EVALUATION AND MANAGEMENT OF STUDENT DIVERSITY: A NEW MODEL FOR TERTIARY SCIENCE EDUCATION

Luby Simson, Imi Moore, Jim Woolnough, Steve Pittard

Presenting author: Luby Simson (Luby.Simson@canberra.edu.au)
Faculty of Applied Science, University of Canberra, Bruce ACT 2617, Australia

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ABSTRACT

Managing student diversity in the tertiary sector calls for new approaches to tertiary science education. This paper explores the dichotomy between increasing University accessibility while ensuring academic success to a wider demographic of students and proposes a new model for tertiary science education. Since adopting a modified admissions policy in 2010, we found that students who entered our science-related degrees with an ATAR/UAI of less than 70 or with no ATAR performed poorly compared to students with a higher ATAR/UAI. We have established a Diploma of Science pathway, UC-SUCCEED, the aim of which is to more effectively cater for our diverse student cohort. The one-year Diploma of Science program is designed to articulate directly into our 1st year Bachelor Science courses, providing the foundation knowledge to better prepare students for successful university studies in the Sciences and a transformative educational experience.

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INTRODUCTION

Pride has been expressed in Australia's position as an international leader in the movement from elite to mass higher education systems. Indeed the targets set by the 2008 Review of Higher Education (Bradley, 2008) include attainment of a bachelor-level qualification for 40 % of Australian 25- to 34-year-olds, with 20 % of undergraduate enrolments in higher education to come from low socio-economic backgrounds. But there are clear signs that the quality of the educational experience is declining (Bradley, 2008).

Deputy Vice-Chancellor of Victoria University, Prof. Anne Jones, recently stated "attrition rates are likely to rise because universities aren't set up to teach less-prepared students" (Trounsen, 2011). In the same article in *The Australian* newspaper, Prof. Peter Rathjen, new Vice-Chancellor of the University of Tasmania, suggested that "40 % of students are not necessarily going to benefit from an education that was [originally designed] for a very small number of people". Both Jones and Rathjen go on to point out that many of these students require a more intensive, hands-on experience that universities find it difficult to resource and provide. Studies by Mc Innes and James into the first year experience in Australian Universities (James, Krause, & Jennings, 2010) highlight the many challenges faced by first year students: adjusting to different teaching styles, identifying new standards and expectations, and managing workloads. These challenges have been easily apparent to lecturers of large first year subjects where the need to create an effective learning environment is firstly encountered.

In 2010 the University of Canberra modified its admissions policy to include various admission pathways, not unlike many Australian Universities, enabling entry to students with a wider range of Australian Tertiary Admission Ranks (ATARs) than in previous years. The ATAR is a ranking system based on a combination of school-based assessment and final examinations (University Admissions Centre, 2011). It is designed to provide some comparability between students throughout NSW, Victoria and the ACT and is based on the total number of students within any year cohort who completed Year 10. It replaced the previous ranking system called UAI, but is not significantly different to the UAI in any way that affects this study. In addition, a greater number of students were facilitated to enroll with no ATAR/UAI through Direct Entry. The Direct Entry admissions included mature-age students and international students. Several short-term programs were put in place to orientate students with an ATAR/UAI below 70. The modification in the admission pathways resulted in a significantly larger and diverse cohort of students enrolled in the foundational first semester units.

THE STUDY

Within the Faculty of Applied Science at the University of Canberra the two 1st year foundation Concepts in Biology (CiB) and Chemistry 1a, core units for all the Bachelor Science degrees, had around 400 students enrolled at census in 2010 and 2011. Typically some 30-50 students will have already withdrawn from these units by census date, and are not included in this study.

In 2010, the mean ATAR/UAI of students enrolled in CiB was 73 although some 34% of our students do not enter with an ATAR and are enrolled by direct entry. Many students enrolling in these units have not completed any science at senior secondary level, which is consistent with a national trend, since 1992, in a decline of secondary school students participating in the sciences (Goodrum, Hackling, & Rennie, 2000; Ainley, Kos, & Nicholas, 2008). Within the 2010 cohort 45% came from the ACT and 27% came from regional areas. A smaller proportion, around 8%, came from other Australian cities. There were a small number of International students. The background of 18% of students could not be determined and many came through two fee paying University Preparatory programs. In this evaluation the success of students within each of these groups was tracked.

THE OUTCOMES

The success rate of students over the last two years has been disappointing, particularly for students with low or no ATAR/UAI (Figure 1). Interestingly, a comparison of 2010 and 2011 data shows a repetition over the two year study period (Figure 1).

