Addressing the 'R' in STAR: a Deakin case study

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Abstract

Internationally there are proportionally more tertiary graduates within the humanities (social science, law and education) compared to those within the disciplines of Science, Technology, Engineering and Mathematics (STEM). While initiatives to improve retention of higher education students have been heavily invested in, the deficit of STEM graduates has affected labour markets, with the supply not meeting the demand for jobs. Thus is it imperative to identify how to best support tertiary STEM students throughout their degrees, in order to produce graduates who will fulfil the requirements of the future workforce. This emerging initiative report outlines a 3-year project to longitudinally track a cohort of STEM students throughout their degrees. This will provide an opportunity to identify the factors influencing retention at each year level and inform the development of a framework aimed at improving retention in STEM graduates.

Introduction "The Issue"

In higher education globally, attrition in STEM disciplines is higher than non-STEM disciplines (Chen, 2015; O'Toole, 2013; Wilson et al., 2012), with less than half of the students entering into a STEM discipline graduating with a STEM degree (Department of Education and Training, 2017). STEM attrition has been attributed to factors including large class sizes which leads to students feeling left out, and "coldness" within the classroom reflecting a student perception that the faculty (teaching staff) did not like to teach and valued research over teaching (Daempfle, 2003).

Attrition of STEM students has the potential to impact on Australia's place in the global economy. Insufficient course completions in STEM degrees may lead to insufficient graduates available to employ as scientists, engineers and mathematicians for the future workforce that is expanding (1.5 times the rate of other jobs (Australian Bureau of Statistics, 2014)). It is not only traditional STEM disciplines that are of concern. Employers are looking for "a STEM-literate population that celebrates discovery and entrepreneurship" (Office of the Chief Scientist, 2014, p. 9).

In order to be able to improve attrition rates, we need to understand student retention and student persistence. Retention and persistence, have been used interchangeably within the literature (Hagedorn, 2006) but in this paper are recognised as two separate phenomena. *Persistence* measures the students' ability to continue in a course or stay in a university through their own will and motivation. Retention is defined as methods applied by an institution in

order to retain students within the institution. A variety of support mechanisms and programs have been and are used by Universities globally to aide in retention and support persistence.

This report outlines a 3-year project that longitudinally tracks a cohort of STEM students within a single STEM Faculty in a Victorian University., The project will: (i) identify the support mechanisms that are currently in place; (ii) determine the mechanisms being used by the students; (iii) assess how effective the mechanisms are from a student perspective; and (iv) examine the student experience of transitioning between year levels and its impact on retention rates.. Identifying the drivers and barriers of retention at each level of study will provide key reference points to build a framework to improve STEM retention.

What is being done? Deakin Case Study

Participants in the study are students from the Faculty of Science, Engineering and Built Environment (SEBE), Deakin University. Deakin University is a multi-campus university and has a mid-range ranking in regards to retention and attrition for all courses; within the State of Victoria in 2014 Deakin ranked 5th (out of 9) in both attrition (14.42%) and retention (85.25%) of commencing bachelor students (Department of Education and Training, 2014).

In April 2016, all first year students in the Faculty of SEBE were invited to participate in the study. The first stage was a voluntary online survey. The second stage involved student focus groups that focussed on the student experiences of the first year of their degree. This longitudinal study will follow this cohort of undergraduate STEM students throughout their degrees.

The online survey

The online survey, titled "First Year Experience and Support" was sent via email to all first year students enrolled in a SEBE course at Deakin University (n = 1303), as of the 28th of March, 2016, which fell after the university census date. The email was sent to each student with a letter of invitation to participate in the survey and included a URL link to the online survey. No incentive was provided to participate in the survey and the survey was voluntary. The study was approved by the Deakin University Human Research Ethics Committee (project number 2015-305).

The 36-question survey was based on the design of Brockett (2002) and included sections on demographics (gender, age), current enrolment status (course and mode), studies/life prior to beginning university, family or friends with STEM qualifications, reasons for course choice use/knowledge of University learning and support facilities contact and approachability of teaching staff, study/work/life balance, and travel. Themes identified during data analysis were used to develop interview questions for the focus group discussions.

One hundred and eighty four students responded to the survey (14.1%).

In order to be able to readminister the survey in 2017 and 2018 to the same cohort of students, the online survey was amended to reflect the changes in year to determine key factors such as changes in use and knowledge of University learning and support facilities, and changes in study/work/life balance.

