SMC&PA Submission 177
Received 13 May 2013

To: **The Education and Innovative Committee, Queensland Parliament**

Re: **Inquiry into the Assessment of senior maths, chemistry and physics in Queensland schools**

My Personal Details

Name: **Denis Bridger (B Sc, Dip Ed, Gr Dip Comp Sc, M IT)**

[redacted]

Dear Committee Members

I write this submission in a personal capacity but also as a parent, a teacher, freelance educator and developer of tertiary entrance related school management information system software.

Yours faithfully

Denis Bridger

Introduction

Society needs people to study Mathematics, Chemistry and Physics in order to maintain and improve our physical and spiritual wellbeing. Individual students choose to study these subjects at school because success in them can be a "ticket" for a career, but also for many, they satisfy a thirst for knowledge.

In the Queensland upper secondary school context, amongst many other reasons, subject assessment is used to rank students' achievement for tertiary entry selection as demand for tertiary places is greater than the number available.

Subject assessment and tertiary entrance cannot be considered in isolation. Current mistrust of methods of assessment in Mathematics, Chemistry and Physics is related to a lack of knowledge about our tertiary entrance system amongst many stakeholders. Assessment and tertiary entrance are inextricably linked. In this submission, I will outline the current relationship between subject assessment and tertiary entrance using the terms of reference of the committee as a framework.

I am aware of the intention in the near future to review the tertiary entrance system currently used in Queensland and realise that this paper addresses issues that should also be considered at that time. Due to the link between subject assessment and tertiary entrance scores in the Queensland context, this paper addresses issues that are also relevant to this inquiry.

Assessment Methods used in Senior Mathematics, Chemistry and Physics in Queensland Schools

The Queensland Upper Secondary School subject syllabi outline the course of study and the assessment requirements needed to measure student achievement on a 5 point scale called the Level of Achievement (LOA). These levels of achievement are, starting from the highest, Very High Achievement (VH), High Achievement (HA), Sound Achievement (SA), Limited Achievement (LA) and Very Limited Achievement (VL).

In all scientific and social science disciplines, there is an uncertainty associated with measurement. LOAs measure student achievement. As a result of this, there will be some students who are assigned a VH who should have been assigned a HA and vice versa. This is simply a fact of measurement. Of course on such a "coarse" measurement scale as LOAs, it would be a concern if there were many students who were assigned a level that was 2 levels from what they deserve. But does this occur? Perhaps this could be looked into if it has not already been done. Making reports public that address this issue would allow the general community to make informed evaluations in this area.

Although not even addressed in the syllabi, schools are required by government regulation to divide each LOA into 10 subsections called rungs with VH 10 the highest possible assigned achievement and VL 1 the lowest. Further, where there are 14 or more students who wish to be ranked on the Tertiary Entry scale, schools have to further place students on a 201 point scale that ranges from 200 to 400. As mentioned before, Queensland subject syllabi do not address this requirement. These regulations are in addition to the subject syllabi. However, the starting point for placing students on this "fine" 201 point numerical scale is the 5 point "coarse" qualitative LOA scale and the assessment results used to determine the LOAs. The SAI distribution for students at a school for each subject has to be consistent with the 50 point LOA and rung scale which in turn has to be consistent with the 5 point LOA scale. The Queensland Studies Authority

monitors and moderates the assignment of LOAs and students' positions on the 50 point scale through its subject panels. It also checks and offers feedback to schools before SAI distributions are accepted.

Although definitely open to debate about their effectiveness, the syllabi do have criteria which guide teachers in the decision making process in assigning LOAs. However, detailed criteria for each of the 10 sections within LOAs are not explicitly stated in the syllabi, nor as far as the author is aware, elsewhere. However, there are guidelines that reference syllabi assessment statements without explicitly stating which rung should be used for particular achievement. Although also not part of the syllabi, guidelines and restrictions do exist for assigning the subject achievement indicators (SAIs), that is, the values on the 201 point numerical scale, but the actual methods used for assigning SAIs vary from school to school and even from subject to subject within a school. Although schools do have some flexibility in assigning SAIs, this flexibility is in fact only modest. It should also be noted that the SAIs are then combined with group student results on the Queensland Core Skills Test (QCST) to determine students' contribution to their OP for the subjects they study that have 14 or more "OP Eligible" students in the subject at their school. Students with fewer than 14 "OP Eligible" students in a subject have their contribution towards their OP determined using another method that depends on their LOA and the rung within the LOA.

