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Short, multi-modal, pre-commencement transition programs for a diverse STEM cohort.

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Short, multi-modal, pre-commencement transition programs for a diverse STEM cohort.

Abstract

A 'quantum leap' (Kift, 2015) in our understanding of the transition to university studies has brought about a reimagining of the role of transition programs from attempting to remediate deficiencies in 'underprepared' students, to instead using engagement with the curriculum to instil success-oriented behaviours and attitudes in them. In particular commencers from non-traditional backgrounds are confronted by greater sociocultural incongruities when starting higher education (Devlin, 2013), and face greater challenges in developing their new student identity. While affective change of this kind may necessarily be long-term in nature, semester or year-long 'foundation' or 'bridging' programs create barriers themselves in terms of time, cost, and stigma. This study provides evidence that significant results can be achieved with short, accessible, manageable, pre-commencement transition programs, that are situated in the curriculum, but also focussed on nurturing those behaviours and attitudes in at-risk students that are associated with greater likelihood of success and retention.

Keywords

Transition, success and retention, STEM, non-traditional students, low SES students, first in family students, low ATAR students

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Introduction

Transition to higher education has become a key focus of universities worldwide in their efforts to ensure the success and retention of commencing students, in particular those from under-represented backgrounds, such as low socio-economic status (SES), low tertiary entrance ranking, and first in family. A wealth of literature has emerged advocating how institutions can best support the transition experience of an increasingly diverse student body, and a degree of consensus has emerged about what can be considered best practice in transition program design. In particular a holistic approach is favoured, one that links academic preparedness with affective elements such as self-efficacy, resourcefulness, a feeling of belonging, and the development of a sense of identity as a member of a learning community. Despite this emerging consensus, few studies have measured the extent to which ‘non-traditional’ students actually engage with universities’ transition programs, particular in the case of STEM disciplines, and there has been little direct measurement of whether these programs have the desired effect on the success and retention of at-risk cohorts. Furthermore, as universities increasingly seek institution-wide solutions to teaching and learning challenges, it is imperative that such programs are scalable at the institutional level.

This paper evaluates a short, pre-commencement transition program, dubbed *Get Ready*, that was trialled in 2018 in three large first-year science subjects in an Australian university. The design of this program was informed by the recent transition literature and focuses on building self-efficacy in ‘non-traditional’ students by supporting them through the development of key attitudes and behaviours that the literature informs us are most closely associated with success. These include developing realistic expectations, gaining confidence in one’s ability to make progress by engaging with learning activities, exhibiting help-seeking behaviour, building networks with peers and staff, and experiencing a sense of belonging. Comprehensive data were collected on the students in the three large-enrolment subjects into which *Get Ready* was embedded, allowing us to address the question: to what extent can a short, pre-commencement transition program, designed to nurture the behaviours and sense of identity of a successful student through engagement with the curriculum, meet the needs of a diverse commencing cohort, in particular ‘non-traditional’ students from low-SES or first-in-family backgrounds, and/or with low tertiary entrance rankings.

The Transition Experience of Non-traditional Students

With the broadening of access to higher education, universities are faced with the challenges of supporting commencing students who may be less academically prepared, less familiar with the expectations the institution has of them, and less conversant in the social and cultural norms of higher education institutions than previous generations of students (Wilson et al., 2016; Kift, 2015).

In Australia, Baik et al report that “there has been substantial growth in the size of the low ATAR [Australian Tertiary Admission Rank] cohort” in recent years, with much of this growth concentrated in a subset of institutions. They found that low-ATAR students are “less prepared for university”, “more likely to report having difficulties with their studies”, and “less likely to have been actively involved in their university orientation programs” (2015, pp. 66-73). The same study also found that low-SES students ‘feel less academically prepared for university’ and are much less likely to feel ‘that university life really suited them’ (Baik et al., 2015). Norton and Cakitaki found that while “higher education attainment has increased across all SES groups, high and low ... SES differences in university participation remain large” (2017, p. 27). Baik et al. advocate

“rethinking the role of preparatory pre-bachelors programs, so they support students not only to develop necessary academic skills, but also help them *shape new student identities*” (2015, p. 6). Wilson (2009, pp. 5-11) has found that first-in-family, minority and disadvantaged students are more likely to discontinue their studies, and calls for the ‘front-loading’ of subjects that students typically find the most difficult in their first-year, through such measures as preparatory workshops, and low-stakes, early self-assessment tasks with feedback. Wilson (2009, p. 11) argues that [o]ptimising the chances of an experience of “early success” builds academic and personal efficacy.

