PANEL

"Integration of Theory and Practice and/or/versus (Evidence-Based) Research as a Service to Practice"

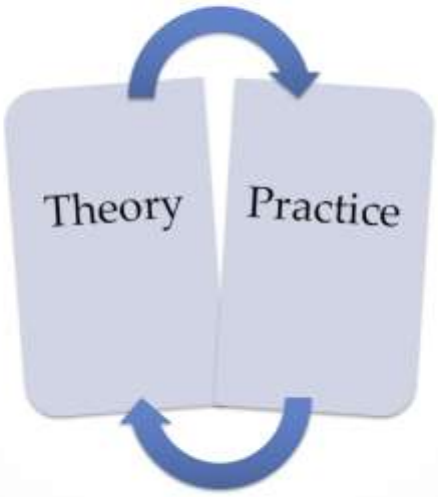
"Intégration de la théorié et des pratiques et/ou/versus recherches empiriques au service des pratiques"

Theory and Practice as a dialectical relatioship: an example from the FaSMEd Project

Cristina Sabena
(University of Torino, Italy)

CIEAEM Restricted Meeting – Prague, July 22-23, 2016

Theory and Practice as a dialectical relationship



Theory and Practice as a dialectical relationship

[P,M,Q]

Radford, 2008

Theory can be seen as a **way of producing understandings and ways of action** based on:

- A system, **P**, of **basic principles**, which includes implicit views and explicit statements that delineate the frontier of what will be the universe of discourse and the adopted research perspective.
- A **methodology**, **M**, which includes techniques of data collection and data-interpretation as supported by P.
- A set, **Q**, of **paradigmatic research questions**: templates or schemas that generate specific questions as new interpretations arise or as the principles are deepened, expanded or modified.

Theory and Practice as a **dialectical relationship**: an example from the FaSMEd Project

Improving Progress for Lower Achievers through Formative Assessment in Science and Mathematics Education

FaSMEd

Principles:

- Formative Assessment is a suitable method for enhancing students' learning in math and science
- (New) technologies can support students and teachers in this respect

Theory and Practice as a **dialectical relationship**: an example from the FaSMEd Project

Formative assessment strategies:

Black & Wiliam, 2009

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

Theory and Practice as a **dialectical relationship**: an example from the FaSMEd Project

Formative assessment strategies:

Black & Wiliam, 2009

	Où les élèves doivent aller ?	Où les élèves en sont ?	Comment y aller ?
Professeur	Clarifier les intentions didactiques et les critères de réussite.	Construire des interactions dans la classe pour mettre en évidence les connaissances des élèves.	Produire les rétroactions permettant de faire avancer les élèves.
Groupe classe	Comprendre et partager les intentions d'apprentissage et les critères de réussite.	Mettre les actions et les productions de chacun à disposition des autres.	
Elève	Comprendre les intentions d'apprentissage et les critères de réussite.	Méta-cognition : réfléchir et agir sur son propre apprentissage.	

Theory and Practice as a **dialectical relationship**: an example from the FaSMEd Project

Improving Progress for Lower Achievers through Formative Assessment in Science and Mathematics Education

Methodology

- **Design-based research**

An Example from the FaSMEd Project

Improving Progress for Lower Achievers through Formative Assessment in Science and Mathematics Education

Methodology

- **Design-based research**: a formative approach in which a product or process is envisaged, designed, developed and refined through cycles of enactment, observation, analysis and redesign, with systematic feedback from practice.

Theory and Practice as a **dialectical relationship**: an example from the FaSMEd Project

Improving Progress for Lower Achievers through Formative Assessment in Science and Mathematics Education

FaSMEd

Research Question:

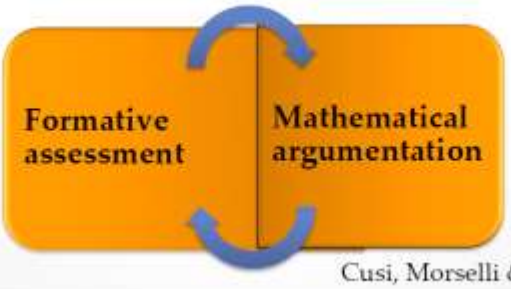
- How can technology be used in order to foster formative assessment classroom practices in ways that allow teachers to respond to the emerging needs of low achieving learners in mathematics and science so that they are better motivated in their learning of these important subjects?

