

Sharing Inspiration 2008

Plenary speaker: Truus DEKKER
Freudenthal Institute, Netherlands

Using technology to assess mathematics: threat or treat?

How should teachers go about developing and integrating such assessment opportunities in their own classrooms?

TD Here are some steps that might be taken (a full answer would require another lecture!)

- Work as a team, don't do this on your own. Discuss and adjust problems with your colleagues.
- Don't do everything at once, start changing or adding one problem at a time.
- Change an existing problem at reproduction level into a higher level problem.
- Look for interesting problems. They can be found anywhere. In newspapers, in your neighbourhood, in advertisement brochures, on the internet.... Keep a camera ready.
- Look for problems designed by other people and adapt them for your own use. You do not need to "invent the wheel" again.
- Start designing as many different questions you can, using the context you found. But then, reduce the number of questions.

Do different technologies lead to different solutions and therefore assess different skills and concepts?

TD Personally, I am convinced that different technologies indeed lead to different questions that can be posed and also a much larger variety of solutions to a problem. Therefore, different skills and concepts may be assessed.

Why is it that when we speak about activities we speak of social interactions, when we speak of assessment the student is alone?

TD Well, for me that certainly is not the case. As a teacher, I used to make an assessment plan (together with colleagues teaching in the same grades). We always made sure that one of the assessments included an investigational task and group work, often one of the assessments would involve observing students at work, we could have a computer task, etcetera. A balanced assessment plan should show a variety of assessment formats since students have different learning styles and a teacher will want to assess a wide variety of skills and competences. Just as a test should have test problems that go beyond reproduction, an assessment plan should contain tests that go beyond time restricted paper and pencil tests.

How much, in the speaker's opinion, is the way the teacher formulates problems, solves them, presents them to students and assesses them is dependent on particular technology uses? (PC, calculator etc.)

TD From my point of view, it is not only the teacher who formulates problems and solves them. The teacher should guide the work of the students, not steer it. If the teacher only expects the students to reproduce exactly what was taught and in the way it was taught, of course that is what the teacher gets.

Assessment Pyramid.

Can you give an example of an "easy" problem in the top of the pyramid?

TD As you can see, in the top of the pyramid, there is no clear distinction anymore between different mathematics strands and neither between easy/difficult. That means, the answer is no, by nature a level 3 question is difficult.

If the "reproduction-level" is boring, why teach it? Who is it who stays on the "reproduction-level?"

TD The reproduction level is necessary since students have to learn, use, and maintain their *mathematical tools*. They are not meant to stay on that level but develop competences beyond the reproduction level. However, in many classroom tests as well as in many examinations, the majority of the questions and sometimes all of the questions are on the reproduction level.

Can we set up a *Sharing Inspiration* website with examples of level 2 and level 3 questions?

TD This is an excellent suggestion. Who from TI could respond to this suggestion?

[Additional note from Philippe Fortin: *for sure this would be interesting. I am not from TI, but I am the webmaster of the current Sharing Inspiration website. I will of course be ready to help.*]

National Exams

Do you put level three questions in every exam? How do you evaluate?

TD We try to have level 3 questions in the national exams. However, it is easier to pose that type of question within the (Dutch) school exam where group work is possible as well as more investigational work over a longer period, say a whole day. The national exam work is evaluated through a set scoring guide where certain elements of the answer are awarded with score points. For more open work, there are evaluation and scoring guides set up by the teachers themselves.

When will the examination system change from a written assessment to include more oral and other forms of communication? Will it ever change?

Graphing calculators and “by hand” competences

Why do people still think that students who are used to using graphing calculators have less “by hand” algebraic skills and competences although studies have showed otherwise?

TD In the Netherlands, universities are complaining that students who are not allowed to use a computer and/or a graphing calculator at universities show lacking algebraic competences. I will ask the person who posed this question to send the studies he was referring to and we might pose them on that *Sharing Inspiration* website.

Graphing Calculators and digital (fully computer based) national exams

Has consideration been given to making a graphing calculator available within the computer exam software?

TD The digital exams in the Netherlands we spoke about are low level vocational exams at age 16. Personally, I would like for these students to have a separate simple graphing calculator available such as the TI 73. But another possibility would indeed be to have a calculator available within the computer exam software. At this moment that is not possible for a variety of reasons. For older students at higher educational levels, I would prefer for the students to have a graphing calculator or TI-Nspire available during their exams.

Is there a strong case for hybrid assessments (mixture of digital and print-used), given the current limitations of technology? Also, this might provide a truer reflection of real life, which is what assessment should be all about.

TD This might be possible and when starting the digital exams, we did use printed worksheets. But consider the small amount of space students usually have in a computer room. I know (from a survey) that teachers as well as students would prefer having a completely digital format only. When observing those exams, I saw how students, even when scrap paper was available, hardly ever used paper and pencil at all during the digital exam.

If teaching is focused on the examinations (eg in England) then computer based assessment could lead to only computer assessable maths being taught.

TD I agree. That is why in the Netherlands we have a school exam that could have any format, as well as a national exam that is equal for all students both in content as well as format (time restricted, paper and pencil or digital).

Problem design

The speaker said a problem should be “interesting”. What does that mean? Where does the interest reside? In the problem? In the person? Why is one problem considered to be interesting and the other one is not? Who decides?

TD The first question I personally pose whenever I am screening test questions is *Who cares? Why would I want to know?* In my view, we should take students seriously and bother them with a context that is clearly unrealistic. For some students, this even becomes a hurdle they find it difficult to take. I always prefer a “bare” problem instead of a “made up” context or nontext with the same mathematical content.

From “Learn to use towards use to learn”.

And what about “use to learn what has been learnt?”

TD I am not really sure what was meant by this remark. But I take it the person who posed it meant that after you have learned the use of certain mathematical tools (procedures, algorithms) you need to maintain that knowledge and practice but you also need to learn how to use those mathematical tools in a variety of situations, both from mathematics itself as from situations within a profession or within society.

You said that new questions were needed. But do students have to learn something during exams?

TD Students do not *have to learn* something during their examinations but of course it is not forbidden either! A good test problem helps a student to *show what (s)he* knows and can do and often, under pressure, students show they can do far more than even they themselves knew they could.

Teacher training

What are the better ways to train teachers (in-service) to use technology in the classroom to improve learning?

TD Teaching (prospective) teachers how to design a balanced assessment and make a balanced assessment plan would be a good start. Many teachers I talked to complained that design test problems and/or a complete test was hardly addressed at all during their teacher education.