SMALL GRANTS RESEARCH PROGRAM REPORT

Evidence-based pedagogies to support online engagement of low SES, and regional, rural, and remote students

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Acknowledgement of Country

The Australian Centre for Student Equity and Success acknowledges Indigenous peoples across Australia as the Traditional Owners of the lands on which the nation's campuses are situated. With a history spanning more than 60,000 years as the original educators, Indigenous peoples hold a unique place in our nation. We recognise the importance of their knowledge and culture, and reflect the principles of participation, equity, and cultural respect in our work. We pay our respects to Elders past, present, and future, and consider it an honour to learn from our Indigenous colleagues, partners, and friends.

The research team also wish to acknowledge and pay respect to the palawa/pakana people of lutruwita, the traditional owners of the land upon which we live and work. We pay respects to Elders past, present, and emerging, as the knowledge holders and sharers. We honour their strong culture and knowledge as vital to the self-determination, wellbeing, and resilience of their communities. We stand for a future that profoundly respects and acknowledges Aboriginal perspectives, culture, language, and history.

At a glance

Background

Online learning has increased significantly. Online learning may be able to reduce or mitigate barriers to higher education that students from low socio-economic status (SES) and/or regional, rural, and remote (RRR) backgrounds might experience. Unfortunately, course completion rates in higher education are significantly lower for students studying online, with a disproportionate impact on students from disadvantaged backgrounds. This project aimed to address this issue.

What we did

Using data from the University of Tasmania, we described online engagement patterns of low SES and RRR students and identified online pedagogical practices that maximise the engagement of these students, so as to develop a holistic model of online engagement. We did this first by collecting quantitative data, including learning management system data and survey responses, from 119 low SES and RRR students in a suite of 16 online and blended subjects. We then collected qualitative interview data from teachers, students, and support staff to examine teachers' pedagogical approaches that helped foster the engagement of students in the target priority groups.

What we found

Low SES and RRR students can have multiple associated challenges, but with the right pedagogical support, these students can achieve outcomes as positive as their online peers. Creating a sense of belonging and of (virtual) place can support these students' social integration into university life.

Online pedagogical designs differed significantly between disciplines and individual subjects. Students sought consistency in how to navigate learning management systems (LMS) in multiple subjects and emphasised the importance of aesthetics and visual design. Subjects based on Universal Design of Learning principles were well received by low SES students and RRR students.

Overall, low SES and RRR students thrive in online learning when they are provided with pedagogical support that recognises their needs and is embedded in a whole of institution support system.

What we recommend

As access expands and student cohorts become more diverse, institutions should align support and resources to match the needs of the cohort and staff supporting them.

Universities should prioritise improving online pedagogies and fostering interactive and socially engaging virtual environments.

Institutions should interpret their LMS data considering the academic context and being aware of the varied quality and reliability of the data available. They should explore ways to understand and track students' social presence and engagement in online learning.

We provide a toolkit (see Table 6 in Section 7.2) with a range of online pedagogical tools and strategies that can foster social and cognitive engagement. Teachers in online and blended subjects should select the tools suitable for their learner cohorts.

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- Professor Sue Kilpatrick, University of Tasmania
- Professor Rob Ellis, Griffith University
- Professor Cathy Stone, University of Newcastle
- Professor David Kember, Gravelly Beach, Tasmania
- Professor Tracey Muir, Australian Catholic University

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Table of contents

List of tables

List of figures

Abbreviations

ASGC-RA	Accessibility/Remoteness Index of Australia
ATAR	Australian Tertiary Admissions Rank
CoI	Community of Inquiry
DoE	Department of Education
GenAI	Generative Artificial Intelligence
HE	Higher education
IEO	Index of Education and Occupation
SEM	Structural equation modelling
SES	Socio-economic status
LMS	Learning management system
MMM	Modified Monash Model
MyLO	My Learning Online
RPL	Recognition of prior learning
RRR	Regional, rural, and remote
RQ	Research question
SEM	Structural equation modelling
UDL	Universal Design of Learning
UTAS	University of Tasmania

1. Executive summary

1.1 Background

Course completion rates in higher education (HE) are significantly lower for students studying online, with a disproportionate impact on students from disadvantaged backgrounds (DoE, 2025). The Australian Department of Education (DoE) found fewer than 40% of online undergraduate students completed their degrees over a 9-year period, and withdrawal without a qualification is 2.5 times more likely than for their on-campus counterparts (DoE, 2025), costing the student, university, and society. This project sought to address the issue of disengagement and attrition by providing a holistic model of online engagement for low socio-economic status (SES) and regional, rural, and remote (RRR) students and identifying evidence-based pedagogical practices to maximise the engagement and retention of students in these groups.

1.2 Methods

This project was conducted at the University of Tasmania (UTAS), which holds a unique position in online course delivery. UTAS has one of the highest online enrolment rates among Australian public universities, one of the highest proportions of enrolments of low SES students and RRR students, and one of the highest attrition rates of online students (DoE, 2025). The university's current position offered a unique and highly relevant context for this project. This project had the following aims:

1. To describe online engagement patterns of low SES students and RRR students.
2. To identify evidence-based online pedagogical practices that maximise the engagement of low SES students and RRR students.
3. To develop a holistic model of online engagement for low SES and RRR students, which demonstrates interplay between student perceptions, student behaviours, and student outcomes and the influence of SES and RRR backgrounds, and other demographic factors.

In this project, we used the Community of Inquiry (CoI) framework (Garrison et al., 2000) as the conceptual framework in the data generation and analysis throughout the project. In this framework, online learner engagement is promoted through the development of three distinct types of presence: cognitive, social, and teaching (Garrison et al., 2000). Cognitive presence represents the ability of the learner to construct meaning through sustained communication in the online learning environment. Social presence refers to the learner's ability to project their personal characteristics into the online community and present themselves to other members as a real person. Teaching presence consists of the design and facilitation of the learning experience. The CoI framework was used to guide the generation as well as analysis of all sources of data.

This study was conducted in two phases, and used a mixed methods design, integrating both qualitative and quantitative data. In **Phase 1**, the project collected quantitative data, including learning management system (LMS) data and survey responses, from low SES

and RRR students (*n* = 119) in a selected suite of online and blended subjects (*n* = 16). This phase examined the engagement patterns of these students, and the interplay between student perceptions, student behaviours, and student outcomes and the influence of SES and RRR backgrounds, and other demographic factors. Based on the findings from the first phase, seven of the 16 subjects were chosen from those that showed high engagement through the survey responses, by students in the target priority groups. **Phase 2** of the project collected qualitative semi-structured interview data from teachers (*n* = 9) and students (*n* = 10) in the chosen seven subjects, and support staff at this university (*n* = 5). This later phase examined teachers' pedagogical approaches that helped foster the engagement of students in the target priority groups.

1.3 Key findings

1.3.1 Online engagement patterns of low SES students and RRR students (Aim 1)

1. The teachers interviewed recognised there have been significant changes in student profile over the past few decades, calling for reconsideration of student equity groups.
2. In many cases, low SES and RRR students can belong to more than one equity group and can be considered as students with multiple associated challenges.
3. Teachers in online and blended subjects often need to cater for large student cohorts that, in many cases, are multi-disciplinary or at different stages of study (for example, in different year groups).
4. The teachers interviewed recognised the need to learn about the student cohort in their individual subjects.
5. There is a clear need to create a sense of belonging and a sense of (virtual) place among low SES and RRR students studying online to support these students' social integration into university life.
6. Low SES and RRR students relied on multiple sources of support, including teachers and peers in the subject, family and friends, and other student organisations (for example, student union).
7. Online students from low SES and RRR backgrounds, in the subjects involved in this study, achieve as positive outcomes as the other peer students studying online.

1.3.2 Evidence-based online pedagogical practices that maximise the engagement of low SES students and RRR students (Aim 2)

1. Online pedagogical designs differed significantly between disciplines and individual subjects.
2. Teachers' presence and pedagogical design have a significant impact on the online engagement of low SES and RRR students, in both social engagement and cognitive learning aspects.
3. Subjects that are designed based on Universal Design of Learning (UDL) principles were well received by low SES students and RRR students.
4. Teachers can design online activities to help create online learning communities.

5. Online learning communities can help foster a sense of belonging and a sense of (virtual) place among low SES and RRR students.
6. Students sought consistency in how to navigate the LMS spaces across multiple subjects and emphasised the importance of aesthetics/visual design on student experience.
7. Teachers in individual subjects remained students' first point of contact when they needed support.
8. Teachers in individual subjects called for better ways to identify at-risk students at early stages and to develop preventative approaches.

1.3.3 Interplay between student perceptions, student behaviours, and student outcomes and the influence of SES and RRR backgrounds, and other demographic factors (Aim 3)

1. Low SES students spent more time on the LMS, but this does not necessarily mean greater access or content completion. Similarly, remote students accessed the platform less often but spent more time and completed more content. This may reflect differences in available time or internet accessibility.
2. Low SES students showed slightly lower perceptions of engagement, across the three aspects of the Community of Inquiry (CoI) framework (teaching, social, and cognitive), compared to the broader learning community. This pattern also applies across the remoteness spectrum.
3. There was a complex interplay between student demographics, engagement factors, and academic outcomes in online HE. Social, teaching, and cognitive presence interacted in ways that shaped student success, with subject access and perceptions of teaching playing key roles. This can be summarised thus:
    - SES and remoteness both have a small impact on teaching presence—students from more remote or lower SES backgrounds are likely to perceive this to be lower than other students.
    - Teaching presence has a large positive impact on cognitive presence, while social presence has a medium positive effect. This highlights the importance of instructional support and peer interaction in fostering deeper learning.
    - Cognitive presence has a small positive effect on both subject access and final grades. Students who engage in higher-order thinking are slightly more likely to access subject materials and achieve better academic outcomes.
    - Subject complexity has a small negative impact on final grades. More challenging subjects may create barriers to student success, even if other engagement factors are strong.
    - Subject access has a medium positive impact on final grades, suggesting its importance in academic success. Students who regularly engage with learning materials tend to perform better overall.

