



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 Wiliam's (2009) model to include the use of technology in FA processes.

Three main dimensions are considered:

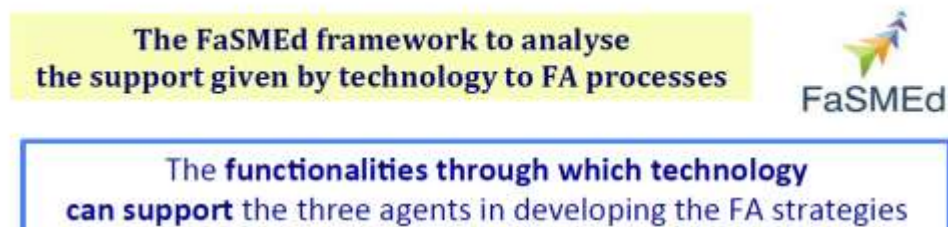
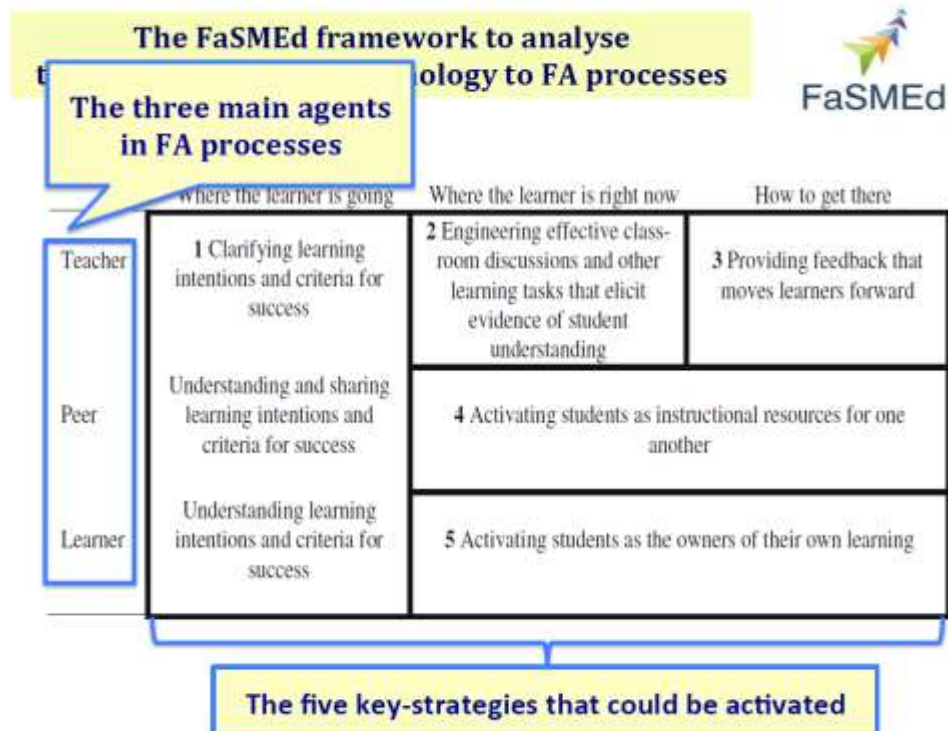
- the five **FA key-strategies** introduced by Wiliam and Thompson (2007)
- the **three main agents** that intervene (the teacher, the student, the peers)
- the **functionalities through which technology can support** the three agents in developing the FA strategies.

**The FaSMEd framework to analyse
the support given by technology to FA processes**



	Where the learner is going	Where the learner is right now	How to get there
Teacher	1 Clarifying learning intentions and criteria for success	2 Engineering effective class-room discussions and other learning tasks that elicit evidence of student understanding	3 Providing feedback that moves learners forward
Peer	Understanding and sharing learning intentions and criteria for success	4 Activating students as instructional resources for one another	
Learner	Understanding learning intentions and criteria for success	5 Activating students as the owners of their own learning	