Theory and Practice as a **dialectical relationship**: an example from the FaSMEd Project

- **At a local level:** Torino Unit

Additional Principles:

- Formative Assessment may be fruitfully linked to argumentation processes in order to foster mathematical thinking



Cusi, Morselli & Sabena (in print)

Theory and Practice as a **dialectical relationship**: an example from the FaSMEd Project

- **At a local level:** Torino Unit

Additional Principles:

- During class activities, and in particular in formative assessment activities, it is important to **enable students to make their thinking visible** (Collins, Brown and Newmann 1989) and **share** it with the teacher and the classmates.

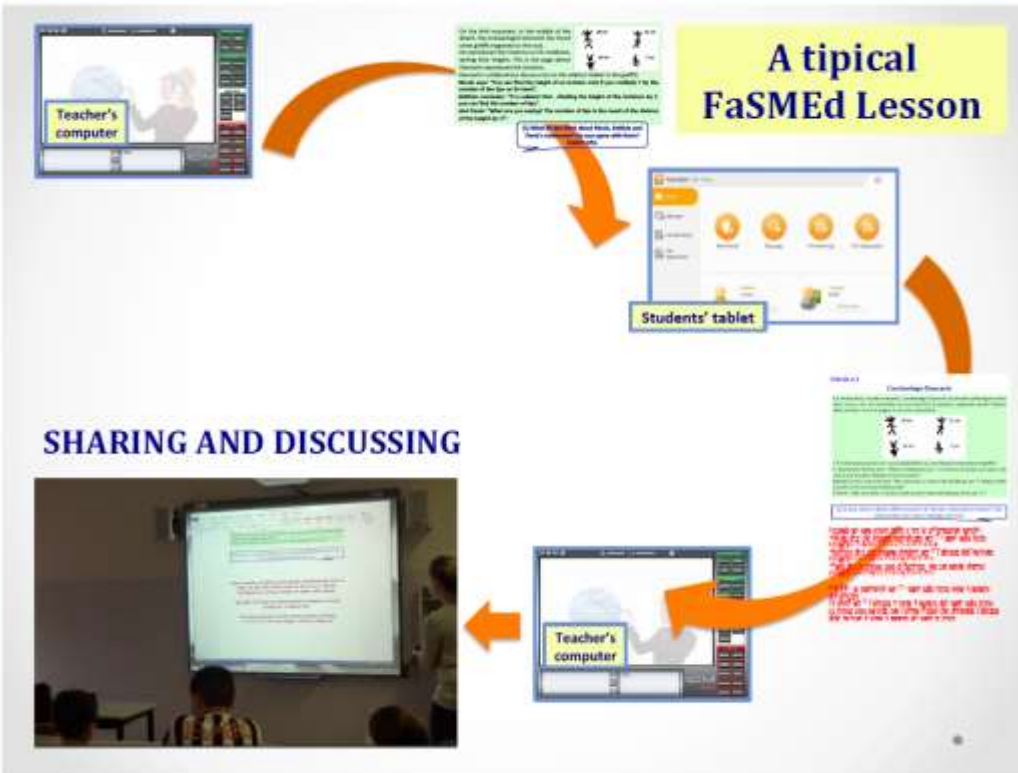
Collins, A., Brown, J.S. e Newman, S.E. (1989). Cognitive Apprenticeship: Teaching the Crafts of Reading, Writing and Mathematics! In L.B. Resnick (Ed.), *Knowing, Learning, and Instruction: Essays in Honor of Robert Glaser* (pp. 453-494). Hillsdale, NJ: Lawrence Erlbaum Associates.

Theory and Practice as a **dialectical relationship**: an example from the FaSMEd Project

- **At a local level:** Torino Unit

Methodology

- Group-works + classroom discussions
- Use of connected-classroom technology



A quick zoom during the teaching-experiment

- Grade V
- During the group-work phase, students faced the following task:

Between two plants, two parking lots can be placed, as in the following drawings:

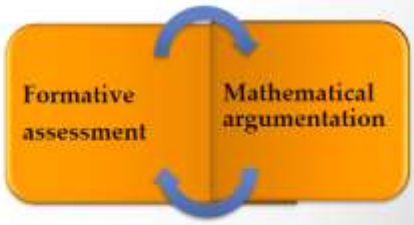
How many parking slots, if there are 37 plants?

