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Submission to the Parliamentary Committee of Inquiry into Assessment in school Mathematics and Sciences, from Robert Nelder, 11/5/13.

I have taught Mathematics in Queensland high schools continuously since January 1969. I was a Subject Master in Science in 1978, and since 1979 have been Subject Master and then HOD in Mathematics. I firmly believe that the assessment policies imposed on schools have become unnecessarily complicated during the last decade or so, and that this reduces the effectiveness of teaching and learning.

The inquiry's terms of reference that are addressed in my submission here are

- Ensuring assessment processes are supported by teachers – I don't believe that the current processes have widespread support, for reasons outlined below. I attended meetings in Brisbane in 2010 and 2012 where between 100 and 200 teachers expressed grave dissatisfaction with and minimal confidence in Queensland's current assessment system in Mathematics and Sciences.

- The ability of assessment processes to support valid and reliable judgments of student outcomes – I believe that the judgements currently produced with the onerous criteria and standards-descriptor system are not consistently valid and reliable, as outlined below. There is considerable arbitrariness associated with the processes. Further, teachers commonly express concerns about the review panel process.

Mathematics assessment in Queensland Schools needs improvement urgently, because the present QSA system

- is far too cumbersome to use, compared with a simple marks-based system
- is difficult for students, their families, and many teachers to understand
- does not produce consistent results from review panels
- is essentially an adoption of "criterion-sheet" systems better suited to "written" subjects like English, the Arts, and the Humanities
- dominates the teaching and learning agenda, by forcing teachers *and particularly beginning teachers* to spend much of their formal and informal professional development time trying to master the assessment structure, instead of improving the teaching of lessons by gaining a better knowledge of the actual subject matter, its real-world applications, and strategies for inspiring students to learn the subject.

1) ASSESSMENT IS DRIVING THE AGENDA, INSTEAD OF TEACHING AND LEARNING. WE NEED AN IMMEDIATE RETURN TO THE SIMPLE USE OF MARKS.

A central authority could outline the general requirements for a series of exam papers, by specifying the content, and then asking for tests with a suitable range of difficulty levels, a balance of theoretical and practical questions, from familiar to unfamiliar, and a range from short response to extended. There would be no need for the massive amount of criteria and verbal descriptors of standards that we have now. After that, it should be up to the schools to set exams or projects and ***use marks to assess the students and grade them.*** Many schools believe that they must avoid using marks and must use criteria sheets instead, which are matrices of cells containing verbal statements of standards.

Some QSA review panels and school leaders have wrongly told their teachers that marks are altogether forbidden. QSA's seldom publicised position is that marks *can* be used, but decisions on ratings cannot be made by simply using cutoff marks. The standards matrices must be applied. They insist that a mark of say 90% doesn't guarantee an *"A"* standard of work because the student may not have fulfilled all of the *"A"*-descriptors in the syllabus. However, the following extract from p32 of the Qld. MAB syllabus, produced by QSA, states that a standard can be obtained *without necessarily ticking every descriptor*. I can't see the difference:-

"When teachers are determining a standard for each criterion, it is not always necessary for the student to have met each descriptor for a particular standard; the standard awarded should be informed by how the qualities of the work match the descriptors overall".

If we were simply able to award *marks* when assessing a well-set exam paper, it would be the job of review panels to check that suitable standards and balances have been maintained. This is what happened before the QSA became such a powerful influence and advocate for non-marks assessment. It worked well. *The best students got the best ratings*. We don't need a cumbersome system in order to achieve that. Mathematics teachers are good at setting suitably balanced assessment and also at awarding part marks for imperfect solutions and giving full credit for correct alternative solution methods.

The advantage of this would be greater simplicity in devising assessment tasks and in marking them and grading students. There would be no loss of validity of the grades produced. In classrooms, the change would produce better teaching and learning. ***At the moment, assessment is driving the agenda***, because of the many requirements to be satisfied by an "assessment package". That's wrong – ***our emphasis should be on teaching and learning***. Young teachers including pre-service teachers, and also experienced teachers, have to spend large amounts of professional development time trying to understand QSA's onerous assessment requirements. But what we all need to be doing instead, is learning more about our subject and its applications and about the best ways of introducing topics to students and inspiring them in the subject. We are prevented from using our time to the best pedagogical advantage, because of the time taken to embed a host of little detailed requirements into an "assessment package".

The marks system is working well in NSW, Victoria, England, and other places, and

in most Universities. The following website shows a recent NSW Senior Mathematics paper set with marks for each question, and an easy-to-use marking scheme. [Please scroll down to the Mathematics tests, e.g. "Extension 2"]. This simple style of assessment would help Queensland teachers and students:-

http://www.boardofstudies.nsw.edu.au/hsc_exams/hsc2011exams/

Some of QSA's own QCS tests are assessed with a marks system. It's amazing that students must suffer under QSA's cumbersome system for school assessment, and then enter University to find that they are assessed simply and validly by using marks only.

Using marks allows teachers to differentiate between students more readily than by placing ticks in the cells of criteria sheets. Advocates of the latter system place ticks toward the right or left edges of the cells in the criterion sheet, or in the centre, depending on how well they judge the student to have met the particular descriptor. That's all very subjective, vague, and unreliable. Awarding marks according to a marking scheme, and giving credit for alternative solutions which are different from the adopted marking scheme, produces fair and defensible judgments and allows teachers to rank students in order of merit when required to do so.