2. Recommendations

This report provides the following recommendations, with actionable items categorised into two levels: subject-level pedagogical approaches and institution-level support approaches. These recommendations are also discussed in Section 8 with rationale provided.

2.1 Recommendations for subject-level pedagogical approaches

1. Teachers should learn about the characteristics and needs of their learner cohorts and continuously inform their pedagogy by reflecting on what students say they need.
2. Teachers should embed links between the formal curriculum and co-curricular support and resources in subject level design to help students understand what help is available for their studies.
3. Teachers in large online subjects, or blended subjects that have a significant online component, should use Universal Design of Learning (UDL) principles to cater for the needs of their diverse learner cohorts.
4. This report provides a toolkit with a range of tools that can be used to foster student engagement. Teachers in online and blended subjects should select the tools suitable for their learner cohorts.
5. To foster social integration, teachers should aim to create a sense of belonging and a sense of (virtual) place through online community-building.
6. Teachers should aim to reduce cognitive load for students through the design and layout of their online teaching spaces.
7. Teachers should be familiar with institutional level support and how to assist students to access them.

2.2 Recommendations for institution-level support

8. As access expands and cohorts become more diverse, institutions should align support and resources to match the needs of the cohort and staff supporting them.
9. Learning support services requested by equity students for successful progression should inform the design of a co-curricular support framework that supports each key stage of their degree to help them to move on to the next stage of their university course.
10. When using LMS data, institutions should interpret the data considering the academic context and being aware of the varied quality and reliability of the data available.
11. Institutions should seek higher accessibility and presentation of learning and teaching data, allowing leaderships at different levels, and teachers in individual subjects, to understand their student cohorts.
12. Institutions should have more preventative approaches in supporting equity students and identifying at-risk students.

13. Institutions should explore ways to understand and track students' social presence/engagement in online learning.
14. Universities should prioritise improving online pedagogies and fostering interactive and socially engaging virtual environments and how students from various equity groups respond to these.

3. Introduction

Low SES and RRR students are more likely to drop out from their courses than peers from higher SES or metropolitan areas, for reasons such as finance, family responsibilities (Li & Jackson, 2024; Stone, 2017), and mental wellbeing (Crawford, 2021). Factors that can mitigate these challenges include knowledge within communities (Kilpatrick et al., 2021), strong teacher presence (Stone, 2017), and meaningful relationships with teachers and peers (Hopwood et al., 2021), leading to better outcomes and success for students in these equity groups.

Earlier ACSES research (Stone, 2017) has clearly pointed to the value of learning analytics, using institutional data, in supporting the retention and success of students in equity groups. Learning analytics presents value in achieving many key strategies for these students, such as identifying student needs, informing the development of personalised and targeted intervention, enabling a strong teacher-presence, and ensuring interactive content, curriculum, and delivery (Stone, 2017). Although its value is recognised, learning analytics research has not always been accepted without critique. For example, research by Dyment et al. (2020) identified risks associated with using findings of learning analytics as the sole data source to measure online student engagement. Indeed, evaluation using only LMS data will not capture engagement that occurs outside of the LMS, and it may cause artificially inflated engagement by capturing mandatory activities (Dyment et al., 2020). Consequently, this present research used a mixed-methods approach, with findings resulting from the use of both quantitative LMS and student survey data and qualitative interview data.

This project has built upon the earlier work of Stone (2017) and Dyment et al. (2020), as well as the research team's research in online student engagement (Fan et al., 2023) and learning analytics (Fan et al., 2018; Liu et al., 2023). We took on the challenge proposed by Dyment et al. (2020) that multiple data sources should be used in understanding online student engagement, to capture both the visible and invisible. We present innovative data integration, involving LMS data and survey data from students, and interview data from students, teachers, and university support staff. The three types of data will be integrated to achieve the following key:

1. To describe online engagement patterns of low SES and RRR students.
2. To identify evidence-based online pedagogical practices that maximise the engagement of low SES and RRR students.
3. To develop a holistic model of online engagement for low SES and RRR students, which demonstrates interplay between student perceptions, student behaviours, and student outcomes and the influence of SES and RRR backgrounds, and other demographic factors.

This project was conducted at one Australian regional university: the University of Tasmania (UTAS). As the only university in a state with high levels of disadvantage and a dispersed population, UTAS has one of Australia's highest proportions of student intake for low SES and RRR students, with most of these students studying in online or blended courses.

The data was collected in two phases. In **Phase 1**, the project started with collecting LMS data and student survey responses from selected online subjects (n = 16). The LMS data

were collected from a LMS platform called My Learning Online (MyLO), which is the central system used in all online subjects at the university. The LMS data were used to reveal and establish trends in the engagement behaviour and patterns for students from the target equity groups. Survey responses captured students' self-reported data on their perceptions and views towards their own online engagement and learning experience in the online or blended subject. Integration of the LMS data and survey data led to the development of a holistic model revealing interactions between student perceptions, student behaviours, and student outcomes and the influence of SES and RRR backgrounds, and other demographic factors.

In **Phase 2**, based on findings from the LMS and survey data, seven of the 16 subjects were chosen from those that showed high student engagement by low SES and RRR students. Students from these equity groups and teachers from the seven chosen subjects were invited to participate in semi-structured interviews. These teachers and students were asked about pedagogical approaches used in the subject that may have led to the engagement of students. Phase 2 also included interviews with central support staff at the university who played an important role in supporting equity students. The findings led to the production of a toolkit with best practices for engaging low SES and RRR students in HE online courses.

This project demonstrates value both theoretically and pedagogically, contributing to the three areas of research with which it engages: (a) low SES and RRR student participation; (b) online student engagement and retention; and (c) HE online pedagogy. One immediate output is a toolkit including effective pedagogical practices for students in these priority groups demonstrating how teachers' pedagogical design can help enhance these students' engagement through social and cognitive integration. The project's methodological design demonstrates an innovative method of LMS data extraction and analysis that can be employed by other universities to identify online student engagement patterns and trends.

UTAS shares many commonalities with the other Australian public universities, such as course structures and the adoption of institutional-wide LMS. Therefore, the project findings will be of high relevance to other universities, particularly as all universities are admitting increasingly diverse student populations. Overall, it is anticipated the findings of this project will contribute insights into student needs, challenges, and perceptions in these priority groups, which will inform HE policies, admission, and support strategies for these students.

4. Background

4.1 Background and context

Both globally (Salama & Hinton, 2023) and in Australia (Australian Department of Education, 2024), online learning has increased significantly in recent years. A variety of conditions including changing student demographics (Roddy et al., 2017), advancements in technology (Coates, 2020), the expansion and improvement of online courses (Stone, 2019), and increased political and economic pressures to marketise higher education (Morris, et al., 2020), have led to this digital transformation. And, in many cases, the coordinated global response to the COVID-19 pandemic accelerated this expansion (Nworie, 2021; Rapanta, et al., 2020).

4.2 Policy mandate to expand access

Concurrently, yet separate to the digital transformation, there has been a global effort to expand access to HE. At an international level, the 1994 United Nations Salamanca Report identified achieving education for all as a priority. This seminal report represented a shift in mindset and led to inclusive education efforts around the world (Hernández-Torrano et al., 2020). Looking more specifically at Australia, there has also been a clear mandate to expand access to HE over time. In 2008, the Australian government released the Review of Australian Higher Education (the Bradley Report), which called for an increase in participation in HE for students from low SES backgrounds. This was followed by the 2018 Independent Review into Regional, Rural and Remote Education (Halsey Review) and the 2019 Regional Rural and Remote Education Strategy (Napthine Review), the former calling for expanded HE access, including sub-bachelor courses, for regional, rural, and remote (RRR) students, and the latter identifying a significant city–country divide when it comes to access, participation, and attainment in HE. Most recently, the Australian government, through the Australian Universities Accord (the Accord), committed to ensuring a high-quality and equitable HE system as a key element in helping Australia to achieve its full potential as an economy and society by 2035 (Australian Department of Education, 2024) and identified increasing enrolments with a more diverse intake as a key target for the next two decades.

Researchers have found that online learning may be able to reduce or mitigate barriers to HE that RRR students experience (Corbett et al., 2023). As such, in order to expand access to the extent described in the Accord, online learning will likely be an important component of the Accord implementation. Unfortunately, research also shows that completion rates are traditionally lower in online and blended courses, as compared to on-campus groups and these figures tend to be even lower for disadvantaged student groups (Stone, 2017). Identifying strategies to support these students is vital to meeting the needs of the incoming cohorts and increasing their chance of successful outcomes.

