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A Pre-semester, Online, Introductory Course to Anatomy and Physiology Boosts the Self-Confidence and Assessment Outcomes of First-year Healthcare Professional Students Studying Bioscience

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Abstract

Healthcare and allied health degrees include the study of anatomy and physiology, collectively termed "bioscience", in the first-year curriculum. It is well established that undergraduate nursing students, while appreciating the importance of bioscience for effective clinical practice, perceive it as difficult. This generates anxiety, which can negatively impact academic performance. Our study has revealed that this concern is also shared by occupational therapy and midwifery students. To address this issue, a fully online, self-directed short course, Jumpstart A&P, was developed to introduce students to basic bioscience concepts before the start of their first semester. Survey results revealed that engagement with Jumpstart A&P reduced student anxiety and enhanced self-reported confidence in studying bioscience. This was significantly associated with improved academic performance for those who completed at least half of the course. Therefore, the Jumpstart A&P course is an effective online intervention that improves students' agency and confidence.

Keywords*:* First year university; healthcare professional students; allied health care; transition; bioscience; anatomy and physiology; preparatory course; anxiety; confidence; academic performance.

Introduction

It is well established that the transition to tertiary education and the acquisition of the academic and social skills needed to become a successful, independent learner can be stressful for students (Kift, 2015; Vitali et al., 2020; Wilson et al., 2016). For students embarking upon a healthcare or allied health (healthcare professional) course, this transition may become even more challenging due to the requirement to study anatomy and physiology (A&P, also referred to as bioscience). Undergraduate nursing students commonly believe that the study of bioscience is difficult and, as such, will be challenging and more time-consuming than their other units (Craft et al., 2013; McVicar et al., 2014, 2015; Smales 2010; Vitali et al., 2020; Whyte et al., 2011). This preconception likely stems from several factors, including the absence of bioscience prerequisites for numerous healthcare professional courses and the fact that many high school students do not study these subjects during their secondary schooling. As a result, students often begin their studies with limited foundational knowledge or familiarity with bioscience concepts and terminology, leaving them feeling largely unprepared (Craft et al., 2013; Smales 2010).

Feelings of inadequacy may be further compounded by the recognition that bioscience knowledge is essential for successful clinical and professional practice (Perkins, 2019). As a result, the study of bioscience can be a significant source of academic-related feelings of anxiety for many students, negatively affecting student experience, confidence and scholastic performance (Abdullahi & Gannon, 2012; Andrew et al., 2015; Kennett et al., 2025; Larsen et al., 2020). Self-efficacy—a quality positively related to confidence and defined as the belief in one's ability to overcome challenges, complete tasks successfully and achieve goals—can mitigate these adverse effects. Students who possess a stronger sense of self-efficacy are generally better equipped to manage the transition to tertiary study and achieve higher academic performance, including in bioscience subjects (Ackerman, 2018; Andrew et al., 2015; Schütze et al., 2021: Zajacova et al., 2005).

To help students navigate these challenges, various transition initiatives and bridging courses have been developed to improve healthcare professional students' confidence and outcomes in the study of bioscience (Abdullahi & Gannon, 2012; Boelen & Kenny, 2009; Ford et al., 2016; Gretsy & Cotton, 2003; Hopper, 2011; Larsen et al., 2020; Logan et al., 2017; Owens & Moroney, 2017; Thalluri, 2016; Thalluri et al., 2021). These programs vary in format, combining face-to-face lectures and workshops with different levels of online content, and may occur before or during the semester. They have generally been effective in reducing students' anxiety about studying bioscience, boosting their confidence and retention, and, in some cases, improving their grades.

For example, Larsen et al. (2020) described a successful transition program for a large, diverse cohort undertaking a first-year physiology program. Get Ready was based on the Five Senses of Success (Lizzio, 2006), which includes developing a sense of capability (understanding knowledge and skills), connectedness, purpose, resourcefulness and culture. This program combined online resources and a face-to-face workshop, resulting in increased student confidence and higher grades at the end of the semester, with the degree of participation in the course positively correlating with these outcomes. Similarly, Thalluri et al. (2021) reported that the four-day face-to-face ScienceReady preparatory course resulted in a significant improvement in self-efficacy. However, they did not directly ascertain any impact on academic performance. As successful as many of these initiatives have been, none have addressed the ability of an exclusively online course to enhance student confidence and, concomitantly, improve academic performance. Therefore, this study seeks to fill a gap in higher education research by creating an online resource that alleviates students' anxiety about studying bioscience and enhances their confidence and academic performance.

Research Aims

We developed a tailored online resource, Jumpstart A&P, to provide our diverse cohort of first-year healthcare professional students in nursing, nursing and midwifery, and occupational therapy with a preparatory course on the basic concepts of A&P. Our study aimed to determine if the Jumpstart A&P course could (i) reduce students' anxiety about the study of bioscience, and (ii) enhance their confidence in their ability to undertake bioscience successfully. In addition, this study sought to determine if enhanced confidence was associated with improved academic outcomes. The success of these goals was determined via student surveys using a pre-post study design and by comparing the degree of completion of Jumpstart A&P with the grades obtained for a mid-semester test and the final unit result.

