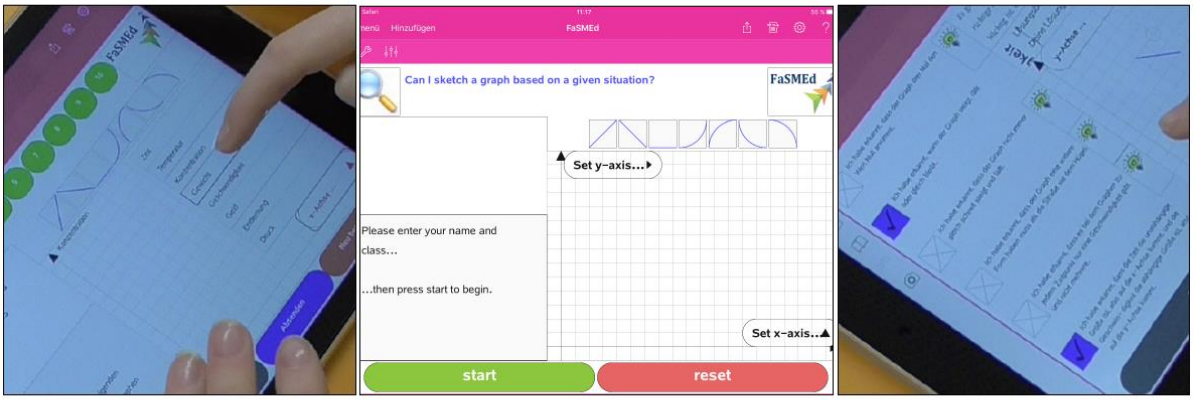
Developing a Digital Tool for Formative Self-Assessment



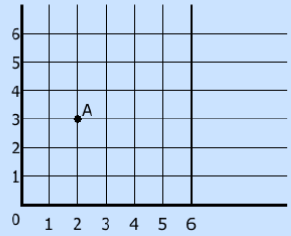
Aim

Technology enhanced self-assessments often look like this:

„Self" refers mostly to the organization of the assessment

Question

Q1. Which of the following is the co-ordinates of the point A given in the graph below ?



Answer

A. (3,2)
B. (3,3)
C. (2,3) ✓
D. (2,2)

Evaluation is based on two categories: right or wrong

Well Done!

Technology takes on the role of the assessor

◀ Previous Next ▶ Show Topics

(www.wwolt.com)

Aim

BUT:

- active involvement of students is a key aspect of formative assessment
- investigating their (mis-)conceptions helps students to:
  - gain sensitivity for their strengths and weaknesses
  - use metacognitive strategies
  - adopt responsibility for their own learning process

Aim: Develop a digital tool that allows students to become assessors themselves!

(Black & Wiliam 2009, Wiliam & Thompson 2007, Heritage 2007)

Agenda

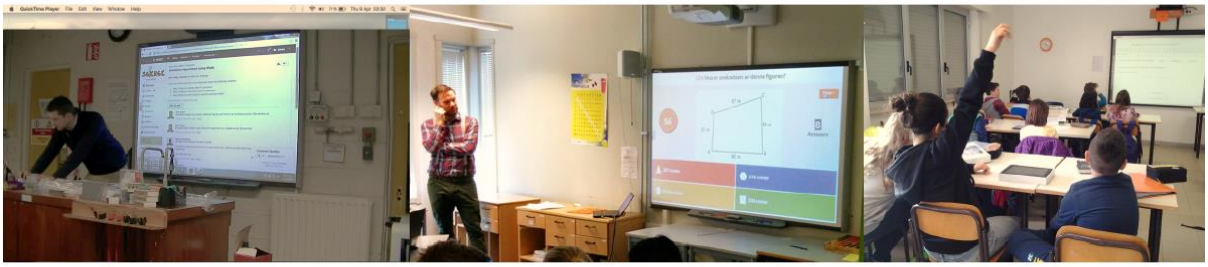
- Context: EU-Project FaSMEd
- Theoretical Background
- Tool Design
- Methodology
- First Results of Case Studies

Context

FaSMEd = Raising Achievement through Formative Assessment in Science and Mathematics Education

- Introduction and investigation of technology enhanced formative assessment practices
- design-based research
- 2014 - 2016
- 9 partners in 8 countries: FR, IE, IT, NL, NO, UK, ZA, DE

Final Toolkit will be available 12/16 : **www.fasmed.eu**



online learning communities | quick polls | connected classroom

Theoretical Background

Formative Assessment (FA)

"Assessment can be considered **formative**
only if it results in action by the teacher and students
to enhance student learning."