4.3 Low SES and RRR student participation

Encouragingly, recent efforts to widen participation in HE have resulted in an increase in equity group student enrolments due in large part to the availability of online learning opportunities. Research has shown there are larger proportions of equity group students in online courses than there are in on-campus offerings (Stone, 2017, 2019; Stone & O'Shea, 2019). However, the *Australian Universities Accord Final Report* (Australian Department of Education, 2024) noted that there is a risk of this positive trend stalling if efforts are not made to continue development of and support for online learning. While numbers of identified equity group students have increased, the rate of growth in low SES and RRR categories has slowed in recent years (Koshy, 2020). In addition, course completion rates in HE are significantly lower for students studying online, with a disproportionate impact on students from disadvantaged backgrounds (Australian Department of Education, 2024). The Australian Department of Education and Training found fewer than 40% of online undergraduate students completed their degrees over a 9-year period, and withdrawal without a qualification is 2.5 times more likely than their on-campus counterparts (Department of Education, 2023). In addition, low SES students and regional and remote students are more likely to drop out from their courses than peers from higher SES or metropolitan areas, for reasons such as finance, family responsibilities (Li & Jackson, 2024; Stone, 2017), and mental wellbeing (Crawford, 2021). While technology has improved access to HE for many, Farley and Burbules (2022) suggested that strategies to best support online students need to be considered with an equity lens, as equity groups may be uniquely disadvantaged by learning in a virtual space. Additionally, Tate and Warschauer (2022) cautioned that online learning can amplify the performance gap between online and face-to-face learners for low-income and minority learners.

Research has shown that many factors that can mitigate these challenges—including knowledge about HE within communities (Kilpatrick et al., 2021), strong teacher presence (Stone, 2017), and meaningful relationships with teachers and peers (Hopwood et al., 2023)—lead to better outcomes and success for students in these equity groups. However, student engagement and integration have long been considered key aspects of the success and retention of equity group students (Sweet, 1986); a sense of belonging is important (Pedler et al., 2022).

4.4 Engagement definitions and frameworks

Active engagement not only enriches the educational experience but also significantly contributes to students' overall success as well as their commitment to their academic journey (Tinto, 1975, 2014). The concept of engagement is multifaceted; various frameworks and definitions (Bowden et al., 2021) have been proposed to illustrate and define this complexity, and focus on how involved, interested, and connected students are to their classes (Axelson & Flick, 2010; Goode et al., 2022; Kahu, 2013; Kahu & Nelson, 2018). While there is some variation between definitions of engagement and frameworks, there is agreement that the key aspects are interconnected and should be considered for effective student engagement in the online teaching learning environment (Redmond et al., 2018).

4.4.1 Definitions of engagement

Despite an increase in research focused on student engagement, there is no consensus on the meaning of the concept of engagement or how to measure it. Tight (2020) presented a systematic review of the student engagement and retention literature and pointed out that despite this lack of consensus the number of papers addressing student engagement has increased steadily and significantly worldwide since the 1970s; scholars continue to explore the components of the complex concept of engagement. There is general agreement that engagement in “educationally purposeful activities” (Kahu, 2013, p. 759; Kuh et al., 2008) is positively related to student success, but there is less agreement on what engagement means and how it can and should be measured. In general, scholars agree that strong engagement is multifaceted and consists of behavioural, emotional, and cognitive aspects. It should be noted that despite this agreement, there exists a spectrum of definitions. One school of thought places an emphasis on the importance of “interaction” (Bowden et al., 2021) and relies on participation. Regardless, scholars have critiqued this more extrovert-centric view and have warned that “private, silent, unobserved and solitary practices may be pathologised or rendered invisible” (Gourlay, 2015, p. 410) despite these “quiet” or more “passive” ways of learning being central and effective for many students (Coates, 2007). Indeed, they may be exclusionary to equity group students (Vallee, 2017). Schaufeli et al. (2002) included elements of vigour, dedication, and absorption in their definition of engagement. Schaufeli et al.’s definition was further explained by Bowden et al. (2021) as “a multi-aspect construct that include effort, resiliency, and persistence while facing obstacles (vigour), passion, inspiration, and pride in academic learning (dedication), and involvement in learning activities and tasks (absorption) as the main facets of this construct” (p. 120). Finally, the concepts of academic and social integration (Lakhal et al., 2020; Tinto, 1975) in place of engagement are beginning to re-emerge and bear consideration. A student’s sense of belonging is closely related to engagement (Thomas, 2012) and has been found to be a key factor enabling students to function successfully in their learning environment (Kember, Trimble, & Fan, 2023; Trimble & Fan, 2023).

4.4.2 Engagement frameworks

As with definitions, various frameworks describing different dimensions of engagement have been developed over time. There is some variation in the number of types of engagement that each framework includes and some variation in the definitions used to describe those types of engagement. Axelson and Flick (2010) discussed the semantics of engagement, explaining that the associated terms and concepts are often interwoven in the academic literature by various researchers. They suggested that to clarify, it would be helpful to “refine engagement questions by including specific learning goals, learning contexts, types of students, and the processes through which they become engaged” (p. 42). Kahu (2013) presented a framework that included four aspects of student engagement: behavioural, psychological, sociocultural, and holistic. Five years later, another study (Redmond et al., 2018) built on Kahu’s framework identified five types of engagement that should be considered including cognitive, behavioural, emotional, collaborative, and social. Table 1 shows a summary of the theoretical development of student engagement definitions and frameworks over time, including the CoI framework, which we ultimately chose for our research.

Table 1: Theoretical development of student engagement definitions and frameworks over time

Year	Author(s)	Key points on engagement
1999	Garrison, Anderson, & Archer	Online student engagement, identified cognitive, social, and teaching as three key types of presence that promote engagement. First edition of CoI framework.
2007	Garrison & Arbaugh	Identified issues with 1999 framework and future directions.
2010	Axelson & Flick	Discussed semantics of engagement and argued behavioural engagement often used as a proxy for emotional and cognitive engagement, but it is not a good measure of those two.
2013	Kahu	Reviewed four dominant research perspectives on student engagement (behavioural, psychological, sociocultural, and holistic) and then presented a new framework.
2018	Kahu & Nelson	Refined framework based on Kahu 2013 presentation.
2018	Redmond et al.	Identified five types of engagement that should be considered, including cognitive, behavioural, emotional, collaborative, and social.
2019	Garrison	Further discussed issues and ways to move forward with the CoI framework.
2022	Goode et al.	Made the argument that behavioural engagement IS a good measure of learning.
2023	Bond & Bergdahl	Bioecological model of student engagement with meso- and micro-levels presented.

The CoI framework (Garrison, 2019; Garrison & Arbaugh, 2007; Garrison et al., 1999) has been used by many researchers and refined multiple times by the authors themselves. We chose this framework to guide our research because Garrison et al. (2000) looked specifically at online student engagement and the authors have continued to update and refine their model as knowledge has expanded and contexts changed (Garrison, 2019). The CoI framework identifies three “presences”—cognitive, social, and teaching—as the three overlapping key elements that promote engagement. The social presence includes effective communication, open communication, and group cohesion; cognitive presence includes exploration, integration, and resolution; and teaching presence includes facilitating discourse and direct instruction. The authors also suggested indicators that can be used to measure each presence as follows: risk-free expression and encouraging collaboration for social presence; information exchange, connecting ideas, and applying new ideas for cognitive presence; and sharing personal meaning and focusing discussion for teaching presence. While we have used the highly cited 2019 version of the CoI framework, this framework continues to be refined by others. For example, Shea et al. (2022) have recently proposed a fourth presence, the learner presence, as an attempt to advance the framework.

4.5 Supporting online students

4.5.1 Engagement

Research has investigated various methods for supporting online students to remain engaged. These supports range from those that are internal to the tertiary education system—including individual-level faculty–student interactions and pedagogical strategies (Kelly et al., 2023; Muir et al. 2019); subject-level engagement and support, which focuses on subject or class content design; and systemic and institutional university-level engagement (Kember, Ellis, et al., 2023; Kember et al., 2019; Kember, Trimble, & Fan, 2023)—to supports external to the education system, such as support from class peers (Kember, Ellis, et al., 2023; Kember, Trimble, & Fan, 2023) and support from family and friends in their community (Fan et al., 2023).

In addition to support systems, personal characteristics and social contexts have also been shown to affect students' engagement. Chiu (2022) explained that student engagement is closely linked to a student's motivation, which is in turn closely linked to self-determination. Self-determination theory (Ryan & Deci, 2000, 2020) suggests that all humans have the psychological need to feel autonomy, competence, and relatedness or connectedness. When those psychological needs are met, students will be motivated to engage in learning. Conversely, if a student is feeling isolated, reactive, and/or fragmented, there will be low motivation to engage. Pedagogical design can be used to address these universal needs by creating social contexts in which students feel self-governed, effective, and connected. For example, in one study, students who perceived a controlling teaching style experienced increased feelings of frustration that, in turn, were related to lower motivation and avoidance of challenges (Liu et al., 2017). In terms of relatedness, researchers have found that when students feel that they belong and are connected to their learning community they are more likely to engage in learning (Lu & Zhang, 2023; O'Shea et al., 2015). Therefore, building a sense of community within virtual classrooms is as important as it is within on-campus classrooms.

4.5.2 Retention

Student engagement is closely linked to student retention (O'Shea et al., 2015; Tight, 2020), which is linked to student success. The two concepts of engagement and retention are often seen as two different, but similar, approaches to researching the same underlying problem of how to keep students interested and participating in their learning. Where engagement is focused on interaction and connection, retention is focused on continuation. Students who are engaged are more likely to continue their studies. While the emphasis has shifted from researching from a retention perspective to an engagement perspective over the last several decades, Tight (2020) highlighted the persistent necessity of a holistic approach that considers academic, social, and emotional factors.

Supporting online student retention is just as multifaceted as supporting engagement. Tight (2020) suggested there is a need to better understand what it is like to be a student today, including being aware of students' lives beyond their courses and institutions. Interactions between students and their families, friends, social activities, and employment all need to be considered. For example, peer support—including academic, social, and pastoral support—

and the formation of learning communities for online students have been identified as important factors in success for online and blended learners (Cotton et al., 2017; Trimble & Fan, 2023) as they work to combat the loneliness and isolation that is inherent to online learning and to create a sense of belonging. Teachers may need to assist with the formation of learning communities (Bawa, 2016; Trimble & Fan, 2023). Also highlighting the importance of human interaction, Reyes-Fournier et al. (2020) suggested that rather than being mere content interaction, effective teaching and the role of the teacher in engaging students in their learning are two of the most significant factors in student satisfaction and study completion. A strong teacher presence, including welcoming students, providing timely feedback on assignments, and personalised responses on discussion boards, helps to create connections between students and teachers (Farley & Burbules, 2022; Hopwood et al., 2023). Genuine relationships and a sense of belonging are key to successful engagement and retention (Pedler et al., 2022).