Student Focus Groups

The second stage of the project involves tracking a self-selected cohort of students throughout their degree. After completing the online survey, students were offered the opportunity to volunteer for a focus group that tracks their university experience at regular intervals throughout their degree. The purpose of the focus groups is to gain more personalised and detailed information about the student experience within their STEM degree to determine if the support services provided to students and to identify any areas of support that are lacking.

A plain language statement and consent form was sent to all of students who stated a willingness to participate (n=59). Of the 59 initial respondents, 11 agreed to take part in the focus group. To expand this pool in 2017 and 2018 students who participate in the online survey will again be invited to participate in the focus group study. While these students will not be part of the 3 year study, it is hoped their contribution will provide a richer data set.

The longitudinal study involves the students participating in a focus group twice a year for the length of their course, which in general is 3 years. The students were offered a financial incentive of $10 per focus group attended.

Building a framework: building on and extending good practice and knowledge

Frameworks for enhancing student retention do exist within Australia, including the *Student Engagement Maturity Model* (Nelson, Clarke, Stoodley, & Creagh, 2014), which is currently integrated into six Australian Universities. Such frameworks, while effective, tackle broad-scale retention and attrition issues, rather than discipline specific retention and attrition which this project aims to address.

A large proportion of literature on retention in within looks at first year retention and support programs. Emerging literature has begun to describe second year support programs in Australia, and there is limited literature addressing the final year experience (Figure 1). McBurnie, Campbell, and West (2012) indicate that there is a large transition gap between 1st and 2nd Year STEM education, in the 2017 survey and focus groups we aim to address whether this gap in transition is evident in the sample cohort (Figure 1).

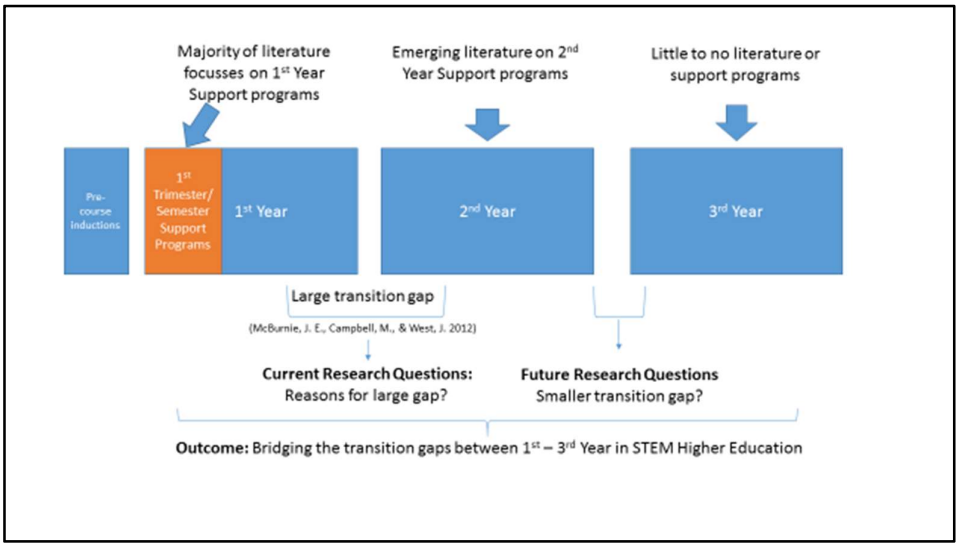

Figure 1. Longitundinal STEM Retention Framework, adapted from Nelson (2014).

Implications and Applications

This research will potentially not only influence the wider community associated with this study by improving Deakin University's attrition rate, but potentially inform STEM retention on a national and international level, as a longitudinal study of this nature has not previously been undertaken. A clearer understanding of why STEM students make certain decisions in regards to their undergraduate studies, will assist in developing and supporting retention programs that are of most use to STEM students, and thus will assist in students completing their degrees.

This project addresses the 'R' in STARS. Increasing retention has wide ranging implications for tertiary institutes, the workforce and economic growth. This framework offers a comprehensive overview of the university experience from the student perspective. Finding answers to such questions below will provide valuable guidance to develop a comprehensive framework to address the 'R' in STARS across all year levels.

The Office of the Chief Scientist (2014) emphasizes that our economic growth cannot be sustained without a community of curious and capable people.

Questions/Issues to be addressed

Universities offer a range of programs to support undergraduate students.

1. Are students aware of the support programs available to them?
2. What are the support programs that are most utilised by students?
3. Do students prefer online, and/or on-campus support programs?
4. Are there peak times during the year that students utilise support programs?
5. Do the needs of students change as they progress through their degree? Do students need targeted programs for each stage?

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