

ASSESSING MATHEMATICAL CONTENT IN A TECHNOLOGY ENVIRONMENT

Discussion Panel-One hour

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It seems that teaching and assessment are two independent aspects of the educational process. At least that is the trend in the past years. While teaching is left almost entirely to classroom teachers, assessment is mostly a matter of school districts and governments.

Teachers teach with the support of textbooks and teaching activities, and assessment is made mostly with tests and examinations.

In an educational context, assessment has always been attached to the process of grading, and test, exams or questionnaires are the main assessment tool. But currently, there is an overestimation of this tool, as some journalist points out in the next quote:

Tests have always been a part of teaching, traditionally used as just one means of evaluating students' progress along the long, curving path of learning as well as a means of documenting their outcomes at the end of a teaching cycle. What's different in today's test-obsessed educational culture is the increasing frequency and prevalence of high-stakes exams as a primary tool of assessment and the decreasing autonomy teachers have over what skills and knowledge get measured and how. http://www.lcsun-news.com/las_cruces-opinion/ci_22859295/their-view-educational-testing-new-march-madness (recovered March 30, 2013).

Besides, assessment always (or almost always) has been on students' performance, knowledge and skills. For instance take a look to what the American Psychology Association says about tests:

Today, many school districts are mandating tests to measure student performance and to hold individual schools and school systems accountable for that performance. Knowing if and what students are learning is important. Test results give classroom teachers important information on how well individual students are learning and provide feedback to the teachers themselves on their teaching methods and curriculum materials.

It is important to remember, however, that no test is valid for all purposes. Indeed, tests vary in their intended uses and in their ability to provide meaningful assessments of student learning. Therefore, while the goal of using large-scale testing to measure and improve student and school system performance is laudable, it is also critical that such tests are sound, are scored properly, and are used appropriately. <http://www.apa.org/pubs/info/brochures/testing.aspx> (recovered March 30, 2013).

This regarding of tests as the one and only assessment tool is affecting the way and goal of teaching in basic education, as one high school teacher in Slovenia commented in a Mathematics Education Course given in Lubljana: *"Yes, this methodology of learning mathematics, doing mathematics is alright, but I find it hard to implement here in Slovenia because that way of teaching is slow and takes time, and we have a very heavy curriculum and our students must score well in 'matura' (state tests), so the best we can do is to prepare pupils for 'matura'"*

In the USA, for instance, high stake testing is becoming a nuisance for students, teachers and school authorities. For instance, it is relevant to take a look to the webpage of The National Center for Fair and Open Testing.

One of the aspects of this is the growing cases of cheating in tests, the more relevant case being the one of Atlanta: <http://www.fairtest.org/2013-Cheating-Report-PressRelease> (Recovered March 30, 2013)

The other one is how low scores in standardized testing is affecting teachers and school performance and financial bonuses (<http://www.fairtest.org/k-12/teachers>, recovered March 30, 2013)

The reaction to this kind of problems is an increasing reject of high stake tests by teachers, parents and administrators (<http://www.fairtest.org/k-12/high%20stakes>, recovered 30 March, 2013)

And in many countries, PISA scores, a mere indicator as how is the state of education, is becoming an ultimate goal for education systems, instead of acquisition of knowledge.

Mathematics education is not the exception to the rule.

One way of overcoming these problems -or at least to avoid some of the problematic aspects of high stake testing- is to focus our attention in the classroom. Assessment can be done inside the classroom (formative assessment), and outside the classroom (school system evaluation); and it could be a close relationship between the two.

On one hand, standardized exams is the only way government educational offices and international organizations (as OECD or UNESCO) have in order to measure students' performance and state of educational systems, this kind of assessment is done outside the classroom by agents not directly involved in the teaching-learning process as teachers and students; on the other, formative assessment is the way teachers and students have in order to measure their performance and development in learning tasks and their acquisition of knowledge inside the classroom.

What I call classroom assessment should be the way to improve teaching-learning processes; and outside evaluation (standardized testing made outside the classroom) would be the gauge to measure the acquisition of knowledge and skills in schools.

Traditionally, the teaching process has been classified in three stages: planning, applying, and assessing. In general, assessment is made by way of tests or examinations in order to get information about students' previous knowledge and skills, and about the ones acquired during the teaching-learning process. But almost always, tests and questionnaires are given at the end of a teaching cycle -call it teaching unit, course or semester-, and almost always its only function is to gather evidences of the note the student has got. In the educational literature this is called summative assessment.

So, we understand classroom assessment as the gathering of information to feedback and improve the teaching and learning of any content matter. In order to be effective it should be an integral part of the teaching methodology and not a separate issue (Flores and Gómez, 2009). That is, the teaching-learning process should take place in an environment of classroom assessment -this concept is close to the concept of formative assessment.

Took in this way, assessment should be a continuous process in which teaching and learning is embedded, and it could be used as well to give a note to the student at the end of the course, i.e. students grading is but only a tiny part of assessment.

In what Mathematics Education is concerned, as well as in the teaching and learning of science and engineering, the use of technology is widely spread in classrooms; manly CAS and DG software, and Information and Computer Technology (ICT).

With the use of technology in the teaching of mathematics people rises the question on how to have an assessment that takes into account the technological aspect of the process. We claim that it is not necessary to be concerned about this: The relevant issue on the use of technology, besides its capacity to foster problem-solving skills and to develop mathematical thinking, is its potential use as an assessment tool itself. That is, technology, particularly mathematics teaching technology, could be a window toward student's knowledge and attitudes in the sense of Hoyles and Noss (1996).

Let's see for instance, if we ask our students to construct a square using only paper and pencil and look at the figures, we are going to see more or less good drawings of squares, but no more

information about the knowledge of the student on the issue; in the other end of the situation, if we ask students to construct a square in three different ways using a DG Software, depending on the construction we are going to have a lot more information about the concept of square the student knows and, besides, on the use of the software.

The discussion panel will discuss assessment and educational technology in this context and the objective would be to jump into some preliminary conclusions and lay the basis for further discussions and research projects.

Some of the questions that will trigger the discussion are:

- Should we use the same assessment tools as questionnaires and tests to assess technology based teaching activities or we should look for different assessment tools?
- How can we observe the knowledge that a student puts into play when is using technology in mathematical tasks?
- Is this knowledge the same regardless the technology, for instance a DG software or a CAS software?
- We need to assess the use of technology on everyday classroom or should we use technology as an assessment tool by itself?

The structure of the panel would be as follows:

- 1) The panel is one hour in duration
- 2) It is proposed at most three panelists. Each one should have a ten minutes presentation addressing one or several of the discussion questions posed above. (30 minutes)
- 3) After this, we open the session to the opinions and commentaries of the audience (15 minutes).
- 4) Finally, each panelist should have 5 more minutes in order to closed his/her intervention and propose some further discussion.
- 5) The panel should have a coordinator who organizes the discussion.

References

Flores, H. and Gómez, A. (2009). Aprender Matemática, Haciendo Matemática: la evaluación en el aula. *Educación Matemática*, vol. 21, núm. 2, pp. 117-142.

Noss, R. and Hoyles, C. (1996). *Windows on Mathematical Meanings: Learning Cultures and Computers*. Dordrecht: Kluwer Academic Publishers.

Note: The proposal of this Discussion Panel is part of the Infocab Project PB101213.