Methodology

Participants

Participants in this study were incoming first-year health professional students undertaking a Bachelor of Occupational Therapy (Honours) (BOccTherHons), a Bachelor of Nursing (BN) (located across two campuses) or a Bachelor of Nursing and Bachelor of Midwifery (Honours) (BNBMHons) at a large research-intensive university in Victoria, Australia. Of the BOccTherHons students, 73% identified as female and 27% as male; 61% were domestic students and 39% were international students, the majority of whom were from Hong Kong. BN students were 90% female and 10% male; 84% were domestic students and 16% international. By contrast, the BNBMHons students were 100% female, 91% domestic and 9% international. The vast majority of each cohort were recent school leavers. To be included in this study, students had to be over 18 years of age, enrolled full time in a healthcare professional degree, and consent to participate. Data collection occurred before and during the first semester of 2022 (February to April).

Jumpstart A&P Course Description

The Jumpstart A&P course was developed as a completely online, self-paced introduction to the fundamental concepts in A&P. The online presentation of Jumpstart A&P utilised the learning management system students would encounter in their first-semester A&P unit, and the variety of learning activities mirrored the online study resources that complemented the face-to-face delivery of the unit. Incoming first-year students were invited to undertake the Jumpstart A&P course via an email delivered before their first-semester orientation week. Students received a self-assessment quiz to gauge their readiness for bioscience study; those who scored below 60% were strongly encouraged to complete the Jumpstart A&P course.

The A&P course consisted of four modules, each with its own learning objectives, tailored to the specific needs of healthcare professional students. The modules covered (i) the language of anatomy, including body regions and cavities, and directional and movement terms; (ii) body basics, covering structural hierarchy, organ systems and homeostasis; (iii) basic biochemistry, including elements, atoms, electrolytes, pH, macromolecules and body fluid compartments; and (iv) cell biology, providing an overview of cell structure, organelles, the plasma membrane and transport processes (Marieb & Hoehn, 2023).

Each module presented content using a combination of prerecorded lectures, text and images sourced from the prescribed A&P textbook for the in-semester A&P unit, interactive learning activities using H5P (HTML5 Package, a free, open-source content collaboration framework), YouTube videos, and a module-specific self-assessment quiz. Following completion of the A&P course, a re-assessment quiz was provided to enable students to assess their enhanced understanding of bioscience concepts. The course also included general advice on effective study strategies for future learning. Access to assistance was facilitated through a moderated discussion forum where teaching staff could address individual student learning needs.

Instrumentation and Procedure

Using a pre-post study design, two online, self-report surveys using the Qualtrics XM platform were provided to students via the Jumpstart A&P Moodle site: (i) a pre-Jumpstart A&P survey completed before undertaking the course and (ii) a post-Jumpstart A&P survey taken after finishing as much of the course as each student determined appropriate for their needs.

The survey questions were adapted from those previously validated by Craft et al. (2013). Both the pre- and post-Jumpstart A&P survey questions were reviewed by three doctorally qualified researchers with expertise in questionnaire development and survey design, and their constructive feedback was incorporated. The survey questions were also piloted on six senior health science undergraduate students, who provided feedback on their wording and phrasing. This provided preliminary evidence of the face and content validity of the pre- and post-Jumpstart A&P survey questions and built on their prior use by Craft et al. (2013).

The surveys were designed to be completed within 10 minutes. Participants rated their agreement with each statement on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). For data presentation and analysis purposes, the Likert scale categories were re-coded into three points: disagree (1), neutral (2), and agree (3) (Madhuvu et al., 2023).

The survey questions were used to examine students' perceptions of bioscience and related anxiety. The factor structure of the pre-Jumpstart A&P survey items was determined using exploratory factor analysis (Williams et al., 2010). The items loaded on four factors with eigenvalues greater than one: (i) Preconceptions of bioscience (3 items), (ii) Pre-Jumpstart A&P course readiness to study bioscience (2 items), (iii) Understanding the relevance of bioscience (4 items) and (iv) Motivation to undertake the Jumpstart A&P course (4 items). These resulted in the final questions listed in Table 1.

The factor structure of the post-Jumpstart A&P survey items was determined using exploratory factor analysis. The items loaded on three factors with eigenvalues greater than one (see Table 3): (i) Student engagement with the Jumpstart A&P course (2 items), (ii) Outcome of undertaking the Jumpstart A&P course (2 items) and (iii) Post-Jumpstart A&P course readiness to study bioscience (6 items). The second survey included an open-ended question requesting qualitative feedback on the course.

