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Submission to the Parliamentary Inquiry in Assessment Methods for Senior Mathematics, Chemistry and Physics.

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Personal Background

I have taught Mathematics in both NSW and Queensland, in Government, Catholic and Independent schools in various areas of each state for a period of 38 years. For the past six years I have been the Learning Area Coordinator for Senior Mathematics at [redacted]. Over a period of well in excess of twenty years I have been a member of District Review Panels in the areas of Information Processing and Technology, Mathematics B and Mathematics C. I believe that my broad experience has given me a good insight into assessment practices in Mathematics at senior school level, particularly in Queensland.

I would point out that the views expressed in this submission are my own, rather than reflecting the views of schools at which I have been or am currently employed.

There are various aspects to this submission which are outlined below. As my experience is primarily in the field of Senior Mathematics, I will focus my discussion to that area in particular.

1. Whether or not assessment practices are supported by teachers

In relation to this criteria I can only reflect on my own experience, and conversations that I have had with numerous other teachers over many years. My view is that many teachers are broadly supportive of the concept of Criterion Based Assessment, but that it is the QSA implementation of this type of assessment practice to the exclusion of other assessment techniques and strategies that is primarily the issue.

Teachers in my view primarily want the following from an assessment system:

(i) That the system is fair to their students - any reasonably thinking person could not possibly argue that the current system of assessment in Queensland is in any way fair and equitable to students. Taking aside the issue that the education system itself in Australia is not fair and equitable to all students (as clearly evidenced by Gonski), the Queensland system only exacerbates the problems in relation to Mathematics assessment.

The simplest way to explain this is probably to look at what happens in most schools. Typically, (and there are variations) many school undertake about six major pieces of assessment in both Years 11 and 12. In most schools, Year 11 is formative, and Year 12 summative. The six pieces of assessment in each year are often four examinations, and two extended research tasks. Despite being different in nature, the items have to be treated as equal in weighting. There are however serious questions

as to the validity of student results based on extended research-type tasks. It is difficult to gauge the input to the task from sources like other students, tutors, parents or older siblings. As a consequence, there are both authenticity and equity issues associated with the use of these types of tasks. Further, there are real questions as to whether or not boys are disadvantaged by such writing tasks. Anecdotally, this would seem to be the case.

In examination type tasks there is also doubt as to the level of preparation given to students and the extent to which the task is unseen. It is essentially a system that relies on the professionalism and integrity of teachers. A further question that has arisen in each type of assessment is the validity of the use of marks. Regardless of QSA's contention that marks can be used by teachers so long as they relate to the criteria, there has been over a period of time a quite definite encouragement of teachers to move away from using marks in Mathematics exams. This has been embraced by some teachers and strongly opposed by others. Some teachers, including myself, have employed a hybrid system that uses both approaches. Any form of consistency in approach seems to be decidedly lacking, and there is great variation between schools.

The argument seems to be that things can be achieved by using criteria that cannot be achieved using marks. What seems to be overlooked is that the converse is also true. In any assessment that is primarily examining a student's understanding of content and mathematical techniques, the use of marks has a clear and valid role to play. Likewise, in assessment that is appraising concepts such as assumptions, problem solving strategies, and synthesising mathematical models, the use of criteria grids would seem to make more sense.

To suggest that one approach or the other is superior in all cases for Mathematics is spurious at best. However, I have seen it suggested at panel meetings that it is not really appropriate to allocate marks from 1-5 for a task, but that the use of A-E for the same task for some reason has much more educational merit. Teachers have also been advised to be careful to avoid the temptation of making A equal to 5, B equal to 4, etc., as though there is something intrinsically wrong with such a process, because teachers might feel tempted to add up the numbers associated with the letters.

Strangely enough, these dubious suggestions and recommendations to teachers are actually part of an overall system in Queensland that supports the superiority of A-E type grades for all assessment tasks in Mathematics, citing marks as inappropriate, but at the end of Year 12 then requires teachers to somehow add all of the A-E grades together, arrive at a total, place the students in rank-order, and then allocate them a mark from 200 to 400 for each subject. This mark is then adjusted several times statistically on the basis of a Core Skills Test that purports to assess learning up to Year 10 standard, and then proceeds to determine an OP 'mark' for each student ranging from 1-25. The soundness of the logic of all of this is difficult to comprehend.