2) A HOST OF UNNECESSARY CRITERIA AND STANDARDS DESCRIPTORS.

At present there is a plethora of criteria and descriptors of standards in the syllabuses. See for example the Assessment criteria on pages 34-36 of the current Queensland Mathematics B syllabus at:-

http://www.qsa.qld.edu.au/1892.html

There are dot-points such as *"comment on the strengths and limitations of models, both given and developed"* or *"identification of assumptions and their associated effects, parameters and/or variables"* which require understandings that are sometimes more appropriate to tertiary level studies. It's a more urgent priority for high school students to gain and apply mathematical skills to make predictions or solve problems, but these other idealistic dot-point requirements draw away from the time available in school for students to develop basic appreciations of their subject. The tragedy of the current situation is that if a school should happen to omit *even one* of these micro-specifications from their assessment "package", their proposed ratings will be reduced by review panels, *even though the level of challenge in the school's questions may be higher* than that of schools who have diligently ticked all the boxes by attending to the many little dot-points. When exam questions are designed with lots of tick-boxes in mind, the assessment can become somewhat stilted and artificial. Questions need only be graded according to level of challenge, and to be broadly divided into a basic level, suitable for students to obtain a "Pass", and a higher level that would examine problem-solving skills in a range of situations and allow people to achieve the highest ratings.

3) CRITERIA ASSESSMENT MODE NOW PENETRATING RIGHT DOWN INTO INFANT SCHOOL LEVEL.

At the website below this paragraph, you will see the newest incarnation of the standards to be applied in Years 1-10, in this case Year 1. They are called "Standards Elaborations" and they are the means by which teachers are expected to assess their Year 1 students. By changing the "1" where it says "yr1" in the URL, you can get to the other year levels:

http://www.qsa.qld.edu.au/downloads/p_10/ac_math_yr1_se.pdf

If you compare the descriptors in (say) columns 1 and 2 for Year 1, you might agree with me that it would be very hard for a Year 1 teacher, or anyone else, to decide which column is most appropriate for a particular student's responses. Who wants their children or grandchildren to bring home a results sheet like this, or a single letter rating derived from this matrix? It would be far superior and more useful for the child to bring home a spelling or other test or project marked "18/20" with the mistakes highlighted, etc. Marking would be much easier and more reliable, and families could easily see how the child is progressing. Yet this criterion sheet system is now being used throughout Years 1-10 in our State.

To finish this section about the current "standards" assessment in Queensland, here is one of a few short video-clips purporting to show teachers how to apply a **"Guide to making judgments"**, which is one of QSA's favoured assessment methods and involves applying an instrument-specific criterion sheet to a piece of assessment. After spending time meeting for discussion about how to do this, teachers are usually still confused and certainly far from consistent in their approaches to marking students' work using this "Guide" method. It is not nearly as straightforward and understandable as a normal marking scheme.

http://www.qsa.qld.edu.au/14735.html

4) EXTERNAL EXAMS ARE MORE EQUITABLE.

External exams would be better than the patchwork quilt system that Queensland has now, where schools all set different exams from each other, and no-one is really sure whether questions marked "unfamiliar" are really so. The NSW system combining school assessment with the HSC works very well, and it should be easy for Qld to move to that kind of system. It ensures more reliable comparability of students from different schools. As the National Curriculum is implemented throughout Qld schools, it makes sense for us to adopt a national assessment approach. QSA have been setting external Senior exams in Qld (for example, Mathematics A can be found here: http://www.qsa.qld.edu.au/2567.html), but have announced that they will discontinue them. It seems easily possible that they could continue to set them for full-scale use in schools. Money saved on review panels could be used to pay for teams of markers.

5) WE CURRENTLY HAVE A "ONE SIZE FITS ALL" APPROACH

QSA claims that Queensland's assessment system is "world's best practice". There is no objective evidence to support this. It is the belief of academic theorists. No other education system has conferred this compliment on QSA - it is merely a wistful statement by insiders, and therefore of little value. If it were world's best practice, why haven't NSW, Victoria, the UK, etc, converted to it? Why don't our University Mathematics departments adopt it?

Experienced teachers of non-mathematical subjects like Social Sciences and English have told me that while an assessment system involving criteria sheets and assignments might be suitable for their subjects, they are surprised that it should be forced on Mathematics and Science subjects. It is a "one size fits all" approach because some educators theorised that all syllabuses (English, Social Studies, Mathematics, Sciences, etc) should "look the same", and unfortunately for teachers and students, Queensland's decision making body accepted and enforced the practice. Yet there is no valid reason to insist that Maths and Science subjects need to be assessed like this. I accept that it *may* be difficult to award *a mark such as 16/20* to an essay answer in an English or Geography test, but it is easy, useful, and valid if done carefully in Mathematics and Sciences. We must acknowledge that subjects are inherently *different* and require different approaches to assessment.

Let's improve mathematics teaching in the schools by freeing up teachers' time so they can concentrate on improving pedagogy and inspiring students, instead of suffocating in a straitjacket of unnecessary assessment requirements. Let parents once again receive clear simple statements of marks earned by their children.