The five key-strategies that could be activated

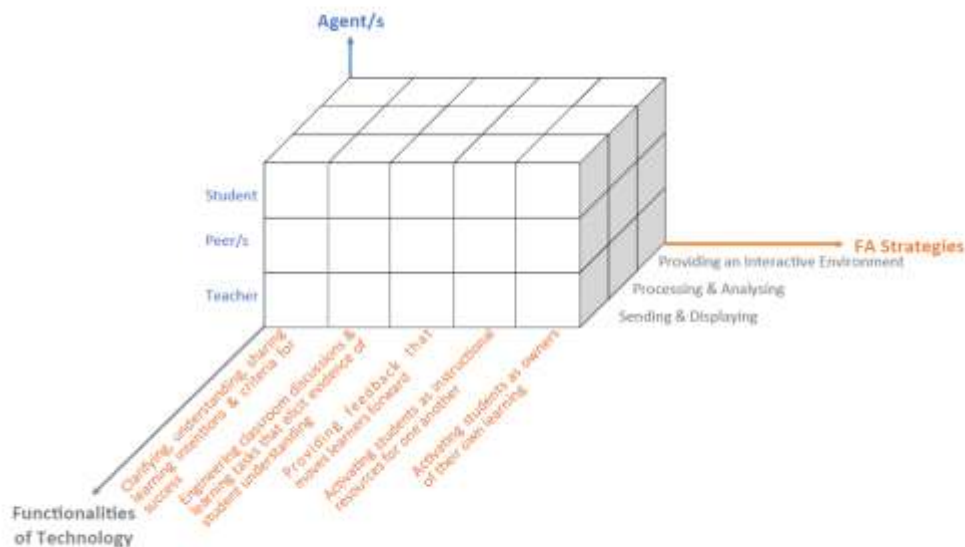


(a) Sending and sharing: when technology is used to support communication among the agents of FA processes and to activate fruitful discussions.

(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

Connected classroom technology



- **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**.





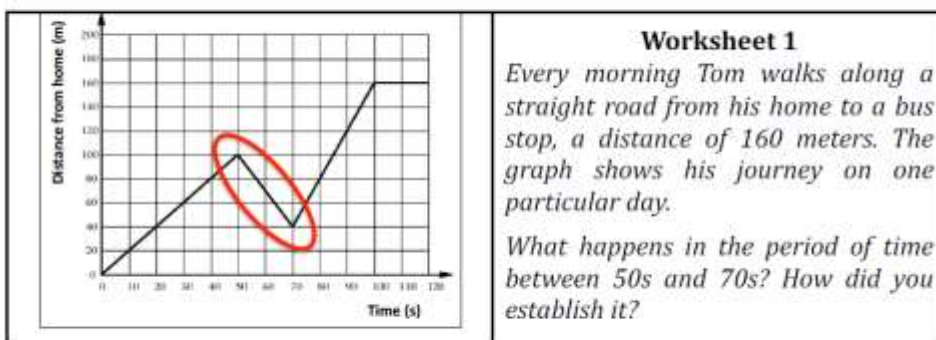
IN THIS CONTRIBUTION



→ 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

ANALYSIS OF AN EPISODE: THE ACTIVITY



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

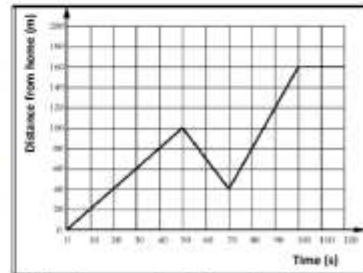
Researcher present as a **participant observer**, supporting the teacher in managing the **discussion**.

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.



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

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

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")

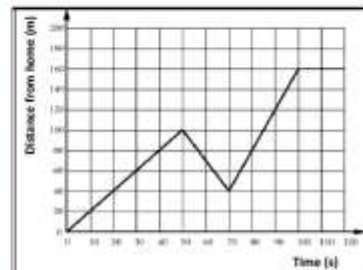
147. Teacher: Who doesn't agree on the fact that he goes back? (None of the pupils raises his/her hand)

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).



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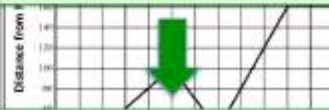
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The functionality of technology:
SENDING & DISPLAYING



FA STRATEGY 2:
Engineering effective classroom discussions that elicit evidence of student understanding

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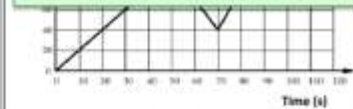
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Arturo is activated as an instructional resource for his classmates

→ FA STRATEGY 4



What happens in the period of time

FA STRATEGY 3 AT THE PEERS' LEVEL:
Arturo provides feedback to his classmates

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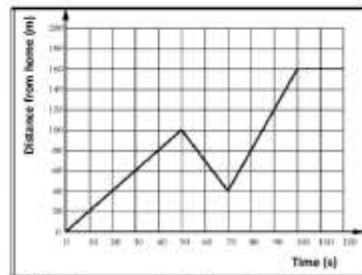
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FA STRATEGY 3 AT THE TEACHER'S LEVEL:
the Researcher recognizes that the student has provided a correct argument.

obtaining 20s, then we subtracted 60m from 100m and we obtained 40 metres".

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.