(ii*) that the system is reasonable in terms of teacher work-load* - I think most teachers would agree that changes to senior Mathematics (and Science) assessment in recent times have resulted in a dramatically increased work-load for teachers in these subject areas. This increased work-load has happened without any discussion with teachers, increase in release time, or any increase in remuneration. Most teachers however put in the extra effort because they want to do the right thing by their students.

Assessment items of a standard as required by QSA take a considerable amount of time to develop. Consequently, once an item has been passed successfully through the panel process, it tends to be used over and over again by a school. This happens in every school, apparently to allow a local flavour to the assessment and give some autonomy to teachers in developing their own items. This is seen as preferable to QSA providing any form of standard assessment for use in schools. The reality is it creates a considerable amount of work for teachers who are effectively re-inventing the wheel, and surely such time could be better spent on improving pedagogy, developing resources and focusing on effective class-room teaching.

The marking of assessment items is also unnecessarily time consuming for teachers. Even at the recently recommended 1500 word limit for research tasks(which is generally exceeded by students) the thorough marking of one student's extended research task can take up to an hour. Given 25 students in a class, the workload rapidly escalates. The real question is whether or not anything is really gained by the use of such tasks in forming an overall view of a student's achievement that could not be gained by simpler means, particularly given the questions relating to task authenticity.

(iii*) that the system informs the students and the parents* - one of the major functions of assessment tasks is to evaluate the effectiveness of teaching and learning. For this to have real meaning to a student, the turn-around time for marking the assessment needs to be relatively short, so that the feed-back is timely for the student and can be useful in modifying class-room instruction.

However, it seems increasingly the case that turn-around times are now much longer due to the complexity associated with criterion based marking. Some considerable time can pass before tasks are returned to students, and much of the meaningfulness and currency of the feedback for the student can be lost. A further purpose of assessment is surely to provide information to parents who are also key stake-holders in their child's education. Many of the criteria that have to be used in assessment tasks are confusing to teachers, let alone providing meaningful information to parents.

2. Participation Levels by Students

There would seem to be little doubt that the numbers of students taking higher level Mathematics and Science courses has declined in recent years. There is in fact research being undertaken in at least one Queensland University at the present time that is looking at this very issue. We have also recently seen some universities giving extra entry credits for students who have completed Mathematics C at high school. Questions as to the level of preparation that our system provides for tertiary study are probably best answered by the universities, but again anecdotally, the level of preparation seems inadequate.

The question also arises as to whether or not student participation levels in Mathematics, Physics and Chemistry are influenced at all by current QSA assessment practices. The answer to this can at best be speculation in my view, but if QSA assessment processes can be shown to be part of the problem, then there is surely a case for a review of those assessment practices. Another main concern must also be as to whether or not assessment practices in Mathematics, Chemistry and Physics contribute to an increase in the stress under which our students have to perform in Years 11 and 12.

Extended writing tasks in particular can occur across all subject areas, and without doubt place many of our students under very high levels of stress when several tasks are due for submission around the same time. This in turn must impact on family life, attendance at school, concentration in class, meeting homework commitments, and other requirements for students to perform at their best. Strangely, one of the main objections to external examinations is that they place unnecessary stress on students, but my view would be that current QSA assessment strategies are much better at producing such stress within our students.

3. The ability of assessment processes to support valid and reliable judgement of student outcomes.

In Mathematics, the use of A-E grades to determine student performance has some major short-comings. For example, in a Knowledge and Procedures task, it is not uncommon to see students who are capable of solving an A-level question, but who at the same time struggle to solve C and D level problems. The question for the teacher is how to grade such a student, particularly in comparison to the student who performs highly in B, C and D level questions, but has no success with A-level. Who is the better student? Some schools use systems of ticks and crosses to indicate achievement in content sections of exams, and for panellists the transformation of this into an overall result can be bewildering at best.

In Modelling and Problem Solving there are often even greater dilemmas. A typical exam might have a C–level, B-level and A-level question for Modelling and Problem Solving section. If for example the A-level problem could produce results ranging from A+ to E-, the B-level from B+ to E- and the C-level from C+ to E-, then there would be 15 x 12 x 9 = 1620 possible combinations of results. Not only is it difficult to decide on a result for an individual student, but equating the various possible combinations of student performance to compare students is an absolute minefield. Throw Communication & Justification criteria into the mix and it is little doubt that teachers often struggle with decisions about assessment, and one wonders if the decision is sometimes little more than an educated guess.