Data Analysis

Data were analysed using IBM SPSS Statistics (Version 30.0) predictive analytics software. Descriptive statistics for survey results are presented as frequencies (percentages) and means with standard deviation. Student mid-semester test results and final unit grades were compared by degree of Jumpstart A&P completion, both across the total cohort and within the degree

programs in which students were enrolled. Parametric tests were applied since the academic results followed a normal distribution by visual inspection. An independent samples *t*-test compared the performance of three groups: students who did not attempt the Jumpstart A&P course (this included those who did not access the course or those who enrolled but did not undertake any activities as they scored over 60% in their pre-test or did not continue with the course), those who completed less than 50% of the course activities and those who completed more than 50%. Statistical significance was set at $p < 0.05$. A content analysis approach was used to summarise the responses to the open-ended question.

Ethical Considerations

Ethical approval was granted by the Monash University Human Research Ethics Committee (project # 27373, approved 17/02/2021). Students were asked to provide their student identification numbers to compare the aggregate results of those who completed, and those who did not complete, the Jumpstart A&P course. Students were assured that all data were deidentified and strictly confidential. All survey data were securely stored in accordance with Monash University's Research Data Management policy, on a password-protected drive to ensure privacy.

Results

Participants

Of the 592 students enrolled across the three courses, 34% completed some or all of the Jumpstart A&P course: 55 of 120 BOccTherHons students (46%), 133 of 420 BN students (32%) and 26 of 52 BNBMHons students (50%). Furthermore, 89% of students who scored less than 60% on the initial quiz to assess their readiness for bioscience study complied with the recommendation to complete some or all of the Jumpstart A&P course.

Pre-Jumpstart A&P Survey Results

Students who accessed the Jumpstart A&P course were invited to complete an initial survey to assess their preconceptions of bioscience as part of their healthcare professional degree. This survey was completed by 42% (n = 251) of the incoming cohort, representing 45% of BOccTherHons students, 41% of BN students, and 45% of BNBMHons students. Students' responses were grouped by scale factors to examine their preconceptions of bioscience, their readiness to study bioscience, their understanding of the relevance of bioscience to their future clinical and professional success, and their motivation to undertake the Jumpstart A&P course (see Table 1).

In examining students' preconceptions of bioscience, almost half of the respondents (45%) agreed that bioscience was difficult to understand and would be more challenging than their other first-year subjects (49%). Furthermore, 55% of respondents felt anxious about studying bioscience, although 70% indicated they had completed at least one bioscience-related subject at secondary school in the first survey. This trend was similar across all three student cohorts (see Table 2). A greater proportion of BNBMHons students expected bioscience to be difficult, although these students were the least anxious about studying the subject.

Feelings of readiness to study bioscience were reported by 67% of all respondents, with 54% reporting confidence in their ability to do so (see Table 1). Cohort analysis revealed that BNBMHons students felt most prepared (65%) and confident (62%) about studying bioscience, while BOccTherHons students reported the least confidence (51%) (see Table 2).

The relevance of bioscience as foundational knowledge for successful clinical and professional practice and to help achieve better clinical outcomes for future patients was clear for the vast majority of students (>98%) (see Table 1). Similarly, almost all respondents (>97%) were motivated to undertake the Jumpstart A&P course to prepare for, and feel more confident about, studying bioscience and undertaking bioscience assessment tasks.

Table 1

Pre-Jumpstart A&P Survey Results (n = 251)

Factor	Descriptor	Respondents (%)			*M* (*SD*)	Group *M* (*SD*)
		Disagree	Neutral	Agree		
Preconceptions of bioscience	Bioscience is hard to understand.	19.1	35.5	45.4	3.31 (0.90)	3.37 (0.92)
	Bioscience will be more difficult than my other subjects.	14.0	37.5	48.5	3.42 (0.89)	
	I feel anxious about studying bioscience.	20.7	24.7	54.6	3.39 (0.97)	
Pre-Jumpstart A&P course readiness to study bioscience	I feel prepared to study bioscience.	10.0	23.5	66.5	3.80 (0.95)	3.67 (0.95)
	I feel confident about studying bioscience.	14.0	32.3	53.7	3.54 (0.96)	
Understanding the relevance of bioscience	Understanding how the body works is foundational knowledge for my future clinical practice.	0.4	0.8	98.8	4.87 (0.42)	4.90 (0.37)
	Understanding how the body works will help me to effectively apply my training to my future clinical practice.	0.4	0.0	99.6	4.91 (0.32)	
	Understanding how the body works will help me to be a better healthcare professional.	0.4	1.2	98.4	4.89 (0.41)	
	Understanding how the body works will help me to achieve better outcomes for my future patients/clients.	0.0	0.8	99.2	4.91 (0.31)	
Motivation to undertake the Jumpstart A&P course	I am undertaking Jumpstart A&P to help me feel more prepared to study bioscience.	0.4	2.0	97.6	4.82 (0.49)	4.81 (0.47)
	I am undertaking Jumpstart A&P to help me feel more prepared for bioscience assessment tasks.	0.8	2.4	96.8	4.79 (0.53)	
	I am undertaking Jumpstart A&P to help me feel more confident about studying bioscience.	0.0	1.6	98.4	4.83 (0.42)	
	I am undertaking Jumpstart A&P to help me feel more confident about bioscience assessment tasks.	0.0	1.6	98.4	4.82 (0.43)	

