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Influence of new transition and retention strategies at Western Sydney University

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ABSTRACT

CONTEXT

Student progression and retention are the major concerns facing higher education (HE) institutions. Lack of progression and high drop-out rates lead to the perception that educational institutions may be failing to provide adequate supports and resources to the students to help them with their studies. The COVID-19 pandemic has exacerbated the situation as many students feel isolated and disconnected from their peers and teachers. There is a danger that there are not enough activities that could benefit the students' connectedness and help them overcome the adverse impacts of COVID-19.

PURPOSE OR GOAL

Since COVID-19 reduces the inflow of international students significantly in Australian Universities, the importance of student retention is more crucial than ever before. Therefore, the aim of this study is to investigate the effectiveness of several strategies that have been implemented in the first-year learning and teaching activities at Western Sydney University by the Engineering discipline, within the School of Engineering, Design and built Environment, to improve student retention, leading to a smooth transition to the second semester.

APPROACH OR METHODOLOGY/METHODS

A first-year advisory team has been formed to contact students who are irregular in participating in teaching activities. This is to confirm that the students are using all the available resources that have been put in place by the university. The advisory team also run additional drop-in sessions (two one-hour sessions every week) where students can pop in and discuss their issues or concerns. The team has established student focus groups, which are run regularly and bring students from different disciplines to connect with their peers and discuss their problems. The suggestions are noted and provided to the Associate Dean Learning and Teaching with suggestions for potential changes to programs or subjects. Moreover, the advisory team publishes student newsletters every second week, which include important information about the university's educational resources and services to support student learning. The advisory team also facilitates peer review sessions in some of the offered units in the first year.

ACTUAL OR ANTICIPATED OUTCOMES

The investigation will help to understand which of the retention and transition strategies are working effectively.

CONCLUSIONS/RECOMMENDATIONS/SUMMARY

It can be concluded that with proper strategies in place, the dropout rate can be reduced significantly.

KEYWORDS

Transition, retention, first-year teaching, engineering course.

Introduction

The demand for skilled engineers in Australia has been rising in the last few years. It is predicted that the rise will continue for the next several years as the country is investing significantly in infrastructure development and advanced manufacturing (Nguyen, Mai, & Anh Do, 2020). However, even before the pandemic, employers struggled to find skilled candidates from a tiny talent pool. When one looks at the lack of graduates coming out of national universities, it is clear that the situation is getting worse (Frize et al., 2021). Enrolments have been steadily declining over the last decade, going from 21,456 to 18,855 in only four years – a fall of 12.9% (ACED, 2020; EasySkill, 2021). This might be related to students not exposed to science and engineering demonstration in the early stage of their life.

The challenge becomes even more serious when there is a low undergraduate degree completion rate. Retention and a smooth transition are two of the most critical areas that contribute significantly towards the local production of engineers as well as the survival of the engineering programs (Wilkinson, 2020). The work starts from the first year since all students in the Engineering programs must complete common first-year units. It is important to remember that students coming from high schools experience a substantial cultural difference, in terms of learning and teaching, as they are expected to be more autonomous learners at university. A meaningful learning environment that can boost students' confidence and increase their appetite for degree completion requires a significant amount of focused and skilled effort (Bairaktarova & Pilotte, 2020).

Western Sydney University (WSU) is a student-focused institution that thrives on creating effective learning and teaching environments. Academics in the School of Engineering at WSU diligently work on developing effective teaching methods that can produce job-ready engineers for national and international markets (Rahman, 2017; Shrestha, 2015, 2018). While the university is satisfied with the learning and teaching skills of academic staff, retention and transition is emphasised as a continuing concern. Usually, WSU experiences its biggest student dropout in the first year. Therefore, the first-year academic course advisors and first-year unit coordinators have been working together under the guidance of the Associate Dean of Learning and Teaching to implement several new strategies to improve student success. Through these strategies the School is aiming to stabilise the progression rate above 90%.

The aim of this study, after implementing several strategies to help first-year students in their academic journey, is to share the findings on retention and transition rates in order to increase the number of engineers graduating from university. The methodology that we followed in this research was to conduct a review of the past three years' failure rates in first-year units and identify possible contributing factors. The number of students who dropped out after the census date in the Autumn semester of 2021 and the common causes were also identified. It is important to mention that these are preliminary findings and warrant further verification when we enter into a post-pandemic era. It is also necessary to note that the repeatability of the results have not yet been confirmed.