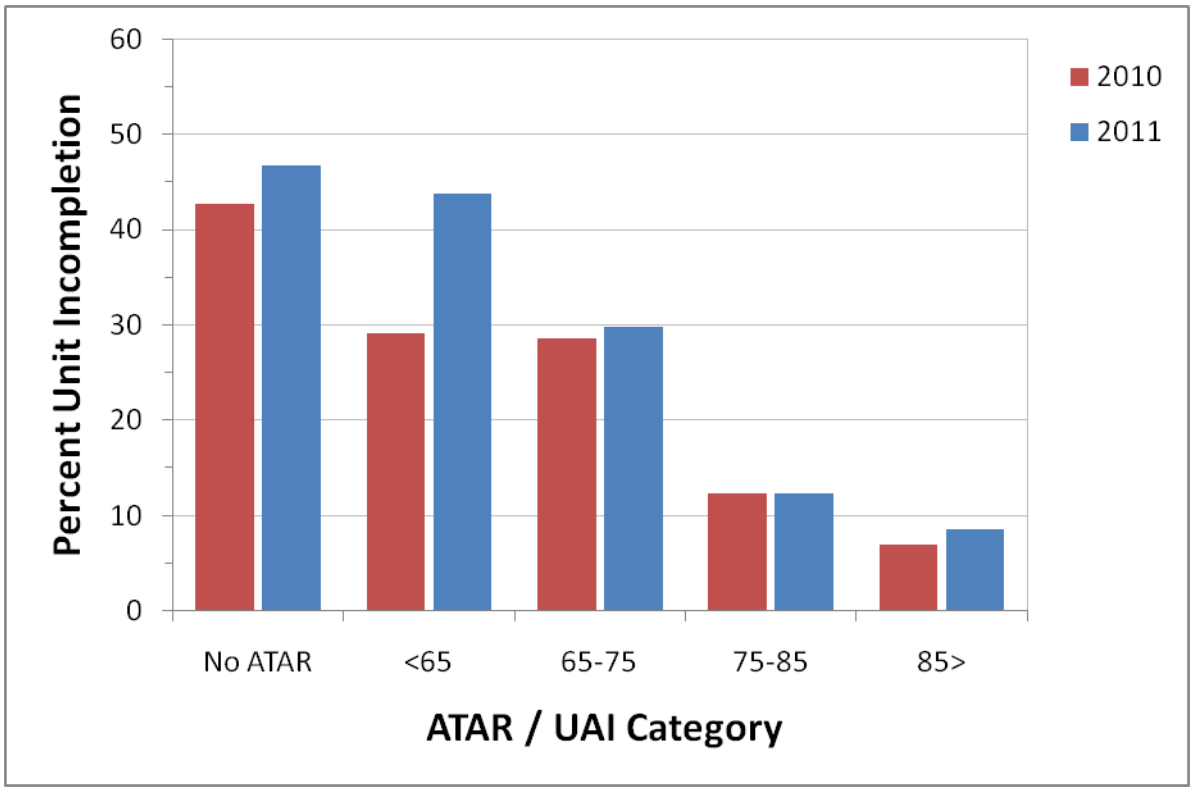

Figure1: 2010 vs 2011 comparison of the percentage of students within each ATAR / UAI category that did not complete the unit. Number of students in each group 2010: No ATAR, n = 156: <65, n = 48; 65-75, n = 91; 75-85, n=89; 85>, n = 29; and 2011: No ATAR, n = 156: <65, n = 48; 65-75, n = 67; 75-85, n = 73; 85>, n = 35

There is a weak, although consistent, correlation between incoming ATAR/UAI and final result in the Semester 1 units over most of the range (Figure 2). In all categories, particularly those with no ATAR/UAI, the range of results was very large. For these cohorts the pattern of final results in relation to incoming ATAR/UAI is typical of the pattern found over many years.

The Faculty provides an extensive support system through our Science Resource Centre, which provides on-demand discipline-based support through peer mentoring, one on one assistance, study

areas and support staff for all student cohorts. Many students engage with this program and there is evidence that participation does contribute to greater success (data not shown), as highlighted in previous studies evaluating discipline-based academic skills programs (Baik & Greig, 2009).