Margolis et al. (2001) encapsulated the difficulties faced by ‘non-traditional’ students in terms of a ‘hidden curriculum’ which functions as a mechanism for exclusion. Devlin (2013, pp. 939-944), however, warns against the assumption that ‘the only deficit for institutions is in not being clear enough about how they expect students to fit into existing structures and expectations’, and calls instead for a ‘“joint venture” toward bridging socio-cultural incongruity’. In the same vein, Kahu and Nelson (2018) conceptualize transition in terms of an ‘educational interface’ where institutional culture and individual identity meet in a process of mutual renegotiation. Key components of a student experience in the interface are self-efficacy, positive emotions, a sense of belonging, and well-being.

Kift (2015, p. 51) has welcomed the ‘enormous gains’ that have been made in the understanding of transition to university for an increasingly diverse student body and speaks of a ‘quantum leap in conceptualising the first year experience’. On the basis of longitudinal first-year experience survey data, Baik et al. also conclude that “much has improved in the FYE [First Year Experience] of students in Australian universities over the past two decades” (2019, p. 535). Others have found, however, that this paradigm shift has not taken place uniformly across the sector. O’Shea et al. find that “problematizing certain student cohorts as ‘lacking’ or needing to be ‘acted upon’ rather than ‘acted with’ retains currency” (2016, p. 332).

According to Kift (2015, p. 54), a well-designed first year experience should ‘foster a critical sense of belonging and student identity, through involvement and connectedness’. Kift calls on institutions “to cease problematising individual students, to reject a deficit discourse of student blame ... and to focus instead on inclusion and achievement, with the curriculum as the centrepiece, rather than desultory, inequitable efforts on the curriculum’s periphery” (2015, p. 58).

In light of these findings, the *Get Ready* programs were created to address the transition challenges faced by non-traditional students through nurturing the development of an identity of success and of belonging, while engaging directly with the curriculum.

Engaging Students Pre-commencement

Summarizing the results of a major Higher Education Academy project investigating ‘what works’ in improving retention and success for commencing tertiary students in the UK, Thomas (2012) concludes:

Effective interventions start pre-entry, and have an emphasis on engagement and an overt academic purpose. They develop peer networks and friendships, create links with academic members of staff, provide key information, shape realistic expectations, improve academic skills, develop students’ confidence, demonstrate future relevance and nurture belonging (Thomas, 2012, p. 15).

Tinto also advocates prioritizing the nurturing of engagement and a sense of belonging “as early as orientation if not before”. He describes self-efficacy as ‘the foundation upon which student success is built’ and stresses the need for students to understand that seeking help is not a sign of weakness or ‘an admission that they are not cut out for university’ (2017, pp. 3-4). Meehan and Howells (2018, p. 901) likewise contend that ‘creating a sense of belonging’ via establishing an online community pre-commencement is a major element in ‘what really matters’ to commencing students. Kearny (2019, p. 11) also finds that ‘[t]he transition year needs to cultivate student engagement and foster a sense of belonging’ and argues that self and peer assessment is well-placed to inspire engagement with the curriculum and self-efficacy.

From an investigation of transition programs for Health Science students, Wilson et al. (2016, p. 1025) also conclude that the first few weeks are a critical time for students transitioning to university study, describing this period as a ‘window of maximal risk’. That study finds a “stable and consistent pattern of early transition needs”, and ranks them in descending order as: external resourcefulness, that is, the ability to navigate institutional systems and find help from support services; internal resourcefulness, meaning comprehending the expectations of tertiary study and balancing those demands with work and life responsibilities; and peer connectedness (Wilson et al., 2016, p. 1036). McWilliams and Allan (2014) also underline the importance of embedding academic literacy programs in the curriculum, in discipline-specific contexts.

Lizzio (2006, p. 11) provides an over-arching framework for conceptualizing the design of orientation and transition experiences in terms of five ‘senses of success’: capability or self-efficacy; connectedness with other students and staff; purpose regarding reasons for study and long-term goals; resourcefulness; and academic culture, which includes appreciating values such as critical thinking and enquiry, ethical principles, and a ‘spirit of curiosity and openness’.

The recurring theme of early intervention points to the weeks immediately preceding commencement as propitious timing for a transition program. A number of studies have reported success with short, pre-commencement ‘bridging’ programs for first-year STEM subjects. Abdullahi and Gannon (2012) describe a voluntary 2-week workshop series for first-year Anatomy and Physiology which resulted in lower withdrawal rates amongst workshop participants, concluding that the program improved study skills and raised students’ confidence. Boelen and Kenny (2009) report on a compulsory 1-week program in Anatomy, Physiology and Chemistry for enrolled nurses seeking to qualify for the higher professional category of registered nurse, in which the main aim was to develop study and transition skills, and build confidence. They found improvements in self-reported confidence. Schmid et al. (2012, p. 1212) report on a voluntary 1-week intensive bridging program for first-year Chemistry students, and likewise note the importance of building confidence in students, commenting that ‘[t]he aim is to furnish an attitude of achievement in chemistry’. The authors found that students felt more prepared having completed the program, and reported higher confidence and self-efficacy. Similarly, Thalluri (2016) reports success in improving attrition rates in first-year health science studies through an optional 1-week intensive ‘Preparing for Health Sciences’ workshop. Students reported increased confidence and reduced anxiety as among the benefits of participation.

