Improving progress through Formative Assessment in Science and Mathematics Education - FaSMEd

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Improving mathematics and science education is not only a concern in developing countries such as South Africa. For example, the Rocard report (2007) identified widespread concern across the European Union about the economic consequences and social impact of underachievement in mathematics, science and technology education. This concern has resulted in numerous research projects including FaSMEd, the project described below.

FaSMEd is a research project in mathematics and science education, with a particular focus on supporting teachers in the use of formative assessment with low achieving students. Supporting teachers through professional development is important as teacher quality is linked to student success (Rockoff, 2004; Rivkin, Hanushek & Kain, 2005). This is particularly relevant in South Africa where Joubert's research, also reported at SAARMSTE 2015, reveals that the general belief is that poor teaching is the major cause of the mathematics problems.

Formative assessment, which is concerned with collecting evidence about student learning to make informed decisions about how to process with the instruction, has been shown to improve student achievement (Wiliam, 2011: 50). This is because it is never possible to predict what students will learn from a particular lesson (Wiliam, 2011: 50) and so by adjusting the sequence or content of a lesson, based on what students have in fact learnt so far, the lesson becomes more relevant. By focusing professional development on formative assessment teacher quality and subsequently learner achievement can be improved.

The research described in this snapshot will be done in South Africa by the African Institute for Mathematical Sciences Schools Enrichment Centre (AIMSSEC), and is part of FaSMEd, a larger research project funded by the European Union under the 7th Framework Programme. FaSMEd, which began in January 2014 and runs until December 2016, involves nine partners (eight from European countries and AIMSSEC from South Africa) and aims to design activities that can be used to support formative assessment in mathematics classrooms as well as appropriate support material for teachers to use these activities effectively.

The project has two main research components:

- a design research phase (January 2015 to December 2015) to develop a "toolkit" comprising classroom activities with an emphasis on formative assessment (including activities, lesson plans and guidance for teachers). This involves working closely with between six and eight teachers, from three or four schools to understand what works for them, using instruments such as interviews, questionnaires and classroom observation (using video and observation schedules).

- a case study phase (January 2016 to September 2016) in which between 20 and 30 other teachers use the toolkit developed in the previous phase in their classrooms. For the teachers this will involve working through the guidance and any other supporting materials to prepare for the lesson, and then teaching the lesson using the activities in the toolkit. The research will focus on what happens in the classroom, and in particular a) changes in teachers' practice and b) learner responses to activities.

According to Van den Akker, Gravemeijer, McKenny and Nieveen (2006: 3), design research "stems from the desire to increase the relevance of research for educational policy and practice". As such it is an appropriate research approach for FaSMEd, which aims to produce research relevant to both the educational practice of the teachers involved and relevant to the educational policies of the participating countries.

Following a design research approach, the toolkit will be developed through an iterative process of analysis, design, evaluation and revision (Plomp & Nieveen, 2003:17). The six to eight teachers selected for the first phase will be very involved in the evaluation stage in this process. They will use activities from the initial toolkit, along with supporting material, to plan and teach a number of lessons. Together with the other teachers and the researchers they will then reflect on these lessons and on the activities. This feedback will be used to revise the toolkit and will also provide case studies, which will be included in the final version of the toolkit. The revised toolkit will then be used with a larger group of teachers during the second phase.

Although this research is currently in its initial stages, the following has already been achieved:

- a literature review on the approaches to low achievers in mathematics in South Africa
- a literature review about the design of toolkits
- two workshops supporting teachers in the use of formative assessment (one at AMESA and one as part of a course in mathematical thinking offered by AIMSSEC).

By January 2015 the first version of the toolkit will have been developed, more workshops will have been presented, and schools and teachers will have been identified and selected for involvement in the first phase of the project. These and any other developments will also be reported on in the snapshot presentation.

References

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