(Bell & Cowie 2001, p.539)

Theoretical Background

Conceptualizing formative assessment

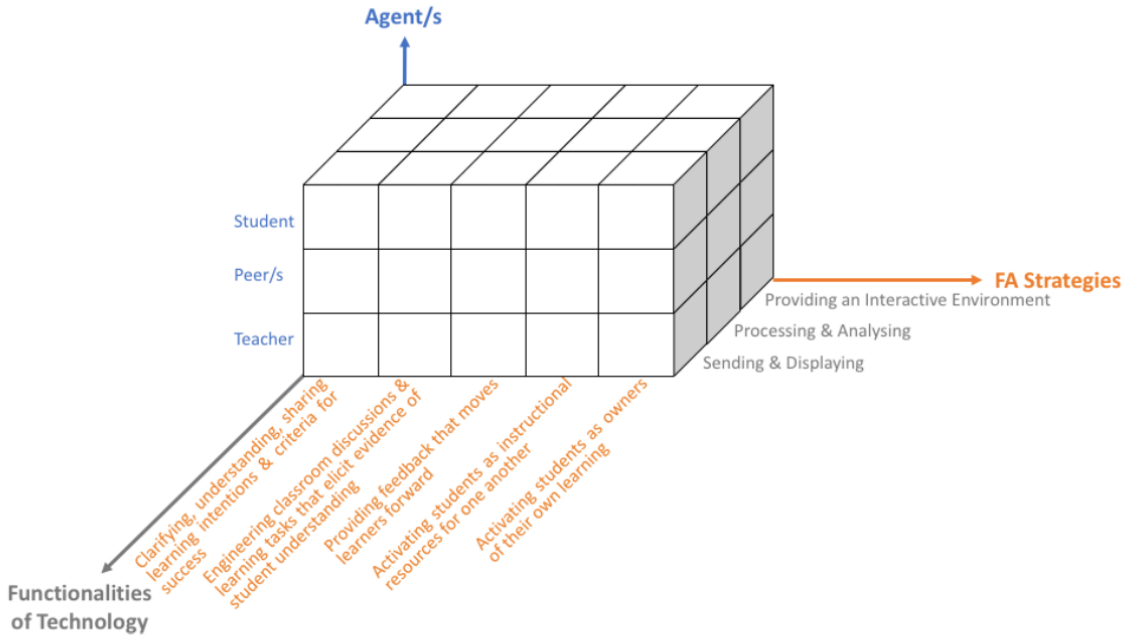
Wiliam & Thompson (2007) conceptualize FA in **5 key strategies**:

	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	

(Black & Wiliam 2009, Wiliam & Thompson 2007)

Theoretical Background

Conceptualizing formative assessment - FaSMEd framework



(www.fasmed.eu)

Theoretical Background

The concept of functions

Transformation of representations:

situational description

graphical representation

(Barzel 2009, Duval 2002)

Mental mathematical representations of functions („Grundvorstellungen"):

mapping	covariation	object
The function maps one value of the independent quantity to exactly one value of the dependent quantity.	The function describes the change of two quantities with each other.	The function as a whole describes a new object.
static local view	dynamic regional view	structural global view

(Blum 1998, Dubinsky & Harel 1992, Tall 1996, Vollrath 1989, Vom Hofe & Blum 2016)

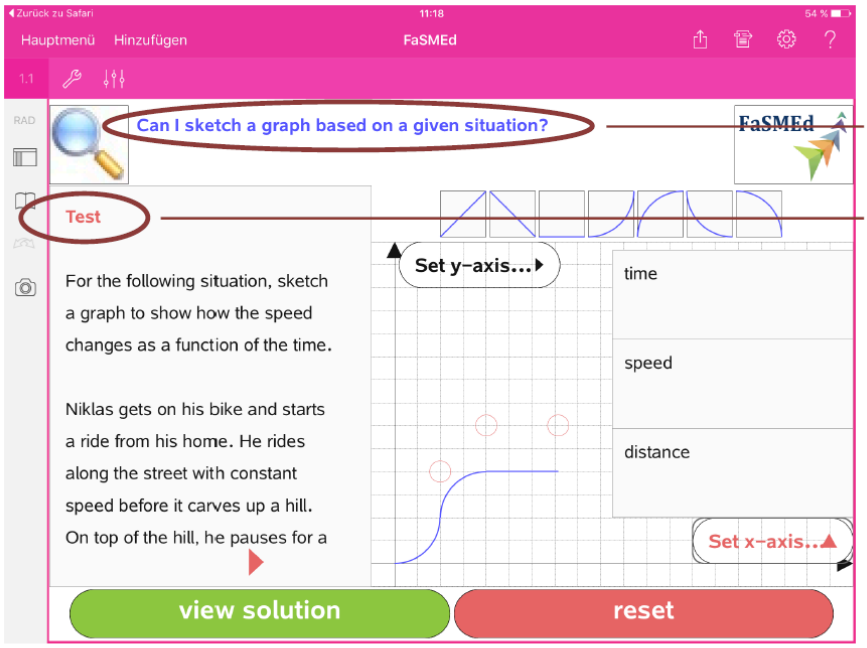
Typical misconceptions:

