a media repository (virtual space that includes videos, materials and tools) for teacher training, designed to support the proper use of formative assessment (Laurent et al., 2016);
- draft, test and validate a formative assessment training model for middle school mathematics teachers.

The project's main aim was to design and implement a teacher training programme on formative assessment using videos to show real life examples of formative assessment occurred in the classroom. The videos were filmed in participant countries with the contribution of partner schools associated to the project. Videos are the core of the proposed training model and are collected in a virtual space (media repository) which was made specifically to archive videos and documents supplied by project partners. This training methodology is intended to enhance teachers' skills concerning the use of formative assessment when teaching mathematics, so as to promote effective learning for all students.

[1] The Comenius FAMT&L Project is part of the European Lifelong Learning Programme (LLP) (http://www.famt-l.eu/).

2. Formative assessment

Starting from the 1960s, the scientific community has been distinguishing two different functions of assessment: summative assessment, that certifies the learning achieved by students; and formative assessment, associated to the teaching/learning process. The last aims at providing feedback, corrective measures and support in each stage of the process, both to teachers and students (Mottier-Lopez, 2015). The need to use formative assessment arises from the shortcomings of traditional assessment methods, that are used during or at the end of a learning process with the sole aim of providing a numerical mark (score), without the latter having any influence on the very learning and teaching process.
Over the years, the concept of formative assessment has been reviewed, discussed, developed and studied by numerous researchers who emphasised its importance. For example, in their 1998 review Black and Wiliam stated, based on empirical studies, that formative assessment improves the learning process:

> «Formative assessment does improve learning. The gains in achievement appear to be quite considerable, and as noted earlier, among the largest ever reported for educational interventions. As an illustration of just how big these gains are, an effect size of 0.7, if it could be achieved on a nationwide scale, would be equivalent to raising the mathematics attainment score of an "average" country like England, New Zealand or the United States into the "top five" after the Pacific Rim countries of Singapore, Korea, Japan and Hong Kong» (Beaton et al., 1996, quoted in Black and Wiliam, 1998, p. 61).

In his 2009 review on the state of art of effective teaching, Hattie highlighted that effectiveness is determined by the nature of the interaction between teacher and student, and especially by how feedback and formative assessment are managed. Some authors, like Stiggins in North America and the *Assessment Reform Group* in the UK, have suggested the concept of *assessment for learning*, to stress the difference between formative and summative assessment: «Assessment for learning is the process of seeking and interpreting evidence for use by learners and their teachers to decide where they are in their learning, where they need to go and how best to get there» (OECD, 2005, p. 131). This idea of formative assessment echoes the concept of regulation found in French-speaking literature, whereby different forms of regulation represent a continuous adaptation of the learning and teaching process that can occur before, during or after the lesson as a result of interaction between teacher and student, between students and between student and teaching material (Allal & Mottier Lopez, 2005). Assessment should nevertheless be an integrating part of the teaching-learning process and should therefore occur also within the lesson, and not as a specific event that follows the teaching stage (Allal & Mottier Lopez, 2005).
The concept of regulation is similar to the concept of feedback that was developed mainly in English-language literature. Nicol and Macfarlane-Dick (2004) consider that formative assessment can also generate feedback which can be used both by students, to improve their learning process and to achieve the aims set, and by teachers, to regulate their teaching practices to match their students' needs. More specifically, according to Clark (2011) feedback becomes formative when students:
a) engage in a process which focuses on meta-cognitive strategies, i.e. on gaining awareness so as to adjust one's actions/performance;
b) are supported in their efforts to think about their own thinking;

c) understand the relationship between what they know already, what they are learning and what they have to achieve in terms of learning goals;
d) are activated as owners of their own learning.
Within this framework it is important to consider that feedback can be provided not only by the teacher, but also by classmates (Nicol & Macfarlane-Dick, 2004).
Since the 1990s, some researchers have stressed the importance of students' active participation in assessment, with a shift towards peer assessment and self-assessment. This implies being aware, being directly involved in the assessment and requires meta-cognitive thinking aimed at answering questions such as: What do I know? What are the things I know how to do? What can I change? Several authors underline the importance of involving students in the assessment of their own procedures, of their own understanding and of their own achievement. They also emphasise the need for students to participate more in defining learning targets, assessment criteria and tools to be used. From this viewpoint, assessment is no longer something to do with the teacher, but provides greater responsibility and independence to students vis-à-vis their learning process (Mottier-Lopez, 2015).

Review of publications on assessment

The OECD (2005) publication *Formative Assessment - Improving Learning in Secondary Classrooms* provides an overview of assessment literature, listing separately works written in French (Allal & Mottier Lopez, 2005), English (Black & Wiliam, 2005) and German (Köller, 2005). Based on such reviews and descriptive summaries different schools of thought about assessment can be identified.

For a comprehensive overview about assessment please refer to: *Evaluations formative et certificative des apprentissages* (Mottier Lopez, 2015).

Although the literature has stressed the importance of formative assessment, numerous countries still encounter difficulties that make it hard to concretely implement these practices in the classroom. This happens for different reasons, the main perhaps being the supposed tension, or even a clash between the formative and the summative/certifying role of assessment. Indeed, summative assessment is the most visible form of assessment (for example through the students' school reports) and is understood by many as an objective measure. In addition, summative assessments weigh more strongly on a student's individual career than formative assessments (for example: the need to achieve an average mark to access some specific types of higher education) (OECD, 2005). Deploying formative assessment is difficult also for another reason, namely the teachers' perception that they do not have enough time to use formative assessment in the classroom in addition to summative assessment. In that respect, specific training on formative assessment could contribute to removing the tension that has built over time between these two types of assessment.

While assessment functions, targets and practices are closely linked to a specific historical and cultural context and are a defining feature of education systems, the partners of the FAMT&L project required a shared theoretical framework for their research. As a result, they drafted a definition of formative assessment including those which are considered to be the most important concepts for this specific project, bearing in mind ongoing discussions in the international research community.

Below is our proposed definition:

«The FA is connected with a concept of learning according to which all students are able to acquire, at an adequate level, the basic skills of a discipline. The learning passes through the use of teaching methodologies which can respond effectively to different learning time for each student, their different learning styles and their zones of proximal development.
The FA classroom is an assessment FOR teaching and learning.

It:

- is part of the teaching-learning process and regulates it;
- identifies, in an analytical way, the strengths and weaknesses of student's learning, in order to allow teachers to reflect on and may modify their own practices;
- allows in a form of formative feedback to establish a dialogue between teacher and student and to design educational interventions aimed to the recovery;
- promotes and fosters the learning of all students through differentiated teaching that ensures each student different rhythms and different teaching and learning strategies;
- involves the student in the analysis of own errors/weaknesses and own ability to promote self- and peer-assessment and active participation in the teaching-learning process.»

3. Using videos for training

Building on comparative studies aimed at identifying the practices which make the teaching process effective, *Evidence Based Education* (EBE)[2] showed that the *Lesson Study method* [3] – where teachers cooperate to plan, implement, analyse and re-examine a lesson using audio-visual recordings – and new technologies have given a major impulse to video education (Calvani et al., 2014).

There is increasing awareness that teacher training programmes should place participants in workshop-like situations, engaging them in activities that foster critical thinking and exchange of ideas. Of course this cannot be based solely on verbal (oral or written) practices, but requires «a blend of modelling, practice and review of one's behaviour, also supported by visual documentation where possible. Within this context, new opportunities are offered by video-based education that allows the use of an archive of external teaching models» (Calvani et al., 2014, p. 81)[4]. Indeed, over the years, several studies have stressed the effectiveness of using videos in teacher training (Santagata, Zannoni & Stigler, 2007). An example worth mentioning is the *microteaching* technique developed in the 1960s (Allen, 1967; Cooper & Allen, 1970): it consists in giving and filming short lessons (5-25 minutes) with a small group of students, in a less complex environment than the real classroom. Generally speaking, by watching the video and listening to the comments of colleagues and trainers, the teachers who were filmed can observe their own way of teaching "under the microscope" and receive *feedback* on what they tried out, in addition to suggestions on how to improve their teaching practice.

