FAMT&L

FORMATIVE ASSESSMENT IN MATHEMATICS FOR TEACHING AND LEARNING

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

Deliverable D4.2 - Implementing of ground pilot training courses in schools

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

Lead organisation for this deliverable: **SUPSI**

<table>
<tr><td>Deliverable number</td><td colspan="3">D4.2</td></tr>
<tr><td>Title</td><td colspan="3">Implementing of ground pilot training courses in schools</td></tr>
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<tr><td>Nature</td><td colspan="3">☐ Report
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<tr><td>Language versions</td><td colspan="3">EN, IT, GR, FR, DU</td></tr>
<tr><td>Target languages</td><td colspan="3"></td></tr>
<tr><td colspan="4">Description (limit 1000 characters)</td></tr>
<tr><td colspan="4">The ground pilot training courses in schools will be realized by each project partner, following a common training model, including the definition of:

- Objectives and tasks
- Contents and methodologies
- paradigmatic situations or case studies concerning assessment processes
- assessment procedures and methodologies
In order to improve teacher reflexive thinking and competence, each teacher-training course will provide some case studies on which teachers have to reflect, in order to analyze their teaching and assessment practices and acquire new skills in the use of formative assessment in mathematics education.</td></tr>
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Executive summary

This document is a report including the description of a training model for middle school math teachers (that can be applied to in-service and pre-service training) with the purpose to improve teachers' competences on educational planning and formative assessment: assessment for learning) and on mathematics didactics. It is included the general structure (long or short version) of the course and its implementation in each country.

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. Introduction

This document is a report including the description of a training model for middle school math teachers (that can be applied to in-service and pre-service training) with the purpose to improve teachers' competences on educational planning and assessment and on mathematics didactics.

The training model 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, encouraging teachers' reflective and critical thinking about effective/ineffective teaching and assessment strategies. It will include also the develop of training methodological patterns (or schema) in order to model five training paths or to give some methodological criteria to build on other training paths. The training model will be used to define training paths organized trough blended learning and face-to-face lessons, according to learning needs and resources (including those reported in the web-repository).

To meet the needs of all countries we have proposed two versions of the training model, a complete and a more light. The proposed models include remote training sessions through an e-learning platform[1] and face-to-face lessons in the classroom. These models 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. 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?
5. Draw conclusions about formative assessment. Trainers and teachers summarise the elements of formative assessment arising from the course.

In order to improve teacher reflexive thinking and competence, each teacher-training course will provide some case studies on which teachers have to reflect, in order to analyze their teaching and assessment practices and acquire new skills in the use of formative assessment in mathematics education.

[1] Within the FAMT&L project the e-learning platform ESPACE was used.

2. Structure of course: organization (course long)

Two types of complete training model are outlined, one with training sessions through an e-learning platform and face-to-face lessons in the classroom and one only through platform.

Hours	Face-to-face and Platform Training model	Only Platform Training model
Total	90	90
Face-to-face lessons	15	0
Work at home (planning lessons) and on the platform	75	90
ECTS	3	

2.1 Structure of course face-to-face/platform

• Tools

- Questionnaire to be administered at the beginning and at the end of the course (the first questionnaire collects early 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.
- Course assessment questionnaire.
- Media repository, including videos (tool 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.
- Tutorials how to use platform.

• Teachers and trainers

- Teachers: maximum 25 mathematics teachers for face-to-face courses, otherwise no restriction; trainee teachers or practicing teachers.

- Trainers: a teacher who is an expert in assessment and a teacher of mathematics' education (teaching jointly), teachers from partner schools**.**

• 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, with the main questions of the questionnaire administered by each country.

Step 2: Course presentation - Discussion on beliefs and practices

Modality: face to face.

Presentation of the European project and its principal objectives and potential for teachers and their students in the classroom.

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.

Comparison with the beliefs of teachers of mathematics in different countries: results of European questionnaires.

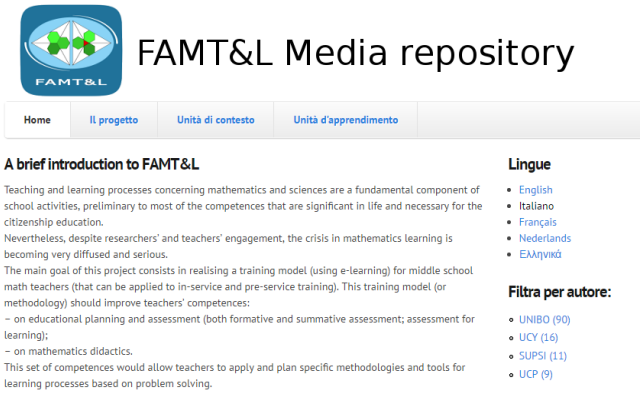
Information is provided on how to access the e-learning platform and Media repository and how these tools work. The platform contains a tutorial on how to use it.

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.



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 specific indicators created by researchers. 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 required 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. At this step it requires the help of mathematics teachers of the partner schools.

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.
At this step it requires the help of mathematics teachers of the partner schools.

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 of indicators).
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 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).

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/.

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.
Through the various information from the course researchers can refine the grid.