Another key aspect of retention is the first-year experience. Because attrition occurs more often earlier in a student's academic journey, research (James et al., 2010; Kuh et al. 2008) has highlighted the importance of the first-year experience. While Tinto's (1975, 2014) work primarily focused on face-to-face learners, others (Kember & Hicks, 2023) have shown that it is also relevant to online students. Because attrition rates are higher for online students (Bawa, 2016; Delnoij et al., 2020; Kember et al., 2019), the first-year experience is crucial for this cohort. In addition to ensuring social and academic integration are achieved as part of the first-year experience (Tinto 1975; 2014), the literature suggests that developing good study habits and a positive mindset (Kahu et at., 2022), as well as fostering help-seeking behaviour (Fong et al., 2023; Li et al., 2023; Ruihua et al., 2025), are also important during this stage of study to set the stage for students' future higher education success.

Finally, it should be noted that Farley and Burbules (2022) have called for support for online students to be considered through an equity lens and warned of the perils of a one-size-fits-all approach. They pointed out that, while certain strategies and tools may be beneficial for some groups of students, for equity groups they may have the opposite effect and prove to be barriers. For example, while technology has been shown to remove some barriers for students accessing HE, for equity group students, technology may create new inequalities. In addition, other structural (including environmental, technical, and social) and instructional (including course design and organisation, course content, instructor interaction, and social presence) factors can amplify barriers for equity group students. Limited social connection, which is a general issue in online learning, can make those already feeling different to others feel even more socially isolated. Axelson and Flick (2010) have also suggested that methods used to encourage engagement may not be straightforward and that we might ask, "How do we engage (cognitively, behaviourally, and/or emotionally) type X students most effectively in type Y learning processes/contexts so that they will attain knowledge, skill, or disposition Z?" (p. 41).

4.6 Online pedagogy for HE

Overall, the research focused on online pedagogy remains underdeveloped. While the response to the COVID-19 pandemic forced rapid growth in online instruction beginning in 2020, research exploring online teaching and learning is still a relatively young field of research. The quick change from face-to-face to online teaching left many academics feeling

pedagogically unprepared (Burke et al., 2022). That said, the academic literature covers a wide variety of online pedagogy topics as described next.

4.6.1 Differences between modalities

There are various forms of online learning ranging from entirely asynchronous online to synchronous online to blended courses which are partially online with face-to-face components. In addition, the same subject or class may be offered in multiple modes simultaneously. While some research shows that modality does not affect academic achievement or student experience (Yen et al., 2018) and online learning can be as effective as face-to-face learning, it has been repeatedly shown that effective pedagogical approaches for online teaching are different to those used in a traditional classroom (Burke et al., 2022; Coker, 2018; Gasevic, 2020). For example, cognitive load theory (Sweller, 2020) shows that online learners process digital learning materials through their working memory (limited capacity) before transferring it to long-term memory (unlimited capacity), and, as such, instructional designers should aim to "reduce extraneous cognitive load to enable learners to cope with intrinsic cognitive load processes" through the design and presentation of the online learning environment (Schneider et al., 2022, p. 3). Research has also confirmed that not all cohorts will perform as well in an online learning situation. Yen et al. (2018) found that while academic achievement can be similar across modalities, students further along in their studies tended to have higher academic achievement than students in their earliest years of university. The same study also suggested that students' levels of social satisfaction were greater in blended class design subjects than those of their entirely online peers as they allow more opportunities for social presence and peer interaction. The role of student–teacher interaction was again noted as important in all modalities.

4.6.2 Core teacher competencies

Looking more closely at the role of teachers, a number of competencies frameworks for online education have been developed over the years (for example, Beaudoin, 2015; Denis et al., 2004; United Nations Educational, Scientific and Cultural Organization, 2011). While there is some variation among frameworks, the key factors identified generally include: discipline content knowledge (Roddy et al., 2017); pedagogical knowledge (Rapanta et al., 2020), which should account for learner attributes; and technology knowledge (Mishra & Koehler, 2006), meaning that teachers must be capable of using technology and teaching others how to use it. Many frameworks also include a communicational competency. Online learning places different demands on students than face-to-face learning, making the ability of the teacher to communicate asynchronously very important. Teachers need to be able to communicate not only content, but also technology requirements and management.

4.6.3 Belongingness and online learning communities

As with retention, student–teacher relationships have been noted as being pivotal factors in improving online student engagement (Akram & Li, 2024). When meaningful connections are established between staff and online students, not only do motivation and engagement increase (Burgueño et al., 2023; Schneider et al., 2022), but so too does the quality of life for both students and teachers (Vagos & Carvalhais, 2022). Creating a sense of authentic interaction and connectedness is particularly important for online teaching and learning

(Bennett et al., 2015; Chiu, 2022; Redmond et al., 2018; Roddy et al., 2017). While there is agreement in the literature about the importance of creating a sense of relatedness and online learning communities, creating a sense of place in a virtual world can be challenging. As previously described, online communities are comprised of social, cognitive, and teaching presences (Garrison, 2019) and, in creating an online learning community, each of these presences should be considered.

Schneider et al. (2021) highlighted social presence when they argued that a sense of place and belonging in virtual environments is crucial for student engagement and satisfaction. While it is widely acknowledged that learning is a social process, Schneider et al. explained that not only social but also parasocial processes affect cognitive processes. Establishing a presence in the virtual learning space is key to teachers connecting with and motivating their students (Archambault et al., 2022; Beautemps & Bresges, 2022; Martin & Borup, 2022). Parasocial relationships are those where, despite a lack of direct interaction and reciprocity, a learner will form a relationship with a media presenter based on factors such as social attractiveness, perceived realism (how authentic the presenter and the setting in which they are presenting appears), and perceived similarities between the learner and presenter (Beautemps & Bresges, 2022). Media studies (Horton & Wohl, 1956) have long researched this phenomenon in order to attract and retain viewers. Beautemps and Bresges (2022) suggested that some of the same techniques used by media can be used by teachers to connect to and motivate learners in online environments.

In addition to considering social and parasocial processes when designing virtual learning environments, teaching and cognitive presences should be considered. Using Sorensen and Baylen's (2009) adapted Seven Principles of Good Practice to a Web-based Instructional Environment and the CoI framework, Fiock (2020) offered a comprehensive and detailed set of instructional activities gleaned from the literature that have been found to help create online learning communities where students feel connected. These activities range from creating a “Meet Your Classmates” section to help students build connections early on, to using real-time communications such as chat, collaborative whiteboards, interactive video, text, or virtual messaging, to providing ways for student and teacher profiles to be created within the LMS to help personalise (Beautemps & Bresges, 2022) the online learning experience. Many of Fiock’s (2020) suggested activities are consistent with Dyment et al.’s (2019) recommended good practices in online teacher education. Careful design of learning activities and presentation of learning materials can help prevent cognitive overload (Schneider et al., 2022) for learners.

4.6.4 Strategies to improve engagement

To encourage online student engagement and success, researchers have identified various strategies and principles (Farley & Burbules, 2022; Kebritchi et al., 2017; Mahani, 2023; Miller, 2014). For example, Farley and Burbules (2022) offered a set of general principles for course design and organisation as well as several instructional interventions. Their course design strategies included ideas such as using a simple user interface, providing clear expectations, using active and adaptive learning tasks, promoting a “social presence” (Garrison & Arbaugh, 2007), promoting social connection, using culturally relevant (Mahani, 2023) and challenging course material, following universal design for learning principles, and using blended modalities. The instructional interventions described are much more specific. For example, teachers should: provide an orientation to online learning, including how to

access information and how to participate in class; help to build student self-efficacy and student confidence in themselves as academics; and, perhaps most importantly, establish rapport with students by making themselves present and available to students through virtual office hours, mentoring, and expressing care, concern, and interest in their students. In general, factors that are considered best practices for HE pedagogy in general (Bangert, 2004) have been found to be even more important for online students (Farley & Burbules, 2022). Many studies highlighted the importance of considering online student engagement through an equity lens (for example, Kang & Yang, 2016; Kumi–Yeboah et al., 2018; Kuo, 2014).

4.7 Unmeasurables of pedagogy

In addition to specific competencies and practices, the “unmeasurables” of pedagogy should also be considered. These aspects of pedagogy encompass elements that significantly influence the teaching and learning process. While difficult to quantify, these factors play a central role in shaping educational outcomes and fostering a conducive learning environment. Burke et al. (2022) explained, “These ‘unmeasurable’ elements were found to be related to the exercising of pedagogical care, not just in interactions between teacher and students, but an overall online pedagogy of care that permeated all aspects of course design and delivery” (p. 287). Likewise, Roddy et al. (2017) wrote about the “intangibles” that are crucial to successful online learning. They described four pillars of support—academic support, technology support, a sense of community, and health and wellbeing—noting that academic support moves beyond basic academic skills and includes easy access to not only online-friendly academic resources, but also abundant opportunities for student–instructor interaction. It is important to note that, as Burke et al. (2022) pointed out, although it is difficult to quantify these aspects of pedagogy, this type of pedagogical approach is more intensive than on-campus teaching and requires significantly more time and support. Because technology has led to student expectation of 24-hour access to online learning resources, including educators, educators can often feel overwhelmed and under-supported in their online teaching efforts. Within current models that focus on rewarding publications and research revenue, HE institutions currently offer limited incentives to provide this intensive care for students and, as such, educators may not feel motivated to offer a pedagogy of care (Burke et al., 2022; Busteed, 2015).

