

Assessment in support of planning teaching to improve learning

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While it becomes more and more widely accepted that assessment should not be used to filter students out of educational opportunities, the search for ways to fulfil this view is still in its infancy. Traditionally assessment is viewed as a tool for determining what students know, its results are used to justify the allocation of students to different levels of mathematics learning and eventually to filter many of them out of learning mathematics. This link - between the results of assessment and the filtering process - is traditionally justified by the nature of mathematics and by the perception of what makes a learner successful in mathematics. Mathematics is perceived as “graded”, “linear”, “structured”, “cumulative” – making it impossible to work with students on different levels of knowledge (Ruthven, 1987). Assessment, in this view, is a practical tool to execute the unavoidable process of streaming and filtering. Assessment is a tool for sorting students into their “right” places. The link - between the results of assessment and the filtering process - is also justified by the view (that many mathematics educators share) that students’ ability is the major factor explaining the differences in their achievement in mathematics. This view implies that students’ ability in mathematics is reflected in a non-discriminatory way in the results of achievement tests. It also implies that students’ ability and not our teaching methods and didactical interventions, is the major variable determining their performance. As such, the results of assessment can be used reliably to filter students out of higher levels of mathematics and eventually out of mathematics itself.

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One of the widespread suggestions in the search for assessment that will not serve as a filtering device is to rethink what and how we assess. As appears in: *Measuring What Counts, A Conceptual Guide For Mathematics Assessment* (1993, p. 92):

“Just as good instruction accommodates differences in the ways learners construct knowledge, good assessments accommodate differences in the ways that the learners think about and display mathematical understanding.” (p. 92) “The equity principle implies that assessments must be sufficiently flexible to all students to show what they know and can do” (ibid, p. 92).

In this view, the way to implement the equity principle is to design assessments that permit multiple entry and exit points as well as allowing students to respond in ways that reflect different levels of mathematical knowledge and sophistication. In our view, however, these approaches deal only with one aspect of the equity principle since they still perceive assessment only as a summative tool. What they actually do is to manipulate the “tool” to be able to measure a larger scale of outputs rather than intervening in the learning processes.

In this workshop we will try to look at assessment as a tool for determining what a student or a group of students need to learn in order to cope with the curriculum demands. We will try to show that assessment can be and should be a communication process between the teacher and the learners, a process that supports teaching and improves learning. It is a tool that fosters equity by providing the teacher with the necessary analysis of the students’ needs. The needs, if not fulfilled, will in the long run filter them out of mathematics. If we want to give the learners a fair chance to succeed in mathematics in the long run, and not only on the short term, we have to find ways to support them in the construction of some key mathematical notions. We will have to be able to discriminate between cases in which legitimising a wide range of “different levels of mathematical knowledge and sophistication” is the right approach and cases in which it is, eventually, at the expense of a “fair” chance to cope with

mathematics. In our opinion, the role of assessment is different in these two different cases. In this workshop we would like to present the role assessment can play in the second case.

Assessment is just one more step

Assessments aimed at evaluating students' performance on core material or on topics/concepts that are crucial for understanding the subsequent topics in the curriculum, should be an integral part of the teaching plan. Decisions regarding the design of activities and class organisation should, to a great extent, be dependent on the analysis of such assessments.

The main question, of course, is what do we mean by analysing test results to inform class organisation and the design of activities? Let's look at a specific example:

The students in Grade 8 (in one of our project schools) have just finished a period of several weeks engaged in activities which emphasised structural views of numerical expressions, for example, number laws, order of operations, brackets and the like. They were about to start "real" algebra. In our workshops with project-school teachers alternative approaches to the introduction of algebra were discussed. In the end, having considered the advantages and the disadvantages of the different approaches, the decision was to introduce algebra via an operational approach. This approach is based on students' ability to make sense of numerical identities, to manipulate numerical expressions correctly, flexibly and efficiently and to judge the equivalence of numerical expressions numerically and structurally. Having analysed these perspectives, the teachers came to the conclusion that choosing the operational approach to algebra implies that the previous topic (in this case, structural views of numerical expressions) is "crucial for understanding the subsequent topic in the curriculum" (in this case, the agreed upon introduction to algebra). Not making sure that all students are on the required level of understanding means violating

the equity principle. It simply means that these students are prevented from having a fair chance to cope with future activities. We would like to note that this does not mean that all students have to be on the same level of knowledge and understanding at the end of the previous topic. Obviously, this is not and cannot be the situation. Taking into account these considerations leads, in our opinion, to only one conclusion – we need a “tool” which will enable us to identify the students who need review and thereafter provide them with the necessary teaching interventions. At the same time, however, it does not mean that all students need to review the previous topic. No doubt many students have acquired a sufficient level of understanding and it is not in their or our interest to force an unnecessary review on them (Linchevski and Kutcher, 1998). Our suggestion is that in a case like this, in which a previously learnt topic is “crucial for understanding the subsequent topic in the curriculum” the assessment on the previous learnt topic, if planned and used adequately, is an appropriate tool for fostering the equity principle. The assessment should be planned in such a way that students who need review on the previous topic will be identified and their needs analysed. The possible diversity in students’ understanding should be identified, taken into consideration and integrated into the teaching plan. The assessment is not the final summative step, it is one more step in the learning process. Assessment, if designed and analysed with this purpose in mind, can play a major role at a stage like this (Linchevski, 1996; Linchevski and Kutcher, 1998).

We prepared with the teachers a short assessment that included four activities. The activities had to allow the identification of different groups of students: students who are fluent in the relevant topics, students who need a thorough review and students who are at various transitional stages. Moreover, the analysis should leave room to unpredicted observations and to allow a close look at specific students needs. In the workshop we will present an example of an assessment and of the relevant analysing process.

The Profile

An integral part of each assessment is the construction of personal (for each individual student) and class profiles. These profiles are used for further planning - for identifying the students who need review, determining what kind of review they need and thereafter setting up the appropriate groups. Of course, review is employed only if a group of students exists for whom this activity is relevant. Although we emphasised in previous sections again and again that review is intended for students who have been found to be in need, it does not necessarily and automatically mean that the other students must always be excluded. It may sometimes be to the benefit of all sides if students who achieved satisfactory in the assessed topic are also involved in the review. Review may therefore take place either in homogeneous or heterogeneous groups.

The heterogeneous groups are constructed differently on each occasion according to the results of the evaluation and the analysis of the profiles where a student with good understanding in this particular topic helps a student who needs consolidation. The rationale for constructing the groups this way is that each of the members, both those with good and those with average achievement, is able to contribute to the group. The basic idea is that this set-up avoids a contributor-acceptor relationship (univocal interaction - Cobb, 1994), replacing it with a situation in which both sides contribute and both gain (Forman, 1989). In the discussion between the students one tries to explain to the other what sort of difficulty he or she has, while the other tries to understand the problem from the viewpoint of the first one and helps him or her to solve it. When students are asked to explain their thinking to other students, their "thought is not merely expressed in words, it comes into existence through them (Vygotsky, 1986, p.218), thus their reflections deepen their own understanding."

When the review takes place in homogeneous groups the various groups are usually given different tasks. Those students who still need a more thorough review of the topic are generally placed in one group that is taught by the class

teacher. Some other groups might be engaged in activities related to the reviewed topic on various levels, while others might be given new topics to study independently on their own.

In the workshop we will construct and analyse personal and class profiles (based on the assessment presented at the workshop) and on the basis of this analysis we will address the issue of diversity in the class.

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