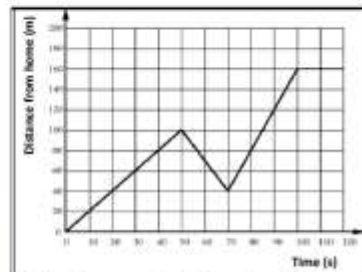
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167. Mirco: We would keep our first answer.

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169. Mirco: That Tommaso went back! We did not write it.

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FA STRATEGY 5 AT THE TEACHER'S LEVEL:
Activating students as the owners of their own learning

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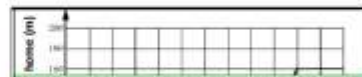
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FA STRATEGY 3 AT THE TEACHER'S LEVEL:

The researcher accepts Mirco's answer without further questioning it

She prompts students to focus on the same answer and look for something that is missing

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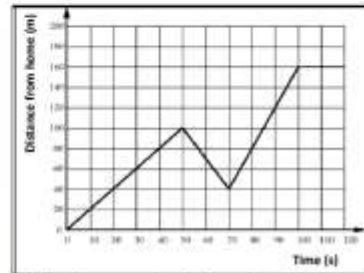
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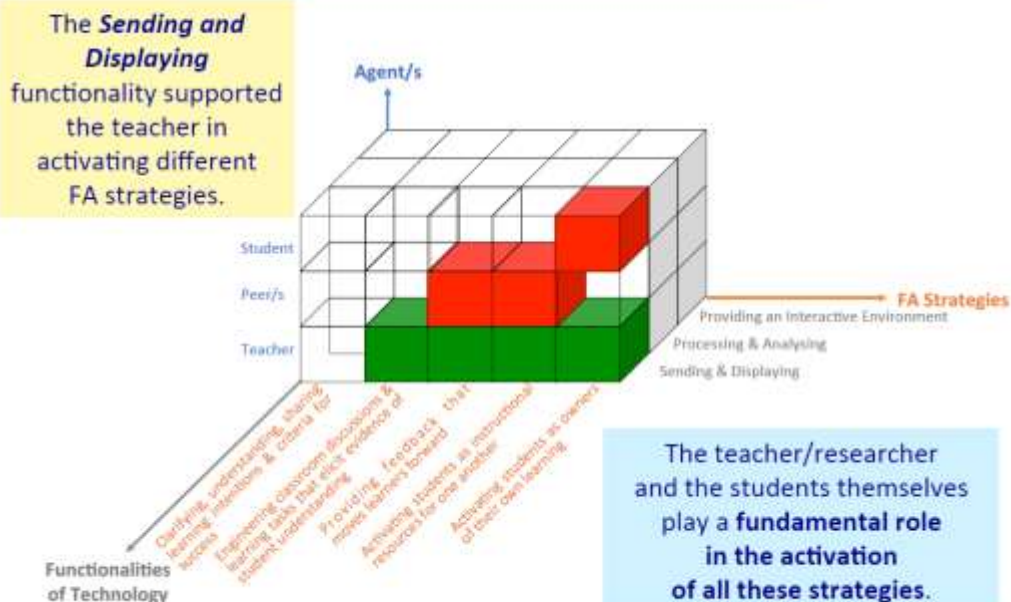
FA STRATEGY 5 AT THE LEARNER'S LEVEL:

Mirco shows that he really has activated himself as the owner of his own learning

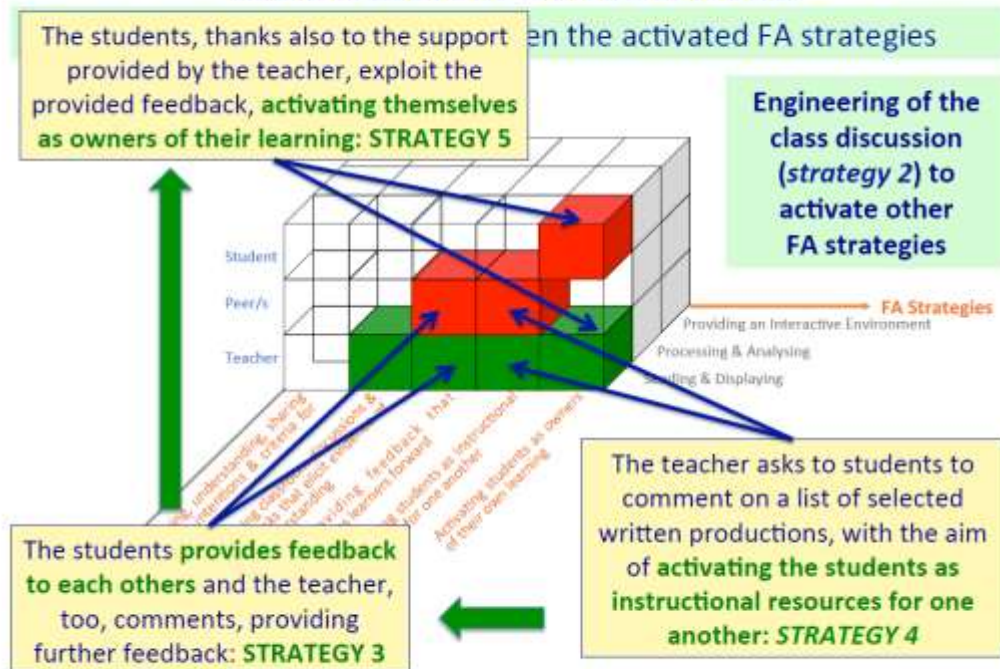
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GLOBAL LECTURE OF THE EPISODE

