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ASSESSING THE IMPACT OF THE SCIENCEREADY PREPARATORY SHORT COURSE ON STUDENT ACADEMIC PERFORMANCE

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Abstract

Starting university can be a daunting experience representing a big adjustment for first year students. Facilitating a smooth transition to university sets students up for successful degree completion; however, if students struggle or become disengaged, they can underperform or drop out completely. An early support system, the 'ScienceReady' short course has been designed to assist with the transition to university study for nursing and midwifery students. It

has been designed to provide essential academic skills and foundational science knowledge, reduce anxiety, and assist in the formation of early friendship groups, with the overall aim to improve student success. As well as improving background knowledge, the course also allows students to visit laboratories, meet staff and interact with their peers. Despite its scope, we knew little about the impact of attending ScienceReady on later academic outcomes. This study assessed the impact of ScienceReady attendance on first-year academic success, providing evidence for the importance of early support systems in tertiary success.

Keywords

Preparatory Course, Academic Performance, Nursing, Midwifery

1. Introduction

It is well established that the first year of tertiary study represents a critical point of transition for new students not just academically, but also socially, culturally, and environmentally (Kift, 2008; Wilson et al., 2016). Commencing the first year is far more complex than simply a transition to a university institution, for many it represents a period of substantive change across many facets of their life. In various combinations, students must navigate the changes in learning styles that frequently confront them in the tertiary environment, manage changes in routine and potentially living arrangements, regulate self-efficacy, and learn to balance their work and family commitments around study (Harvey et al., 2006; Wilson et al., 2016). As such, the first year of tertiary education can be challenging for many students, and the experiential outcome may not always match the expectation, leading to disengagement and potentially voluntary withdrawal (Hassel & Ridout, 2018; Shetty, 2018); something that has been observed specifically within the nursing and midwifery cohorts (Thalluri & King, 2009; O'Donnell, 2011). Given the high rate of attrition during the first year of university studies (Crisp et al., 2009; Australian Government, 2017), it is clear that more support is required to ensure a positive first-year experience, whilst effectively laying the foundations for continued tertiary success (Kift, 2015; Gultice et al., 2015; Jansen & van der Meer, 2012).

For over two decades, staff from the University of South Australia (UniSA) have run an optional, nominal fee-paying science preparatory course called ScienceReady (previously called Preparing for Health Sciences) for new students, prior to their commencement of formal study in a variety of health science and allied health-related programs. Students cite numerous reasons for choosing to participate in this weeklong course, including gaining fundamental science knowledge and a kick start to their tertiary study, developing a smooth transition to

university, and to alleviate some of the anxiety surrounding starting university (Thalluri, 2016). Indeed, the social adjustment to university is considered a critical factor in determining a student's ability to navigate and overcome the challenges encountered at university in their first year, with a negative social transition associated with increased difficulties (Kantanis, 2000). As such, the scope of the ScienceReady course extends well beyond simply providing background knowledge in the relevant sciences and addresses many student anxieties by providing an avenue to meet staff and interact with peers, familiarizing students with learning spaces and campus facilities, and introducing students to a variety of valuable academic skills. We have previously shown that attending ScienceReady improved student confidence and preparedness to start university, reduced anxiety, and that students were able to advance their basic understanding of biological principles (Thalluri, 2016; Thalluri & Penman, 2019).

The ScienceReady course curriculum is divided across ten topics that run over a period of a week, prior to the official commencement of the first semester, and is delivered by staff who are directly involved with teaching first year science courses. The course website, which mimics course websites students will be exposed to in their primary degrees, is available a few days prior to commencement of the course and is supplemented with regular email communication on how to prepare and navigate the learning materials. The content itself is presented in a relaxed setting on campus with an open dialogue and questions encouraged either face-to-face or via discussion board/emails in both formal and informal settings. The course curriculum topics include study skills for independent study and tips on navigating the online environment, academic skills around writing, referencing and how to seek help from student support services as needed (for example, international students, students with learning difficulties or disabilities), decoding medical terminology, introduction to body systems, and concepts around homeostasis, chemistry and physics – specifically how these topics relate to human bodily functions. Students are also given the opportunity to visit a human anatomy laboratory to view normal and pathological human specimens/organs and participate in a series of hands-on activities in the teaching laboratories allowing them to familiarize themselves to campus laboratory work and facilities. All these activities are carefully chosen for inclusion in the ScienceReady program to spark student interest in learning first year science courses.

