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Submission to the " Inquiry into Academic Standards of School Education"

We appreciate the opportunity to contribute to the inquiry regarding the " Inquiry into Academic Standards of School Education". In this document we will not pass any comment on the situation in high schools regarding Maths Physics and Chemistry education, but will rather offer a perspective on the situation that we face with our first year Science and Engineering students. Between us we have experience in teaching and research in a wide range of disciplines including Engineering, Mathematics, Physics, IT, Geology, and Environmental Sciences.

We are able to make objective evaluations of the standard of mathematics and physics at the end of grade 12 over a period of more than two decades. We have found a significant decrease in standards.

At first year level, like most Universities, we now offer two streams of maths catering for students with differing mathematical abilities and backgrounds. The first stream is a very elementary level of maths that does not go beyond the level studied at high schools (e.g. Queensland Maths B). The second stream assumes that students have studied Maths B at high school and is the maths subject required if students are to move into second year subjects in engineering, physics and mathematics courses. There is no doubt that we are now unable to teach this subject to the same depth as we

were in the 70s, 80's and early 90s. The level of mathematics competence of students entering this subject has forced us to reduce the difficulty of this subject twice in the last 15 years. A cursory examination of the change in our subjects indicates that it is doubtful if our students, when they finish first-year University, are further advanced than a student at the end of year twelve, 20 years ago. We believe that the adverse comparisons with levels in other OECD countries reflect these changes.

The above comment may be interpreted as an implicit criticism of the high schools. However the Universities must share a significant part of the blame for the demise of maths in the schools, and consequently in the universities. A particularly damaging action by the Universities has been to remove the higher-level high school mathematics courses (Maths C in QLD) from the list of prerequisites especially in engineering. Maths C is a higher level maths course in years 11 and 12 and was a prerequisite for engineering at many universities until about a decade ago. The University of QLD removed it from the prerequisite list and the other universities in the State quickly followed. This was done mainly because maintaining student numbers is central to the very survival of university faculties and lowering prerequisites is one way to get more students. A university that acts unilaterally to require prerequisites will quickly go out of business. A more unified and principled approach is required.

With the removal of Maths C as a prerequisite subject for any university subject, there was no longer any compelling reason for students to do this subject in the schools and the numbers dropped rapidly. Now there are a significant number of schools in QLD that do not offer Maths C because of insufficient students.

Other discipline areas in the Faculty of Science Engineering and Information Technology (such as the Biological, Earth and Environmental Sciences) are forced to assume no knowledge, or very limited knowledge, of basic mathematical concepts at first year level, requiring remedial action, or a curriculum that is less than ideal. A basic understanding of calculus, algebra and statistics is often essential to successfully work in these disciplines. The ability to do simple algebra and arithmetic cannot be taken for granted in today's first year cohort.

Our own faculty (Science, Engineering and Information Technology) is keen to improve the mathematical ability of our students and we have instituted changes to ensure that all students will do some maths or physical sciences in their first year studies. However, in many cases, the subjects that these students will study will be the low level subjects which do not advance the students knowledge greatly beyond what they would have if they had studied these disciplines at schools. For example a student who has not done physics at schools will do a low level course in physics in first year University. He or she would probably not be able to undertake the normal first-year university subject in physics, even though it is considerably simpler than the same course of a decade ago.

We recognise that by requiring all students to do some maths or physics at first year, we may discourage a fraction of the students from undertaking science, and to enter other non-scientific programs, but we believe that action is essential.

The low participation in rigorous mathematics in senior High Schools (Maths C in QLD, with equivalents in other states) is causing a crisis in university mathematics and physics disciplines. We urge the Review Committee to investigate the factors that are influencing student choices at the end of year 10. IF students are not taking rigorous maths and physics courses in year 11, then it is inevitable that they will not be able to take such courses at the university level.

We hope the above comments will be useful and that the committee should be in no doubt that we are seeing a significant reduction in the mathematical ability of students entering Universities relative to a decade ago. We urge the committee to consider ways to reverse this decline.

Yours faithfully

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