While such programs are typically aimed at ‘under-prepared’ students, and indeed the last-mentioned intervention was targeted specifically at ‘mature-age students . . . , international students, students with little or no background in biology, chemistry or physics, and students who are

anxious about starting university studies' (Thalluri, 2016, p. 39), in fact none of the above studies provide data specifically on the effectiveness of their programs with respect to such at-risk student groups. This is a significant gap in the literature, which this study hopes to address. We measure the effect on the performance of at-risk students of participation in short, pre-commencement transition programs, which have been designed in accordance with the principles that have emerged from the recent literature. These principles include a focus on nurturing the development of a success-oriented student identity, exhibiting behaviours such as self-efficacy, resourcefulness and connectedness, and achieving this through engagement with the curriculum.

Description of Get Ready Programs

The model for the *Get Ready* program was developed over the period 2014-2017 in a first-year Human Physiology subject (Larsen et al., 2020), before being extended in 2018 to large-enrolment Biology and Chemistry subjects, within the context of a broader institutional retention strategy. Student anxiety about commencing a 'difficult' subject in their first semester of university is a known issue in the case of all three subjects.

In the Human Physiology *Get Ready* program, all commencing students receive an email to their personal accounts a month or so before commencement (early in February in Australia) or as they enrol later in the month, inviting them to take part in the program. Detailed instructions are attached for the benefit of students unfamiliar with using a Learning Management System (LMS). Students first encounter welcome messages and a diagnostic test, on completion of which they receive a recommendation on whether to continue to the *Get Ready* learning activities (i.e. if they score under 80% on the diagnostic test). At the same time, high-achieving students are not discouraged from continuing (and many do), in the interests of inclusivity and avoiding stigmatization of 'underprepared' students. The rest of the LMS introduces students to the key concepts and terminology they will encounter in the first few weeks of study in the subject, focusing particularly on areas students typically have difficulties with. As a result, participating students commence the subject proper with a basic familiarity with important terms and concepts that they will encounter in their first weeks of study. The LMS is responsive, with a number of opportunities for students to check their understanding through automatically marked tests, thus receiving reassurance that they are making progress. The LMS aims to welcome students into a community. Short, explanatory videos in a warm and encouraging style are prepared by current teaching staff, which serve the dual function of reinforcing content and introducing students to their teachers. Students are also encouraged to interact with staff and other students via the discussion forum, which is closely monitored. Basic resourcefulness behaviours are also inculcated. The LMS refers students to the e-text, which they are required to buy or at least access via the library website, in order to complete the learning activities. Participating students thus enact the process of using the textbook as a resource (rather than viewing it as an intimidating compendium of 'everything we need to know'), just as they are encouraged to perform help-seeking behaviour by sharing their questions on the forum for other students or staff to respond to. The LMS finishes by directing students to register for orientation week workshops, in which they revise the learning materials through face-to-face group activities that mimic an authentic class setting. Students continue to enact resourcefulness skills, as they work together with their peers in solving problems, and teaching staff make themselves accessible to students or groups having difficulties in understanding. Getting students on campus and into classrooms pre-commencement and in a low-stakes, friendly environment also supports them in beginning to develop a sense of belonging. Nurturing a sense of place is a major aim of the program; bearing in mind that while place is most commonly associated with the physical campus, familiarity with the online

architecture and culture can also be considered a significant component of a sense of belonging. In recognition of this, one synchronous online tutorial is also offered for students who are unable to attend the face-to-face sessions in orientation week.

The Biology *Get Ready* program follows a similar pattern, the major difference being the absence of instructional videos on the LMS, with instead an emphasis on reading. The social function served by the Physiology videos in welcoming students to their new community of learning is fulfilled by a much stronger emphasis on social interaction in the discussion forum. Four weeks before the start of semester the subject's LMS opens with a 'social introduction' thread in the discussion forum, in which the lecturer introduces himself, describes his interests (which include playing and hand-crafting electric basses), and invites students to do the same.

