25 August 2014

A national forum, *Assumed knowledge in maths: Its broad impact on tertiary STEM programs*, was convened in Sydney in February 2014. The forum met to consider the impact of the ways that universities ensure that enrolling students have mathematical background appropriate to their chosen degree programs. The forum was attended by a wide range of academics from mathematics and the sciences, as well as policy makers and tertiary and secondary education specialists.

Participants expressed significant concern about the current use of 'assumed knowledge' as a university entry standard for those degree programs that require prior mathematical knowledge. Their concern reflects one that is widespread throughout the university sector.

An assumed knowledge model means that students are expected to have completed particular background studies, but which are not required for selection purposes. In contrast, a prerequisite model mandates such knowledge rather than merely expects it. 'Assumed knowledge' has allowed large numbers of students to enter programs like science, engineering and commerce, without the necessary knowledge.

The chief concern expressed by forum participants was that if students are to make choices on the basis of assumed knowledge then they must be given information adequate to judge

- their ability to progress through their chosen degree program in the absence of that knowledge,
- their capacity to gain that knowledge in the course of their program,
- the efficacy of the options for them to do so.

The Higher Education Standards Framework Section 3.1 requires that "students have adequate prior knowledge and skills to undertake the course of study successfully". We believe that the information currently provided by many universities to enrolling students about the mathematics necessary for success in their courses may well breach this standard, in that it is not adequate for judgement on this matter.

The Forum also noted that the 'assumed knowledge' approach

- negatively impacts on student retention and success across a broad range of discipline areas, particularly in bachelor's degrees in science and engineering,
- contributes to the decreasing enrolment in intermediate and advanced level mathematics subjects in secondary schools across the country, since `assumed knowledge' is interpreted by many groups to mean that higher-level mathematics is not actually required.
- leads to considerable duplication of effort and inefficiencies, due to the extra time required to teach the secondary level mathematics that students lack, and the resulting decrease in the amount of time available for the pursuit of their chosen specialty.

The Forum participants have agreed to issue the attached communiqué to highlight these concerns.

Forum Communiqué

The national forum, *Assumed knowledge in maths: Its broad impact on tertiary STEM programs*, Sydney 13-14 February 2014, was convened to discuss the impact of the removal or weakening of hard prerequisites in mathematics for degree programs including science and engineering.

The current practice of `assumed knowledge' used by many universities to inform prospective students about the mathematics knowledge required for success in their degree programs is vastly inadequate. The lack of clarity and ambiguous nature of this information is contributing to high failure rates, poor retention, and limited pathways for students in science, technology, engineering and mathematics degrees.

Current practice does not allow prospective students, their parents, teachers and advisers, to make reasonably informed judgments about their ability to undertake their chosen degree programs. Additionally, it sends the wrong message to students, teachers and parents about the importance of high-level mathematical study in senior secondary school, and impacts negatively on the level of quantitative skills that our future graduates need.

Without action, the situation will only worsen.

In order to address these concerns, we, the participants,

- **Urge the Minister to initiate an inquiry, in the context of Section 3.1 of the Higher Education Standards Framework, into the adequacy of information provided by universities to prospective students about the essential mathematical background required for their degree programs, and about the consequences for students who do not have that knowledge.**

- **Urge Universities Australia to seek agreement from its members, that university science, engineering, commerce, education and mathematics schools and departments review their selection criteria to ensure that the mathematical and statistical skills necessary for progression through their degrees are clearly and accurately stated.**

Background context:

- Many students enter degree programs without the expected `assumed knowledge'. Universities do not regard assumed knowledge as a prerequisite for selection into their programs and, in these cases, students' mathematical backgrounds are not assessed by the institution.
- Information on university websites and brochures about assumed knowledge entry standards in mathematics is not consistent across institutions. It is difficult for students and their advisers to judge whether they have the assumed knowledge as stated, as there is often no specific reference to Year 12 subjects by name or, more importantly, to the essential content of these subjects.
- The term 'assumed knowledge', in relation to mathematics, is interpreted by many teachers, parents and students to mean that mathematics is not an essential requirement for proceeding to study science and mathematics at university.

- This misleading information impacts on students, contributing to high failure rates in mathematics and science subjects in first-year and beyond, increased costs associated with re-taking subjects, additional required bridging subjects and limited subject choices and pathways later in their degrees.
- Academics in chemistry, physics, engineering, mathematics, statistics and life sciences report that students entering without the appropriate assumed knowledge in mathematics struggle with mathematics content in their science and engineering subjects with very high failure rates reported, in some cases as high as 60%.
- Universities currently expend significant resources teaching secondary-school-level mathematics to students who lack the level of mathematics they need for success in their university programs. Bridging courses (some for credit, some not for credit) and multiple entry-level subjects are offered to cater for students without the appropriate assumed knowledge. This duplication is a significant and costly inefficiency both in terms of academic and administrative considerations.

Cc: The Hon. Christopher Pyne, MP, Minister for Education

Ms Belinda Robinson, Chief Executive, Universities Australia

Ms Jennifer Westacott, Chief Executive, Business Council of Australia

Professor Ian Chubb, Chief Scientist of Australia

Dr Roslyn Prinsley, National Science & Mathematics Education & Industry Adviser

Professor Russell Crawford, President, Australian Council of Deans of Science

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