Table 2

Preconceptions of Bioscience and Pre-Jumpstart A&P Readiness Within Each Student Cohort

Factor	**Descriptor**	**Proportion of Students Who Agree/Strongly Agree (%)**		
		BOccTherHons ***n*** **= 54**	**BN** ***n*** **= 172**	**BNBMHons** ***n*** **= 25**
Preconceptions of bioscience	Bioscience is hard to understand.	40.7	45.4	61.6
	Bioscience will be more difficult than my other subjects.	44.0	51.2	50.1
	I feel anxious about studying bioscience.	55.9	55.2	46.2
Pre-Jumpstart A&P course readiness to study bioscience	I feel prepared to study bioscience.	61.0	68.5	65.4
	I feel confident about studying bioscience.	50.7	56.9	61.5

Post-Jumpstart A&P Survey Results

Following completion of the Jumpstart A&P course, students were again invited to undertake a survey (see Table 3). Student responses were grouped into three scale factors: (i) Student engagement with the Jumpstart A&P course, (ii) Outcome of undertaking the Jumpstart A&P course and (iii) Post-Jumpstart A&P course readiness to study bioscience.

All students who engaged with the Jumpstart A&P course (100%) found the self-assessment quizzes useful for assessing their personal degree of bioscience understanding, and all would recommend the course to their peers. Student feedback confirmed this, with comments highlighting the helpful aspects of the course, such as:

> Having the quiz at both the start and the end really helped me to measure my progress.
>
> Having quizzes after each module to consolidate knowledge.

In completing the Jumpstart A&P course, 97% of respondents reported that they could better understand basic bioscience concepts and 84% discovered previously unknown concepts, indicating a very positive outcome from completing the course. Post-Jumpstart A&P readiness for the study of bioscience was indicated by the majority of respondents reporting a greater sense of preparedness to study bioscience (97%) and to complete assessment tasks (87%). Similarly, most respondents felt more confident about studying bioscience (93%) and undertaking assessment tasks (87%). The confidence of the majority of students (94%) was further increased by receiving a higher score on their post-Jumpstart A&P quiz, which assessed their general bioscience knowledge. A high proportion of students (69%) now believed that bioscience would not be as difficult as they first assumed.

Table 3

Post-Jumpstart A&P Survey Results (n = 69)

Factor	Descriptor	Respondents (%)			*M* (*SD*)	Group *M* (*SD*)
		Disagree	Neutral	Agree		
Engagement with the Jumpstart A&P course	The self-assessment quizzes within each module helped me to assess my understanding of that content.	0.0	0.0	100	4.78 (0.42)	4.86 (0.42)
	I would recommend Jumpstart A&P to other first-year students.	0.0	0.0	100	4.93 (0.42)	
Outcome of undertaking the Jumpstart A&P course	Jumpstart A&P helped me to understand basic bioscience concepts.	1.4	1.4	97.2	4.77 (0.62)	4.48 (0.79)
	Jumpstart A&P introduced me to concepts I was previously unaware of.	8.6	7.2	84.0	4.19 (0.95)	
Post-Jumpstart A&P course readiness to study bioscience	Completing some/all Jumpstart A&P modules has helped me feel more prepared to study bioscience.	1.4	1.4	97.2	4.55 (0.68)	4.37 (0.71)
	Completing some/all Jumpstart A&P modules has helped me feel more confident about studying bioscience.	1.4	5.8	92.8	4.55 (0.68)	
	Completing some/all Jumpstart A&P modules has helped me feel more prepared for bioscience assessment tasks.	2.9	10.1	87.0	4.30 (0.77)	
	Completing some/all Jumpstart A&P modules has helped me feel more confident about bioscience assessment tasks.	2.9	10.3	86.8	4.32 0.78)	
	An improved score in my "Assess your bioscience knowledge" quiz helps me to feel more confident about studying bioscience.	0.0	5.9	94.1	4.59 (0.60)	
	Now that I have completed some/all Jumpstart A&P modules, I no longer think that studying bioscience will be as difficult as I first believed.	1.5	29.4	69.1	3.93 (0.78)	