The first semester of Chemistry at our institution is streamed into two subjects: General Principles of Chemistry for those who have studied it in their final year of secondary school, and Chemistry Foundations, incorporating extra tutorial support, for those who have not. *Get Ready* is attached to the Chemistry Foundations subject and follows the same basic pattern as its counterparts. One peculiarity of the Chemistry *Get Ready* is the need for a much stronger focus on orientation for the laboratory component of the subject. On the Chemistry LMS not all of the videos were produced by the teaching staff: a few were sourced from public platforms, selected as much for their inspirational nature as for their content. Amongst the videos are introductions to the nature of science and the scientific process, past students' perspectives which aim to promote new students' confidence, and a series of content videos on topics typically considered challenging by commencing students. Another unique feature of the foundational Chemistry *Get Ready* program is that at the conclusion of the LMS component, students are directed to a survey that requires them to reflect on their anxieties and their expectations, before going on to complete the final test.

While the Physiology *Get Ready* program features multiple parallel workshop-like orientation sessions, with staffing of these built into the subject's workload planning, the Biology and Chemistry Foundations orientation sessions are in lecture format, with interactivity provided via activities such as scratch-card quizzes. This reflects the teaching arrangements in the subjects, whereby the Physiology subject employs a flipped classroom approach, in which 'lectures' are fully online and face-to-face sessions are problem-solving workshops, while Biology and Chemistry have retained face-to-face lectures (along with tutorials and practicals).

Thus, while the three programs vary in their details, their core designs are very similar. All three aim to nurture self-efficacy by demonstrating that progress can be made through completing learning activities; resourcefulness by stepping students through some basic help-seeking behaviours; and a sense of belonging by building peer and staff interconnections, as well as familiarity with the physical and/or online space in which learning activities occur.

The increasing importance of building a sense of identification with online learning spaces has most recently been highlighted by the COVID-19 pandemic, with the accompanying restrictions on campus access for most students. Though *Get Ready* needed to be redesigned to accommodate the change in teaching and learning arrangements to fully online delivery, the function remains the same: to acclimatize students to and foster in them a sense of identification with their new learning community. This time orientation sessions are fully online, but still designed to enable a scaffolded introduction of students to their new learning environment, now consisting of 'congregating' in video conferences, and interacting in break-out rooms. The content learning materials have also been bolstered with H5P interactive activities, and more deliberate opportunities for peer-to-peer interaction, via online icebreakers, get-to-know-you activities, and

fun online polling. The orientation sessions have also been staggered over two weeks to provide more time for acclimatization.

Study Methodology

With this study we aim to evaluate the impact of the *Get Ready* transition programs on student success and retention across three large-enrolment first-year STEM subjects, in particular with respect to low-ATAR, low-SES and first-in-family students. A range of demographic indicators were collated: gender, degree program, international/domestic status, ATAR if this was the basis for acceptance, SES, and whether first in family. At the end of the semester these data were correlated with LMS records indicating whether the student had completed all, some, or none of the *Get Ready* learning activities, along with the student's final grade. This allowed us to measure the effect on average final grades and pass rates of participation in the program, for our target demographic groups. Enrolment status in the following semester, as well as the following year, was also recorded, in order to provide a measure of retention. Students who attended orientation-week workshops, the final phase of the *Get Ready* program, were invited to complete a survey, in which they were asked how much of the *Get Ready* activities they had completed, and to rate on a Likert scale the extent to which participation had increased their confidence to succeed. The data from this survey could not be linked to other indicators described above, however, due to the anonymity of the surveys. Ethics approval was sought and duly granted for this study.

Results

Regarding overall participation rates, the LMS analytics revealed that over 60% of Biology and Chemistry students, and over 70% of Human Physiology students completed all or some of the LMS activities (Table 1). The program was thus successful in reaching high proportions of students.

Table 1

The number of students in each subject (n) and the overall participation rates (%) in the Get Ready program.

	n	Participation rate (%) in <i>Get Ready</i>	
		all	all or some
Physiology	1443	26.5	72.8
Biology	737	20.1	61.5
Chemistry	474	19.0	61.0

Students' Perceptions

In the survey administered at the end of the orientation week sessions, students were asked to rate how much participation in the *Get Ready* program increased their confidence to perform well in the subject proper. Surveys of confidence are widely used to measure students' self-efficacy, a key factor in the transition experience (Tinto, 2017, p. 3; Lawrence, 2005; Bandura, 1977). Table 2 shows the average Likert rating, and Figure 1 the distribution of these ratings for those students who identified as having completed at least some of the *Get Ready* LMS activities. These results

indicate that the overwhelming majority of respondents felt that their confidence had been boosted to at least a moderate degree (rating 3-5).