Taking advantage of technological advancements, this method has been recently reviewed and enhanced with further features. More specifically:

- virtual platforms were developed to share videos on specific parts of lessons;[5]

[2] "Evidence Based Education" (EBE) postulates that educational decisions have to be made and justified based on evidence provided by empirical research as to the greater or lesser effectiveness of certain teaching options (Cole, 1999).

[3] http://professionallyspeaking.oct.ca/march_2010/features/lesson_study/. See also paragraph 5 of this document.

[4] Translations by the authors.

[5] https://www.teachingchannel.org/or http://neo.ens-lyon.fr/neo.

- video annotation tools are now available which allow annotating comments directly on the video and performing statistics (counting, for example, the number of times a student talks during a lesson);
- a higher number of video-based training tools is now available [for example those suggested by Santagata (2012), Morrissette & Compaoré (2012)].

Generally speaking, videos are acknowledged as valid tools in training for the following reasons:

1. they build practices (modelling): videos are presented as a possible example and the practices shown are analysed and discussed in order to improve them (Santagata & Guarino, 2011);
2. they encourage the increased use and development of a specific professional terminology: by analysing the videos viewers can identify the actions of teachers and students alike and discuss them using a language shared by the group (Minaříková et at., 2014);
3. they «promote general and personal reflection for self-analysis on teaching methods (as, for example in microteaching» (Van Es & Sherin, 2002, quoted by Calvani et al., 2014, p.73)[6]. In this case, teachers film their own lesson and use specific questions and grids to reflect upon their practices (Santagata & Guarino, 2011);
4. they focus the attention on how students think: the video allows exploring the ways in which students think in specific situations, tracing their misunderstandings and misconceptions, if any, or else determining which are the most effective questions that a teacher can ask to expose the student's reasoning (Calvani et al., 2014; Santagata & Guarino, 2011).

As a result, to be effective, videos must be integrated in a well structured training model. For example, Santagata (2012) suggests a four-pronged training model, namely: define the learning aims of the course; choose the type of video to show to the participants that best corresponds to the targets; suggest a guide for viewing the video (for example setting specific questions to focus the participants' attention); and elaborate the tools for assessing the course (Santagata, 2012). Santagata stresses the importance of including a mediator (facilitator) in the training process who can guide and support participants as they watch and analyse the videos.

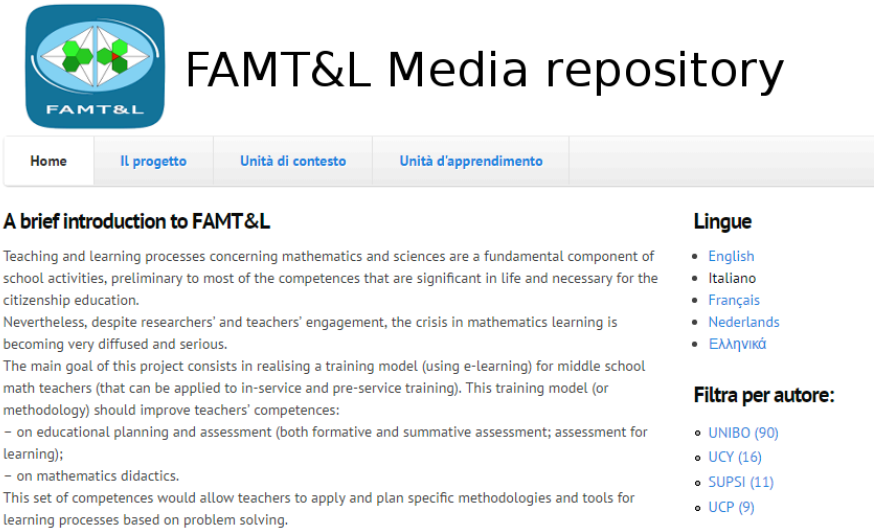
Platforms are increasingly being used as a means to share practices and ideas. The FAMT&L media repository which will be described in the next paragraph is an example of virtual platform that includes video content. The FAMT&L training model on formative assessment uses videos of real classroom situations; its aim is to encourage researchers/trainers and teachers to define a formative assessment concept in a participatory way, using a mix of theory and practice to specify its features and applications.

4. The virtual space: FAMT&L media repository

Under the FAMT&L project a virtual space called *FAMT&L Media Repository* (http://famtl.scedu.unibo.it/it[7]) has been created to archive videos and materials on formative assessment produced by project partners in five countries, to be used for training.

[6] Translations by the authors.

[7] Credentials are required to access the media repository. Please contact antonio.fracasso3@unibo.it.



The videos were archived based on a classification that uses macro-categories and shared indicators set by project researchers (see Annex 1). The six macro-categories in the grid enable the video to be classified based on the lesson's specifics, namely:

0. Observations about the classroom relational mood;
1. Contents of mathematics (Numbers, Spaces and shape, Relations and Functions, Data and Uncertainty) and mathematical process involved (communication, mathematising, representation, reasoning and argumentation, devising strategies for solving problems, using symbolic, formal and technical language and operations);
2. Time of assessment (before, during or after the specific learning activity);
3. Setting of assessment (whole class, work group, individual work);
4. Tools and strategies for data collection of students' skills (formal, by means of structured grids or informal, without systematic and structured observation tools);
5. Phases of assessment (presentation of the assessment, administration of the test/assessment tools, registration of information collected, formative feedback, informal interaction).

This last macro-category explicitly includes a set of indicators that allow viewers to put the actions of teachers and students in the videos into perspective.

The media repository is equipped with a search system that allows videos to be searched based on author, macro-categories and specific indicators. Users, for example, can select to view videos recorded in different settings (whole classroom, work group or individual work) but having the same formative function, for example self-assessment. This promotes comparison and provides the chance to view different examples of assessment practices instead of focusing on just one example, which would risk becoming the only model to follow.

Each video includes a description that allows the viewer to understand when the video was filmed during the lesson and the reason why it was saved in the media repository as an example of formative assessment practice.

Below each video, users can upload documents concerning the lesson, for example lesson plans, the assessment tool used, the activities performed by students. These additional materials complement the video and provide some background so that the viewer can analyse the lesson in greater depth.

Video:

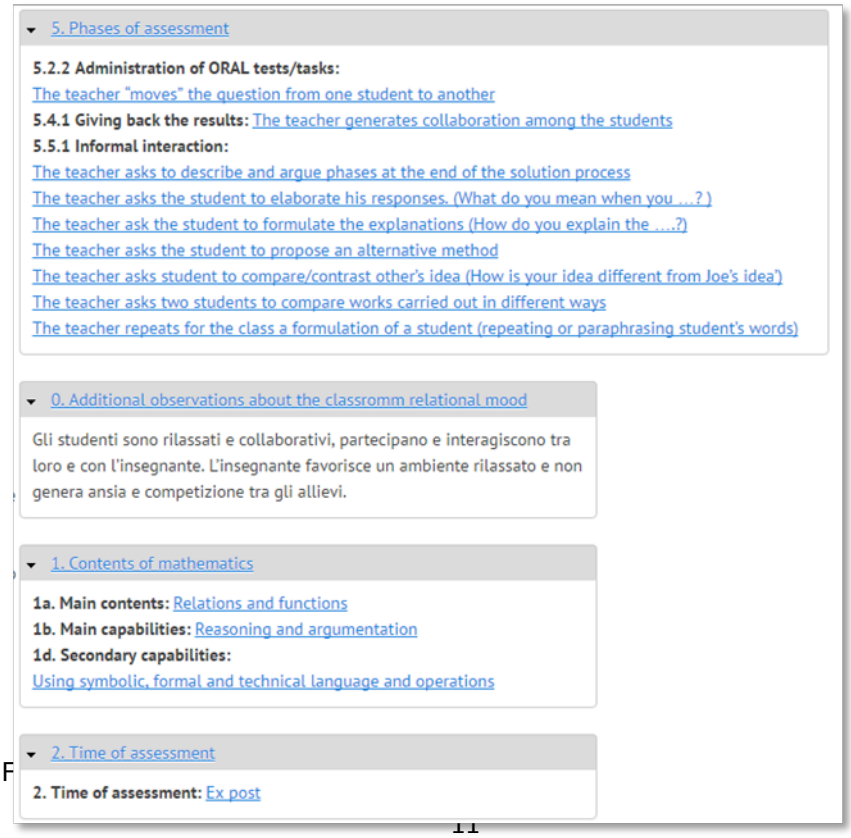
Last modified: 03/02/2016 - 13:41

L'insegnante chiede ai tre allievi di spiegare quale risultato hanno ottenuto e come hanno fatto ad arrivarci. In questo spezzone si possono individuare le tre fasi del processo "questioning cycle" : eliciting (far emergere cosa hanno fatto e cosa sanno gli allievi), recognizing (riconoscere ciò che hanno detto gli allievi e integrarlo nel discorso)e use the information (utilizzare ciò che è stato detto per progredire nel discorso nella conoscenza).