Some would argue that the whole assessment process in Years 11 and 12 in Queensland is OK and is robustly supported by the Review Panel system. However, that is far from the truth in my opinion. In over 20 years on panels I have often seen similar levels of achievement allocated to students from different schools, even though the standard of work can be very different. I've seen outstanding pieces of assessment from some schools and exceptionally low standard assessment items from other schools. This must impact on student performance.

Unfortunately at panels I've also seen public school teachers who are overly critical of independent schools, and independent school teachers who are equally critical of public schools. Such opinions have no place in any valid assessment system. The simple fact that work from a school is reviewed by multiple teachers itself suggests that the process is flawed, and decisions in relation to individual schools quite definitely can come down to which reviewer is the most assertive in putting their views across. Many teachers, in my experience, join Review Panels to gain ideas from other schools because of the lack of quality and quantity advice from QSA, and often have the view that by being on the panel they are better placed to look after the interests of their own school.

Review Panellists are required to review the work of a school in about two hours. Given that this entails looking at the school work programme, a minimum of 6 assessment items, gaining an understanding of what method this school is using to produce an overall assessment, and review the work folios of about 5 students, it does seem questionable as to whether the time is adequate for a satisfactory review process to occur, and whether or not the outcomes from such a system are valid.

Equally frustrating for panellists is the increasing vagueness of advice that they are allowed to offer to schools. The generic statements that are provided for panellists to use are almost meaningless in terms of providing detailed, constructive advice where it is clearly needed.

Finally, the Panel System also supports the unusual notion that assessment items that go through the process un-challenged one year can still be scrutinised and challenged the following year if they were to be reviewed by a different person. I have had this happen at a school at which I was teaching, and when the questioning of the assessment items in the second year was challenged by the school, the items were eventually deemed to be satisfactory, as they had been the previous year. Clearly the Review Panel system requires a major overhaul if it is to provide equity between schools and students, and consistency in the reviewing of school assessment items.

4. Where to From Here?

I do struggle with the notion that there is a panacea that will solve the frustrations that are felt by many teachers in relation to assessment practices in Mathematics, Chemistry and Physics. The major concern is that many teachers are frustrated by current QSA assessment practices, and even more importantly there is the question as to whether or not these assessment practices are fair to students.

An summative external examination where all students are assessed on the same task is not the single answer in my view, but it could well be part of an overall solution. Such examinations are widely used in other states and internationally, and one does wonder if everyone else except Queensland has got it wrong. There may well be some problems with external exams, but there are equally many problems with internal assessment as it is structured and implemented at present in Queensland.

Some form of broadly based examination developed by QSA and assessing content and technique in subject areas such as Mathematics could surely also be used to moderate other forms of criterion based internal assessment in schools. Such moderation must at least be as valid as the current Core Skills based moderation that is used to adjust student results at the end of Year 12. Further it would seem logical that banks of appropriate ideas for research tasks within schools could be provided by QSA from the pool of excellent tasks that already exist in our schools. Perhaps a student's result could be a combination of both types of assessment. Another benefit from a formal examination might be that schools actually teach for understanding of the content of the entire syllabus, rather than the current "teach, assess, forget" unitary approach. Further, schools might return to the realisation that the preparation for such broad based understanding best begins in the junior secondary years.

Finally, one of the major claims in relation to the courses of study in Mathematics in Queensland is that they promote the development of high level problem solving skills in our students, yet it seems

contradictory that successful performance in Modelling and Problem Solving assessment tasks seems to be the area of major difficulty for students in our schools. If we are indeed developing such skills, our assessment practices often seem to limit the demonstration of student achievement in this area. We also place great emphasis on Communication & Justification yet many of our students (boys in particular) seem to struggle in relation to producing a written extended report showing and communicating real depth of understanding. The question arises as to whether or not current QSA assessment practices actually achieve their goals.

The bottom line is that the outcomes from assessment in Years 11 and 12 are high stakes outcomes for our students and their parents, with possible life-long implications. We need to have a system that is as fair and equitable as possible for our students and allows them to reach their potential, but which at the same time does not impose intolerable work-loads and stress on our teachers and students.

I urge the Committee to look deeply at the concerns expressed by educators within this Parliamentary Inquiry, and thank the Committee for the opportunity to express an opinion.

Trevor Barrett