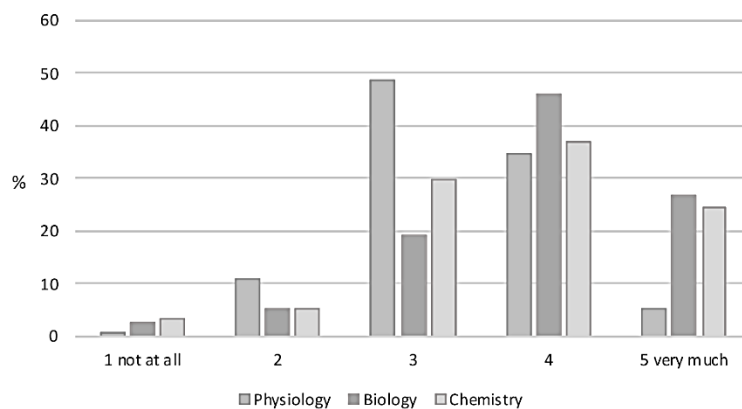
Table 2

Average Likert rating (1-5) indicating how much students' confidence to perform well in a subject had been increased by Get Ready.

	Confidence
Physiology	3.30
Biology	3.61
Chemistry	3.49

Figure 1

Distribution of Likert rating of how much students' confidence to perform well in a subject had been increased by Get Ready.



Overall Impact on Student Success and Retention

As mentioned, participation in the orientation sessions could not be linked with the demographic and success data we gathered. Henceforth 'participation' in *Get Ready* is measured in terms of having completed 'all', 'some', or 'none' of the LMS activities.

Before focussing on our at-risk cohorts, it is informative first to look at the overall data. Participation in the *Get Ready* program was found to be related to higher average final grades and pass rates. Figures 2 and 3 present these data, with 95% confidence intervals. While the trend was observable in all three subjects, only in the cases of the Biology and Chemistry subjects was this

relationship found to be statistically significant. In the Biology subject there was also a statistically significant difference between only doing part and doing all of the *Get Ready* LMS activities.

The lack of significance in the Human Physiology data may at first appear surprising, given the larger 'n' for this subject (see Table 1), however it is likely to be related to the high component of group-work assessment in this subject. This will have confounded the effect of participation in *Get Ready* on final grades and pass rates, given that groups were a mixture of students who had completed at least some of *Get Ready* and others who had not attempted any.

Figure 2

Average final grade (%) according to participation in the Get Ready LMS, with 95% confidence intervals.

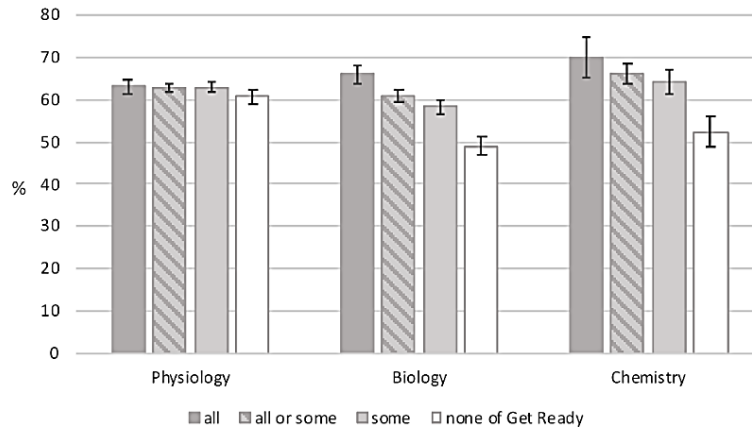
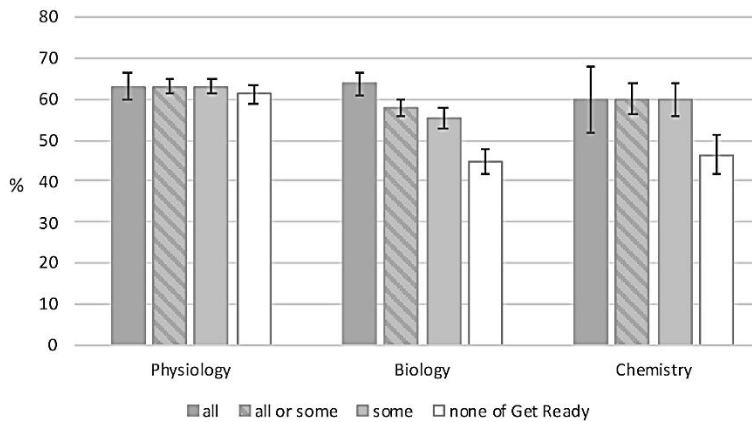


Figure 3

Pass rates (%) according to participation in the Get Ready LMS, with 95% confidence intervals.



