

FaSMEd

Raising Achievement through
Formative Assessment
in Science and Mathematics
Education



Manual for Professional Development Digital Assessment Environment for Professional Development Leaders

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Subject: Mathematics

Age of students: 10 - 14 years

Used Technology: Digital Mathematics Environment © FI – Peter Boon



1. Introduction

1.1 The FaSMEd project

FaSMEd is an acronym for *Formative Assessment in Science and Mathematics Education*. The FaSMEd study is a large, international research project in which universities from England, Ireland, Germany, Norway, France, Italy, South Africa, and the Netherlands participate. The study is financed by the European Union and aims at the development and research of formative assessment in mathematics and science education. The Dutch FaSMEd project is conducted by the Freudenthal Group of the Faculty of Social and Behavioural Sciences at Utrecht University, in collaboration with the Freudenthal Institute. In this Dutch part of the project, a digital assessment environment is being developed for mathematics education in grades 5 and 6 of primary school.

1.2 Professional development

The goal of the professional development is on the one hand to reveal and extend teachers' notions and experiences on formative assessment and on the other hand to familiarise the teachers with a digital tool (Digital Assessment Environment) that enables them to check what their students can do with regard to the topics percents, fractions, the metric system, and graphs.

The purpose of the DAE is that teachers use the information about the mathematics skills that their students obtained to adapt their teaching to the students' needs. This may mean, for example, that teachers pay extra attention in class to a particular kind of problem, or that certain students receive additional instruction. The assistance provided can differ in nature, depending on the obstacles that students are facing.

This manual will offer you information about:

1. Formative assessment
2. Technology
3. Resources and preparation
4. A sample professional development plan.

2. Formative assessment

Assessment is usually directly associated with the use of standardised instruments with which the achievement level of students in certain content areas can be measured, based on which one can make decisions about, for example, passing an exam or giving students access to a particular school type. This form of assessment is called summative assessment and aims to give a final judgement about the competence of a student.

Formative assessment concerns interim assessment. This form of assessment is focused on finding indications for further instruction. Formative assessment is in fact something teachers do continually during teaching. After all, proper teaching means that the provided instructions match the competence of the students, that the teacher knows which stumbling blocks there are, but also that the teacher knows what will help the students to (further) develop their understanding or skill.

Information about this can be collected in a number of different ways; for example, by asking questions, by observing students as they work alone or in groups, by assigning a



series of teacher-developed problems, but also by administering an externally developed standardised test from a student monitoring system or a textbook, or having the students doing a test on the computer. All these methods of information collection are possible in formative assessment, as long as the assessment is focused on making didactical decisions. In other words, it is not in the first place the method of assessment that distinguishes between summative and formative assessment, but the intention with which it is conducted. An externally developed test can also be used formatively, but to yield true information for didactical decisions, it will have to produce more than a total score of correctly answered problems for each student. The Digital Assessment Environment that is being developed at Utrecht University within the FaSMEd project is not limited to providing such a total score, but also makes the students' strategies visible.

3. Technology

The technology that is used is the FaSMEd Digital Assessment Environment. It is a web-based environment with which teachers can collect information about their students' mathematics skills. The DAE was built within the Digital Mathematics Environment (DME). The DME is a software programme developed by Peter Boon and his colleagues of the Freudenthal Institute at Utrecht University. Teachers and students need an account in order to have full access to one of the most important features of the DME: The recording facilities. When students log in, the DME saves their work and process it into an overview so that the teacher can have easy access to their students' work. However, an overview in the DAE does not only make visible how many problems each student solved correctly, but also which auxiliary tool(s) the students used to reach their solutions. In this way, the DAE provides the teachers with important clues as to how students can be helped best to (further) develop an understanding or skill.

Information about a school account is available on www.dwo.nl/en

4. Resources and preparation

Resources

For the PD leader:

UU_PDmeeting1.pdf or UU_PDmeeting1.pptx

UU_PDmeeting2.pdf or UU_PDmeeting2.pptx

UU_PDmeeting3.pdf or UU_PDmeeting3.pptx

UU_ManualDAE_PD

For the teachers:

UU-TGpercents.pdf

UU-TGfractions.pdf

UU-TGmetric.pdf

UU-TGgraphs.pdf

UU_ManualDAE_teachers



Preparation

Step 1

- Download the files that are needed.
- Send a request for a school account on www.dwo.nl/en.
We advise to use just one school account for the PD. The participants get the role of the teachers of your “PD-school.” They create their classes and students in that school. This will be less time consuming, and you will always have an overview of the teachers’ and their classes’ work as a school administrator.

Step 2

- Set up a School admin account using the school’s school login and password as described in the UU_ManualDAE_PD.
- Log in as school admin on www.dwo.nl/dae and work through the files that are designed for the students.

Step 3

- Invite teachers for the professional development meetings and send them, for example, the teacher guide belonging to the first module on Percents (UU-TGpercents.pdf) and information on the Digital Assessment Environment (UU_ManualDAE_teachers).

Step 4

Make a reservation for a computer lab with the following requirements:

- computers with internet access and Java available in the computers’ browser
- a projector that is connected with one of the computers

5. Sample professional development plan

This sample professional development plan is organised in three meetings with the teachers, about 90 minutes each. The available presentation slides will guide you through each meeting.

Meeting 1

Materials:

UU_PDmeeting1.pptx (presentation slides)

UU-TGpercents.pdf (hand-out)

UU-TGfractions.pdf (hand-out)

During this meeting the teachers will be familiarised with the digital environment and will receive background information about the first two topics (Percents and Fractions) and about the use of the auxiliary tools that are available for students to use: scrap paper, a bar, a number line, a ratio table, or a hint. These auxiliary tools are optional. The students may

use them, but are not required to do so. However, by offering students this possibility, they get the chance to show what they are capable of with some support. In this way the ‘zone of proximal development’ is uncovered. To see which auxiliary tools students can use successfully is useful for the teacher to take further steps in their instruction.

Between Meeting 1 and Meeting 2, teachers have their students work in the DAE on the modules Percents and Fractions. Note that the students first work on “Percents on the computer” and then make “Percents test A” (“Percents test B” is optional). Then they work on on “Fractions on the computer” and then make “Fractions test A” (“Fractions test B” is optional).

Meeting 2

Materials:

UU_PDmeeting2.pttx (presentation slides)

UU-TGmetric.pdf (hand-out)

UU-TGgraphs.pdf (hand-out)

This meeting starts with a reflection on the experiences of the outcome of the first two assessed topics. How have the auxiliary tools been used by the students? Are they familiar with these tools? What ideas do the teachers have for further instruction?

When using the test data, three points of interest can be distinguished:

- the class as a whole
- individual students
- the learning opportunities offered by the textbook curriculum that is used

A particular point of interest concerns the mathematics textbook that is used in class. Based on the class overview of the students’ results connected to the key problems and auxiliary tools included in the DAE, the teacher can investigate whether the textbook offers sufficient learning opportunities to the students. Does the mathematics textbook pay enough attention to all of the core competencies and the auxiliary tools?

Then the next two topics are discussed: Metric and Graphs.

Between Meeting 2 and Meeting 3, teachers have their students work in the DAE on the modules Metric and Graphs.

Meeting 3

Materials:

UU_PDmeeting3.pttx (presentation slides)

This meeting starts with a reflection on the experiences of the outcome of the second two assessed topics. What ideas do the teachers have for further instruction?



FINALLY

If you have questions or problems, please visit the website
<http://www.dwo.nl/en/>
and select **Contact**