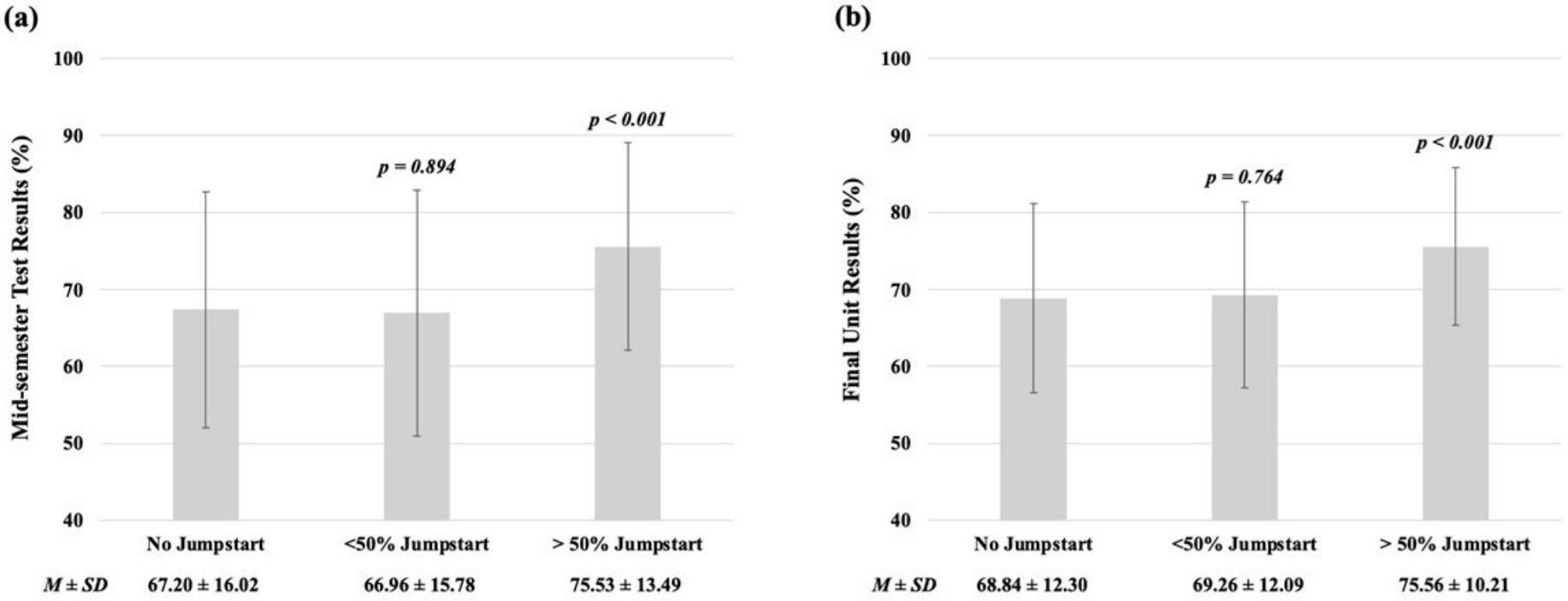
Comparison of Pre- and Post-Jumpstart A&P Course Completion Participant Groups

Further analysis determined whether these improved feelings of preparedness and confidence about bioscience studies and assessment tasks affected academic performance. The results of the mid-semester test and the final unit grades for the first-semester unit were compared using an independent samples *t*-test for students who completed Jumpstart A&P course activities (less than 50% completion and more than 50% completion) and those who did not complete any. Figure 1 reveals that the average mid-semester test score for students who did not complete any of the Jumpstart A&P course activities was 67.20 ± 16.02 ($M \pm SD$). This result was not significantly different to the average score for students who completed less than 50% of the course activities (66.96 ± 15.78, $p = 0.894$). However, students who completed more than 50% of the course activities showed a significant increase in average mid-semester test score (75.53 ± 13.49, $p < 0.001$) compared to those students who did not undertake the Jumpstart A&P course. The same trend was observed in the final unit score (see Figure 1), with a significant increase in average score only seen when students completed at least 50% of the Jumpstart A&P course (75.56 ± 10.21 compared to 68.84 ± 12.30, $p < 0.001$).

When analysed by cohort, this significant improvement in assessment results for students who completed more than 50% of the course activities compared with those who did not complete any was attributable to the largest cohort, students undertaking a BN (mid-semester test score 73.39 ± 13.39 versus 66.01 ± 16.03, $p < 0.001$; see Figure 2). While there was an increase in the average grades of BOccTherHons and BNBMHons students who completed more than 50% of the Jumpstart A&P course activities compared to those who did not attempt the course, this difference was not statistically significant (see Figure 2). The much smaller sample size likely explains this finding.