We were also able to relate participation in *Get Ready* to retention. From the combined retention data of all three subjects, students who had done some or all of *Get Ready* were shown to be significantly more likely to be retained past the census date (last date for withdrawal without incurring fees) the following semester ($p < 0.05$), as indicated in the first column of Table 3. What is more, these students were also significantly more likely to be retained past the census the following year ($p < 0.01$), see the second column in Table 3. In the latter case, retention was classified based on current admittance into a degree program, whether or not it was the same degree the student was originally admitted into.

These data provide evidence of a longer-term correlation between participation in the *Get Ready* transition program, and improved retention.

Table 3

Retention (%) post-census in the following semester, and the following year, according to participation in the Get Ready LMS.

Amount of <i>Get Ready</i>	Post-census in the following semester (semester 2, 2018)			Post-census in the following year (semester 1, 2019)		
	Retained	Deferred/leave of absence	Not retained	Retained	Deferred/leave of absence	Not retained
All or some	94.4	0.9	4.7	81.3	7.4	11.3
None	80.8	3.6	15.6	62.6	4.1	33.3

Target Cohorts: Impact on Student Success

While the relatively high overall participation rates and the apparent correlation of participation in *Get Ready* with success and retention are encouraging, the purpose of the program was to target students from historically under-represented backgrounds. We looked at three such cohorts for which we had data: low-SES students, first-in-family students, and low-ATAR students. Here we have used below 60 (< 60) as our definition of low-ATAR, in line with the finding of Edwards and McMillan (2015) that these students are at particularly high risk of non-completion. We considered the average final grade and pass rate for these cohorts according to how much of the *Get Ready* program they had completed. While each of these groups was looked at in turn, the results were similar in each case. For the sake of more statistically meaningful results, and brevity of data presentation, we present the results for the combined cohort, consisting of students who were low-ATAR, and/or low-SES, and/or first-in-family.

As Table 4 illustrates, participation rates were somewhat lower for the target cohorts, than overall. Furthermore, a lower proportion of these students went on to complete all of the *Get Ready* LMS, once they had started it. These are areas where future iterations of the program should aim for improvement. By the same token it is a positive result that well over half our target cohorts completed at least some of the transition program.

Table 4

The number of students (*n*) in the target cohorts in each subject and their participation rates in the *Get Ready* program.

	n	Participation rate (%) in <i>Get Ready</i>	
		all	all or some
Physiology	561	21.75	62.75
Biology	348	16.67	58.33
Chemistry	220	16.36	56.82

Figures 4 and 5 display the average final grade and pass rates for these target cohorts according to transition program completion. Once again 95% confidence intervals are indicated. In the cases of the Biology and the Chemistry subjects, completion of at least some of the *Get Ready* program is related to statistically significant improvements in performance. Indeed, for the Biology subject there is once again a significant difference in performance between students completing all of *Get Ready*, and those only doing some of it. Notably, for our target cohorts in these two subjects, in terms of average final grade completion of at least part of *Get Ready* is associated with the difference between an expectation of passing and one of failing.

These trends were reflected on a smaller scale for the Physiology subject, though again without statistical significance. Once again it is assumed that this is due to a high proportion of group-work assessment confounding the measurement of the effect of *Get Ready* participation on individuals.

Figure 4

Average final grade (%) for the target cohorts according to participation in the *Get Ready* LMS, with 95% confidence intervals.

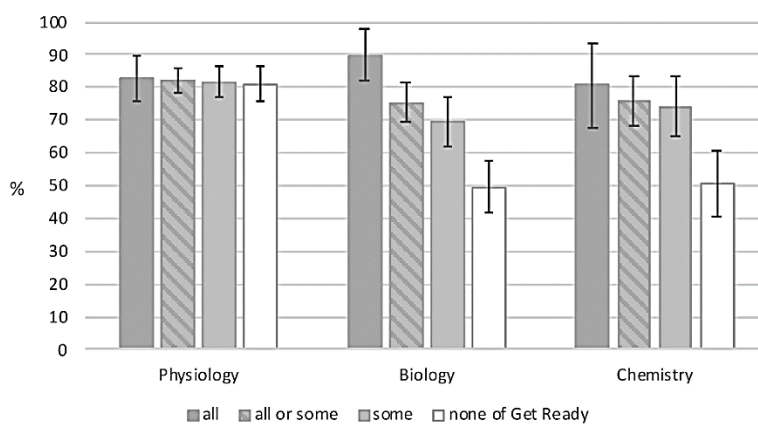
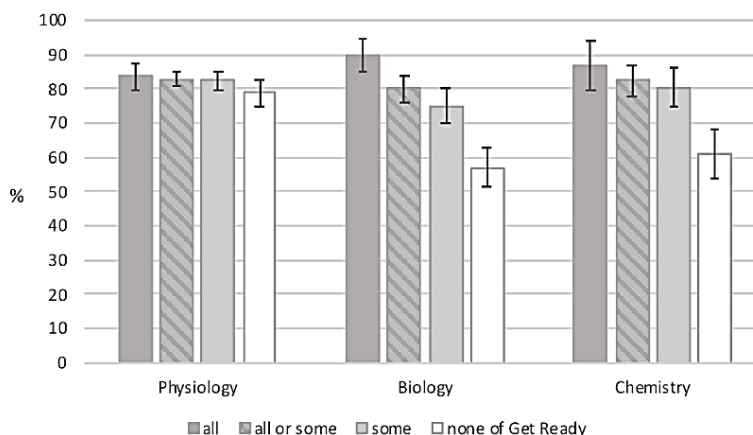