4.8 Equity data

Finally, it should be noted that there have been calls for better equity data (Stephenson, 2024). Most research currently relies on student home postcodes and census data to identify low SES and RRR students, often without notifying the students themselves that they have been identified as equity students. The use of these proxies creates problems with resource allocation and precise identification of student needs, and thus student support. Consequently, as explained in the methods section, our research used a combination of data to identify low SES and RRR students.

5. Methods

This exploratory study used a mixed methods approach to examine the engagement of low SES students and RRR students and pedagogical approaches that can be used to support the engagement of these students. The study received ethics approval from the University of Tasmania Social Sciences Human Research Ethics Committee (Approval H30277).

5.1 Participants

The university context in which the data generation took place was the University of Tasmania (UTAS). UTAS is a regional university and is the only university in the state. Catering for the general population in the state, UTAS traditionally has a high proportion of students from low SES backgrounds. In 2025, 20% of domestic students studying at UTAS were identified as coming from low SES backgrounds. In addition to students from low SES areas, the proportion of students from RRR backgrounds studying at this university is also high. This research was designed with recognition of the history of this university in offering online and blended teaching in the past two decades (Fan, 2011), as well as the extensive experience of this university's academics in catering for students with diverse backgrounds in their online and blended subjects.

In this project, we generated data from teacher and student participants from 16 subjects at UTAS. Eight of these were offered as fully online subjects, seven of them was offered in both fully online and blended modes, and one was offered in blended mode only. Thirteen of these subjects were first-year subjects in undergraduate programs, two were second-year subjects in undergraduate programs, and one was from a postgraduate course. These subjects were from both pure and applied disciplines, including education, humanities, natural sciences, and health sciences (see Appendix C). For inclusion in the data generation, the subject needed to:

- be either fully online or blended with a LMS site that allows activities to be carried out online
- be from a discipline that historically has diverse student backgrounds representing the general UTAS student population
- have primarily domestic students
- have traditionally high subject evaluations by students.

Data were generated through two phases. **Phase 1** generated survey data and LMS data from all the 16 subjects previously mentioned. After Phase 1, seven subjects were selected from the 16 subjects, based on the analysis of survey and LMS data from Phase 1. For inclusion in Phase 2, the subject needed to:

- be a first-year undergraduate subject—this is purposeful, with recognition of the importance of students' first-year experience
- have received positive student responses on student engagement through the survey in Phase 1
- have over half of the cohort as low SES students, RRR students, or students who belong to both groups.

In **Phase 2**, teachers and students from the remaining seven subjects were invited to participate in semi-structured interviews. Five student support staff from the university were also invited to participate in semi-structured interviews, adding further input from a support perspective. An overview of the participants is provided in Table 2.

Table 2: Overview of participants

Data source	Number of participants	Subject involved
Phase 1: Survey & LMS data (quantitative data)	119	Students in subjects 1 to 16
Phase 2: Semi-structured interviews (qualitative data)	9 10 5	Teachers in 7 subjects Students in 7 subjects Support staff at UTAS

5.2 Phase 1: Survey and LMS data collection and analysis

The generation of quantitative data was conducted for a range of purposes. First, to identify unique engagement perceptions, behaviour, and trends between and within the targeted priority groups. Second, to identify the relationships that exist between student demographics, the three dimensions of the CoI framework (teaching, social, and cognitive presence), LMS behaviour, and student outcomes with a view to exploring the predictive power of the CoI survey instrument and its potential to both inform and evaluate online learning.

To achieve the former, descriptive statistics and corresponding cross tabulations were calculated for a range of variables. The results of these are presented in Section 6.1. To achieve the latter, structural equation modelling (SEM) was used. SEM assesses the extent to which a theoretical model aligns with sample data, allowing researchers to test hypotheses and refine models as needed (Schumacker & Lomax, 2010). If the initial model does not fit the data, it can be adjusted and re-evaluated, or alternative theoretical models can be developed and tested. A key advantage of SEM is its ability to handle multiple simultaneous equations while accounting for measurement error, improving the accuracy of findings (Bollen & Long, 1993). Another strength of SEM is its use of diagrammatic representations, which make results more accessible to a wider audience.

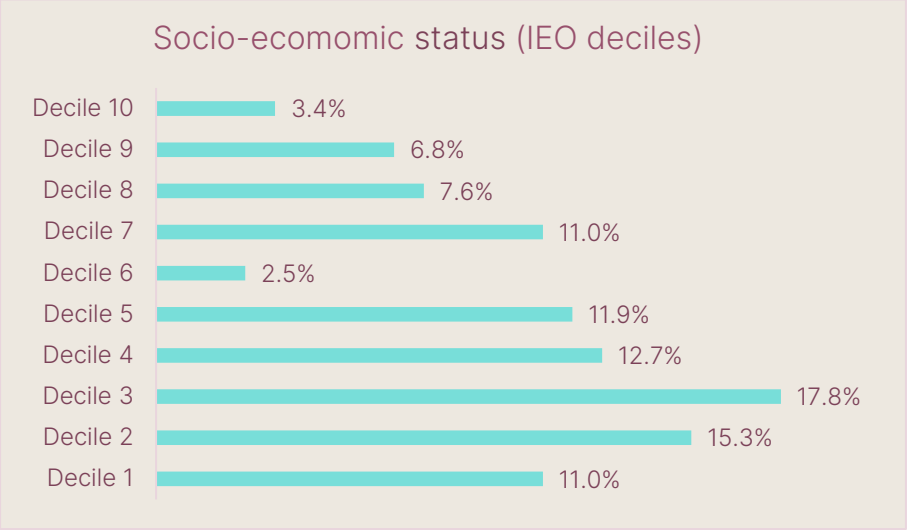
This section outlines the variables used in the quantitative analysis, drawing on student survey responses and LMS data. Key demographic factors include SES background, remoteness, age, employment status, and study load (part-time vs. full-time). In addition to demographic characteristics, student perceptions of their learning experiences were measured using an adapted version of the CoI survey, which assesses cognitive, social, and teaching presence in online learning environments. Finally, LMS data provided measures online behaviour, including content completion, discussion board interactions, login frequency, and total time spent in online subjects although it must be noted that only one of these metrics (login frequency) was employed by the project.

5.2.1 Socio-economic status (survey data)

Deciles of the Index of Education and Occupation (IEO) were used based on the suburb where students grew up, as identified in the survey.[1] Rather than relying on students' current locations, this approach provides a more accurate reflection of socio-economic background. Many students relocate for university, particularly those in programs with significant practical components such as education and health sciences, where proximity to campus is often advantageous—or even necessary—for attending placements, engaging in hands-on learning, and accessing resources. By capturing students' childhood locations instead of their university semester addresses, this metric offers a more stable indicator of SES and its potential impact on higher education engagement and outcomes.

The sample generally reflected the broader demographic make-up of the university within its undergraduate programs although students from lower SES backgrounds were slightly overrepresented with the bottom three deciles accounting for 44% of the sample (see Figure 1). This is likely due to the nature of the subjects and disciplines that were recruited for the study. While, overall, the percentage of low SES students at UTAS is 19%, the percentage of low SES students enrolled in education degrees is significantly higher at 37.4%. It is worth noting that this is not an anomaly unique to UTAS. Rather, it is representative of a broad national trend where an average of 13.7% of all tertiary students are classified as low SES in comparison to 22% of all tertiary students who are enrolled in an undergraduate degree in education (Department of Education, Skills and Employment, 2024).

Figure 1: Distribution population by socio-economic status (IEO deciles)



5.2.2 Remoteness (survey data)

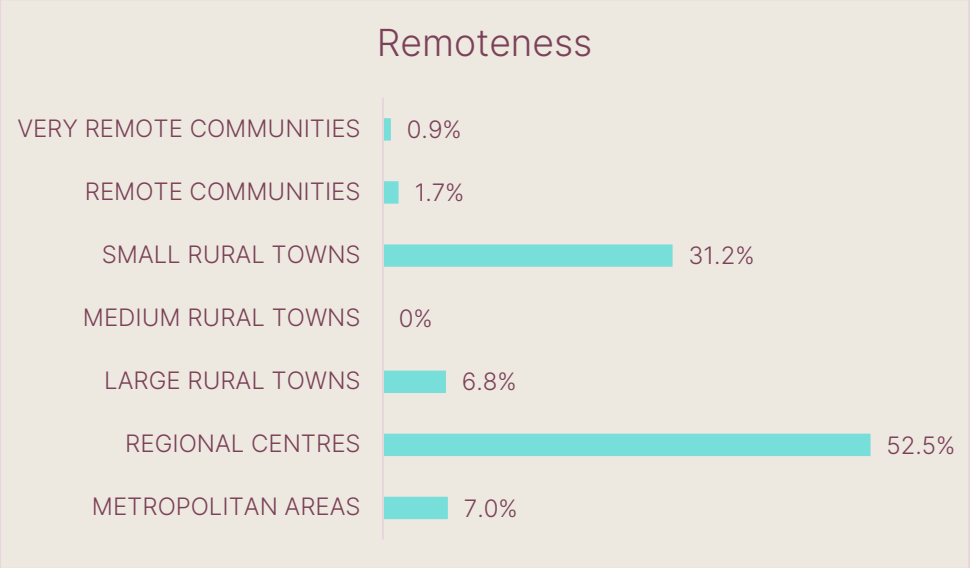
Remoteness was determined based on the suburb where students currently reside, as reported in the survey. This approach was chosen because a student's present location is likely to have a greater influence on their engagement and academic outcomes than where they grew up, particularly in terms of internet access, proximity to campus, and availability of support services (Crawford, 2021; Halsey, 2018; Nelson et al., 2017; Pollard, 2018). Traditionally, the classification of rurality and remoteness in education has relied on the

[1] These were matched to ABS data using ABS data cubes.