Figure 1

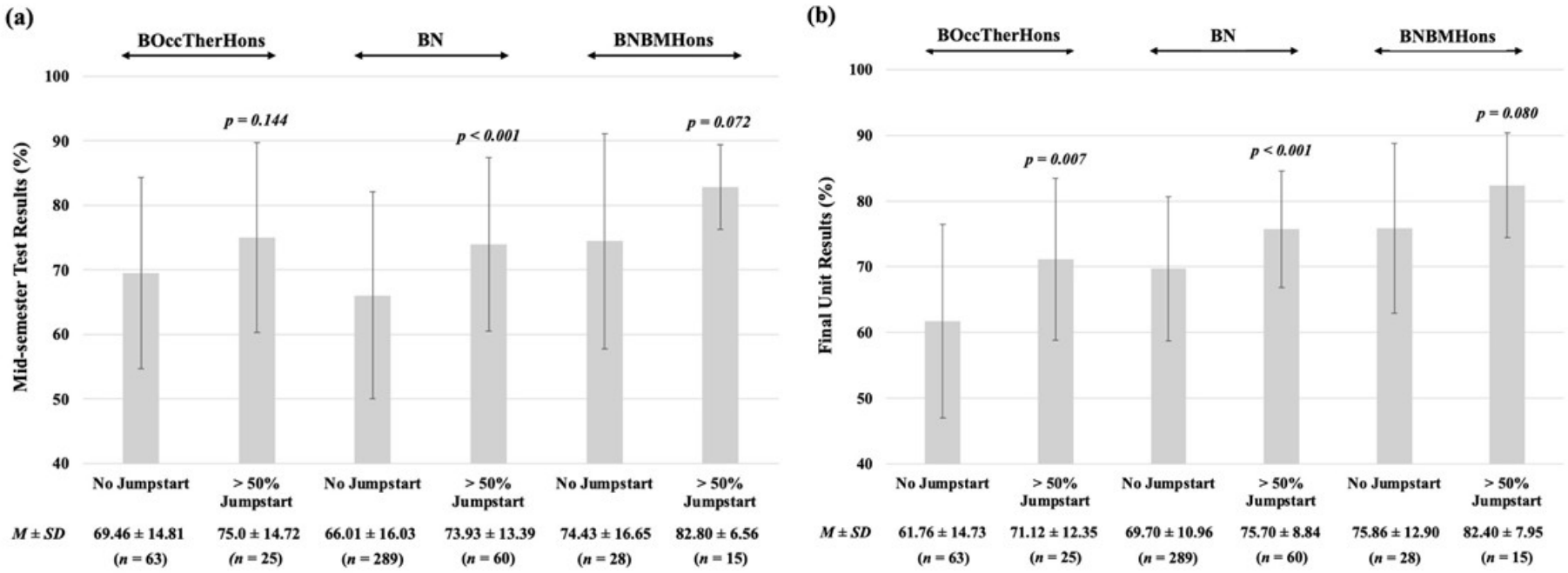
*Average Score (M ± SD) for the (a) Mid-semester Test and (b) Unit for Students in All Cohorts Who Did Not Attempt (*n = *380), Completed Less Than 50% (*n = *96) or Completed More Than 50% (*n = *100) of the Jumpstart A&P Course Activities**



* *Statistical analysis of comparison between students who completed any amount of the Jumpstart A&P course with those who did not attempt the course*

Figure 2

Average Score (M ± SD) *and Statistical Analysis for the (a) Mid-semester Test and (b) Unit for Students Who Did Not Attempt the Jumpstart A&P Course and Those Completing More Than 50% of the Jumpstart A&P Course Activities Undertaking the BOccTherHons, BN or BNBMHons Degrees*



Discussion

The results of this investigation suggest that the Jumpstart A&P course—an introduction to core A&P concepts for first-year healthcare professional students—was effective in reducing anxiety and boosting confidence about studying bioscience, leading to better unit assessment results. Furthermore, the Jumpstart A&P course delivered these outcomes through a completely online format, offering ready accessibility for students and a valuable teaching resource for time-poor academics.

The first survey, undertaken by first-year occupational therapy, nursing, and nursing and midwifery students before attempting the Jumpstart A&P course, revealed that this cohort shared the common preconceptions of many healthcare students regarding bioscience. Respondents believed that bioscience was difficult (45%) and would be more challenging than their other units (49%) and therefore was a source of feelings of anxiety (55%). This "bioscience problem" has been well documented for nursing students and is not surprising given the diversity of student academic and social preparedness for tertiary study (Craft et al., 2013; Gretsy & Cotton, 2003; Jordan et al., 1999; McVicar et al., 2014, 2015; Smales 2010; Vitali et al., 2020; Whyte et al., 2011). This study extends these findings, demonstrating that occupational therapy and nursing and midwifery students similarly felt anxious about studying bioscience.

The vast majority of students (>98%) appreciated the importance of understanding bioscience for successful clinical practice and better patient/client outcomes, as previously reported (Craft et al., 2013; Jordan et al., 1999; McVicar et al., 2014; Smales 2010). The perception of bioscience as challenging, coupled with the understanding of its importance for competent professional practice, likely added to students' feelings of anxiety about studying the subject. This is also the likely driver for the high levels of motivation to undertake the Jumpstart A&P course to feel more prepared for, and confident in, studying bioscience and succeeding in unit assessment tasks.

The Jumpstart A&P course was specifically designed to be a readily accessible learning resource for students transitioning to a tertiary healthcare professional course, with the invitation to participate mediated via a low-stakes email connection. Having the Jumpstart A&P course available online prior to the beginning of the semester minimised the time cost of engaging with the course for students. Additionally, undertaking the course remotely potentially reduced any feelings of performance anxiety that students may have experienced in their initial face-to-face classes. This appears to be a fairly successful approach, given that 34% of the entire first-year cohort completed all or part of the Jumpstart A&P course. Furthermore, 89% of students who scored less than 60% on the basic bioscience knowledge assessment quiz followed the recommendation to complete some or all of the course. This high compliance rate suggests that formative self-assessment, presented in a low-stakes environment, is an effective means of engaging students in learning activities. It also reinforces the findings of Larsen et al. (2020) who demonstrated that a "low-stakes, 'safe' participation environment improves student agency" (p. 25). A pre-semester online course is also advantageous for academics who do not have the capacity to provide face-to-face transition interventions for students during the teaching semester.

