SMC&PA Submission 143
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To: The Education and Innovation Committee
Inquiry into Assessment Methods for Senior Maths, Chemistry and Physics

Please withhold name and personal details from the submission publication.

Addressing the issue
• Ensuring assessment processes are supported by teachers
As a teacher of Maths, Chemistry and Science with 26 years of experience I do not support the current QSA assessment processes

Dear Committee Members

I am writing this submission with two hats on. The first hat is as a state high school teacher while the second hat is as a parent of two students who have recently graduated from the Queensland State High School system.

For the last fourteen years I have taught Senior Maths and Chemistry (usually 2 of each subject) at a large metropolitan state high school. Across the state of Queensland in Week 7/8 of a 9/10 week teaching term, high school teachers try to meet reporting deadlines and most of them will be struggling to do so. During the 4 weeks at the end of each term they work late into the night on school days and all through the weekends. They are simultaneously being asked to prepare revision materials, write assessment items, mark assessment items and prepare the next unit of work that will start the lesson after the last assessment item is submitted. In a medium to large school, the 'average teacher' will have 5 classes of 25 to 30 students, meaning that by Week 7 they will have at least 125 pieces of assessment to process on top of a normal teaching load. You may ask, "How is the position of Senior Maths, Physics and Chemistry teachers any different to that of teachers of other subjects?" It is different enough that, although I have a Chemistry degree (minor in Mathematics) and have taught the subject since 1981 under a number of different syllabi, I asked for the last 5 years under the 2007 Syllabus NOT to be timetabled for the subject-a request that was ignored by my school's administration because of a lack of Chemistry teachers in the system. This year I am at a different school where I do not teach Chemistry.

Firstly I think that it is important for you to appreciate the toll that the lack of suitable requirements and sufficient guidance in assessment by the QSA in implementing the 2007 Syllabi takes on teachers of Senior Maths, Chemistry and Physics. As I write this missive to you my husband, with more years of experience teaching both sciences, is struggling to prepare a Physics paper. Last week it was his Y11 and Y12 Chem. papers. We took a term of long service leave for a second time in the last three years because we were both exhausted. Friends and family know not to invite us out, nor should they organise family occasions, in the last month of each term. My school found it difficult to replace me as a Chemistry teacher not only because of a lack of Chem. teachers but also because few teachers want to teach the subject. One teacher, who was taken off a maths class to take my Y12 Chem., said that it was much harder to teach than Senior Maths, mainly due to assessment requirements. I personally know an extremely experienced, well respected teacher of Senior Maths who collapsed towards the end of the term. The teacher said the doctors consulted attributed the collapse to be mainly due to stress and exhaustion. This person is still on sick leave and says that they cannot return to teaching because of the 'ridiculous assessment requirements and workload'! Is this sufficient to indicate that there are severe ongoing problems with the implementation of the 2007 syllabi?

Why don't teachers of Maths, Chemistry and Physics reuse past assessment items and thus decrease their workload? When the QSA introduced the Syllabi in 2007 no clear cut assessment framework was provided. Schools were left to develop their own assessment packages. Most often we were told

what NOT to do after we had done it. Details of what was expected slowly emerged as feedback was given by the Subject Panels that check the standard of representative samples of student work. The few in-service seminars that were held (and ones we were permitted to attend by the school administration due to funding restrictions) were woefully lacking in clear guidelines. QSA 'Advisers' generally gave advice that meant more work had to be done rather than less and often was contrary to the advice from the Panel. When the assessment packages are reviewed, many assessment items, or questions within them, are not found to be acceptable to the Panels. In Physics and Chemistry the phrase 'does not allow students the opportunity to show an A Standard' regularly appears in the feedback of assessment packages of schools. A student may not be granted the standard allocated by the teacher if the 'Panel' thinks that there is insufficient evidence of the standard in the student's folio of 4 items. Right now you can read on the Chemistry Discussion Group website, requests from teachers across the state for whole assessment items or questions that have been found to be of an acceptable standard by panellists in the past. However that is no guarantee that your panellists will find them acceptable if you use them. Questions that were passed one year may not be acceptable the next year if a different panellist reviews your school's package. The review process itself is flawed because panellists are given a short time limit (2h-minimum of 5 students, 4 pieces of assessment each) for each package review.

Despite requests at Assessment Seminars for an item bank to be set up no such resource is available and, 6 years after the Syllabi were started, teachers are still asking others for items and questions via avenues such as Discussion Groups. The QSA will say that there are exemplar materials on their websites for each subject but this has only slowly evolved over time. I used one exemplar as a model only to have it rejected by the Panel. When contacted, the Academic Advisor from the QSA for my area said that the exemplar was out of date and that 'we have moved on from there'! Teachers continually have to write assessment questions - generally a very difficult and time consuming process. Questions are needed for modelling and guided practice in teaching lessons (most text books do not provide the style of question required in assessment items); for independent practice in homework and revision sheets; as well as for 'practise tests' that give students experience in the 'timing' requirements of assessment items.