Accessibility/Remoteness Index of Australia (ASGC-RA). However, the Modified Monash Model (MMM) provides a more accurate reflection of rurality and remoteness in Tasmania, particularly in the context of HE. This is largely due to the MMM's more detailed classification system, which better accounts for variations in population size and access to services. A justification for the use of the MMM can be found in Appendix B.

Again, the sample was generally reflective of the broader demographic makeup of the university and to some extent, the state—under the MMM model, there are two regional centres in the state (Hobart and Launceston) that, combined, account for roughly 53% of the state's total population (see Fig. 2). There are two large rural towns in the state (Devonport and Burnie). Together, these account for roughly 7% of the total population, with 34% of the population distributed across small rural towns, remote communities, and very remote communities. Those living in metropolitan areas (7%) are largely located in Greater Melbourne.[2]

Figure 2: Distribution of population by remoteness (MMM classification)

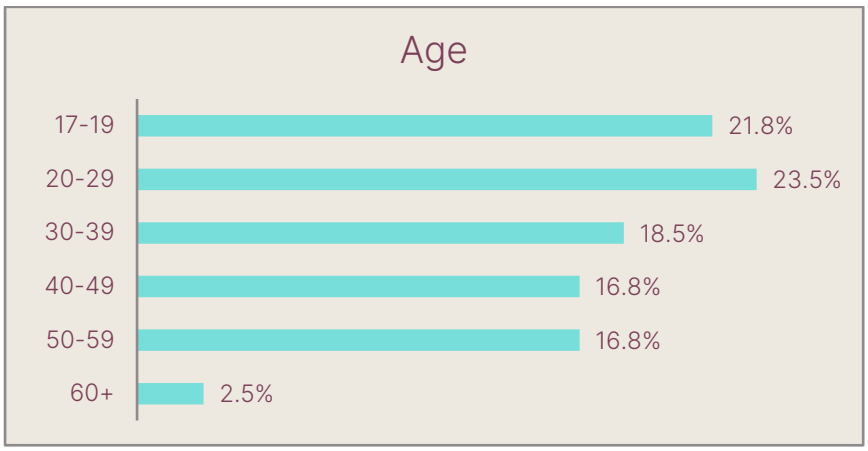


5.2.3 Age (survey data)

Age distribution within the sample was broadly representative of UTAS more broadly where approximately 45% of the student population is aged 25 and above. This could be a reflection of more flexible admission policies that provide entry pathways beyond traditional Australian Tertiary Admissions Rank (ATAR) scores. For example, a significant number of students enter degrees through a range of pathway programs, a specific "mature age" pathway and/or recognition of prior learning (RPL) style initiatives.

[2] There is only one location classified as a medium rural town in the state—Ulverstone.

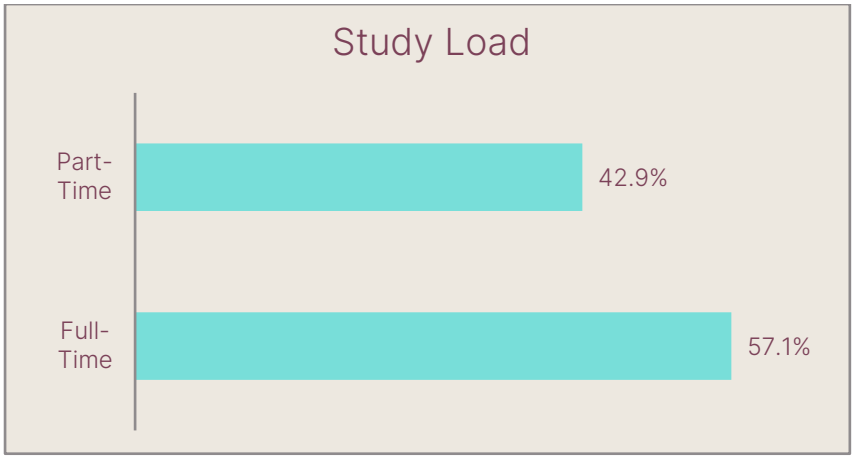
Figure 3: Distribution of population by age



5.2.4 Study load (survey data)

The study load distribution in the sample is reflective of broader trends at the University of Tasmania, where over half of students are enrolled in less than a 70% study load (see Fig. 4). This highlights the university's strong representation of part-time students, a pattern that aligns with its commitment to providing flexible study options. The high proportion of students studying part-time reflects UTAS's role in catering to a diverse student body, including mature age students and those balancing study with work or family commitments.

Figure 4: Distribution of population by study load



5.2.5 Community of inquiry constructs (survey data)

This research used an adapted version of the CoI survey, which is based on the CoI framework (Garrison et al., 2000), and purports to measure three constructs and 10 sub-constructs across 34 items (see Table 3). The CoI framework is an established and comprehensive theoretical framework relevant to online learning contexts (Garrison et al., 2000), which translates each of its interdependent elements (cognitive, social, and teaching presence) into observable indicators. This framework has been used in different contexts (for example, see Díaz et al., 2010). However, to date, there has been limited research adapting this framework for the Australian HE context, which has unique course structures and learner characteristics. This research has adapted the survey tool to the Australian context and validated the adapted tool.

Table 3: Community of Inquiry survey constructs and sub-constructs (Garrison et al., 2000)

Construct	Sub-construct	# Items
Teaching presence	Design & organisation	4
	Facilitation	6
	Explicit instruction	3
Social presence	Affective expression	3
	Open communication	3
	Group cohesion	3
Cognitive presence	Motivation	3
	Exploration	3
	Integration	3
	Resolution	3

To assess the validity and reliability of the tool, a three-step process was employed. First, exploratory factor analysis was employed to assess dimensionality, then confirmatory factor analysis was conducted to assess convergent and discriminant validity following the method proposed by Fornell and Larcker (1981), and finally, Chronbach's Alpha was calculated to assess internal consistency. To achieve an adequate sample size[3] for this process, the survey data generated for the current project were combined with data generated from a previous project employing the same survey resulting in a sample size of n = 304. The results of this process (detailed in Appendix A) were the identification of three main constructs aligned to the initially proposed constructs (teaching presence, social presence, and cognitive presence) across 33 items. The proposed subconstructs were not identified. To enable analysis, average values for the items relating for each construct were calculated.[4]

5.2.6 Online behaviour (LMS data)

We were able to extract the following key variables from the LMS data in relation to the subjects and students participating in the study:

1. Content required—The total number of content pages contained within a subject. This was employed as a proxy for assessing the complexity of the learning environment.
2. Content completed—The percentage of the total number of content pages contained within a subject that a student has viewed.
3. Discussion board threads, replies, and reads.
4. Subject access count—The total number of times a student has logged into a specific subject's LMS site.

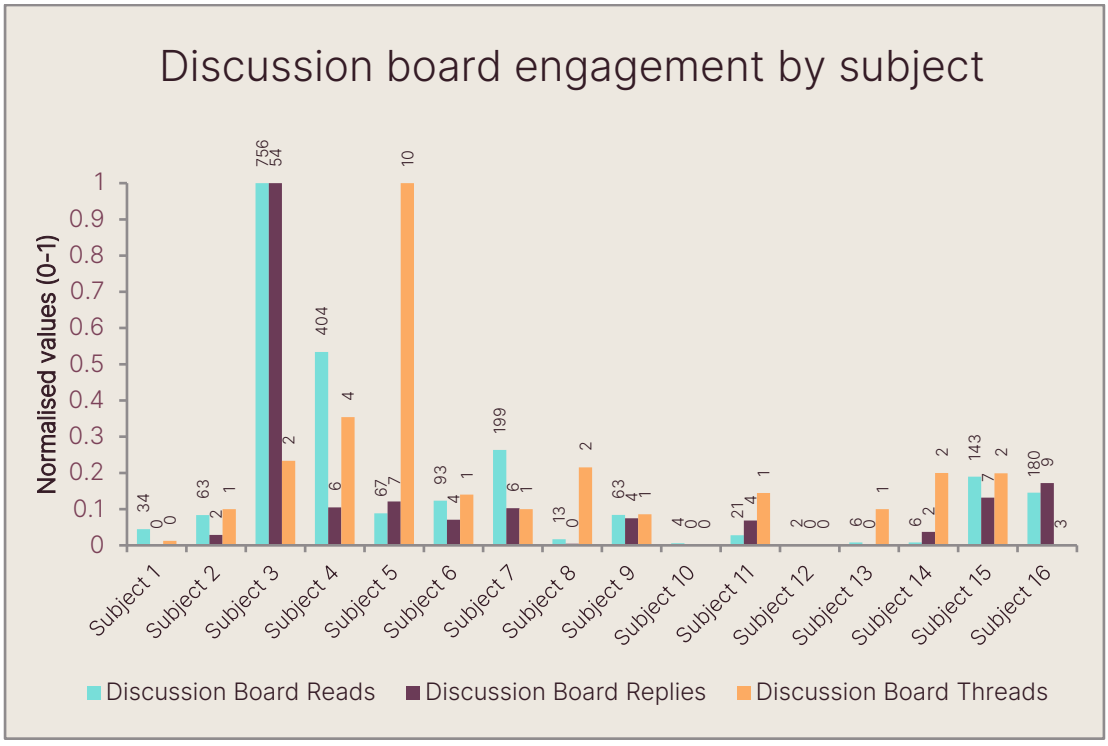
[3] Recommendations for sample size vary widely (for example, n > 100; n > 250, > 3 per item, > 10 per item, it depends on the communalities, etc.). Although there is little consensus (and little empirical evidence) in the literature regarding specifics, there is a clear consensus that larger sample sizes are likely to yield better/more robust results.