Documents:

- Piano lezione.doc
- scheda attività.doc
- Tabella di valutazione.doc
- protocolli.zip
- CH_9_SMGR2_2015_01_01_tabella tempi_ita.docx

- 5. Phases of assessment
- 0. Additional observations about the classromm relational mood
- 1. Contents of mathematics
- 2. Time of assessment
- 3. Setting of assessment
- 4. Tools/Strategies for data collection of students' skills



5. Phases of assessment

5.2.2 Administration of ORAL tests/tasks:
The teacher "moves" the question from one student to another
5.4.1 Giving back the results: The teacher generates collaboration among the students
5.5.1 Informal interaction:
The teacher asks to describe and argue phases at the end of the solution process
The teacher asks the student to elaborate his responses. (What do you mean when you ....?)
The teacher ask the student to formulate the explanations (How do you explain the .....?)
The teacher asks the student to propose an alternative method
The teacher asks student to compare/contrast other's idea (How is your idea different from Joe's idea')
The teacher asks two students to compare works carried out in different ways
The teacher repeats for the class a formulation of a student (repeating or paraphrasing student's words)

0. Additional observations about the classromm relational mood

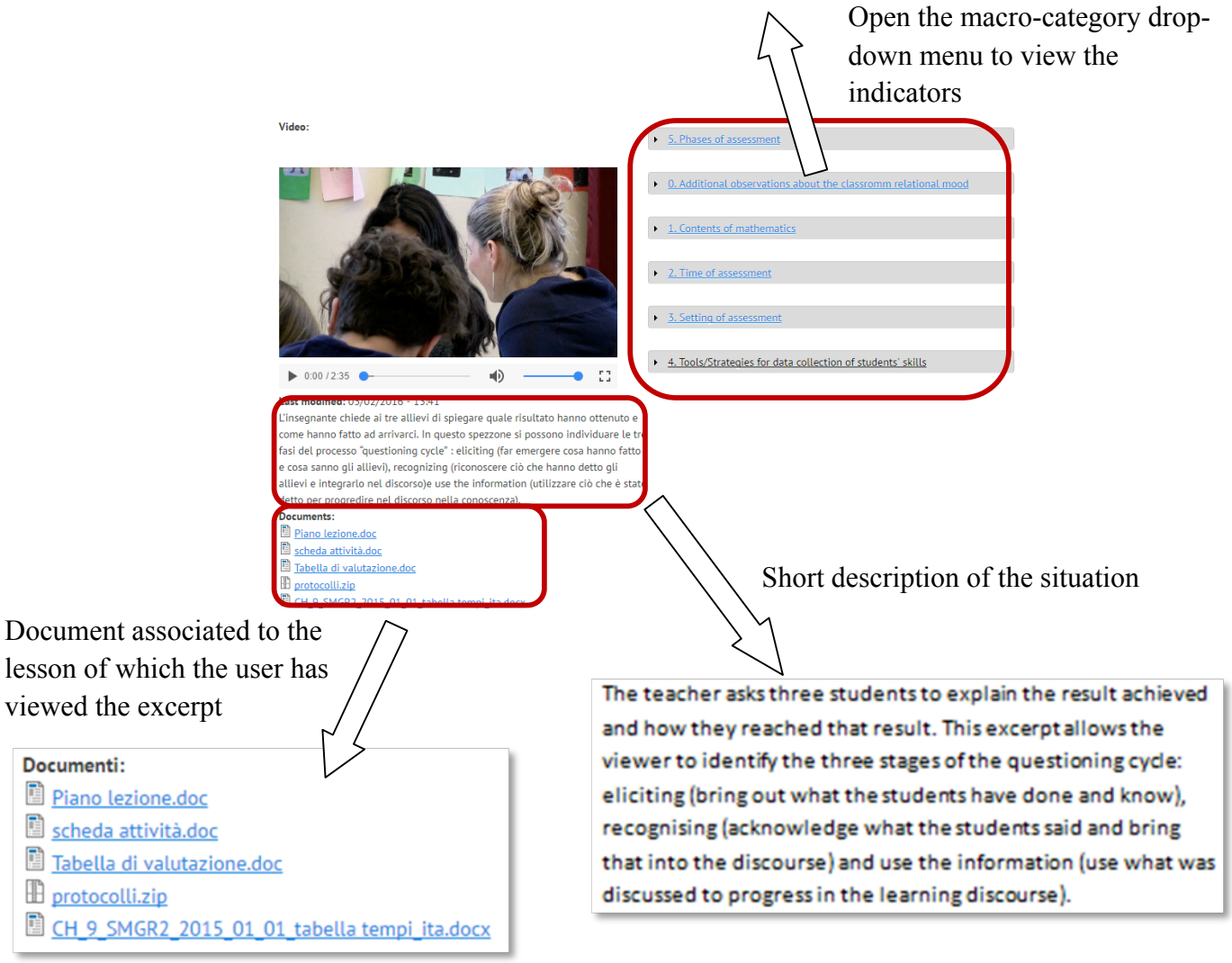
Gli studenti sono rilassati e collaborativi, partecipano e interagiscono tra loro e con l'insegnante. L'insegnante favorisce un ambiente rilassato e non genera ansia e competizione tra gli allievi.

1. Contents of mathematics

1a. Main contents: Relations and functions
1b. Main capabilities: Reasoning and argumentation
1d. Secondary capabilities:
Using symbolic, formal and technical language and operations

2. Time of assessment

2. Time of assessment: Ex post



5. A model for formative assessment training

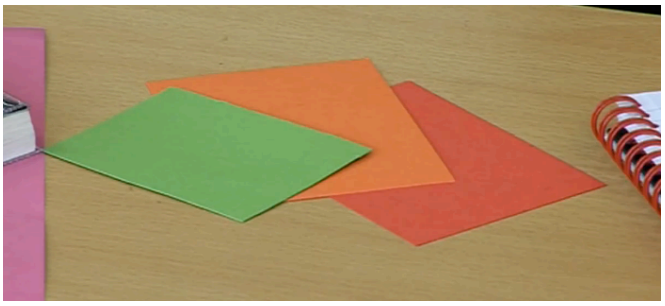
In this paragraph we shall present the training model designed under the FAMT&L project to develop mathematics teachers' skills in formative assessment with a view to promoting the use of such technique in the classroom. The proposed model includes remote training sessions through an e-learning platform[8] and face-to-face lessons in the classroom. This model can be adjusted by changing the number of e-learning or face-to-face sessions, ranging from a course fully taught in the classroom or fully held via the e-learning platform, depending on the needs and available resources. The main aim of the training course is to define what formative assessment is by analysing and reflecting upon the videos.