There are a number of difficulties in writing suitable questions:

- Meeting the requirements of the A standard. If a question is written for an A standard the C standard students generally cannot answer the question-structuring the question is viewed as decreasing the 'complexity' requirement of the A Standard. The paper becomes bigger than 'Ben Hur' if you have to write multiple questions for each standard as is now being done in Maths papers. At my last school only A Standard questions are asked in Chemistry and students are trained to answer generically i.e. we had to write an unstructured question that contained enough information for a C standard student to give a response which fulfilled the requirement of the standard. To write the requirements of each standard for a question, in keeping with the Syllabus Exit Criteria Standards, you have to second guess the types of responses the students will give in order to decide what would be acceptable. Why does the marking criteria have to be this detailed? It needs to be this detailed so that you can be consistent in applying the standard and to justify to the students and the Subject Panel why you gave a particular standard to a response to a question.

- 'Only 3 Assessment Criteria'. In Chemistry and Physics each of these are broken into 3 sub-criteria. This requires questions that allow students to show that they meet the standard requirements of each sub-criterion. In a two year assessment package each sub-criterion is sampled at least twice but you may be told in your feedback that students have not been given enough opportunity to demonstrate the required standard. It has been said that a question can have more than one criterion being assessed in it but this raises two problems. One problem is that if the response that is intended to exhibit the criterion forms only part of the question it often lacks sufficient detail for the standard of the response to be assessed. The other problem is a major one. Debate still occurs around classifying questions or parts of questions as being a particular criterion. Trying to dissect a student's

response in order to determine whether or not a particular criterion is being addressed is a time consuming process. In my last school, in order to get consistency of marking in one subject, each teacher would mark one or two questions for the entire cohort (**(many) students). I am considered a fast marker by my colleagues and it took me 30 mins to process each student's response for one question which means about 24 hours is needed to do a cohort of **(many) students. When do I get the time? At night after school when I am meant to be preparing lessons? Lose a 'day of time' over the weekend? Yes to both, and remember that I teach four senior subjects. Confusingly we were told that 'assessment should not be the tail that wagged the dog' but it has evolved that we are now expected to apply the EXIT Standards Criteria to every piece of assessment.

- Timing issues.

(a) Time allocation for assessment items in exam sessions kept increasing in order to give all students time to read questions and formulate responses. Paper length became a problem for exam timetabling and was also received negatively by the Panel. Extended Experimental Investigations (EEI's) are compulsory, usually take up an entire term and most commonly occur in Term 2 or 3. This means for various reasons a Science/Maths student can be doing up to 3 concurrent EEI's!

(b) Over-assessment. 'In class' assessment items are difficult to organise since two lessons are often needed. One problem is the conflict situation that can arise for Senior Science/Maths students since the assessment requirements of the Maths Syllabus have also resulted in the need for two lessons for each assessment item generally separated by a week. Students would confess that they 'did not study for their Chem. test' because they had a Maths B and/or C test as well. Since test results are used for reporting all tests have to be summative to force students to focus on revising the work.

- The use of marks. Initially in Chemistry we were told we could use marks but not to aggregate them across the Criteria. Then we were told we could not use marks at all. Even with The Extended Trial Pilot Chemistry Syllabus, used in my last school for *** years before the 2007 Syllabus, the QSA, reinforced by Panel comments, made it clear that the use of marks was not desirable - then it became unacceptable and continues to be so.

Initially in Senior Maths (I teach Maths A) questions were graded in complexity and student responses were rated 1 to 5 against predetermined answer parameters. Complicated grids involving combinations of question complexity and standards were then used to determine the overall result. The 1 to 5 ratings were later replaced with letters A to E since it was not possible to meaningfully aggregate the numbers. This evolved into the present situation where to 'grade' a student's test I was given a set of model answers and a profile grid for the test containing the level of the question, the criteria covered by each question and the maximum possible standard that a student can be awarded under each criterion. (This grid is constructed on A3 then shrunk to A4 sized paper.) I was required to correct the student response then make a series of subjective judgements concerning each question and circle the appropriate letter standard (I have been told that the record is about 60 circles on one test profile grid). Then I looked over the pattern of the letters to make another subjective evaluation of the overall standard in each criterion. I used plus and minus so the 5 point scale is actually a 15 point scale. This is for the KAPs test (knowledge and procedures). A different process was used for the MAPs test (Modelling and Problem Solving). Both tests also had Communication criteria as well. The grades for both tests were recorded on a profile sheet then the Syllabus Exit Criteria Standards were applied. These were been interpreted in the school's approved work program using terms such as 'mostly', 'generally', etc. which were quantified in some form such as 'at least 4 out of 7 C's or better' for each major criterion for that reporting period by the Head of Department. The resultant overall grade was obtained by combining those of the three major criteria in a manner also determined by the Head of Department.