The FA processes that take place

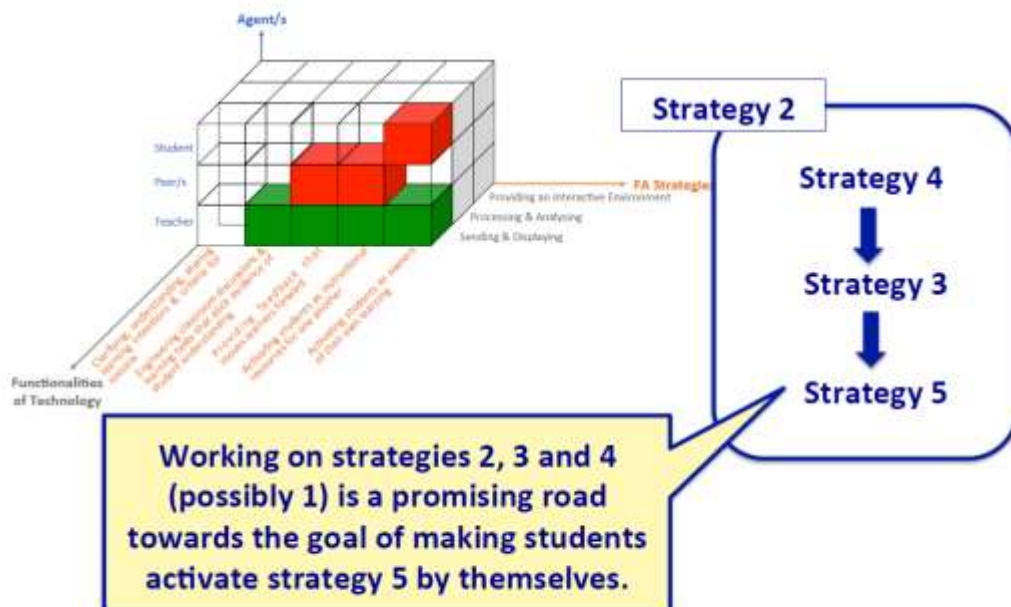


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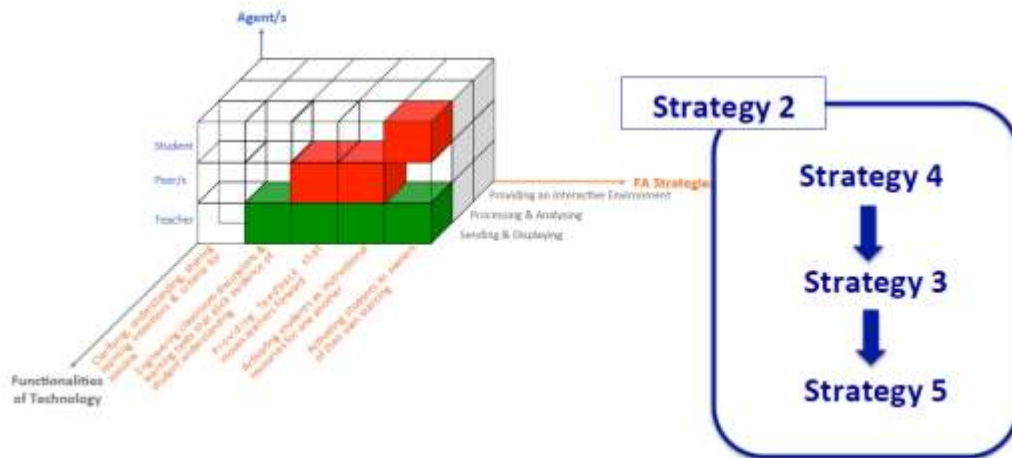
GLOBAL LECTURE OF THE EPISODE

Dynamical development between the activated FA strategies



GLOBAL LECTURE OF THE EPISODE

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THANK YOU!