The course content was specifically designed to meet the learning needs of healthcare professional students, unlike many commercially available introductions to bioscience, which tend to be oriented toward medical or science students. The Jumpstart A&P course was presented using the same learning management system students would encounter during the semester and included the same types of self-directed learning resources. Wilson et al. (2016) reported that the concerns of students in transition included their ability to engage with the learning environment. The presentation of the Jumpstart A&P course thus provided students with a sense of what was expected of them, helping them to develop the self-directed learning skills required for tertiary study. Student comments support this development:

> I found this was good practice for note taking/lectures before starting uni.

> Great unit to prepare for bioscience, highly recommend for first years.

Self-directed learning skills were further supported by a moderated discussion forum, which enabled teaching staff to provide students with individual assistance upon request. This potentially contributed to the development of students' sense of connectedness, an essential component of student success (Lizzio, 2006). All students appreciated the provision of self-assessment quizzes (see Table 3), which helped them to appreciate the requirements and standards for assessment tasks, a concern of transitioning students (Wilson et al., 2016). Alongside the H5P interactive activities, these quizzes provided instant

feedback on their understanding of the content, allowing them to reflect on their learning, identify knowledge gaps, target their study efforts and monitor their progress. Student feedback confirms these benefits:

> The questions that are continually asked throughout the Power Points [*sic*] helped me to consolidate my knowledge and also allowed me to see areas of weakness.

Jacob and Centofanti (2024) reported that students find using H5P activities a positive experience and are eager to engage with such interactive elements. The content presented in the Jumpstart A&P course was revisited early in the first semester, reinforcing students' confidence in their ability to understand bioscience in a low-stakes environment. This development of academic skills and realistic expectations enabled students to develop a sense of capability, which correlates with successful transition and early academic success (Larsen et al., 2020; Lizzio, 2006).

After completing the Jumpstart A&P course, 97% of students reported a better understanding of bioscience concepts and 84% discovered concepts of which they were previously unaware (refer to Table 3). Of the content presented, survey respondents indicated that the anatomical terminology was most beneficial, as reflected in one student's comment:

> I felt more confident as I was able to use medical jargons and understand them.

This confirmed findings reported by Thalluri (2016) and was most likely because anatomical terminology is not typically encountered in their high school science classes. This better understanding correlated with the majority of students reporting a greater sense of preparedness for studying bioscience, increasing from 66% before Jumpstart A&P to 97% after Jumpstart A&P. Concomitantly, student confidence in studying bioscience was enhanced, from 54% to 93%.

The majority of students (94%) reported their confidence was improved by higher self-assessment quiz scores, highlighting the benefit of enabling students to monitor their learning progress. Accordingly, most students (87%) reported feeling more prepared and confident about undertaking bioscience assessment tasks during the semester. This reduction in anxiety and increase in confidence to study bioscience as a result of a transition or bridging course specific to healthcare, health science or allied health students has been previously reported (Abdullahi & Gannon, 2012; Boelen & Kenny, 2009; Gretsy & Cotton, 2003; Larsen et al., 2020; Thalluri & Penman, 2019; Thalluri et al., 2021). As students work through these preparatory programs, including the Jumpstart A&P course, they either gain basic bioscience knowledge and/or are reassured that they possess adequate knowledge to succeed in their studies.

Successful performance in self-assessment tasks offering embedded instant feedback provides students with mastery experiences, leading to improved confidence. Confidence is positively related to self-efficacy, which is the belief that one has the capacity to overcome challenges and achieve goals (Ackerman, 2018; Bandura, 1993) and is akin to Lizzio's (2006) sense of capability. Self-efficacy is a crucial factor in student engagement and academic success in biosciences and other disciplines (Andrew et al., 2015; Ford et al., 2016; Kahu et al., 2017; Malespina et al., 2024; McCarten et al., 2025; McVicar et al., 2015; Schütze et al., 2021; Zajacova et al., 2005).

In this study, the impact of improved confidence on academic performance was evident when student results were compared with the degree of engagement with Jumpstart A&P. Larsen et al. (2020) similarly noted a positive correlation between participation and academic performance, suggesting that improving engagement with the Jumpstart A&P course would be a fruitful future endeavour. Completion of more than, but not less than, 50% of the Jumpstart A&P course activities correlated with a statistically significant improvement in student grades for a mid-semester test, the first major bioscience assessment task these students encountered. This improvement persisted throughout the semester, leading to a significant improvement in final unit results. Further examination revealed that, while each of the three student cohorts showed improved average grades for both assessment tasks, the statistically significant improvement occurred within the nursing cohort.