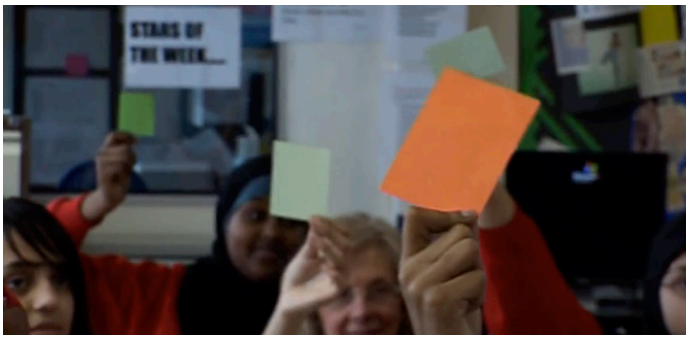
[8] Within the FAMT&L project the e-learning platform ESPACE was used. However any other platform with similar specifics is suitable.

Regardless of the modality chosen - e-learning or face-to-face, or a mix of the two - a few common requirements have to be met for the training course model to work, namely:

1. Administer an initial questionnaire to teachers who attend the course. The questionnaire contains open questions plus some closed questions (optional, depending on the topics chosen for the course). These questions must be administered before the training course begins and once again at the end of the course. A comparison of answers given before and after the course might reveal changes in teacher's beliefs about formative assessment.
2. Use videos to prompt discussion about formative assessment and define with teachers what formative assessment is about.
3. Use the Media repository.
4. Keep track of what happens during the course. Trainers can use a structured grid to record issues that caused resistance, disagreement or difficulties amount participants, or else that participants shared and discussed. Questions contained in the grid include: Which issues caused resistance and difficulties among teachers? Which aspects are shared with ease? Was there something unexpected? (Annex 2 contains an example of grid taken from a lesson report – the topic was video CH_9_SMGR2_2015_01_01 which will be discussed in paragraph 6.1 below).
5. Draw conclusions about formative assessment. Trainers and teachers summarise the elements of formative assessment arising from the course.

In addition, during the training course it is recommendable to engage in formative assessment with course participants for meta-analysis. To determine if a participant has understood or feels able to apply a specific concept a formative assessment tool called *traffic light* can be used: the trainer asks a question and the participant answers by showing one of three cards (or plastic cups) available in the colours red, orange and green that mirror their level of understanding. Red means "I'm stuck", orange means "I'm not sure and have some questions" and green means "I have understood perfectly". This enables the trainer to immediately monitor what has happened in the classroom and to adjust the next part of the lesson. This method can be used also with classroom students, to promote effective self-assessment. The images provided below are taken from the video available at: https://www.teachingchannel.org/videos/peer-teaching--2.





What follows is the plan of the training course designed and experimented in the framework of the FAMT&L project.

Course structure

• Tools

- Questionnaire to be administered at the beginning and at the end of the course (the first questionnaire studies the initial beliefs on formative assessment, whereas the last questionnaire is used in comparison with the first to assess if and how the teachers' ideas on formative assessment and its application in practice have changed as a result of attending the course. Annex 3 provides an example of these questionnaires).
- Course assessment questionnaire (an example is provided in Annex 4).
- Media repository, including videos (this tool is used by teachers to assess their own and others' formative assessment practices), in addition to descriptions, materials and indicators for analysing them.
- E-learning platform to share material and opinions.

• Teachers and trainers

- Teachers: maximum 25 mathematics teachers for face-to-face courses, otherwise no restriction; pre-service or in-service teachers.
- Trainers: a teacher who is an expert in assessment and a professor of mathematics' education (teaching jointly)**.**

• Course layout: steps

Step 1: Questionnaire

Modality: online through a link.
Before the course, teachers have to complete an *online questionnaire* on their beliefs and practices concerning formative assessment.

Step 2: Course presentation - *Discussion on beliefs and practices*

Modality: face-to-face.
Presentation of the course and its objectives, with a focus on the combined training approach which includes face-to-face and platform-based learning sessions.
Questionnaire results are presented to prompt an initial discussion about formative assessment and then introduce some theoretical principles. The discussion is an opportunity for participants to become aware of their own assessment conceptions and practices.
Information is provided on how to access the e-learning platform and Media repository and how these tools work. The platform contains a tutorial on how to use it.
Participants receive a presentation about administrative issues, with a focus on privacy and confidentiality in video recordings.

Step 3: Analysing videos

Modality: e-learning platform and Media repository.
Each participant is asked to analyse a video from the media repository to identify formative assessment situations and their features. Some questions about formative assessment are available on the platform as a support for analysis. During this phase some time can be devoted also to peer-assessment.

Step 4: Sharing the early findings and introduction to the theory of formative assessment

Modality: face-to-face.

Early findings from the analysis of the videos are shared among participants and some distinctive features of formative assessment are identified with the help of reference materials available on the platform.

Together with trainers, teachers watch some short videos which exemplify formative assessment practices and tools. Intended to trigger discussion, videos refer to specific topics and show examples of both good formative assessment practices and not entirely functional practices.

By analysing the videos participants will learn about the phases and features of formative assessment.

Step 5: Reflecting on formative assessment situations

Modality: e-learning platform and Media repository.

Videos of formative assessment situations in the classroom are shown to highlight the main features of the formative assessment process (identify aims, define criteria, collect information, regulation). Teachers are asked to reflect and answer some questions about the constituents of the formative assessment practices presented in the videos.

Step 6: Analysing formative assessment situations – Choosing a topic

Modality: face-to-face.

Considerations from step 5 are shared and discussed, then teachers are asked to analyse again the same videos using some specific indicators (see grid in Annex 1). Indicators used by teachers are compared with those used by researchers, then teachers use the grid indicators to analyse a new video.

After viewing some examples of formative assessment contexts and teaching scenarios which could lend themselves to formative assessment, teachers choose a formative assessment topic to be presented and video-recorded in the classroom. If recording a video with the class is not viable, simulation sessions can be held involving course participants.

Situations that are worth video-recording might include:

- feedback on written tests given by the teacher to the students and ensuing discussion;
- peer assessment situation (e.g. group A students correct tests written by group B students - and vice versa);
- review of problem-solving strategies used by students to deal with an exercise/ problem administered by the teacher;
- a student gives a classroom presentation, while teacher and classmates observe and discuss with him/her;
- self-assessment situations.

Step 7: Planning the lesson

Modality: e-learning platform and Media repository.

Participants are asked to plan a lesson, either individually or in small groups and to provide the relevant documentation (lesson plan, objectives, materials to be handed out to the students, formative assessment tools etc.). The Media repository contains an archive of videos on the proposed topics: guided by trainers, participants can watch the videos that best fit their purpose (self-assessment, peer-assessment, feedback, etc.). Documents and articles will be uploaded on the platform to offer

insights into the theory of formative assessment and teachers will have unrestricted access to such information. A virtual meeting or chat-based discussion will be organized to monitor the teachers' work. The forum and chat features of the e-learning platform allow participants to interact with the trainers to plan educational activities together.

Step 8: Delivering the lesson and making the video

Modality: classroom and e-learning platform.

Teachers are invited to record a video in the classroom on the formative assessment topic they have chosen and planned in the previous steps. On the platform teachers can discuss their video making project informally with fellow participants, without involving the trainers.

A tutorial on how to make videos is available.

Step 9: Sharing and analysing videos

Modality: e-learning platform.

Teachers upload videos and documents of the lesson they delivered so that all participants and trainers can share and analyse them (using the grid).

At first, analyses and comments only take place between teachers (in the virtual and chat room of the platform) – that offers the opportunity of peer review / assessment. At a later stage, trainers will provide instructions to guide the analysis and comments on each video, so that teachers can make adjustments for the next video.