[4] Whilst SEM has the capacity to approach this in a different manner, due to sample size and the number of items in the survey, item parcelling was a preferable approach.

5. Total time spent—The total time (in minutes) a student has spent logged in to a specific subject's LMS site.

A visual analysis of the data and the LMS sites for individual subjects quickly revealed a significant lack of standardisation in how online learning was conceptualised and delivered within the participating subjects. Due to this lack of consistency, many of the available metrics were of limited use beyond the subject from which they originated. In some cases, the reasons were self-evident. For instance, as can be seen in Figure 5, there is extreme variation within discussion board metrics—so much so that it was necessary to employ a normalised scale to generate a comparative bar graph (actual values are included as data labels). This is almost entirely a product of the manner in which discussion boards are employed by each subject. For example, Subject 3 employs discussion boards for a significant component of its assessment—students are asked to read and respond to a number of provocations/threads on the discussion board over the course of the semester. This, combined with a large enrolment (>400) naturally generates extremely high discussion board metrics comparative to other subjects. Conversely, Subjects 10 and 12 do not use discussion boards as a form of online pedagogy, hence zero counts for replies and threads. In the middle, Subject 5 employs discussion boards as a means of asynchronous tutorial participation (as opposed to assessment), asking students to create their own threads in response to a provocation (as opposed to requiring students to reply to a previously created thread). In essence, even the slightest variations in online pedagogy creates extreme variations in discussion board metrics effectively rendering them useless as a measure of online behaviour.

Figure 5: Distribution of discussion board engagement by subject

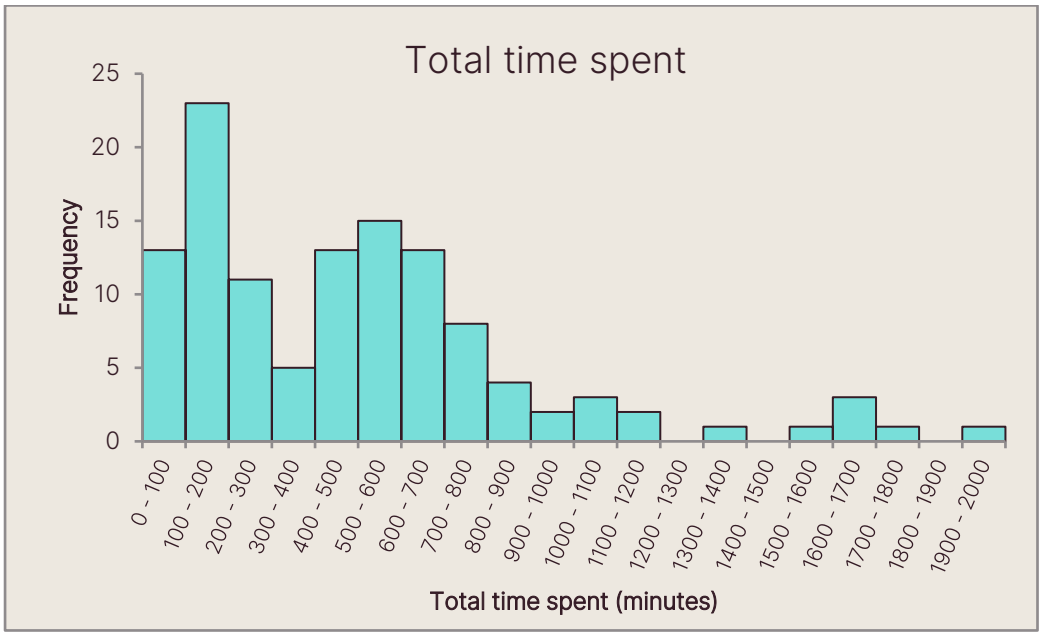


Similarly, tracking content completion percentages across subjects is problematic because different instructional designs influence how content is engaged with. In some subjects, students must complete nearly all content before assessments become available, leading to high completion rates. Conversely, in subjects where content is presented in multiple

modalities, completion rates will naturally be lower, as students simply have neither the time nor the need to engage with the same material multiple times in different formats.

In other cases, metrics that initially seemed reliable were later identified as inadequate for a variety of reasons. For example, while total time spent on MyLO initially appeared to be a strong proxy for engagement, it failed to differentiate between active learning and passive presence. In essence, it is impossible to distinguish between a student who has spent an hour actively engaging with a lecture or tutorial activity, and one who has logged in to check an assignment deadline and forgotten to log out again. This phenomenon can be seen by the presence of outliers within the data. In addition to this, MyLO provides the option for students to download content. For example, they can log in, download readings, tutorial activities, etc, then log out again. The system is unable to determine whether this has occurred. As Figure 6 demonstrates, this results in significant distortions—bins 1 and 2 of the histogram represent students who were (on average) logged into MyLO for 15 minutes or less per week. These two bins contain 36% of students in the sample. It would be fair to assume (given the not insignificant proportion of students who fall into this category and the relatively high final grades demonstrated by the sample), that these students are downloading and/or printing content as opposed to viewing it within the MyLO platform.

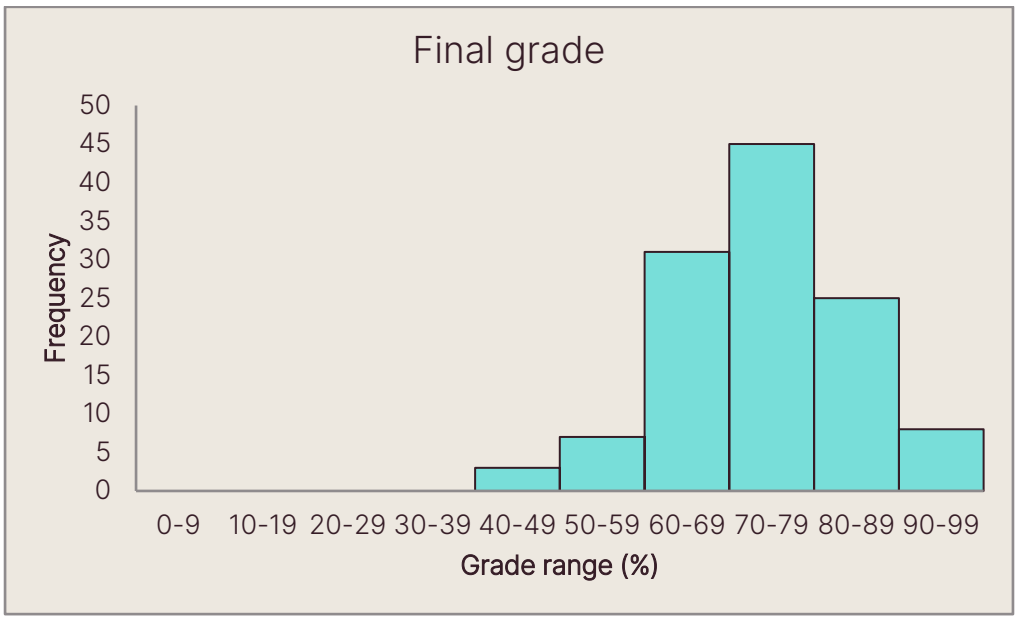
Figure 6: Distribution of total time spent on LMS per semester



5.2.7 Student outcomes (LMS data)

Student outcomes in the form of a final grade for the subject were also extracted from the LMS system. This metric reflects the weighted average grade out of 100 across all assessment tasks for the subject—it is expressed as a percentage. As can be seen in Figure 7, a significant proportion of students achieved a credit (60–69%) or distinction (70–79%), with a smaller but notable group reaching high distinction (80% and above). This is broadly reflective of grading patterns in tertiary education however the small number of fail grades (<50%) suggest that the sample is a relatively high performing cohort.

Figure 7: Distribution of final grade for the subject



5.3 Phase 2: Semi-structured interview data collection and analysis

Based on the survey data and LMS data, three sets of questions were developed for semi-structured interviews with: (a) teachers, (b) students, and (c) support staff at the university. Reflecting the key aspects of the CoI framework underpinning this research, the question lists developed included key elements of engagement, teaching, social, and cognitive presence. The interview questions can be found in Appendix D. The questions for teachers asked about their teaching experience in general and then focused on the design of the subject included in the study and the pedagogical strategies used by the teachers to engage students from the three aspects identified in the CoI framework. The questions for students focused on their learning experiences in general, and then their engagement and experiences learning in the specific subject, from the same three aspects. The questions for support staff included questions on additional support strategies provided by the university at the central level to support student engagement and participation.

Interviews were conducted via Zoom and were recorded as audio files with the participants' permission. The recordings were later transcribed for analysis. The interview transcripts were analysed using a thematic analysis approach (Braun & Clarke, 2022) and student engagement discourse analysis (Wodak & Meyer, 2009). Again, the CoI framework was used as the underpinning theoretical framework throughout the interview data analysis. During the analysis, themes were developed from the data, reflecting an inductive approach (Creswell, 2017). Two members of the research team were involved on the interview data analysis. While this collaborative approach helped to eliminate biases, it is important to note that this analysis process is shaped by the views and experiences of the research team and the interview questions. The emerged themes were then synthesised into categories, answering the research questions proposed for the research.

A desktop audit of the MyLO sites for each subject was also conducted to understand their structure, layout, and design.