Of the three discipline cohorts, nursing students had the lowest Australian Tertiary Admission Rank (ATAR) score for entry into university (occupational therapy 85.10, nursing 74.70–77.05, nursing and midwifery 91.45; Monash University, 2022). While the ATAR is generally an established predictor of academic performance in (bio)science units, its predictive value may vary for other courses and in combination with other factors such as age, gender, socioeconomic status and non-English-speaking background (Anderton, 2017; Messinis & Sheehan, 2015; Rayner & Papakonstantinou, 2018; Whyte et al., 2011; Wright, 2015). Russell et al. (2021) demonstrated that the predictive value of the ATAR score varied with subject type and

level in a podiatry course, showing only a moderate correlation with success in bioscience subjects. They proposed that targeted academic support would improve the academic performance of low-ATAR students.

Hence, it is not surprising that the nursing cohort received the most benefit from engagement with the Jumpstart A&P course. This result concurs with the findings of Larsen et al. (2020), who demonstrated that the Get Ready transition program for a diverse first-year cohort had a greater impact on academic performance among students with low ATAR entry requirements. Kennett et al. (2025) reported that secondary school students with low confidence and high anxiety perform poorly on tests and would benefit from intervention strategies that reduce anxiety and promote self-efficacy. Survey results revealed that engaging with Jumpstart A&P produced a conceptual shift in thinking about bioscience, with 69% of students believing that bioscience would no longer be as difficult as they had assumed, reducing anxiety about assessment tasks and thereby improving academic performance.

While many transition or bridging courses for allied health students have demonstrated a decrease in anxiety and an increase in student confidence (Abdullahi & Gannon, 2012; Boelen & Kenny, 2009; Ford et al., 2016; Gretsy & Cotton, 2003; Larsen et al., 2020; Owens & Moroney, 2017; Thalluri, 2016; Thalluri et al., 2021), not all studies investigated any concomitant improvement in academic performance. An improvement in unit grades was reported by Abdullahi and Gannon (2012) and Larsen et al. (2020). In both cases, preparatory courses ran before the first semester; the former used a two-week face-to-face workshop format and the latter combined online learning resources with a face-to-face workshop. Hopper et al. (2011) and Owens and Moroney (2017) both achieved improved grades using face-to-face tutorials, but these were run weekly throughout the semester in addition to scheduled classes. In addition, Owens and Moroney (2017) also ran a course in which students were required to complete six hours of additional online activities during the semester, which positively affected unit grades. In contrast, Jumpstart A&P reduced anxiety about studying bioscience, promoted confidence and improved academic performance using an exclusively online, pre-semester format, as evidenced by our study results and further supported by student feedback:

> So much more confident and really helped me get through the first few weeks.
>
> I felt extremely prepared and confident in what Jumpstart has taught me.
>
> I would like to say thank you to the creators as this really makes me feel more confident on A&P.

The Jumpstart A&P course, therefore, provides an effective resource to improve student outcomes. In so doing, it meets our research aims of reducing students' anxiety about the study of bioscience and enhancing their confidence in their ability to successfully undertake bioscience, leading to improved academic outcomes.

Limitations and Future Research

This study took place amongst three cohorts of students located across two campuses at one university. As the experiences of these students may differ from those at other institutions, generalisation of results to other institutions should be undertaken with caution. Self-selection bias cannot be controlled for in this study, as motivated, conscientious students are more likely to undertake the Jumpstart A&P course and benefit from it. Improvements in confidence were self-reported and thus potentially subject to bias. Although confidence positively impacts self-efficacy, it is also influenced by many factors, such as age, gender and psychological well-being (Ackerman, 2018; Kennett et al., 2025), which were not explored in this study.

Future research would benefit from including a larger, randomly recruited sample that reflects a broader range of healthcare disciplines and further explores the possible effects of the diverse nature of the cohort, assessing the contribution of age, gender, educational background, socioeconomic status and a non-English-speaking background. Furthermore, it would be beneficial to include a survey that explicitly measures self-efficacy rather than self-reported confidence, and to investigate potential barriers to completing an online pre-semester course and how these might be reduced to increase student engagement.

Conclusion

The compulsory study of bioscience as part of their degree is a source of feelings of anxiety for many students from multiple healthcare and allied health disciplines, including occupational therapy, nursing, and nursing and midwifery. Anxiety is known to negatively impact academic performance. The provision of an introductory preparatory course is well established as a means

of reducing student anxiety, increasing student confidence and improving student outcomes. Jumpstart A&P, an introduction to foundational concepts of A&P, met all our research aims. The Jumpstart A&P course is an engaging, student-focused intervention that provides tailored resources to reduce student anxiety, enhance confidence and, consequently, improve assessment outcomes. In contrast to other transition/bridging courses, Jumpstart A&P achieved these outcomes through exclusively online delivery, making it a versatile and valuable resource for both students and academics. Furthermore, our findings suggest that the combination of learning supports plus formative self-assessment, presented in a low-stakes environment, could be an effective intervention for students studying a variety of disciplines.

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