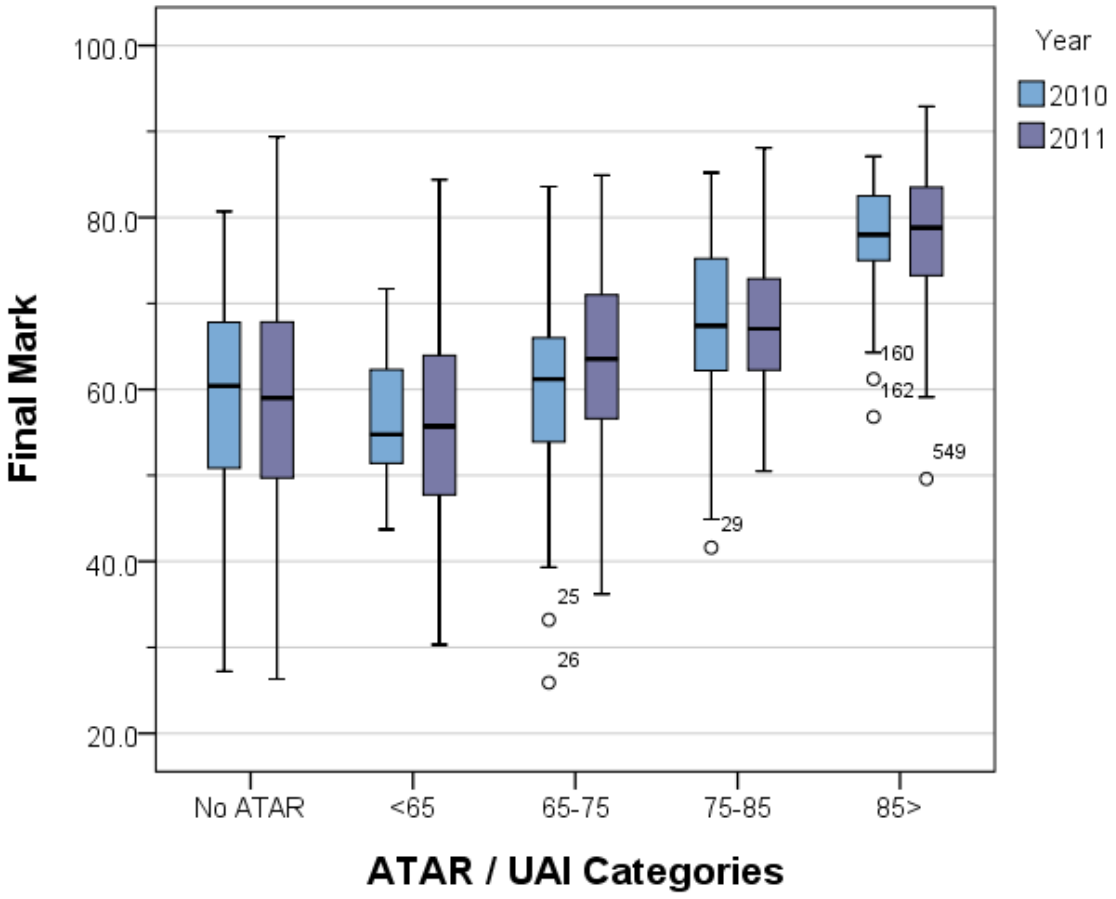

Figure 2: Final mark by ATAR/UAI categories for all students who completed all assessment items for CiB 2010 and 2011. Number of students in each group 2010: No ATAR, n = 48; <65, n = 22; 65-75, n = 66; 75-85, n=66; 85>, n = 22, 2011: No ATAR, n = 111; <65, n = 39; 65-75, n = 54; 75-85, n=64; 85>, n = 32

Although ATAR/UAI is not the only predictor of success it is clear that students with an incoming ATAR/UAI of less than 70 have diminishing chances of passing the unit, particularly considering that Figure 2 only includes those students who completed all assessment items.

What is of more concern is the proportion of students in different ATAR/UAI categories successfully completing the unit. This also correlates with ATAR/UAI (Figure 1). Of particular interest is the significant group of students (N=139) who enter with no ATAR or UAI score. This group includes a small number of international students (of whom 43% failed to complete the unit) as well as mature-aged and regional students.

The situation where more than 30% of students with an ATAR/UAI less than 70, or with no ATAR/UAI, fail to successfully complete this foundation unit in Biology is not acceptable. Many of these students would not have had access to university study even 5 to 10 years ago, and have now had an unsuccessful, and we presume, unhappy experience of the university sector, which may affect their attitudes to further study for a long time.

