Developing a Digital Tool for Formative Self-Assessment

Hamburg, 29th July 2016

Aim

Technology enhanced self-assessments often look like this:

Question:
Which of the following is the co-ordinates of the point A given in the graph below?

Answer:
A. (3.3)
B. (4.3)
C. (2.3)
D. (4.7)

Well Done!

"Self" refers mostly to the organization of the assessment

Evaluation is based on two categories: right or wrong

Technology takes on the role of the assessor

(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
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

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

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

(Black & William 2009, William & Thompson 2007)
Theoretical Background

The concept of functions

Transformation of representations:

situational description  ➔  graphical representation

(Mental mathematical representations of functions („Grundvorstellungen“):

- **mapping**
  - The function maps one value of the independent quantity to exactly one value of the dependent quantity.
  - Static local view

- **covariation**
  - The function describes the change of two quantities with each other.
  - Dynamic regional view

- **object**
  - The function as a whole describes a new object.
  - Structural global view

(Typical misconceptions:
  - Graph as a picture
  - Swap axes
  - ...)


Tool Design

Open assessment task „Test“

Identify learning intentions
Elicit evidence of student understanding

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Tool Design

Structure

Info

Practice

Activate students as owners of their own learning

Check ✔ ✗

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

There are many right answers to the test task.
What is important is...

Set y-axis...

Time

Submit | Reset

Fail

Requirements

Correct solution

Incorrect solution

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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.”
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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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First Results of Case Studies

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- identify mistakes based on the check
- identify correct aspects of their work
- decide to take further steps in their learning
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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

questions?

comments?

Thank you for your attention!

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References

References


www.fasmed.eu

www.wwolt.com