Tertiary Entrance scores for Queensland students are reported on a 1 to 25 scale called the Overall Position (OP). However, Queensland students are also assigned a position on the Australian wide tertiary entrance scale, the ATAR where "The ATAR is calculated in Queensland using the same underlying fine-grained scale as the OP … Occasionally, … the ATAR may be used." (Queensland Studies Authority – QSA http://www.qsa.qld.edu.au/17762.html viewed May 10, 2013).

I believe that the following should be remembered. The OP system has been developed by experienced educators and statisticians who have developed a complex system that exists because of necessity and has aims that, from any reasonable viewpoint, are proper and principled, and practices that are well researched and designed, and by any standards, carried out in an admirable manner.

General lack of knowledge by the stakeholders – students, parents, teachers and even academics – of this process may in fact be a major reason for the questioning of the legitimacy of current assessment processes.

Ensuring Assessment processes are supported by Teachers

Because there is a lack of knowledge and understanding of tertiary entrance procedures, teachers can be placed in positions where they have to make decisions with only limited knowledge. The available professional development, although useful, is limited to a relatively small number of teachers. Also, perhaps due to the restricted time and funds, it is limited in its scope and detail.

Teachers have to perform assessment related duties for tertiary entrance far exceeding those that are outlined in subject syllabi. Subject syllabi outline the requirements needed to assess students on the 5 point LOA scale only. However, teachers are required to further place students on the 50 point VH 10 to VL 1 scale and then when there are 14 or more students in a subject, determine positions on the 201 point SAI scale. A lack of knowledge of the implications of these decisions, and even how the numbers on this scale are actually used to determine OPs, may contribute to teachers' lack of support of assessment processes.

Student Participation Levels

Do the outlined assessment procedures of Queensland subjects encourage student learning and participation levels?

We do have graduates from our school system that are successful in tertiary studies that have these subjects as prerequisites. Of course some students do not have specific knowledge that tertiary institutions would like them to have at entry (especially the 99% or so who achieve at a lower level than a VH 10), but many Queensland students still do graduate with very high levels of achievement at a tertiary level. The current situation in Queensland is certainly not as disastrous as some may like to make out. Of course our current system can be improved, but this is not substantially different to the other syllabi and assessment procedures around the country. Queensland school assessment certainly is not driving away a large number of excellent students, as there are still many students with outstanding results at both a school and university level.

The Ability of Assessment Processes to Support Valid and Reliable Judgments of Student Outcomes

Questions about the legitimacy of assessment practices that include non-verifiable authorship and inconsistency from school to school, due to school based assessment, are at the basis of perceived mistrust of current assessment procedures at both the subject level and more broadly in relation to the OP system. OPs (and ATARs) measure Tertiary Entrance. Like LOAs, OPs (and ATARs) have an uncertainty when measured. Of course, some students who achieve an OP 2 perhaps should really be an OP 1 and vice versa. As stated above, this is a fact of measurement. Do many students receive an OP that differs by 2 from what they perhaps deserve? Or 3 or more? How robust is the OP system? Once again, perhaps this could be looked into if it has not already been done and making reports public that address this issue would allow the general community to make informed evaluations.

Is it a realistic expectation that the "coarse" criteria based assessment practices outlined in each subject syllabi are able to be used validly and reliably to place students on a "fine" 201 point numerical scale for "high stakes" judgments of student tertiary entrance? And all of this to be done perhaps without the use of numerical marks until the actual assigning of a number between 200 and 400 as an indication of each student's demonstrated achievement in relation to the other students in the particular subject. Queensland teachers have done an admirable job in this incredibly challenging task and should be thanked and congratulated profusely for their efforts in this area over the last couple of decades. Of course the success of this daunting task has been steered and monitored by the Queensland Studies Authority where praise should also be directed. The real test for validity and reliability of judgments at a subject level is that that is outlined in the previous paragraph in relation to OPs. It should be noted that although in recent times numerical scales have perhaps been discouraged at a subject level in Queensland, tertiary entrance calculations are exactly that, calculations that use numbers!

Conclusion

It is important to acknowledge that although not perfect, our current assessment practices and tertiary entrance since 1992 have served our community in a way that has certainly worked and perhaps even worked well. Research, and just time, may even show that it has worked far better than what many may realise. Perhaps a better informed community on our current tertiary entrance system, and any new one in

the future, should also be considered as a priority in order to overcome the myths that appear when there is a lack of community knowledge.

Yes, a review of assessment practices is due, but it is important not to isolate aspects of assessment, especially leaving out its use in tertiary entrance. There is a need to investigate all subjects, not just those under investigation in this inquiry. Further, as has been already been acknowledged elsewhere, there is a need to review the tertiary entrance system and in particular, how assessment is used to feed in results to determine tertiary entrance scores.