A similarly cumbersome process was used for Chemistry but is too complex to try to explain here. Suffice to say that our profile sheet was A3 size (shrinking it would make it illegible)!

• Breadth of topic coverage versus depth. To write questions that give sufficient depth of knowledge in Chemistry to enable students to answer an A standard question that is 'complex and challenging' (each criterion has its own version of this requirement) across 9 sub-criteria means that 'teaching to the test' commonly occurs. This has been forced on teachers due to the QSA requirement that any style of assessment item used in the Y12 exit package must be experienced by the students in the Y11 package and because time allocated to other activities in the Senior Curriculum has greatly eroded the number of available lessons. It is a significant problem in Y11 Semester 1 when students have not yet had sufficient grounding in the basics of the subject. The use of standards to assess student work has resulted in assessing the quality of student knowledge in selected topics but not the quantity of their knowledge. Areas of topics or topics themselves, not directly relevant to proposed assessment items, are not covered or are diluted, hence students doing the subject at tertiary level may not have the content and/or skills required to successfully manage it. This is particularly the case when preparing students for EEI's.

• EEI's. These are logistical nightmares and, if they are honest, most teachers dread their approach. The philosophy behind them initially appears sound but because they are used as a major piece of assessment the reality is distorted. My Chemistry colleagues and I had for a number of years been trying to convey to our Head Of Department the difficulties that we had encountered in organising and marking EEI's in Chem. but, until the HOD had to do it while I was on leave, the HOD did not appreciate the degree of difficulty involved. Ideally the research questions that the students investigate, by designing and conducting experiments, should arise from experiments done during their course. In that way students have the background information and the laboratory skills to tackle the research question. Unfortunately the predictable questions that students ask and the experiments designed by the students are considered by panellists as lacking the originality required for an A standard. Also, due to the availability of experiments on to the internet, what would be reasonable for a student to investigate is considered by panellists as lacking the 'challenge' element required for an A standard. The appeal for suitable experiments for students is the second most common focus of requests on the Chemistry Discussion Group website and these are present now since EEI's are about to start for many schools.

Explaining the Assessment Standards of the EEI to students is difficult. For example the first Investigative Processes (IP1) criterion, which can only be assessed by experimental work, requires for an A Standard : "formulation of ***justified significant questions/hypotheses*** which inform effective and efficient design, refinement and management of investigations". Many teachers themselves are still unsure about what is meant by the italicised phrase.

Because of the focus in the Exit Criteria on appropriately manipulating and evaluating numerical data, students must choose a research question that will generate it. The experiment cannot be too complex w.r.t. the chemicals (limited due to safety issues, availability and cost) and equipment required, since in a school, unlike in a research laboratory, the set-up has to be disassembled and reassembled repeatedly because other classes use the same work space and the same equipment. For practical reasons EEI's need to be more structured than the A Standard permits. It is therefore not usually possible to let students choose their own research question and design the experiment when from past experience (we tried several different topics in an attempt to find a suitable one) you know that they are unlikely to generate the required data. Although there is merit in the design and trial process, pressure is put on both student and teacher to generate some viable data in a restricted timeframe so that the experimental report can be written.

The expected length of the experimental report is also a contentious issue. The Syllabus clearly states the required length but this has been updated by the QSA in 2011. It is unclear why some Panel

members have chosen to interpret the word limit as being only for the Introduction and Discussion making the final report extremely large. In order to get the elusive A standard on as many criteria as possible in the EEI some students are writing several thousand words. Processing such large sized drafts and final copies of EEI's drastically increases teacher workload not to mention increasing the stress of the workload on the student.

When these issues were brought to the QSA's attention they responded with 'it is not necessary, or often appropriate, to address each sub-criterion in each assessment item'. True, but as previously mentioned, if you don't give enough opportunities, and your questions are not deemed to demonstrate the required standard, you are called to account in the feedback from Panel and your student may be denied the requested level of achievement. If you do give more opportunities the assessment items are longer or you have to do more of them. Overall from a teacher's point of view, doing all this elaborate assessment, when previous methods gave the same outcomes, is frustrating and exhausting. For many students their experience in doing the current chemistry course is not a pleasant one. Both my children chose to do Chemistry. The elder was in the second year of the 2007 Syllabus. Despite both his parents being Chemistry teachers he struggled to understand the criteria in the task statements. He chose not to continue with any of the sciences in his tertiary studies. My younger son followed two years behind him. He had more success at Chemistry but at the tertiary level he discontinued Chemistry after one semester, preferring to do other subjects. When asked what he thought of his high school Chemistry course as preparation for tertiary studies he said that although he had enough background basic knowledge and skills, he did not like having to do group work with other students who 'have no clue' w.r.t. Chemistry. This may help to explain the low numbers of students enrolling in the sciences and in teaching courses.

Thank you for your forbearance in reading such a long statement but I hope that it has given you a better insight into some aspects of the situation occurring in Queensland Schools at present with regards to Senior Maths, Physics and Chemistry assessment.