THE USE OF DIGITAL TECHNOLOGIES TO ENHANCE FORMATIVE ASSESSMENT PROCESSES

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Improving Progress for Lower Achievers through

Formative Assessment in Science and Mathematics Education
The FaSMEd framework to analyse the support given by technology to FA processes

The framework extends Black and William’s (2009) model to include the use of technology in FA processes.

Three main dimensions are considered:
- the five FA key-strategies introduced by Wiliam and Thompson (2007)
- the three main agents that intervene (the teacher, the student, the peers)
- the functionalities through which technology can support the three agents in developing the FA strategies.

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The five key-strategies that could be activated
The FaSMEd framework to analyse the support given by technology to FA processes

The three main agents in FA processes

- Teacher
- Peer
- Learner

Where the learner is going

1. Clarifying learning intentions and criteria for success
2. Understanding and sharing learning intentions and criteria for success
3. Understanding learning intentions and criteria for success

How to get there

2. Engineering effective classroom discussions and other learning tasks that elicit evidence of student understanding
4. Activating students as instructional resources for one another
5. Activating students as the owners of their own learning

The five key-strategies that could be activated

The functionalities through which technology can support the three agents in developing the FA strategies

(a) Sending and sharing: when technology is used to support communication among the agents of FA processes and to activate fruitful discussions.

(b) Processing and analysing: includes all the functionalities that support the processing and the analysis of the data collected during the lessons.

(c) Providing an interactive environment: those functionalities of technology that enable to create a shared interactive environment within which students can work individually or collaboratively on a task or a learning environment where mathematical/scientific contents could be explored.
The FaSMEd framework to analyse the support given by technology to FA processes

THE FASMED PROJECT IN ITALY

The technology we have identified

- Tablets for the students, who work in pairs;
- Computers for the teachers;
- Interactive whiteboard or data projector.

The activities carried out in the classes

- Argumentation as a FA tool
- Content: Relations and functions, through their different representations (verbal, symbolic, graphic, tabular).
- Integration of the use of connected classroom technologies within a set of activities coming from different sources.
we investigate the **FA processes** that take place in the mathematics classroom context, thanks to the support provided by technology and to the teacher’s choices.

we highlight the complex dynamical development between the different **FA strategies** activated by the agents involved.

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**ANALYSIS OF AN EPISODE: THE ACTIVITY**

**Worksheet 1**

Every morning Tom walks along a straight road from his home to a bus stop, a distance of 160 meters. The graph shows his journey on one particular day.

What happens in the period of time between 50s and 70s? How did you establish it?

- Grade 5
- Focus on **time-distance graphs**
- Discussion on 4 different answers selected and displayed on the IWB.

**Researcher** present as a participant observer, supporting the teacher in managing the discussion.
ANALYSIS OF AN EPISODE: THE DISCUSSION

FIRST PART OF THE DISCUSSION:

• Most of the students think that the answer is not correct and state that Tommaso walked for 40m, not for 60m

• Vincenzo and Mirco (the authors of the answer) declare that they were convinced by their classmates that their answer is not right

• Only one student, Arturo, declares that, in his opinion, the written answer is correct.

➡️ The teacher asks Arturo to explain why.

145. Arturo: ... if we look at the graph, he (Tommaso) arrives at 100m, then he goes back.
146. Teacher: Do we all agree that he goes back? (A chorus of students answer “yes”)
147. Teacher: Who doesn’t agree on the fact that he goes back? (None of the pupils raises his/her hand)
148. Arturo: However, he goes back to 40m, not for 40m (stressing on the words ‘in’ and ‘for’). So we have to do the subtraction 100 minus 40. And the result is 60, not 40. So it is correct.
149. Teacher: So is it (the answer) correct? Do you agree with Arturo? (to the class)
   Silence.
150. Researcher: Please repeat the words you used (speaking with Arturo), since they are very precise. Listen to them (speaking with the other students).

The discussion starts focusing on this answer:

“Tommaso, in 20 seconds, was able to walk for 60 metres. We know that in 20 seconds he walked for 60 metres because we took 50s away from 70s, obtaining 20s, then we subtracted 60m from 100m and we obtained 40 metres.”
ANALYSIS OF AN EPISODE: THE DISCUSSION

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ANALYSIS OF AN EPISODE: THE DISCUSSION

Arturo repeats his reasoning, stating it slower and stressing the most important words, as asked. In particular, he explains that 60m is the result of the difference between 100m and 40m.

166. Researcher: You (speaking to Vincenzo and Mirco) said that you wanted to change your answer. Would you still change it or would you keep it as it is?
167. Mirco: We would keep our first answer.
168. Researcher: Ok. I have one question for all of you (speaking to the whole class): what is missing in this answer?
169. Mirco: That Tommaso went back! We did not write it.
170. Researcher: You did not say that Tommaso went back.

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GLOBAL LECTURE OF THE EPISODE

The FA processes that take place

The Sending and Displaying functionality supported the teacher in activating different FA strategies.

The teacher/researcher and the students themselves play a fundamental role in the activation of all these strategies.
GLOBAL LECTURE OF THE EPISODE

1. The students, thanks also to the support provided by the teacher, exploit the provided feedback, activating themselves as owners of their learning: STRATEGY 5

2. Engineering of the class discussion (strategy 2) to activate other FA strategies

3. The teacher asks to students to comment on a list of selected written productions, with the aim of activating the students as instructional resources for one another: STRATEGY 4

4. The students provide feedback to each other and the teacher, too, comments, providing further feedback: STRATEGY 3

GLOBAL LECTURE OF THE EPISODE

Dynamical development between the activated FA strategies

Working on strategies 2, 3 and 4 (possibly 1) is a promising road towards the goal of making students activate strategy 5 by themselves.
GLOBAL LECTURE OF THE EPISODE

Dynamical development between the activated FA strategies

THANK YOU!