In steps 6, 7, 8 and 9 participants are asked to select a topic around which they will plan, deliver and analyse a lesson. This sequence of steps is very similar to the one proposed by the Lesson study method, which can therefore serve as a reference. The *Lesson study method* aims to systematically analyse a lesson to improve the quality of classroom practices. It consists of 4 main steps, each of which has points in common with a step of the training model developed under the FAMT & L project, namely:

1. Set lesson goals according to the specific student needs and school curriculum. (This step corresponds to steps 6 or 7 of the FAMT&L training

Lesson study

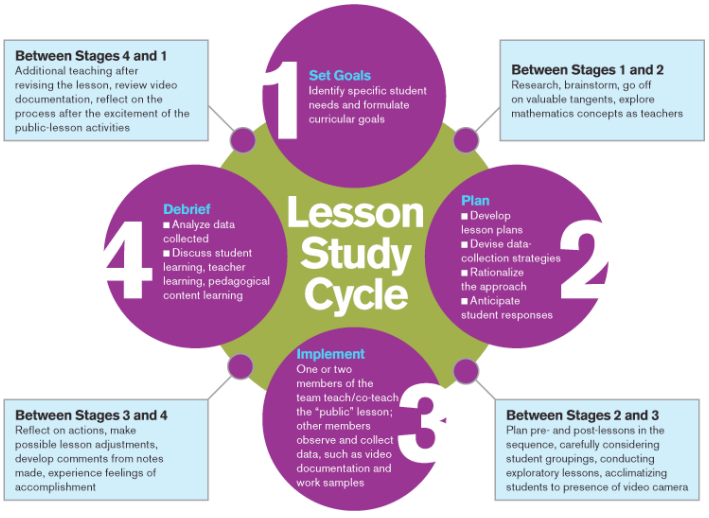
Lesson study is a methodology developed in Japan whose main aim is to foster collaboration among teachers so that they can plan lessons together. To learn more about this methodology, please refer to Bruce & Ladky (2009) or visit the following websites:

http://professionallyspeaking.oct.ca/march_2010/features/lesson_study/

http://www.lessonstudygroup.net/05lesson_study_resources.html

http://walsnet.org.

The diagram below was taken from this website: http://professionallyspeaking.oct.ca/march_2010/features/lesson_study/.



model).

2. Plan the lesson. Teachers, in teams, work together to plan a lesson and develop, for example, a lesson plan. (Step 7 of the FAMT&L training model).

3. Implement the lesson. One or two teachers deliver the lesson, while others collect information through different modes previously agreed with the group. Modes include, for example, observation and video recording. (Step 8 of the FAMT&L training model).

4. Analyse data collected. In teams, participants analyse data collected, discuss the lesson and make adjustments before delivering the same lesson again. (Step 9 of the FAMT&L training model).

Step 10: Planning, making, analysing and sharing other videos

Modality: classroom, e-learning platform and Media repository.
Depending on the choices and conditions in place, steps 7-8-9 can be iterated to produce and analyse other videos for the purpose of going over the same formative assessment topic in more detail or explore new topics.

Step 11: Questionnaire

Modality: online-through a link.
Teachers answer the questions of the online questionnaire on formative assessment they filled out at the beginning of the course: that will allow identifying any changes in their beliefs at the end of the course. Results will be made available on the platform. Moreover teachers express their satisfaction with the course by answering questions contained in a specific online questionnaire.

Step 12: Drawing conclusions and taking stock of lessons

Modality: face-to-face.
Beliefs about formative assessment and opinions about the course exposed by the questionnaire are shared and discussed to summarise significant formative assessment features emerged during the course, highlight practices which proved effective and key theoretical aspects.

6. Videos for training

As mentioned earlier in the text when discussing the theoretical framework, videos can be used in training performs for different purposes (Calvani et al., 2014). The FAMT&L's training scheme uses videos for the following three reasons:

1. to build knowledge, competences and professional practices about formative assessment;
2. to reflect on students' beliefs and misconceptions;
3. to analyse and reflect on one's assessment practices.

The first aim will be discussed in section 6.1, with a reference also to the third aim. The second aim will be addressed in section 6.2, using practical examples from the training courses run during the project.

6.1 Videos to build knowledge, competences and professional practices about formative assessment

To achieve that aim, a number of actions can be suggested. Below are some of them, which emerged from analysing the videos:

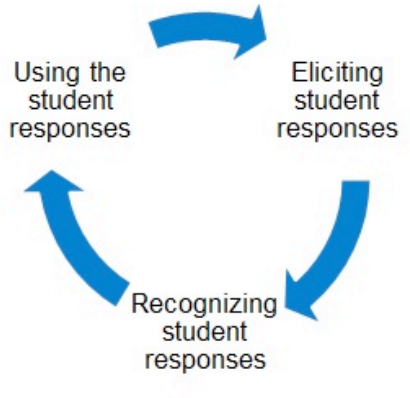
- *Ask general questions about the video inviting participants to identify formative assessment situations.* For example: Does this video show a formative assessment situation? Where? Why?
  These questions prompt an initial reflection and discussion on formative assessment so that participants' views can be collected, trainers and teachers can share ideas and some formative assessment features can be brought out. This also gives participants an opportunity to challenge a video and disagree with the trainers' opinion of the video being an example of a formative assessment.
- *Analyze a video and ask participants to identify, individually or in small groups, indicators that pinpoint a formative assessment episode.* Once the video has been analysed, indicators identified by the participants can be shared and organised into categories. Such indicators can be used to go through other videos made by fellow teachers or self-made filming one's own lessons.
- *Analyze the videos using the indicators of the grid developed by researchers/trainers to index the videos.* The grid facilitates a more detailed analysis of the teacher – student interaction during a formative assessment situation. For example, given the indicator "The teacher asks a question to a student" a deeper analysis would include the following questions: What words did the teacher use to ask the question? Was the question effective? Has the desired result been achieved? Was there another way to ask the question?
- *Compare indicators identified by the participants with those indexed in the videos.* Indicators chosen by the participants are compared against those identified by researchers or trainers and critically reviewed to achieve shared meaning and interpretation.
- *Starting from the videos, reflect on your own practices*. For example: Does the video show something very different from your usual practices? Can you recognize something similar to your usual practices? How could the teacher's practices/actions shown in the video be improved? What would you have done and why?
- *Some of the videos shown do not contain formative assessment situations but rather "missed opportunities".* Trigger questions include: Does this video show a formative assessment situation? Where? Why? If the answer is no, the next question would be: How could the teacher's practices/actions shown in the video be improved to let the interaction become a formative assessment situation?
- *Analyse videos and expose links to current formative assessment theories*. This can be used to show the difference between formal and informal formative assessment.

Formal and informal formative assessment
In the literature a distinction is made between formal and informal formative assessment (Furtak & Ruiz-Primo, 2005).
Formal formative assessment is a planned act designed to obtain information about student's learning. It usually starts with students carrying out an activity designed or selected by the teacher so that information can be more precisely collected (gathering). Commonly, formal formative assessment practices come in the form of curriculum embedded assessments that focus on some specific aspect of learning, but it can also take the form of direct questioning, quizzes and brainstorming.

Instead, informal formative assessment can take place in any student-teacher interaction. It has the potential to occur at any time and can involve whole class, small group or one-on-one interactions. Although said not to be planned because it can happen at any time and there is no specific activity designed for students, it is still possible for teachers to prepare in advance for this type of formative assessment. Certainly, teachers cannot predict exactly when they will be able to gather evidence about students – as this happens in the course of non-planned activities - but they can make available many opportunities for doing so (e.g., by creating more interactions in class, group discussions, or informal observations). Many times it goes unrecorded. It can be verbal (questions to/from students) or non-verbal (based on teacher's observations).

An example

During the training course a video was analyzed to show participants the difference between informal formative assessment and a regular teacher-student interaction. Prior to the analysis session, the informative questioning cycle developed by Ruiz-Primo and Furtak (2004) – see description below - was illustrated to participants, who were then asked to identify the three phases of the cycle in the video and determine whether the situation shown was in fact a formative assessment episode.



Informative questioning cycle

The *informative questioning cycle* described by Furtak and Ruiz-Primo (2004) consists of three stages. First step: *eliciting* - the teacher asks questions to check what students have learnt, bringing out what they know and do not know. Second step: *recognizing* - the teacher recognizes what students have said and incorporates such information into the conversation with the whole class or group; alternatively, the teacher can ask another question. Third step: *using* - the teacher tries different methods to help students progress in the activity they are doing. This process can help the teacher expose the students' reasoning and make it more explicit, so that students can become more aware of their actions. That can help investigate the teaching-learning process more deeply while performing formative assessment.
The process can be applied also in formal (instrumental) assessment situations and it can be used directly by the student for self and peer assessment.

