FaSMEd

Formative assessment in mathematics: a design research project

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What’s the problem?

Low attainment in mathematics

"...In the EU-27 in 2009, an average 22.2% of students were low achievers in mathematics." (Eurydice, 2011)

"South Africa is significantly underperforming in education, particularly mathematics teaching and learning." (CDE 2013)

Teaching

• Teachers matter

• Teaching can be improved

• Using formative assessment

• Using technology

• Helping teachers
FaSMEd: an attempt to improve teaching

- Formative assessment (Fa)
- In science and maths (SM) education (Ed)
  - A three year research project
  - Funded by the European Union
  - Involving nine partners (8 EU and South Africa)

What we do

- Nine workpackages (WP)
- WP 3 - design a toolkit
- WP 4 - classroom interventions
This presentation is about the classroom interventions: what teachers chose to do and why

Theoretical framing

• Design research for the toolkit
  Try something new
  - review and improve
  - try again

• The role of the teacher

• Formative assessment
  - gather information about students’ understanding
  - act accordingly
  - deliberate

• Learning theories
  - social constructivism
  - creating concepts with others
  - as language and tools used and internalised

E.g.: Carraher & Schielmann, 2002; Cobb, Confrey, DiSessa, Lehrer, & Schauble, 2003; Collins, Joseph, & Biehaczyk, 2009

E.g.: Black and William (2006)

E.g.: Vygotsky (1978), John-Steiner (1996)
The interventions

• 20 teachers in 10 secondary schools with students in Grades 8, 9, 10
  - 3 lessons each
  - planning together
  - write up lessons, video
  - interviews
  - cluster meetings

• February to November 2015

• Try out ‘learning experiences’ (lessons)

• Small groups
  - discussion
  - card sorting or matching
  - OR problem solving

• Formative assessment

Origin of the ‘learning experiences’

• Mathematics Assessment Project (Nottingham)
  - pre- and post-lesson assessment
  - active learning approaches
  - advice and guidance for teachers

• Created by us
Guidance

Multiple representations

- Exponents
  - statements

- Comparing numbers
  - (description of numbers)
  - table of values

- Interpreting expressions
  - (equations)

- Time-distance graphs
  - (description of graphs)
  - values

Exponential Growth
Classifying

- Equations and identities
- Central tendency
- Revision
- Quadrilaterals

Overall findings: what happened?

What teachers did

- planning the activity
- introducing the activity in the classroom
- during the task
- finishing off

Our journey with the teachers
Planning the activity

- Choice of lesson
- The design of the tasks
- Lesson plan

Starting the lesson

Following the script
Modelling the activity and using mini whiteboards

'Go!'
During the lesson | "Nothing to do"

During the lesson | Teaching ...
Finishing off  Answers on the board

Finishing off  Going through the answers
Formative assessment

- Good teaching
- Mini whiteboards
- Card activities
- Answers

An important side-effect: teacher learning

- the possibility of creating a space for learning
- the teacher’s role once the space has been created
- the value of using “active learning” tasks
  - FaSMEd tasks
  - self made tasks
- the value of finding out what learners know (FA)
  - using mini whiteboards
  - using pair work
Create a space and learning can take place

made-me-think

made-us-discuss

What about the students? A quick questionnaire
Concluding comments

• A focus on the teachers

• Choices made

• Lesson learned for the toolkit

• More about FaSMEd in South Africa