- Graph as a picture
- Swap axes
- ...

(following Busch 2015, Clement 1985, Hadjidemetriou & Williams 2002, Leinhardt et al. 1990)

Tool Design

Open assessment task „Test"

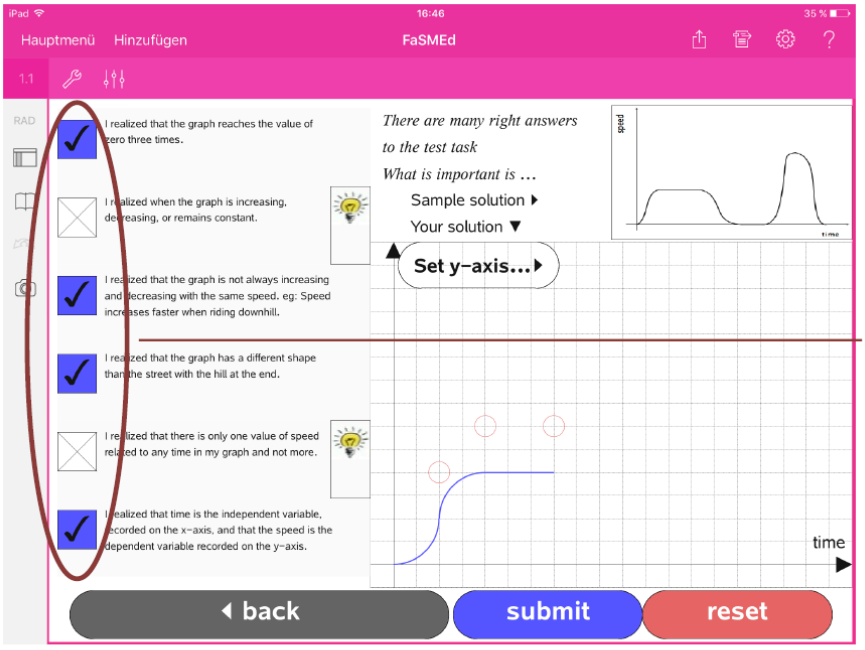


Identify learning intentions

Elicit evidence of student understanding

Tool Design

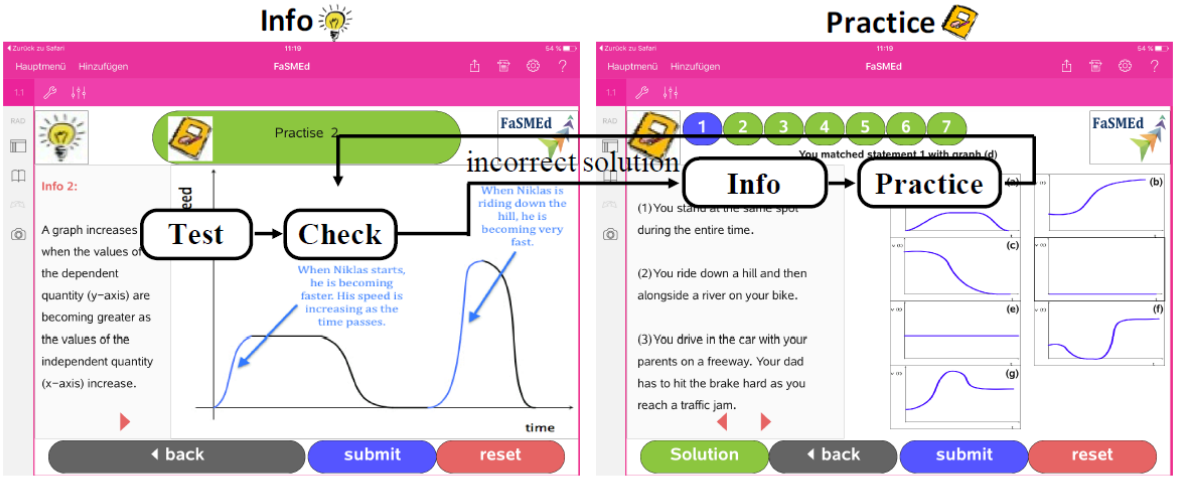
Check



- Understand criteria for success
- Elicit evidence of student understanding
- Support to formulate feedback

Tool Design

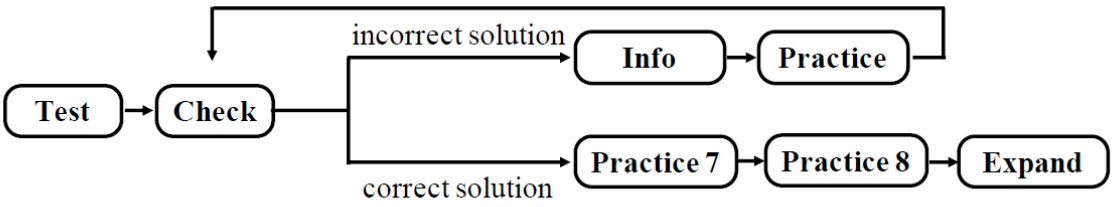
Structure



Activates students as owners of their own learning

Tool Design

Structure



Methodology

Methodology:

- Design-based research
- Case studies: task based interviews & class trials
  - Pilot: pen-&-paper version: 11 students, grade 8 (2 schools)
  - Pre-run: digital version: 18 students, grade 10
  - Cases (Dec 15): 2 students + classes, grade 10 (2 schools)
  - Cases (May 16): 2 university students (2nd semester)

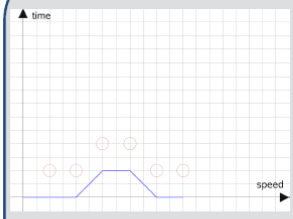
Hypothesis: A digital tool with a hyperlink structure based on typical misconceptions can support students' formative self-assessment.

First Results of Case Studies

We can reconstruct processes of FA as students are able to:

- identify mistakes based on the check (S1)
- identify correct aspects of their work (S2)
- decide to take further steps in their learning