Table 1 below provides an example of how the *informative questioning cycle* was used during the course. The table consists of three parts. The first part contains the transcript of a video with discussions between teacher (T.) and students (L., M. and C.). The second part describes the indicators of the grid used for analysis by all partners involved in the project. The third part shows *informative questioning cycle* phases identified by researchers and participants of the course.

Table 1: Excerpt from video CH_9_SMGR2_2015_01_01

Transcript of the lesson	Indicators	Steps of the questioning cycle
T.: "Then what did you do?" **L.**: "Well, I made the chart, put in all the data and that revealed if it is directly proportional or inversely proportional."	The teacher asks to describe phases of the solution process on-the-job.	Bring out what students have done, what they know (*eliciting*).
T.: "And what did you find out?" **L.**: "I found out that it is directly proportional." **T.**: "Do classmates agree?" **M.**: "Yes." **L.**: "Because the ratio is constant." **T.**: "Which ratio?" **L.**: "Well, for instance, if…" **M.**: "L. can I suggest something? If the chart looks like that, it is not a hyperbola; it is like that instead, you should not… it is like this, because you can see it, it always follows…" **T.**: "Is that enough?" **L.**: "M. , for example, without the chart you would not be able to know if …" **M.**: "I would instead, because if y gets multiplied, also x does." **L.**: "I was getting there! I have only used other words."	The teacher asks to describe phases of the solution process on-the-job.	Bring out what students have done, what they know (*eliciting*).
T.: "Ok L., if I understand you correctly, the fact of drawing a chart has given you a clue	The teacher repeats for the class a formulation of a student (repeating or	The teacher recognizes student responses and clarifies individual contributions vis à

about the type of proportionality. What about you, M. when did you get it?" **M.**: "I got it when I saw that by multiplying x, also y got multiplied..." **T.**: "What about you C. when did you understand it? Was it from a chart like L. or from a table like M.?"	paraphrasing student's words). The teacher asks student to compare/contrast other's idea. The teacher "moves" the question from one student to another.	vis the group (*recognizing*).
T.: "Are there only these two ways to determine the type of proportionality?" **L.**: "There are three ways." **L.**: "Therefore there is a third one we can use." **M.**: "Is it when the constant is regular? No sorry, that's nonsense." **T.**: "Try to talk about it: what is the third way in your opinion? Any ideas from the class?"	The teacher asks the student to propose an alternative method.	Student responses are used as opportunities to advance the teaching- learning process (*using*).

After identifying the steps in the video, participants discussed the teacher's actions in depth so as to fully expose the three phases of the *informative questioning cycle*. Below are some examples of actions taken from Furtak and Ruiz-Primo (2004)'s work in the field of natural sciences.

Eliciting	
Type of actions performed by the teacher	**Examples**
Formulate explanations	Why ...? How do you know that...? What do you expect this to be...? How will you do that? What steps are you taking? How have you achieved that? What rule are you applying?
Elaborate	What do you mean when you say that?
Define concept(s)	What do you think this word means?

Recognizing

Type of actions performed by the teacher	**Examples**
Incorporate student's comments into the ongoing classroom conversation	Carlos is referring back to our discussion a few days ago, when we talked about how things sink when their density is greater than the medium.
Explores students' ideas	Alice, you suggested that the liquid looks very thick, so I'm going to pour it into this container so you can all see what she means.
Repeats or paraphrases students' words	You said the rock will sink because it has a greater density than the water?

Using	
Type of actions performed by the teacher	**Examples**
Promote argumentation	(Providing counter-examples, encouraging students to address each other and to cite evidence for their claims.)
Provides descriptive or helpful feedback	We're trying to develop a universal explanation for why things sink and float. Right now, you're just telling me why things sink. The next step for you is to learn about the variables that control why things float, to put that together as we develop our explanation.

In the proposed training course two types of videos were used, namely videos made by participants in the classroom where they regularly teach – so that teachers can use situations they experienced to reflect on their teaching practices – and videos made by a simulation group outside a school setting, sometimes using the microteaching technique. In all these cases, the lesson is planned (face-to face or remote setting option) highlighting the teacher's choices concerning certain aspects of formative assessment. The project is discussed and modified according to feedback from participants and trainers. The lesson is then delivered, filmed and analysed by the teacher(s) author(s) of the video and their fellow participants. Indicators will be identified for each of these videos. This activity is intended to let course participants become more aware of their skills and feel more at ease when planning and delivering a lesson which contains a formative assessment situation. As pointed out by Bortolon (2004), teachers can observe their own performance in the classroom and become aware of what their teaching practices look like, so that they can identify elements that might interfere with or hinder the achievement of their teaching objectives and goals. Thus, analysing the videos of one's own lessons is an important tool for self-observation and self-correction of teaching behaviours.

6.2 Videos to reflect on students' beliefs and misconceptions

Analysing the videos helps teachers gain a better insight into students' beliefs, attitudes and responses to stimuli provided by the teacher and offers a chance to investigate any misconception students may have. Some of the videos presented during the course expose a number of erroneous and stereotyped students' beliefs and behaviours: that gives teachers the opportunity to engage in constructive reflection on how to manage difficulties.

Two examples of video analysis

Below are two examples of video analysis. Analysis sessions provide an opportunity to discuss some aspects of formative assessment with the teachers and, in the case of mathematics education, show how students' beliefs and misconceptions can be exposed, so that teachers can reflect, look for the possible causes of such misconceptions and plan possible interventions. An accurate reflection on the teaching approach, methods and materials used by the teacher and on the reasoning and problem-solving processes that led the student(s) to give a certain answer allows teachers to plan more targeted actions they can take in similar situations.

First example

The first video is taken from a lesson delivered to 20 sixth grade students (first year of middle school): the teacher gives an exercise to be done in small groups on angles, their size and properties. After handing out a worksheet, the teacher clarifies the objectives of the lesson and interacts with students to assess students' knowledge and skills. The first column of Table 2 contains the dialogue between the teacher (T.) and two students (M. and S.) on how to solve the exercise, the second column lists the corresponding indicators derived from the analysis grid shared by project partners.

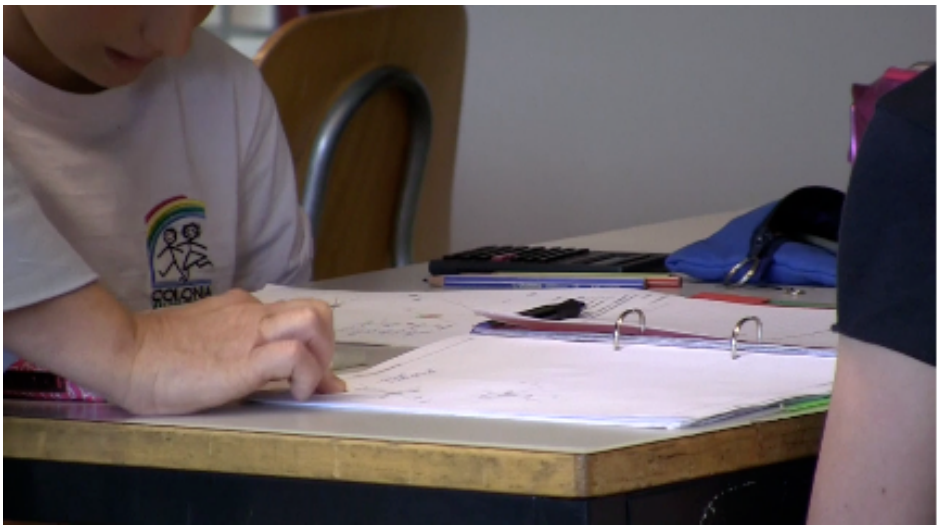
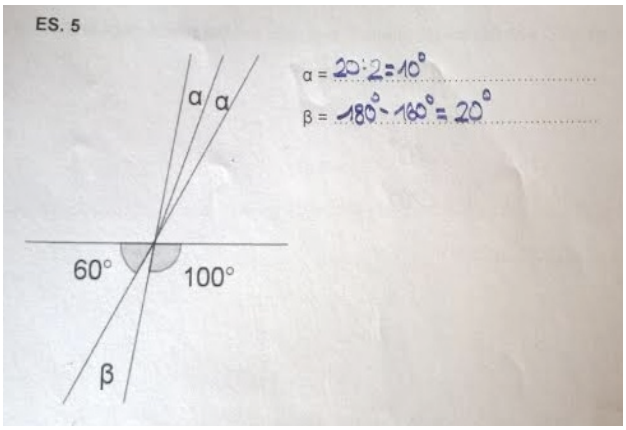


Table 2: Excerpt from video 1 (CH_6_SMGR1_2015_01_09)

Transcript of the lesson	Indicators
T.: "Have you finished?" **M.**: "Here I have to divide in half." **T.**: "Why do you have to divide in half?" **M.**: "Because we have divided in half here." **T.**: "How can you be sure it is really half? It is right in fact…but what tells you that?"	The teacher "moves" the question from one student to another. One or more students ask to intervene about the answer given by another student.