Figure 5

Pass rate (%) for the target cohorts according to participation in the *Get Ready* LMS, with 95% confidence intervals.



Unfortunately, separate retention data were not available for our target cohorts, however there is no reason to think they would contradict the overall findings presented in the section above.

Selection Bias

While the relationship between participation in *Get Ready* and student success for key non-traditional cohorts is promising, it could be argued that the effects measured might be due to more engaged students (who are more likely to do well in the subject anyway) self-selecting into the *Get Ready* program. Evidence against this conclusion is provided by the following matching pairs test.

The Biology cohort was divided into two groups, one consisting of students who had completed all or some of the *Get Ready* LMS, and the other consisting of students who had not done any. Students from each group were matched pairwise by degree, gender, domestic/international status, low SES, first-in-family status, and ATAR (to within 2 points), that is, all available independent variables. Some 72 matching pairs were found. The representation of the matched variables in the paired set was comparable with that of the sample as a whole (see Table 5), indicating that the matching pairs set is an approximately representative sample.

Table 5

The representation of the demographic variables in the matching pairs set compared with the whole sample.

	Representation in matching pairs set	Representation in whole subject cohort
Degree		
B. Animal & Vet. Sc.	29.2%	24.8%
B. Biol. Sc.	15.3%	13.2%
B. Biomed.	27.8%	21.7%
B. Sc.	23.6%	17.5%
Other	4.2%	22.8%
International student	0.0	4.1%
Gender		
Female	58.3%	65.1%
Low SES	12.5%	18.7%
First in family	12.5%	14.9%

In terms of students' results, it was found that the matching pairs exhibit a similar difference in average final grade and pass rate between students completing all or some of *Get Ready*, and those completing none, to that of the whole cohort, although the difference in pass rates for the matching pairs set was not in itself statistically significant, due to low n. Table 6 presents these comparisons, with 95% confidence intervals.

That the positive effect of *Get Ready* persists, even when all other factors for which we have data are accounted for, is a strong indication that the relationship between participation in *Get Ready* and higher average final grades and pass rate is not merely the result of self-selection. It is unlikely that 'student engagement' is independent of all the demographic indicators at our disposal, in particular ATAR.

Table 6

Differences between the average final grade and pass rates of students who had done at least some of Get Ready and those who had not done any, in the matching pairs set, as well as for the whole cohort, with 95% confidence intervals.

	How much <i>Get Ready</i>	Matching pairs	Whole cohort
Ave. final grade (%)	All or some	58.1 ± 2.7	60.8 ± 1.4
	None	49.5 ± 4.1	49.0 ± 2.2
Pass rate (%)	All or some	73.6 ± 10.2	79.9 ± 3.7
	None	59.7 ± 11.3	57.0 ± 5.8

Discussion

Our data show a correlation between participation in the *Get Ready* program on the one hand, and improved retention, average final grades, and pass rates on the other. The strongest results occurred in the Biology subject, which also exhibited a statistically significant difference in terms of success between students who had completed all of the *Get Ready* LMS, and those who had only done only some of it. The trend was reflected in the Human Physiology data, but was not statistically significant in this case, owing presumably to the large group-work component in the subject assessment. Tracking the retention data into the year following commencement also demonstrates that the association between participation in the transition program and improved retention is a lasting effect. Our data also showed that at the conclusion of *Get Ready* a large majority of participants felt the program had increased their confidence to do well in the subject, to a moderate or high degree, indicating that the program is meeting its aim to bolster self-efficacy. Through a matching pairs test we have also provided evidence that the positive effects associated with *Get Ready* cannot simply be attributed to self-selection into the program by more engaged students.