2. Literature Review

Robust self-efficacy, the confidence in one's ability or preparedness to succeed in a task, is known to be a key mediator in improving student outcomes (Honicke & Broadbent,

2016; Morton et al., 2014). Markers of student success may include enhanced confidence and retention rates as well as measurable improvements to academic performance. The 'global' ScienceReady approach – through its provision of both social, personal, and academic scaffolds – has been designed to boost self-efficacy and thereby improve retention and academic performance. Previous work has indicated that the ScienceReady short course improves self-efficacy, with a significant increase in the number of students indicating that they strongly agree with the statement "*I will be able to successfully overcome many challenges*" when compared to the same students asked prior to commencement of the course ($P = 0.0003$, Thalluri et al., 2021). Alongside the benefits seen with improved self-efficacy, we also see a reduction in the first-year attrition rate when compared to other science-based courses, demonstrating the positive impact ScienceReady has on its attendees' self-efficacy (Thalluri, 2016). Considering these benefits and what is known around the importance of self-efficacy, we felt it was vital to assess the impact that ScienceReady had on academic performance to provide a complete and holistic view of the impact that ScienceReady has on its students.

Nursing and midwifery students were of particular interest for this study given that nursing students are frequently reported to struggle with science-based subjects, considered at least partially attributable to a lack of previous or recent science study (Crane & Cox, 2013); an issue that is also mirrored in other fields due in part to changes in prerequisite demands (King & Cattlin, 2015). Supporting this view, we find that nursing and midwifery students make up on average around half of the enrolments in ScienceReady each year. A 2012 analysis of students studying nursing at UniSA, reported 38% of students identified as having no background of science when commencing their degree (unpublished findings, 2012). Furthermore, given that the increasing avoidance of science-based subjects at the high school level is considered a correlation for reduced interest and engagement, as well as heightened anxiety in the tertiary setting (Crane & Cox, 2013), we believed that a course like ScienceReady would be considered particularly advantageous to a cohort that typically struggles with both of these aspects of study.

3. Research

This study was a retrospective study that aimed to address whether attendance at the ScienceReady short course improved student academic success across continuous and final assessments in two first year science courses: Human Body 1 (first semester) and Human Body 2 (second semester) in nursing and midwifery students. Specifically, we sought to determine

whether attendance at ScienceReady correlated with higher overall grades when compared to students that did not attend, something that has not previously been addressed. We correlated student attendance at ScienceReady with grades obtained in a number of assessments across first year courses in five cohorts of students from 2015-2019 inclusive to determine whether the benefits of this short course amount to a measurable impact on students' academic results in their first year.

4. Methodology

Ethics approval was sought and obtained for this study from The University of South Australia Human Ethics Committee, Ethics application protocol ID: 202645. Whilst demographics were not a specific part of this analysis, previous analyses of students completing Human Body 1 and 2 indicated a diverse student population with the majority of students female, approximately half mature age entry with many identifying as coming from a non-English speaking background (unpublished findings, 2012). Similar demographics were observed in students opting to complete the Science Ready program in the studied years.

Students completed several ongoing assessments addressing various aspects of the course (worth 50%) and a final exam (worth 50%) in both Human Body courses. Ongoing assessments consisted of the mid test (30 min duration, examining the first few weeks of content) and the practical assessments (a variety of assessments styles completed across the entire study period), whilst the final exam covered the full semester's content over 120 minutes. The results from these assessments were collated over a 5-year period from 2015 to 2019 for all students that completed Human Body 1 and/or Human Body 2 internally (on campus) and externally (online). Student attendance, or not, at the ScienceReady workshop was then documented against each student name across that time.

There were 6617 enrolments in Human Body 1 or Human Body 2 comprised of both internal (on campus) and external (online) enrolments in the five years from 2015-2019, from which 552 data points were excluded due to a failure to complete the courses in their entirety (predominantly due to early withdrawal), with a further 70 who were excluded due to previously having attempted either human body 1 or 2 (prior to the period under investigation). These repeat enrolments were excluded because they do not align with the research aim to investigate primary performance at university. In total, 5995 data points from students were included (3196 Human Body 1 and 2799 Human Body 2) from a total of 3345 students. Enrolments were sorted into two groups: those who attended the ScienceReady course (SR)

(n=268) and those who did not attend ScienceReady (NSR) (n=5727). Due to the voluntary nature of ScienceReady enrolment, only a small percentage of students opted to attend the course over the time period studied leading to substantially less data points originating from this group. Data from each year and assessment was expressed as percentages and the mean and standard deviations for the populations were obtained. One-tailed equal variance-assumed paired t-tests were performed (Microsoft Excel) to look for statistical difference between SR and NSR grades for each assessment. A p value < 0.05 is denoted with a *.

5. Results

The majority of students completing Human Body 1 and Human Body 2 in our analysis were completing their first year of either a Bachelor of Nursing or a Bachelor of Midwifery degree. As such, the Human body courses represent the first science courses students are exposed to in their undergraduate degree, and for many, their first tertiary courses period. Students undertaking the Human Body courses complete a number of assessments during the two semesters. Both Human Body 1 and Human Body 2 have a mid-test, a number of practical assessments including a mixture of both open and closed book assessments which examine more practical-based content, and then to close off the semester the final exam which encompasses all material covered throughout the courses.