S.: “I know how to do it.” **M.**: “Me too.” **T.**: “I told you that this is right, don’t worry. But how can you be sure it’s half? This makes 20. And you tell me 10 and 10.” **M.**: “I do the calculation in reverse.” **T.**: “And why not 5 and 15?” **S.**: “Can I tell you how I did my calculation?” **T.**: “Yes, please do.” **S.**: “So you start from 180 minus 100 minus 60 and that makes 20. That’s half.” **M.**: “That is what I have done.” **T.**: “All right, but why half?” **M.**: “Because it looks like half?” **T.**: “In maths things are not always what they seem ... Who says it is half, that those two angles there are equal?” **S.**: “I know it! 360 less 20.” **T.**: “No.” **S.**: “But why not?” **T.**: “These here are the same because they have the same letter! Had I written alpha and gamma, maybe it was not the half. For example, we saw that these (referring to a previous exercise) have different letters but are equal (meaning they are the same size) because there is a property which determines that. Here there is no property to guide us, but what have we seen? We have seen that the same letter has been used and when in an exercise you find the same letter it always correspond to the same size, to the same number.”	The teacher asks student if he is confident about the job and the reasons. The teacher asks student to explain the reasons behind the answer. The teacher clarifies/elaborates base upon the student’s responses.

Let us focus on M. and S.’s statements to understand the dialogue captured in the video.



As the conversion unfolds, it is clear that the two students cannot provide a real answer to the teacher’s question («Why are the two angles equal?»): instead of explaining the reason why the angles are the same, they describe the arithmetic procedure they followed, or the graphical representation they see, hence relying exclusively on their visual perception («Because it looks like half.»).

Indeed, it often happens that when studying geometry students focus more on the graphical dimension than on the conceptual dimension.

Yet, as Fischbein (1993) explained in his *theory of figural concepts*, all geometrical figures represent mental entities that possess simultaneously conceptual properties (ideality, abstractness, generality and perfection) and figural properties (shape, position and size)

which are intrinsically linked together. Ideally, the conceptual system should fully govern the meanings, relationships and properties of the figures to establish control in compliance with the geometric theory while preserving the role of the figural component.
The video reveals what sometimes happens when solving mathematical problems: «absence of errors is not tantamount to absence of difficulty: one correct answer can result from incorrect or partial reasoning rather than from genuine understanding» (Zan, 2011, p. 3)[9]. In the case in point, the correct answer written on the worksheet by the students was hiding the fact that they were unable to explain why they had followed a certain procedure and relied solely on perceptual factors. Teachers must avoid the trap of the "correct-answer compromise" which psychologist Gardner (1991) described as «a convenient arrangement between teachers and students who agree on pretending that the correct answer will ensure understanding» (Gardner, 1991 cited by Zan, 2007 p. 28)[10], thus missing valuable opportunities for reflection for both students and teachers. The situation shown in the video is an attempt to engage in formative assessment for the purpose of investigating the students' cognitive process to determine if they are really aware of the answer they are giving, regardless of its correctness. Encouraging the students to go through the specific steps of the cognitive processes that have led them to provide a certain answer helps them become aware of their choices and offers them a chance of dealing with difficulties in a constructive manner. Towards the end of the discussion, however, the teacher, unable to raise the necessary awareness among students, ends up giving the answer without making sure that the students have really understood his point. This happens often in real life teaching, also because teachers need to keep the lesson going. For teaching to be effective, the interaction should be discussed again at a later stage, creating a stimulating situation to reflect together on the critical points which were raised.

Second example
This video is taken from a lesson delivered to 15 sixth grade students who were asked to find out the name of some quadrilaterals given their characteristic properties. Small writing boards were used as a teaching aid: each student had one. On their desks students had some cards handed out by the teacher showing several polygons and, after receiving the instructions, they had to write the names of the geometric shapes with associated properties on their boards. This is not an example of formative assessment practice, but a "missed opportunity". The first step of the informative questioning cycle - in which the teacher should bring out what students already know – is missing here: in this case, the teacher is asking closed or leading questions. This is why the video was not entered in the Media repository. However, this video serves as a stimulus to figure out how the teacher could have handled the initial phase of the lesson differently, encouraging formative practices. This type of examples taken from everyday experience in the classroom can provide food for thought and inspire reflection during training courses. In specific, this video gave participants a chance to reflect on some typical students' misconceptions when learning geometry and to think of how the teacher can address them.

[9] Translations by the authors.
[10] Translations by the authors.

Table 3: Excerpt from video 2

Transcript of the lesson
T.: "I see you are making a sketch as a reminder that this is a square (Figure 1) and this is a rhombus (Figure 2), is that right? Is it true that this is a rhombus?" (Pointing to figure 2). **A.**: "Yes." **T.**: "What if I drew these little symbols A.? (Figure 3) ... Would this still be the same rhombus?" **A.**: "Yes." **T.**: "So, this is a rhombus – what if I add these symbols: what do you think?" **A.**: "What are those symbols?" **T.**: "They are used to mark a right angle." **A.**: "That's a square." **T.**: "Ok! So why do you think I pointed this out to you? What would I like you to understand?" **A.**: "That there must be diagonals for it to be a rhombus!" **T.**: "Not all quadrilaterals have diagonals, but I drew this for you (Figure 3) to make you understand that taking a square is not enough." **A.**: "All sides are equal." **T.**: "All sides are equal, sure it is a square. But when I drew this (Figure 3) I had not a rhombus in my mind, what was I thinking of instead?" **A.**: "A square." **T.**: "So I made that observation to let you realize that it is not enough for you to take..., what is this? (he takes a square cardboard), it is a square, it remains a square even if I turn it. You got it? So maybe if you want to make a sketch of a rhombus, make it different from a square (Figure 4), do not simply turn it."

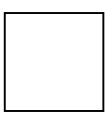


Figure 1

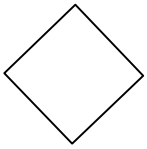


Figure 2

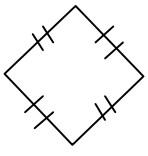


Figure 3

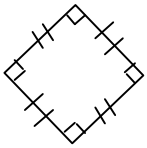


Figure 4

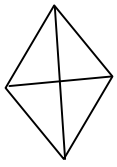
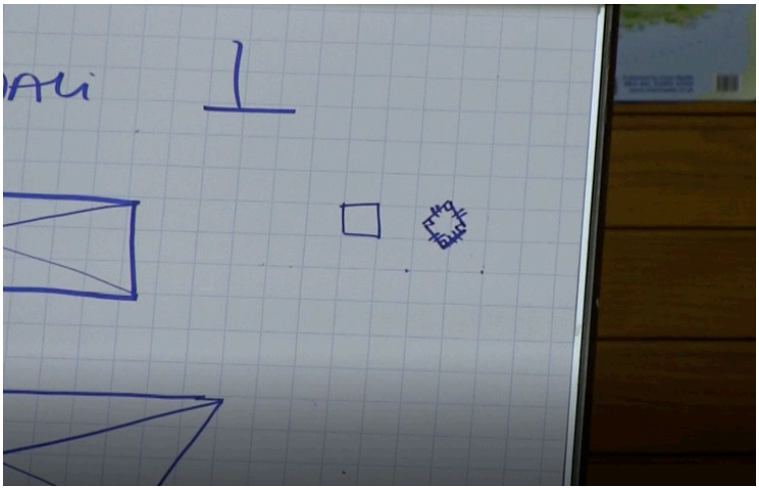