- reflect upon their work
- formulate self-feedback

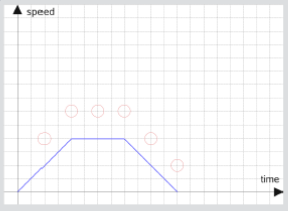
S1



Check:
„I realized that the time is the independent variable recorded on the x-axis and that the speed is the dependent variable recorded on the y-axis."

„The speed and time were wrong, because there [x-axis] needs to be the time and there [y-axis] the speed. I did not realize this."

S2



Reads the ***Info*** concerning the same check-point.

„Oh, that is correct as well, because I did it the same way."

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Open-Minded

First Results of Case Studies

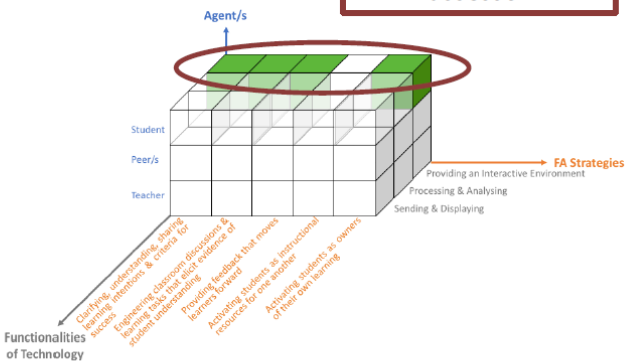
FaSMEd

We can reconstruct processes of FA as students are able to:

- identify mistakes based on the check
- identify correct aspects of their work
- decide to take further steps in their learning
- reflect upon their work
- formulate self-feedback

Hints for students in the role of the assessor

These FA processes can be characterized:



Self-assessment is difficult for students:

- expect feedback from tool or teacher → need for instruction & training
- don't identify all of their mistakes → need for enhancement of tool
- don't overcome all of their mistakes → need for deeper analysis of learning processes

Discussion

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