Most significantly for this study, similar positive effects associated with participation in *Get Ready* were exhibited for our target cohort consisting of low-SES, low-ATAR and first-in-family students. For this group, in the case of the Biology and foundational Chemistry subjects, participation in *Get Ready* meant the difference between an expectation of passing or failing. We did observe, however, that participation rates were lower for this cohort, in particular when it came to completing all of the LMS activities, as opposed to only some. This identifies an obvious area for improvement for future iterations of the program. By the same token, participation rates for this cohort, at well over 50%, were still pleasing, and provide evidence that the format of the program was both accessible and manageable for non-traditional student groups.

Get Ready fulfils a number of functions. Firstly, it provides a platform for students to familiarize themselves with subject content, providing them with a bridgehead to the rapid flow of discipline material that many find overwhelming once the subject proper begins. Significantly, engagement with these materials is interactive: students are encouraged actively to use new terminology and apply novel concepts in test-your-knowledge quizzes and interactions with their peers online and in workshop exercises. They thus gain initial fluency in the discipline vocabulary that will help them through the commencing weeks of the semester.

At the same time *Get Ready* introduces students to their new identity as first-year discipline novices. It does this by prompting them to enact skills such as resourcefulness, by looking concepts up in the textbook, consulting with their peers, or engaging with a staff member, via the LMS discussion forum or directly in the face-to-face workshops. It also instils in them realistic expectations about the pace of university study, and the level at which they will be expected to perform. It nurtures a sense of community by linking students to each other via the discussion forum and in group-based workshop exercises, as well as by introducing key members of academic staff through videos, electronic exchanges, and face-to-face interaction in the workshops. Moreover, it instils in students a sense of self-efficacy, by demonstrating the progress that can be made by approaching the subject with a sense of resourcefulness and connectivity.

Significantly, the program is scalable. This is an important consideration, given the ever more widely acknowledged imperative of a whole-of-institution approach to transition and the first-year experience (Nelson et al., 2012; Kift, 2015). Our experience has demonstrated that once

established in a subject, the programs are not resource-intensive to run or maintain. The expansion of the program from Human Physiology to the Biology and foundational Chemistry subjects was achieved through a one-off provision of 40 hours of developmental workload per subject. This same model was used to expand the program further to a first-year-first-semester Physics subject and the General Principles of Chemistry subject in 2019, though this expansion is yet to be evaluated.

Our study has demonstrated that even for the ‘hard case’ of content-heavy STEM subjects, an approach to transition program design informed by the affective principles that have emerged from the recent literature can be successful. This provides positive affirmation for an understanding of transition, particularly as it relates to non-traditional student groups, that while approaching the status of consensus amongst first-year experience experts and practitioners, is far from universally accepted across the higher education sector.

Conclusion

Transition to university studies is about much more than academic preparedness. It is true that some students will find that their prior studies have prepared them well for commencing first year in higher education, while others may start to feel overwhelmed by the academic expectations of their first few weeks of study. But equally if not more significant, is students’ familiarity with the role of being a successful student in their new learning environment. Once again, some students will find that their life experiences to date give them an advantage over others in this regard.

The *Get Ready* program attempts to build a bridge to students from non-traditional backgrounds to enable their transition to university studies. It does this by providing an introduction to the discourse of the new learning community, by stepping students through a set of behaviours associated with successful transition to university study, and by familiarizing them with their new learning environment (which in a COVID year may even be fully online), in a pre-commencement, low-stakes, and easily accessible format, that represents a manageable time commitment. This study demonstrates that the *Get Ready* program was able to make a difference for commencing low-SES, low-ATAR and first-in-family students in terms of their success, and in terms of retention for the cohort overall. This provides evidence that a meaningful contribution towards the development of a new, success-oriented student identity can be made in the context of a short, pre-commencement program, that is not resource-intensive to develop or run.

By the same token we recognize that this program can only be one component of an institution-wide approach. MacFarlane (2018) has reported on the longitudinal nature of developing a learning identity, and O’Sullivan et al. (2019) found that a sense of belonging continued to increase throughout the whole first year of an on-campus foundation program. There is only so much that can be expected of a program lasting a few weeks. Nevertheless, the program’s scalability lends it to incorporation into an institution-wide approach to transition. Having to rethink *Get Ready* for the time of the COVID-19 pandemic has also demonstrated the flexibility of its approach: building a sense of belonging to an online learning environment is just as important as fostering a sense of identification with the buildings and grounds of the physical campus, if not more so.

On a final, reflective note, we acknowledge that we have also been challenged throughout this study by the possibility that the new approaches to transition are still, in a certain sense, deficit constructions of non-traditional students: as outsiders still having to learn to be like insiders.

Clearly the interface between the individual and the institution is a highly asymmetric one. We do not claim to have an answer to this question. However, we are confident that anything that improves retention for diverse groups is a step in the right direction, in the belief that institutional change is most likely to be effective if it comes from within.

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