Methodology, Results and Discussion

Several strategies were implemented based on the known common reasons that lead students to drop out. In Autumn 2021, first year engineering students were enrolled in four units: (a) Engineering Physics, (b) Engineering Computing, (c) Mathematics for Engineers 1 and (d) Introduction to Engineering Practice. Figure 1 shows the grade distributions in the last three years for these four units at WSU.

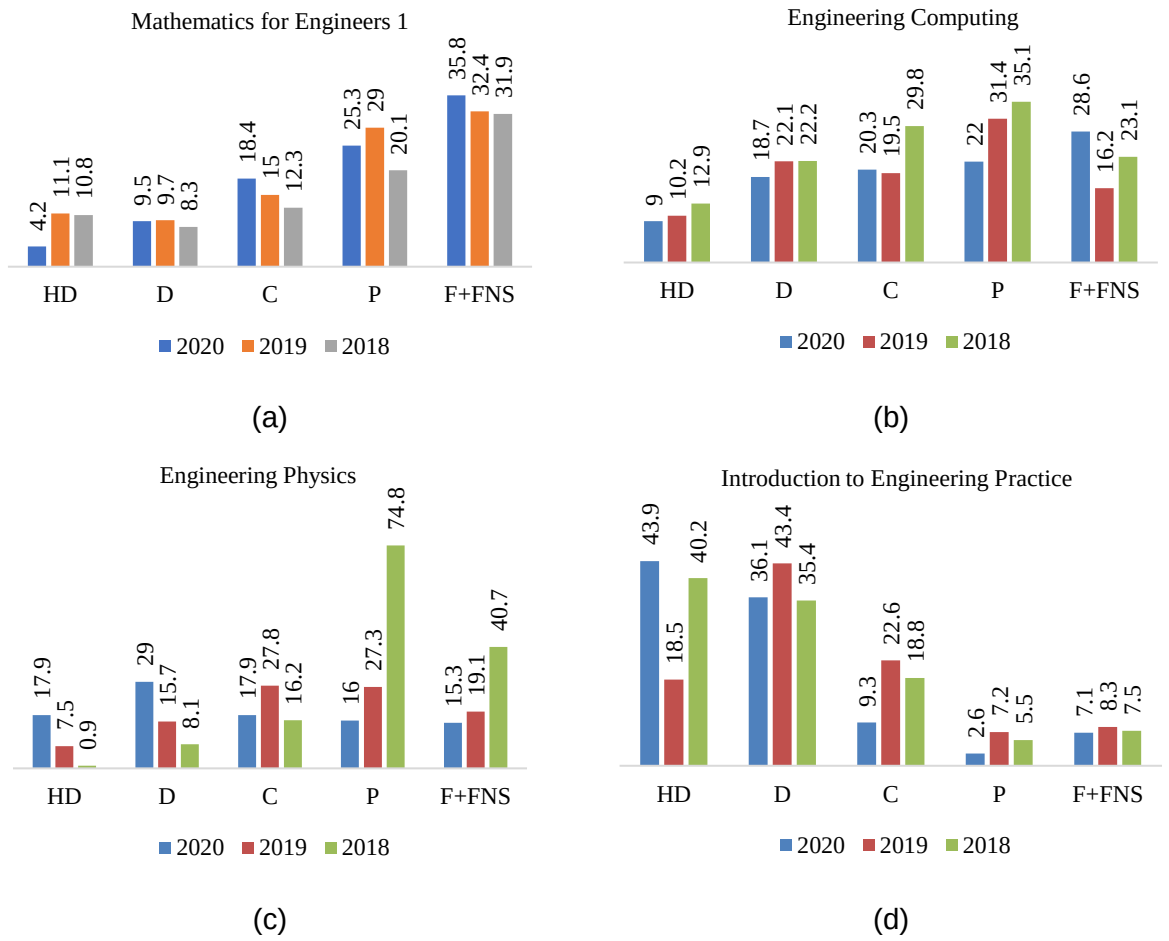


Figure 1: Grade distribution of different first year units (Autumn semester): (a) Mathematics for Engineers; (b) Engineering Computing; (c) Engineering Physics and (d) Introduction to Engineering Practice. (HD = High Distinction, D = Distinction, C = Credit, P = Pass, F = Fail and FNS = Fail non submission).