We would suggest that the drastic change in university admission policies, at this and other universities, has produced a cohort of students for whom a new approach is needed to enable successful tertiary study in the sciences. Extensive support structures during their first semester of study and the traditional entry pathways are no longer sufficient to deal with this issue. University level

education has now become available for many young people who would not have such access only a few years ago, many of whom are poorly equipped for studies in the science discipline and the transition to higher education. Many students in this diverse cohort have a negative and unsuccessful experience and new ways of enabling success are required.

PROPOSED SOLUTION

The design of the Diploma of Science or UC-SUCCEED, is founded on providing students with a grounding in basic concepts in science, including biology, chemistry and physical science, as well as providing skill development in arithmetical techniques, English communication and science study skills. From 2012 the Diploma of Science will become the preferred admission pathway into studies in the Sciences for several cohorts of students: 1) Domestic onshore students with low ATAR/UAI entry scores; 2) Students who have an ATAR/UAI above 65 but have not completed studies in the Sciences at senior secondary school; and 3) International students.

The one-year Diploma of Science program is designed to articulate directly into our 1st year Bachelor Science courses, providing the foundation knowledge to better prepare students for successful university studies in the Sciences (see Figure 3). It is aimed to directly target areas recognised as being critical in providing quality transition to higher education learning (James et al., 2010). The course will be designed to strength interactions between students and academic staff by retaining low student to staff ratios, and retention of a personal dimension to the teaching program (James et al., 2010). Students "at risk", with a low entry ATAR, poor science background, and who are experiencing poor levels of success in the Bachelor program will be encouraged to participate in the course, creating more "buy in" for these students (James et al., 2010).

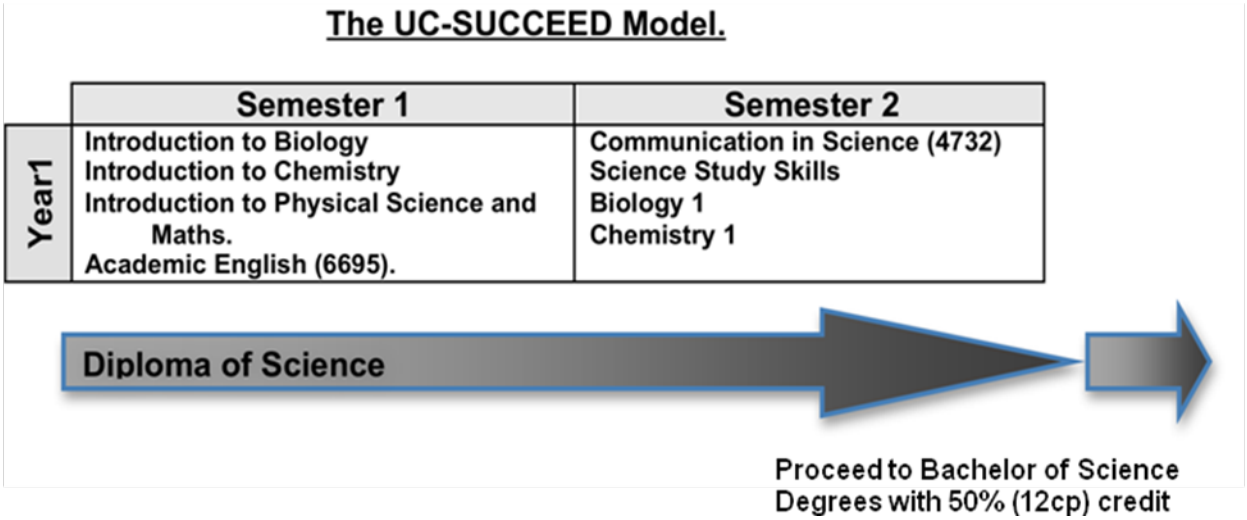

Figure 3: Diploma of Science or UC-SUCCEED: The following model provides an alternative admissions pathway, articulating a pre-Bachelors course study (through a Diploma) with our current Bachelors degrees.

CONCLUSION

Based on an evidence-based approach, the Diploma of Science has been created as a new entry pathway designed to cater more effectively for our diverse student cohort. The Diploma in Science pathway provides a new model for tertiary science education at a time where we are striving for 'a University education for all', as well as "education as a transformative experience for all people irrespective of their origins, age and circumstances, to be used for the public good" (University of Canberra, Strategic Plan, 2008-2012). Importantly, we will continue to map the success of this student cohort and conduct both qualitative and quantitative analyses aimed to identify the effectiveness of this new program in managing student diversity within the higher education sector.

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