

## Submission to the Education and Innovation Committee's review of Assessment Methods for Senior Maths, Chemistry and Physics

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**Expertise and experience of author:** Currently teaching senior physics (year 11 & 12; 7 years experience) and chemistry (year 11; first year of teaching chemistry); qualified physics and mathematics teacher; member of a district review panel for physics (4 years); undergraduate honours thesis in the philosophy of science education.

**Summary:** The design of the Queensland curriculum allows for the delivery of rich and authentic learning experiences. Sustained engagement with the assessment methods that this curriculum requires allows teachers to develop robust and quality tasks that allow students to demonstrate a wide variety of desired skills.

Teachers new to Queensland or teaching outside of their teaching fields should receive more support to provide authentic and rich learning experiences. Greater collegiality via the development of shared tasks could reduce teacher work loads and provide resources for students to rehearse their skills.

### **Comments:**

The design of the Queensland curriculum allows the individual teacher to be incredibly flexible in the delivery of the content and learning sequences. This flexibility allows teachers to tailor their programmes of work to match the local school needs, the resources available and their own areas of expertise. Examples can easily be provided for each of these situations.

A local school may have a particular focus on overseas development, to support this a unit on the “physics of development” where students learn about pumps and solar panels could be taught. Likewise “a chemistry of development” unit could focus on water quality. In this way the curriculum allows for teachers to tailor their programmes of work to match the school needs.

Schools have varying levels of resourcing, both in terms of the equipment owned by the school and the availability of local resources. Many schools in South-East Queensland do a “Theme Park Physics” unit, due to the local availability of theme parks. Schools located in North Queensland would find this a more difficult unit to cover due to the relative difficulty of access to

the theme parks. They, however, have access to resources, such as mines and reefs, from which other aspects of physics can be taught. A similar concept applies to the teaching of chemistry.

Teachers in the course of the university training often cover different areas of physics, chemistry and mathematics based on the areas of focus of their particular institution. As a result, teachers from one university may have studied a topic area not covered in another institution. The Queensland syllabi allow teachers to incorporate these areas of specialisation into their teacher programmes which results in unique and varied learning experiences across a variety of schools. For example, one teacher might choose to cover certain aspects of physics by looking at astrophysics, which looks at questions such as star formation and evolution, another teacher may choose to look solar-terrestrial space physics, which looks the solar wind and its interaction with the Earth. These variations are permitted under the current Queensland syllabi. Further, they should be celebrated as the variety of learning experiences students are experiencing uniquely situates Queensland students to be able to contribute to post-school problem-solving in a multi-faceted manner.

It should be clear that the richness of the curriculum offerings described above requires a syllabus that does not prescribe a one-size-fits-all approach to content. It follows that it is not possible to have a uniform assessment package for all Queensland mathematics and science students.

The assessment programme outlined in the current Queensland science and mathematics syllabi requires teachers to develop a deep and thorough knowledge of assessment practices. Teachers who engage with the standards describing student achievement find that the standards inform quality assessment design and that consistent and reliable decisions can be made. It is fair to say that the process of becoming proficient with the standards is time consuming. However, the end product is teachers who have a rigorous understanding of assessment and are able to produce quality tasks that meet the authentic learning needs of their students.

The richness of the Queensland syllabi presents unique challenges to teachers new to teaching in Queensland and teachers who are teaching outside of the teaching specialties. The time investment required to gain proficiency with and deep understanding of the syllabi makes it difficult for teachers unfamiliar with the Queensland system to provide quality learning and assessment opportunities to their students initially. The Queensland Studies Authority (QSA) could potentially assist teachers new to teaching in Queensland by providing more “off the shelf” units of work and assessment. An accountability system that ensures these teachers gradually develop their own units of work suitable for their school will enable these teachers to also gain proficiency with the Queensland syllabi.

Many schools rely on non-specialist teachers to cover senior classes, particularly in smaller schools and remote schools. These teachers lack the content expertise to develop rich,

authentic and localised units of work that connect to the wider body of content knowledge. The availability of more “off the shelf” units of work and assessment would also assist these teachers.

Assessment systems that rely on external exams are able to produce a large number of questions over time. These past questions are great resource to teachers and students alike. Teachers are able to adapt and modify past exams when preparing assessments for their students. Students are also able to access past exams and use them as an effective learning tool as they prepare for their assessments. The highly unique manner in which Queensland syllabi are delivered in each school provides a barrier for this sort of arrangement. The QSA could collate and publish sets of generic questions from year to year that teachers could use as a resource for their own preparation and that for their students without impairing the integrity of the individualised work programmes.

The Queensland senior mathematics and science syllabi provide the foundation for a rich and authentic learning experience for students. Teachers who engage with the standards descriptors are able to develop rigorous and reliable assessment tasks. Greater support, in terms of curriculum and assessment resources, could enable more teachers to become proficient the the senior mathematics and science syllabi.