As can be seen (Figure 1), the highest failure rate (F+FNS) was in Mathematics for Engineers 1 (MfE 1). More than 30% of the students fail this unit every year. A similar skewness can also be seen for Introduction to Engineering Practice but for HD. It is interesting to see that Engineering Physics (EP) used to have a high failure rate (above 40%); however, in recent years, the failure rates have reduced significantly. This impressive outcome encouraged first-year course advisors to communicate with the unit coordinators of EP to learn the strategy and share it with other unit coordinators. It was found that the EP team focused on fundamental engineering concepts and used a large number of hands-on practical examples to engage students. It should be noted that there were significant challenges in 2020-2022, owing to the COVID-19 pandemic.

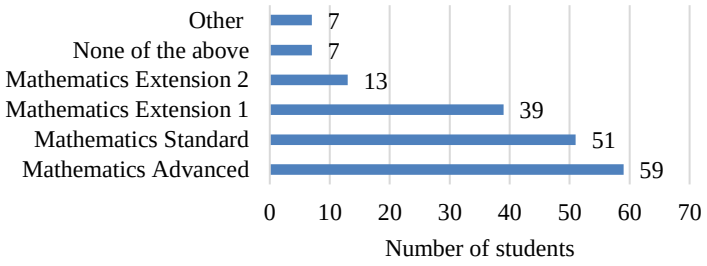
Since the main unit of concern was MfE 1, the advisory team conducted a survey on the mathematics skills of the first-year students who enrolled in an Undergraduate Engineering Degree at WSU. The survey was conducted to investigate whether there was a relationship between the student failure rate and the mathematics skills of students. The survey results are presented in Figure 2. In the survey, the following questions were asked:

1. First name (response optional)
2. Last name (response optional)
3. Student ID (response required)
4. What mathematics course you have completed (select more than one if applicable)?
    - Mathematics Life Skills
    - Mathematics Standard
    - Mathematics Advanced

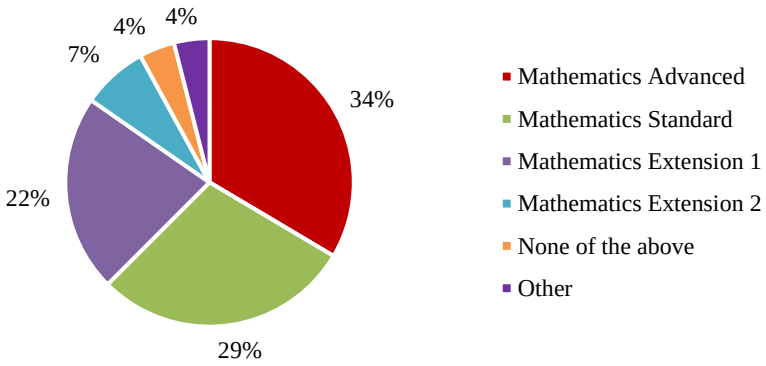
- Mathematics Extension 1
- Mathematics Extension 2
- None of the above
- Other

5. Are you familiar with calculus? (response required, select yes or no).

Altogether, we received 219 responses. Among them, there were 43 repetitive answers, which were filtered for analysis. Though mentioning their name was optional, only five students did not provide their names in the survey response.



(a)



(b)

Figure 2: Number of students coming from a different background (a) and their corresponding percentage (b).

As can be seen, 29% of students had completed either Math Ext 1 and/or Math Ext 2. A large proportion (63%) had completed 2 Unit Mathematics or Advanced Mathematics. Additionally 8% of students had little or no mathematics background. We also asked how many of the students were familiar with calculus since this skill is necessary for engineering students. The response can be seen in Figure 3.

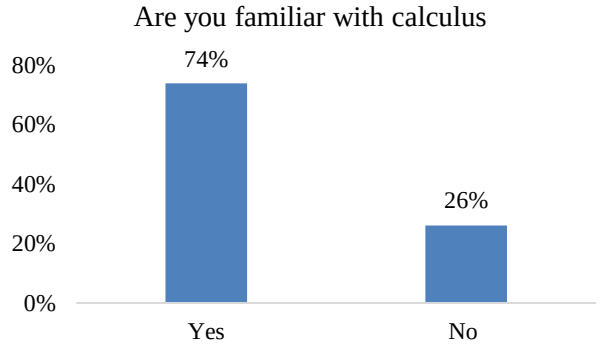


Figure 3: Familiarity with calculus.