2.2 Structure of course only on platform

• Teachers and trainers

- Teachers: maximum 25 mathematics teachers for face-to-face courses, otherwise no restriction; trainee teachers or practicing teachers.

- Trainers: a teacher who is an expert in assessment and a teacher of mathematics' education (teaching jointly), teachers from partner schools**.**

• Course layout: steps

Step 1: Questionnaire and delivery of access to the platform

Modality: online through a link.

Before the course, teachers have to complete an *online questionnaire* on their beliefs and practices concerning formative assessment, with the main questions of the questionnaire administered by each country.

The teachers can find the username and the password to access to the platform in a document and an explanation of how it works, its utilities, its administrative aspects (privacy on video, disclaimer). On the platform there is also a tutorial of how to use it.

Step 2: Presentation of course - Discussion of beliefs and practices

Modality: on platform.

Teachers first can read in a document the aims about the course and its objectives, with a first theoretical overview on formative assessment, presentation of the European project and its principal objectives and potential for teachers and their students in the classroom.
Trainers upload the results about questionnaires on the platform and pose some questions about the comparison between these questionnaires and the internationals. Teachers can find several questions about formative assessment, so that they may provide a first opportunity to become aware of their conceptions and practices of assessment.
Teachers can discuss about formative assessment in the chat or in the forum on the platform.

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.

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

Modality: on platform.

Early findings from the analysis of the videos are shared among participants through a virtual meeting with trainers and some distinctive features of formative assessment are identified with the help of reference materials available on the platform.
On platform teachers can find documents and 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: on platform.

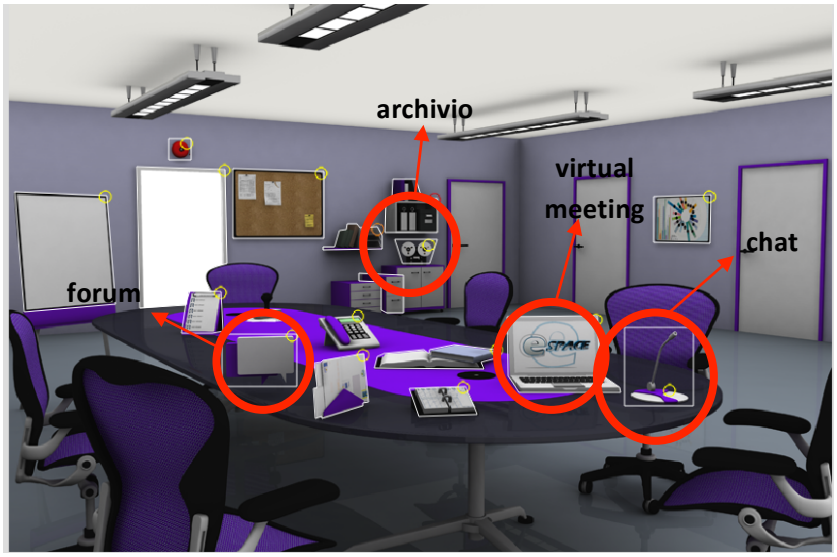
Considerations from step 5 are shared and discussed trough chat and forum. Indicators used by teachers are compared with those used by researchers, then teachers use the grid indicators to analyse a new video.

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 required 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.
At this step it requires the help of mathematics teachers of the partner schools.

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. In chapter 2.1 there are many details.

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, drawing conclusions and taking feedback/reflection from the lessons

Modality: on platform

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.
Through a virtual meeting, share opinions about course and beliefs about formative assessment. 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. Through the various information from the course researchers can refine the grid.

3. Structure of course: organization (course light)

Hours	Face-to-face and Platform Training model	Only Platform Training model
Total	50 hours	50 hours
Face-to-face lessons	18-24 ore (6-8 lessons to 3 hours) (The number of face to face meetings can increase and decrease according to the needs of different countries, depending on the length of the phases 3 and 4).	
Work at home (planning lessons) and on the platform	12 hours of task + 14-20 hours of personal study and deepening.	30 hours on Platform and 20 hours of personal study and deepening.
ECTS	2 (50 hours)	

3.1 Structure of course face-to-face/platform

• Tools
- Questionnaire to be administered at the beginning and at the end of the course (the first questionnaire collects early 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).
- Course assessment questionnaire.
- Media repository, including videos (tool 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.
- Tutorials how to use platform.

• 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)**,** teachers from partners school.

• 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, with the main questions of the questionnaire administered by each country. disclaimer).

Step 2: Course presentation - Discussion on beliefs and practices

Modality: face to face.

Presentation of the European project and its principal objectives and potential for teachers and their students in the classroom.

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.

Comparison with the beliefs of teachers of mathematics in different countries: results of European questionnaires.

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: 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 4: - task: 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 5: Analysing formative assessment situations – Choosing a topic

Modality: face to face.

Considerations from step 4 are shared and discussed, then teachers are asked to analyse again the same videos using specific indicators created by researchers. 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:
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- 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 6 - Planning the lesson

Modality: e-learning platform and Media repository.

Participants are required 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. At this step it requires the help of mathematics teachers of the partner schools.

Step 7: 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.
At this step it requires the help of mathematics teachers of partner schools.

Step 8: 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 9: 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 10: 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.
Through the various information from the course researchers can refine the grid.