Figure 5

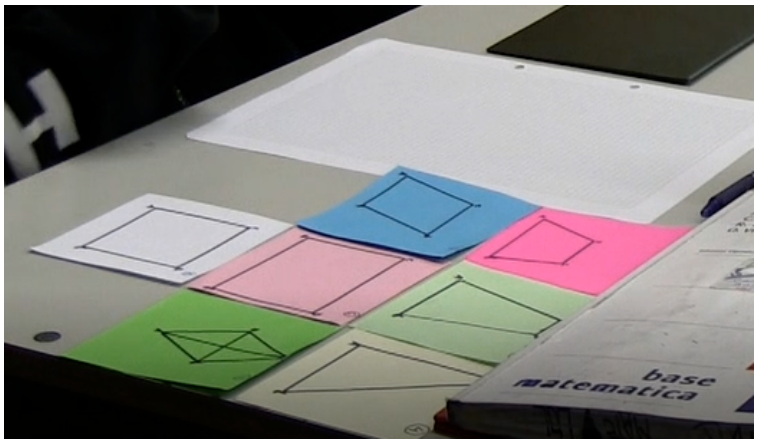
The teacher's intention is to show to the students that the square remains a square not matter how you turn it, thereby discarding the belief that there is a link between properties and graphical layout of the figure. Indeed, that is a common misconception about squares, which seems to have at least two different causes: the repeated exposure to a certain representation offered by teachers over and over again since elementary school and the fact that the teachers' preferred way of drawing squares undergoes verbal and figural formalization to become the standard choice (Martini & Sbaragli, 2005). From a learning perspective, when a teacher offers a strong, persuasive, persistent and - in some cases - univocal concept, that image becomes an intuitive model (Fischbein, 1985). However such model might not accurately reflect the underlying mathematical knowledge, thus generating an erroneous mental model that affects future learning: the square is always expected to have horizontal and vertical sides when seen from the observer's point of view and ceases to look like a square when its position on the sheet gets changed. This is therefore a type of misconception which is "avoidable" (Sbaragli, 2005) since it results from the way in which knowledge is conveyed in school, with teachers following improper practices across levels of education.



Teachers should be very careful about the signs (notation) they choose to represent a mathematical concept that students have to learn and should pay attention also to the contexts and the modes of use of those signs. In addition to caring about using the right words, teachers should also consider other forms of communication, proposing different things across the lesson.

In the video, after recognizing this potential student misconception, the teacher decides to offer a verbal explanation, drawing on the board some figures and symbols which some students do not know, do not remember or cannot see as they are too small. This mode creates some confusion in the class, especially because the reason why the teacher is digressing is not totally clear; for some students the reason remained unclear also after the intervention ended.

The figural representations used by the teacher in the video are not very varied, nor very well presented. As shown in the picture on the right side, all cards given by the teacher to the students contain polygons in standard position, with diagonals marked only in the case of the rhombus and absent from all other polygons, thus erroneously suggesting that the rhombus is the polygon with diagonals *par excellence*.



This representation ends up reinforcing A's misconception about the rhombus: "There must be diagonals for it to be a rhombus!". In this case the teacher's drawing– which is the standard representation found in textbooks - does not help the students understand that all quadrilaterals have got diagonals, not only the rhombus. Above all students are induced to believe that diagonals are an essential element for calculating the rhombus' area. In fact, often students are not taught that the rhombus can be considered a special case of parallelogram - "a parallelogram with sides of the same length" - and that, as a result, to determine the area of a rhombus one can apply the same formula as for the parallelogram: "length of one side (base) multiplied by the corresponding height." After watching the video, a conversation with the teachers attending the course might bring out these reflections, which can prove valuable when teaching mathematics.
As Maier explained (1993, p. 75): «When it comes to geometry, many students have trouble understanding instructions, problems and explanations given by the teacher or by the manual because their geometrical concepts heavily rely on the figures and concrete models used as visual aids to help them form such concepts. In my opinion, this is due to the fact that visual aids for geometry are not used well. Sometimes models chosen are unsuitable for representing the notion under consideration and so students develop misconceptions about the meaning of geometry terminology».
The language used and the graphic representation provided, together with representations from other semiotic registers therefore play a crucial role. It is clear that the student's interpretation process when learning math is strongly influenced by the representations offered by the teacher.
Hence it seems unlikely that a verbal explanation given by the teacher in a few minutes can really help students overcome their misconceptions. What might be beneficial instead is constant practice based on a wide range of well-selected and well-presented materials and representations delivered during meaningful formative assessment situations: that would enable students to progress in their learning.

7. Conclusions

Below are some considerations arising from the experimentation with pilot training courses run by project partners in five countries. These thoughts were inspired both by the monitoring tools used for the courses (the grid to identify key aspects during the course and the discussion in the final phase of the course when trainers and participants summarized the formative assessment features emerged during the course) and by the researchers involved in the project.

Point of view of the course participants

During the training course some of the participants realized that they were already using formative assessment techniques in the classroom without being aware of it. For example, even a regular verbal interaction between teachers and students, or between peers, can be an episode of formative assessment if it is aimed at understanding and improving the teaching-learning process. The course offered the opportunity to render assessment practices more explicit, so that teachers can become aware of them and engage in a critical evaluation of their practices, first focusing on the actions performed by teachers and students and then giving a name to these actions and gestures, using a common vocabulary shared by participants and trainers.

The pilot courses suggested that formative assessment is a practice worth using in the classroom on a permanent basis. That does not mean having to implement it throughout a lesson, but rather selecting when to use it for short sessions, in different ways, with individual students, with a group or with the entire class. It is also desirable to alternate formal and informal formative assessment, so that teachers can investigate the students' reasoning processes in different ways (for example by means of oral or written questions) without having to always resort to structured test tools but with the possibility of keeping track of information about students.

Participants from different countries very much appreciated the structure and modality of the course primarily because "it was not theory-oriented but practice-oriented" and because "the way the course was organized has allowed a continuous and active participation." Participants also reported that the analysis of specific teaching-learning situations filmed in the videos provided food for thought and offered them the chance to reflect on their teaching practices, allowing them to change opinion, implement different behaviours and take consistent and effective decisions.

Also the microteaching phase, which some partners managed to include, was commented very positively by the participants: "It was a good opportunity to try our hand at applying formative assessment techniques in practice."

Point of view of researchers and trainers

There is common agreement among all researchers and trainers involved in the pilot training courses of the FAMT&L project that formative assessment is a powerful practice for improving the teaching-learning process, hence confirming the findings of previous studies (Black & Wiliam, 1998; Hattie, 2009). However, for formative assessment to become an integral part of this process, teachers must be prepared to redefine their priorities and change their beliefs and practices if need be. Change can occur only if training courses last long enough to allow teachers to become more aware of their teaching practices and readjust them if needed, experiment and evolve with enhanced self-awareness and conviction.

The training model proposed here is a good start to develop effective courses on formative assessment regardless of the subject matter: being non discipline-specific, formative assessment techniques can be used for fields other than mathematics. That holds true also for the indicators of the analysis grid, which are expressed in very general terms.

The purpose of this document is to highlight some reflections and describe some tools that may be useful to trainers wishing to organise courses on formative assessment through the use of video or to teachers wishing to use formative assessment in the classroom in a more informed way. The topic of formative assessment is too wide and varied for the document to be exhaustive (for example, a point still open is the coexistence of two types of assessment in the classroom, namely formative and summative assessment). Nonetheless the authors hope that this proposal can provide an opportunity to reflect with increasing awareness on the delicate teaching-learning process of any subject matter.

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