As we can see (Figure 3), 74% of the students were familiar with calculus. They may not have an in-depth understanding; however, it was assumed that they remembered the basics. The reason for this speculation is that students felt comfortable when we introduced essential equations for differentiation and integration in EP tutorial classes.

When adding the numbers of dropout to failed students, the percentage becomes above 50 – 60% on average every year. This figure indicates a very unhealthy retention and transition rate for a university. Moreover, we did not observe any correlation between mathematics skills and failed students. The dropout rates for students with or without math skills remain pretty close to each other. The failure rate in MfE 1, therefore, cannot be explained with the high school background of the enrolled students so focus was turned towards the curriculum, teaching strategy and student experience.

The curriculum and the teaching strategy may need to be revised to improve student performance in this unit. Similarly the team worked on strategies that may improve student experience. Several strategies were developed and implemented to help the students.

***Strategy 1. Drop-in sessions*:** It was noted that many first-year students are unfamiliar with the university learning and teaching system. They struggle with essential things such as accessing learning materials and activities in vUWS (Online Learning Management System used at WSU) and using learning guides for their study. They also struggle with more advanced such as collaborative learning. WSU already has a range of resources dedicated to helping first-year students, such as Peer Assisted Study Sessions (*PASS*) (https://www.westernsydney.edu.au/currentstudents/current_students/services_and_facilities/study_and_life_skills_workshops/pass_-_peer_assisted_study_sessions) and Mathematics Education Support Hub (*MESH*) (https://www.westernsydney.edu.au/mesh). Unfortunately, most of the students are unaware of these resources even though they are advertised in orientation sessions.

The aim of creating drop-in sessions was to open two, one-hour zoom consultation sessions every week where students could come and talk to first year academic advisors. These sessions were used as a platform to inform students about resources to help them succeed and answer any program or subject-related questions. The sessions were very successful and many students attended to talk about their problems in coping with the new university environment. A number of students talked about their thoughts of leaving the university because in their opinion, the university was too demanding. After guidance from the advisors, it is estimated that more than 50% (anecdotal) of the students changed their views by the census date.

***Strategy 2. Working with WSU's retention success team*:** WSU has a retention success team that is dedicated to improving the retention rate by reaching out to students who are not engaging with the online learning materials. Engineering academics from the School worked with the university team to enhance the effectiveness of the student contacts. The attendance of the students was closely monitored for the first three weeks, and a list of students who missed more than one tutorial was generated. The contact details of these students were collected and given to the unit coordinator, 1st year ACA and WSU's retention success team. Students were contacted individually to find out what was preventing them from engaging in learning. Measures were subsequently taken to help them with issues that were identified.

We then collected information about students who failed the first assessment (for example, quiz 1) and shared it with the unit coordinators and tutors. Students were contacted and asked to attend a consultation to see what support they needed. During each consultation session, we conducted a review of the assessment contents with the attending student to help them catch up with the other students. They were also asked to join PASS and MESH sessions to get further help as they continued with their studies.

Strategy 3. Arranging lab tour: One of the positive aspects of studying Engineering is to see the demonstration of complex ideas. Real life examples motivate students to push the limits of understanding further. Therefore, we arranged a lab tour for the first-year students in week three to

show them what they would be doing for the next few years. We planned the visit in a way that not only provided general information about the lab activities but also provided avenues for students to ask questions about their studies. Academics from different disciplines attended the session to help the students with their queries about how they could plan ahead to study in disciplines that interested them.

Strategy 4. Newsletter*:* The School of Engineering also initiated the publication of fortnightly Newsletters. These are intended to assist students to quickly find university resources to help them when they need it. The Newsletters usually consist of information about study tips, library information, unit coordinators' information, upcoming PASS and MESH sessions and exam preparation tips. Additional information about career development seminars and inspirational achievements by academics and previous students from the School was also included in some of the newsletters.