From The Unit "Sequences as functions" – ArAI Project

A quick zoom during the teaching-experiment

- Almost all groups found the correct result (72 parking slots), but following different reasoning paths, with different arguments
- The teacher-researcher (Annalisa Cusi) is coordinating the classroom discussion and projecting the students' answers.
- They are now discussing the formula **37 x 2 – 2**, and Annalisa asks for a justification: **why did they do 37 x 2 – 2?**
- **Sofia** begins to explain:

Video 1



A quick zoom during the teaching-experiment

Transcript

- **Sofia**: In my opinion it is right to do times 2 minus 2 because if… there are all the trees that…between two trees there are two parking lots, but between the first and the last…between the first and the last one there are not two parking lots
- **Annalisa**: would you like to come at the whiteboard, so you explain with the drawing, which may be easier?

A quick zoom during the teaching-experiment

- **Sofia** begins to explain, and the **teacher** asks her to come at the blackboard.

Principle

- **enabling students to make their thinking visible** and **share** it with the teacher and the classmates.

Theory guided practice…

…Annalisa was at the same time researcher and teacher!

A quick zoom during the teaching-experiment

- Sofia agrees to come at the whiteboard to explain her idea:

Video 2

A quick zoom during the teaching-experiment

Transcript

- **Annalisa**: let's take one of these drawings and let's reason on it
- **Sofia**: because…in between these two, for instance, there is a…a parking lot, but between the first and the last one, here and here, there is not parking lot, so minus 2

For the discussion

How would you (as teachers) react to Sofia's explanation?

Is your answer guided by
- your experience?
- your theoretical principles?
- …

- **Sofia**: because…in between these two, for instance, there is a…a parking lot, but between the first and the last one, here and here, there is not parking lot, so minus 2

Thank you
Merci

Research funded by FP VII European Project
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FaSMEd

Coda 1_Practice – How Annalisa did react

- **Annalisa**: Ah! Vittorio you want to interveene: I see your hand up.
- So, Sofia was saying: *Between the first one and the last one there is no parking lot, so I have to take away 2!*

- **Amplifying a piece of Sofia's argument, so to make her thinking visible** and **share** it with the classmates
- **Focusing student's attention on the *wrong warrant* of the argument**
- **Activating students as resources for one another**

Coda 2_Research – Taking another "regard"

- **Sofia**: because…in between these two, for instance, there is a…a parking lot, but between the first and the last one, here and here, there is not parking lot, so minus 2



- **Annalisa**: Ah! Vittorio you want to interveene, I see your hand up. So, Sofia was saying: *Between the first one and the last one there is no parking lot, so I have to take away 2!*

Coda 2_Research – Taking another "regard"

Even if the main focus of design was on the role of verbal and written resources (words, drawings, tables, graphs), looking at the actual practice also gestures and embodied acts come to the front as important resources for Formative Assessment practices

Coda 2_Research – Taking another "regard"

they can be analysed with proper theoretical and methodological tools

Even if the main focus of design was on the role of verbal and written resources (words, drawings, tables, graphs), looking at the actual practice also gestures and embodied acts come to the front as important resources for Formative

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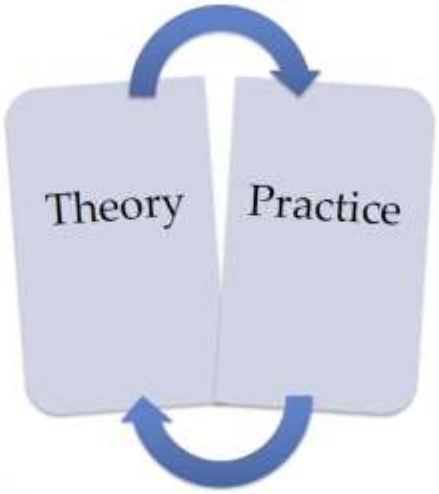
New Research Question

- **How can** gestures be exploited by the teacher as resources for Formative Assessment processes in the classroom?

Theory and Practice as a dialectical relatioship



…a never ending story