The grades for all students that completed the ScienceReady workshop and Human Body 1 and/or Human Body 2 were pooled and compared to the grades of the students that did not attend the ScienceReady workshop. Most students were represented twice because they completed both Human Body 1 and 2. The results showed no significant difference in mean mid test results between the students that attended the ScienceReady (SR) workshop (62.9%), compared to those that didn't (NSR) (62.2%) (Figure 1, part a). When we compared the overall practical assessment scores, we observed a significant difference ($p<0.05$) in the mean scores, with an average score of 67.2% achieved for the practical component by students that attended ScienceReady compared with those students that did not attend (64.2%) (Figure 1, part b).

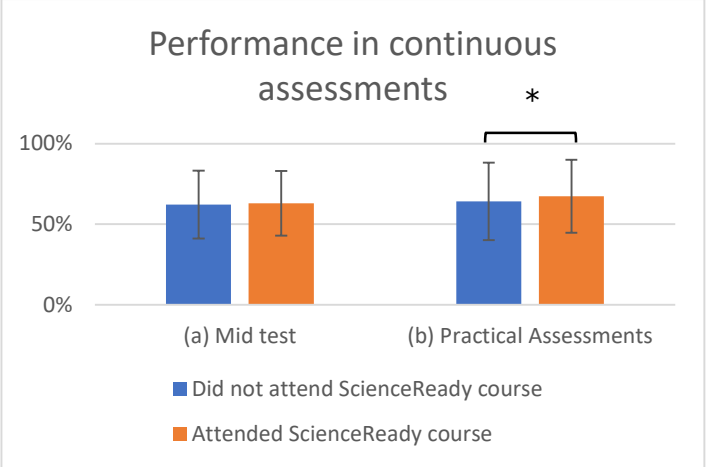

Figure 1: *Performance in Continuous Assessments*

(Source: Authors' own illustration)

Mean percentage of Human Body grades for (a) the mid test and (b) practical assessments for students that attended the ScienceReady course (SR, orange) or did not attend the ScienceReady course (NSR, blue) over 5 years from 2015-2019. Error bars show population standard deviation. One-tailed equal variance-assumed paired t-test was used to test differences between groups (* = $p<0.05$).

The final exam and overall grade covered content encompassing both the theory and practical content. Students that attended ScienceReady trended towards better academic performance in the final exam, with a mean score of 60.1% compared to 58.4% (Figure 2, part a). There was however a significant difference ($p<0.05$) in the final overall grade of students that attended ScienceReady (64%) compared to those that did not (61.6%) (Figure 2, part b) when considering the overall academic performance of students in the courses at the conclusion of the study periods.

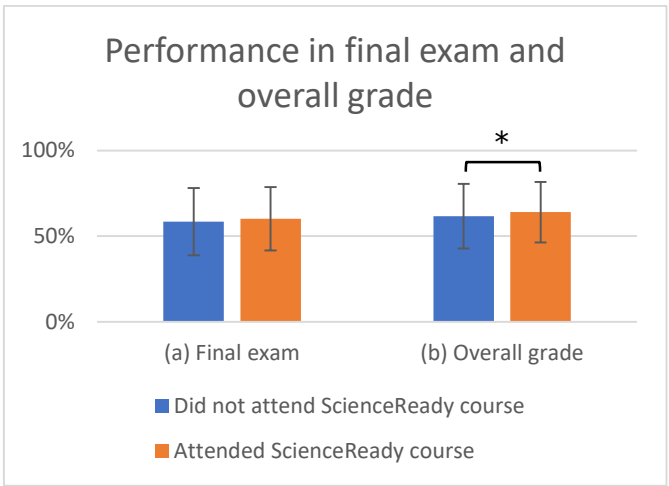

Figure 2: *Performance in Final Exam and Overall Grade*

(Source: Authors' own illustration)

Mean percentage of Human Body grades for the final exam (a) and final overall grade (b) for students that attended the ScienceReady course (SR, orange) or did not attend the ScienceReady course (NSR, blue) over 5 years from 2015-2019. Error bars show standard deviation. One-tailed equal variance-assumed paired t-test test was used to test differences between groups (* = $p<0.05$).