Strategy 5. Student focus group (SFG*):* Continuous improvement in learning and teaching methods is critical to producing quality engineers. While academics are always working together to improve learning and teaching experiences, the students' perspectives are essential too. The School arranged an SFG session to give students the opportunity to share their experience at WSU. We asked the following questions to the attending students during the session:

- What improvements would you like to see in our learning and teaching activities?
- Did WSU meet your expectations?
- How can we improve industry engagement?
- What do you think about face to face and online classes? How can we improve them?
- What is your opinion on using technologies in teaching activities?
- What sort of technologies would you like to see being used in teaching and why?
- What do you think about our current student feedback surveys tools and how can we improve these?
- What are your suggestions to improve PASS and MESH sessions?
- What types of assignments are useful in your view and why?
- Are the assessments adequately designed? Why or why not?

The session was run for about 1 hour and 30 minutes. The discussion was engaging and many additional issues were raised by the students. A summary of the suggestions was made based on SFG discussion and shared with the School Executive Committee to take remedial actions. The most important recommendations made by the students in the SFG session are presented below.

Recommendations

- Need to report back on student feedback surveys: What changes were implemented? How were the issues addressed? Students feel that their feedback is not considered in improving units.
- Assistance with industry placements: This is especially challenging to international students. The option of using work experience gained in their home country was not preferred by students, but they may have no other options. They would like more support with placements.
- Online recordings of all lectures and tutorials to help students revising the lecture/tutorial materials.
- Streamlined online assessments: The structure of the questions and submission portals need to be improved to assist students having better online assessment experience.
- Use of camera for better class engagement: Students felt that their peers should be forced to turn on their cameras during online lecture and tutorial sessions. All who participated agreed that turning on the camera should be made mandatory during online tests to preserve the integrity of online assessments.
- Investigate the possibility of extending PASS to senior level units.

- The content of some units is too much and there is not enough time in tutorial sessions to ask questions and get answers. One possibility is to extend the duration of tutorial sessions.
- Flipped mode of delivery has received a mixed response. While one unit was praised for the way the materials were efficiently and effectively conveyed in tutorial sessions (with well-designed online preparatory material), another unit was identified as needing a lot of improvement.

As can be seen, there is much room for improvement, and the university is gradually addressing most of these issues. The session was run again in week 5 of the Spring session with another planned at the end of the teaching session. It is expected that the whole year's data will be more helpful in understanding students' struggles at different stages of their studies.

Strategy 6. Peer review of the teaching activities*:* Learning from each other is always beneficial and encouraged by the university. The School introduced a peer review process for subjects where academics help each other to develop their skills as educators and a vibrant learning environment. In this activity, academics from different areas joined tutoring sessions in a subject they were not teaching. Based on their observations, they provided constructive suggestions to the teaching academic that they felt might further improve the learning and teaching experience. Initially, the method was not adopted widely because sometimes it can be intimidating to be critiqued. However, after a number of seminars provided by the university about the process, it became clearer and many academics are now actively engaging in the initiative.

With all these strategies in place, the retention and smooth transition have been re-evaluated. The failure rates in EP, Engineering Computing and MfE 1 were 22.7% (F = 6% and FNS = 16.3%), 28.7% (F = 11.6% and FNS = 17.1%) and 47.7% (F = 34% and FNS = 13.7%), respectively in Autumn 2021. As we can see, the failure rate for Engineering Computing remains constant for 2021. However, it is important to note that the actual failure rate was only 11.6% because an FNS grade was given to students who failed because of non submission of a mandatory assessment. A similar trend can be seen for EP. The actual failure rate of this unit is only 6%. Though the overall failure rate (F+FNS) for this unit increased compared to last year, this can be attributed to a large number of non submission fail grades.

Based on the above findings, it can be argued that the implemented strategies have helped the first-year students to engage in their learning and an improved experience at WSU. However, it is worrisome to see a large number of FNS grades which needs to be explored further. This may be the result of students not realising the importance of different assessment tasks and if so academics will need to find effective ways to convey the importance of mandatory submissions to the students. One strategy could be a quiz for Module 1, which has to be completed in Week 1, to progress into Module 2.

Conversely, the failure rate for MfE 1 increased from 35.8% in 2020 to 47.7% in 2021. Given the background of first-year students in Mathematics and their performance in other units, further investigation is needed to find out what is preventing students from achieving success. A discussion between the Mathematics Department, student representatives and Engineering academics needs to happen to identify issues and propose solutions. This unit seems to be a substantial roadblock for many Engineering students and prevents them from making a smooth transition to the next semester. A longitudinal study is needed to identify the most effective strategy which will be the future research direction.

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