

13 May 2013

Rosemary Menkens MP  
Chair, Education and Innovation Committee  
Parliament House  
George Street  
Brisbane QLD 4000

Dear Rosemary

**RE: Ref 11.1 MC&PA    The ability of assessment processes for senior maths, chemistry and physics to support valid and reliable judgements of student outcomes.**

Thank you for the invitation to make a submission to the inquiry. This submission is made on behalf of the School of Education at The University of Queensland.

Education at UQ is ranked first in Australia in research (ERA, 2010, 2012), and the recent QS World University Rankings listed the field of Education at UQ as 10th globally. There is particular expertise in mathematics and science education in the School of Education. In recent years the School has conducted research commissioned by the Queensland and Australian governments to examine curriculum, assessment and reporting in schools. We draw upon our experience in such commissioned projects in the submission that is detailed below.

**(i) Ensuring assessment processes are supported by teachers.**

With regard to the first issue to be addressed by this inquiry, ensuring that assessment processes are supported by teachers, Queensland is recognised worldwide for its system of school-based assessment because of the way it engages teachers in the assessment process and enhances their disciplinary expertise and professional knowledge. The Queensland approach to school-based assessment includes significant safeguards for reliability and validity, and ensures that students can demonstrate their broad knowledge, problem-solving skills and capacity to communicate in the fields of Mathematics, Chemistry and Physics.

During the more than three decades of criterion and standards based assessment, Queensland teachers have developed significant assessment expertise, not only in terms of designing tasks but also in exercising professional judgments about the quality of students' work. From our experience in conducting the Queensland School Reform Longitudinal Study in 1998-2000, we know that teachers in the senior secondary years had greater assessment literacy than teachers at other levels of schooling. Senior secondary teachers are astute at designing assessment tasks that align closely with the mandated curriculum, and that elicit clear evidence of students' learning across the whole span of the curriculum. We attribute this greater assessment literacy to senior secondary teachers' long experience in implementing externally moderated school-based assessment.

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While it is important to ensure that assessment processes are supported by teachers, it is just as important to support teachers in the work of assessing students. This support begins during pre-service teacher education, but must continue throughout teachers' professional careers. Support could include formal professional development workshops, but the process of implementing school-based assessment – and in particular the social moderation of assessment judgments – is in itself a powerful professional learning experience.

### **(ii) Student participation levels**

With regard to student participation levels, this is indeed a concern in science and mathematics education in schools and universities. However, the reasons affecting student participation in these subjects are complex and need to be addressed in strategic ways. One way to address this issue is to develop programs of pre-service teacher education that involve closer collaboration between the STEM disciplines and teacher educators. For example, in April 2013 we were instrumental in organising a national forum hosted by the Australian Council of Deans of Education and the Australian Council of Deans of Science. The forum was designed to promote practical forms of collaboration between the sciences and education in order to increase participation in STEM-related subjects in senior secondary school, increase the supply of qualified teachers in these areas, and enrich the learning experience of students in mathematics and science as dynamic, forward-looking endeavours. Increasing participation of students in STEM disciplines requires strategic initiatives of this sort and on-going close collaboration between the fields of education and science. Projects are currently under review by the Office of Learning and Teaching (OLT) who are managing this particular initiative for Professor Chubb the Chief Scientist for the Commonwealth Government. We believe this initiative will yield significant positive outcomes in changing participation of students in studying Mathematics, Physics and Chemistry.

### **(iii) The ability of assessment processes to support valid and reliable judgments of student outcomes.**

With regard to the ability of assessment processes to support valid and reliable judgments, it is important to recall the reasons why Queensland moved away from external examinations as the sole form of assessment in the senior secondary years. External examinations are very expensive and in addition they –

- cannot provide a broad picture of students' capabilities, especially in relation to higher order thinking and capacity to communicate effectively within the norms of the discipline;
- can disadvantage specific groups of students who cannot perform well under the unrealistic time-constraints of formal assessment or for whom examinations provoke anxiety;
- provide inadequate coverage of learning outcomes for students across two years of senior secondary education.

The current school-based assessment system has various safeguards to protect validity and reliability. These include the provision of explicit criteria and standards to guide assessment judgments, the processes of social moderation at school, district, and state level, random

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sampling by the QSA to check assessment judgments, and finally the Queensland Core Skills Test as a means of scaling assessment judgments between different subjects and between schools.

A concern voiced during an advisory forum focussed on the relevance and validity of assessment tasks that required students to engage in scientific and mathematical investigations and write-up their investigations in the form of a report. Our academic colleagues in the STEM disciplines at UQ support investigations as a means of demonstrating learning. Scientists from the STEM disciplines are required to present their findings at conferences, to explain theories and findings in clear language, and to write reports to be published in scholarly journals. It is also an increasingly important task for scientists to communicate their research to the general public and to participate in public discourse about scientific issues. Within the current school-based approach to assessment students are provided with the opportunity to engage in significant investigations with regard to the disciplines of Physics, Chemistry and Mathematics, and to learn how to communicate effectively to broader audiences. We regard these kinds of assessments as reflecting authentic and necessary aspects of becoming a member of the scholarly communities of chemists, physicists and mathematicians.

We would welcome the opportunity to expand on this submission if requested and look forward to contributing further to the inquiry process.

Yours sincerely



Professor Peter Renshaw  
**Head, School of Education**  
**The University of Queensland**