6. Discussion

Starting University can be a daunting experience, and there are many considerations and contributors that influence a student's success. ScienceReady was developed as a preparatory course for new students commencing allied health degrees at UniSA and has been successfully running for over 20 years. The purpose of ScienceReady is to provide not only an introduction to the sciences and self-directed university study, but arguably more importantly, benefit the psychosocial and emotional aspects often associated with transition to University (Thalluri & Penman 2019). This is especially useful for students who find themselves particularly prone to disengagement and withdrawal, including students belonging to minority groups such as Aboriginal and Torres Strait Islanders, first in family to attend University, mature-aged students, and students living remotely or studying externally (Australian Government Department of Education and Training, 2017; Celli, 2017). Of the students that choose to attend ScienceReady, many fall into the categories mentioned above (Thalluri, 2016). We have previously shown that ScienceReady participation reduces the first-year attrition rate, and reduces student anxiety (Thalluri, 2016) – undoubtedly two important aspects of student success – however prior to this study it was unclear what impact ScienceReady attendance had on a student's ability to succeed academically.

Each year between 600 and 800+ students undertake the two Human Body courses at UniSA making them two of the largest first year courses at the university. In this study we compared students that attended the ScienceReady course, versus those that didn't, over a five-year period to assess whether attendance had any impact on students' academic performance at a first-year level. We saw a consistent trend through all assessments for better academic performance by those who attended the ScienceReady preparatory course compared to those who did not. The practical assessments and overall grade showed a statistically significant improvement in academic success in students that had previously attended the ScienceReady course when compared to those that had not. Whilst results for the mid test and final exam did not reach significance, it is likely that this is at least partially attributable to the comparatively

small ScienceReady cohort size (SR n=268 compared to NSR n=5727). We anticipate that future analysis with larger cohorts would be likely to reveal a statistically significant improvement in student success across all assessments.

It is important to note that ScienceReady is a voluntary opt-in fee-associated preparatory course (equates to a nominal rate of $10 per hour for face-to-face engagement, or $5-6 per hour if online interaction is included) meaning that students choosing to attend are financially invested and therefore perhaps intrinsically motivated to succeed at university, beyond simply their attendance to the course. However, by the same token, a high proportion of ScienceReady attendees considered themselves as having little or no science background (unpublished data, 2012) indicating at least from a content standpoint, attendees felt they were starting university behind many of their peers that may have studied science more recently. It could therefore be hypothesized that students that choose to enroll in ScienceReady may represent those at the highest risk of failure, however we indeed demonstrate the opposite, that these students demonstrate improved academic performance over their peers.

Self-reflection by ScienceReady students indicated an improvement in perceived self-efficacy following the completion of the course (Thalluri et al., 2021), a trait that is now well accepted as being critical to academic success (Honicke & Broadbent, 2016). The findings of this current study clearly demonstrate that this perceived improvement in student preparedness and confidence has translated into overall improved grades in the first-year science courses in these nursing and midwifery student cohorts. Whether these improvements translate to sustained improvements across a student's degree has yet to be assessed.

When considering overall performance in Human Body 1 and Human Body 2, we can see a small but clear correlation between ScienceReady attendance and overall academic performance which goes hand in hand with the personal and social benefits we have described previously (Thalluri et al., 2021; Thalluri, 2016, Thalluri & Penman, 2016). Given the scope of these positive impacts, it may be considered beneficial to implement equivalent preparatory short courses for other challenging fields of study such as mathematics and physics where first year failure and attrition rates continue to remain high. As is clear from the numbers in our study, only a small number of university enrolments opt to enroll in this short course despite the number of benefits we see associated with attendance. Therefore, strategies for improving uptake of the course either with subsidized enrolment, or improved marketing may allow the benefits of preparatory courses like ScienceReady to reach a wider audience.

7. Conclusion

The study presented here describes an associated academic benefit of attending the ScienceReady preparatory course for students entering their first year of a Bachelor of Nursing or Bachelor of Midwifery. Students that attended ScienceReady had mean practical assessment and final overall grades that were statistically higher than the mean of students that did not attend. Together with our previously published data on the social and personal benefits of ScienceReady, this research provides further support for the importance of 'holistic' preparatory courses such as these for those transitioning to university in the maturation of successful and well-rounded learners.

7.1. Research Limitations

The retrospective nature of this study placed some limitations on the data that could be assessed here. This included the ability to assess the impact of ScienceReady on other parameters such as attrition rates which would have been interesting to consider concurrently with the data presented here even though this has been assessed in separate studies previous (Thalluri, 2016). Additionally, the small cohort size of ScienceReady attendees unfortunately placed limits on the authors ability to assess separate enrolment years, enrolment modes and courses which would have been interesting to dissect had more data points been available.

7.2. Scope of Further Research

The research presented here adds further evidence to the benefits associated with preparatory short course attendance in relation to success at university. Further research will aim to extend our understanding of the benefits of attending ScieneReady by assessing the results of further cohorts, and looking at ways to increase participation in these types of courses in the future.

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