6. Findings

This section of the report presents findings that emerged from the data analysis. These findings are organised according to the research aims:

1. To describe online engagement patterns of low SES students and RRR students.
2. To identify evidence-based online pedagogical practices that maximise the engagement of low SES students and RRR students.
3. To develop a holistic model of online engagement for low SES and RRR students, which demonstrates interplay between student perceptions, student behaviours, and student outcomes and the influence of SES and RRR backgrounds and other demographic factors.

Aim 1 is achieved through discussing engagement and behaviour patterns of low SES and RRR students (see Section 6.1).

Aim 2 is achieved through discussing evidence-based online pedagogical practices that maximise the engagement of low SES students and RRR students in two aspects: social engagement (see Section 6.2) and cognitive learning (see Section 6.3).

Aim 3 is achieved in Section 6.4, which contains a holistic model of online engagement, developed through Structural Equation Modelling (SEM), showing the interplay between student perceptions, student behaviours, student outcomes, SES and RRR backgrounds, and other demographic factors.

6.1 Describing engagement of low SES and RRR students (Aim 1)

This section examines the characteristics and engagement patterns of students from low SES and RRR backgrounds, highlighting their overlapping challenges and unique educational experiences. The analysis uses descriptive statistics and visualisations to illustrate key trends related to SES, remoteness, age, employment, study load, and engagement with online learning. Findings suggest that lower SES and RRR students often face greater financial pressures, work more hours, and take on heavier study loads, which may influence their academic engagement and outcomes. Additionally, patterns of online learning engagement and final grades by SES and remoteness are explored, with variations likely influenced by external factors such as digital access, employment demands, and financial stability. This section provides an overview of the sample, and then in Section 6.4, SEM is employed to investigate the relationships between these variables in a structured and analytical manner.

6.1.1 Students with multiple associated challenges

While this study was conducted with a focus on low SES and RRR students, it is important to note that these groups appear to have significant overlaps with each other and with other equity groups. This is observable in the survey data and supported by the interview data. A

majority of the low SES students who participated in the survey also appear to be from RRR areas. Over half (54.6%) of the survey respondents were mature age students above the age of 25 years, with a considerable proportion (38%) of them being the first in family to attend university.

Figure 8: Socio-economic status by remoteness

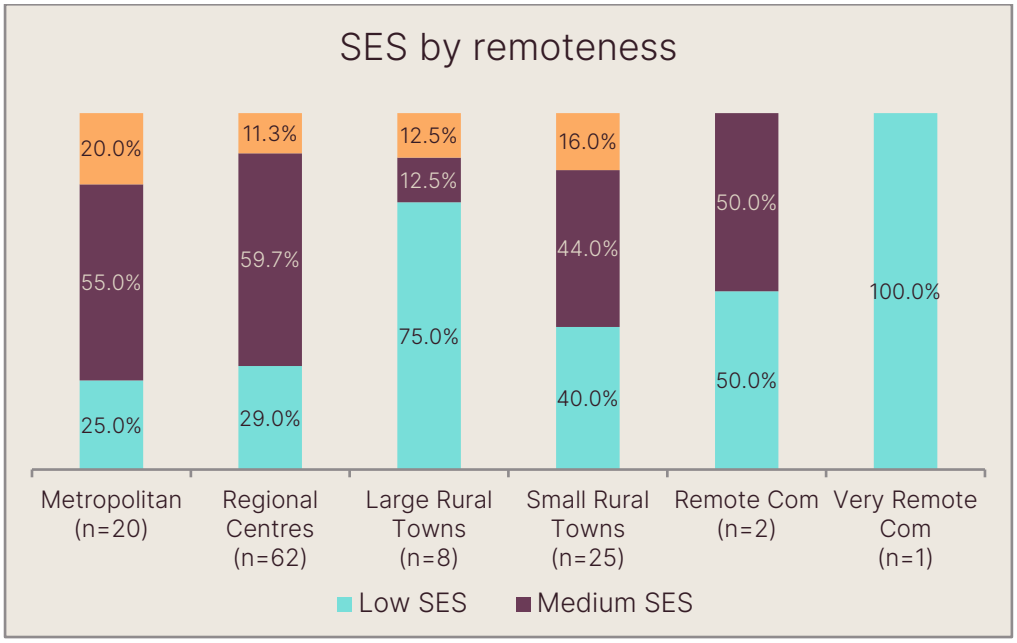


Figure 8 highlights the distribution of SES groups across different remoteness levels. In line with the literature, the graph demonstrates a relationship between remoteness and SES—in essence, areas which are considered more remote demonstrate higher proportions of low SES students. There is, however, an anomaly where large rural towns are concerned—it is highly likely that this is a function of the specific locations that are categorised in this manner under the MMM, these being Burnie and Devonport, both cities having populations significantly shifted towards a lower SES demographic.

Figure 9: Socio-economic status by age

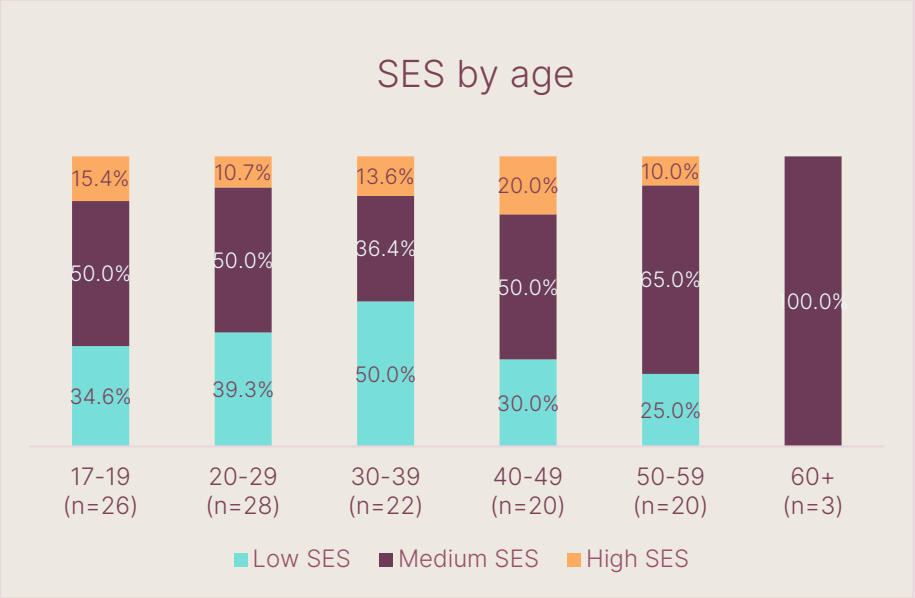


Figure 9 shows the distribution of SES by age. Younger students (17–19 and 20–29) have a relatively balanced distribution between low and medium SES, with a small proportion from high SES backgrounds. The proportion of low SES students peaks in the 30–39 age group (50.0%) before declining in older age categories. Medium SES representation increases notably in the 50–59 and 60+ categories, with the latter consisting entirely of medium SES students, however the sample within this category is very small (*n* = 3). The high SES category remains consistently small across all age groups, peaking at 20% in the 40–49 group. This distribution suggests that older students, particularly those over 50, are more likely to come from medium SES backgrounds, while low SES students are more prominent in younger and middle-aged groups.

Figure 10: Remoteness by age

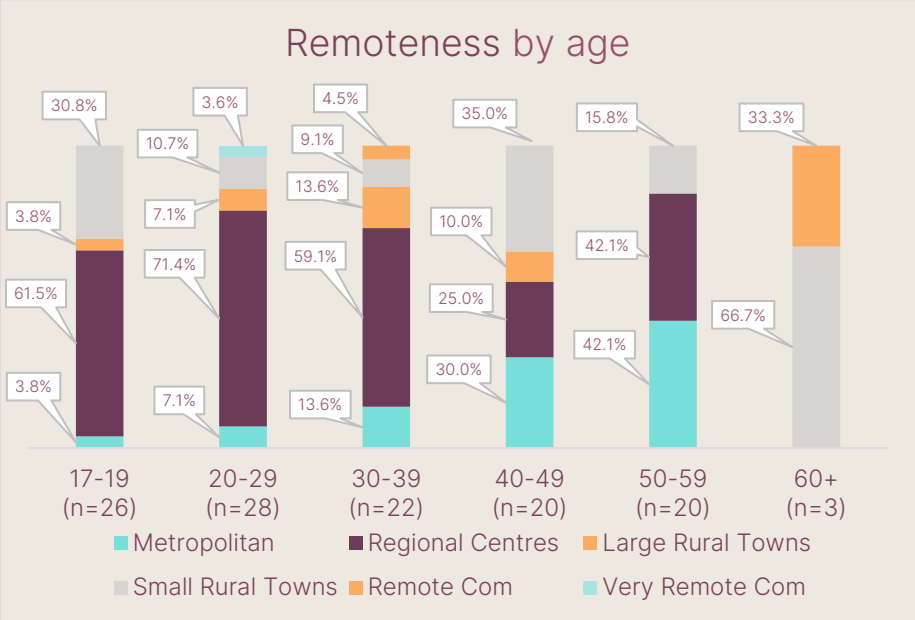


Figure 10 shows the distribution of remoteness by age. The youngest students (17–19) are primarily from regional centres (61.5%), with significant representation from small rural towns (30.8%) and smaller proportions from metropolitan areas (3.8%) and large rural towns (3.8%). There are no students in this group from remote or very remote communities. In the 20–29 group, regional centres remain dominant (71.4%), though metropolitan representation increases slightly (7.1%), and there are small proportions from large rural towns (7.1%), small rural towns (10.7%), and very remote communities (3.6%). The 30–39 age group shows more diversity, with a lower share from regional centres (59.1%) and higher proportions from small rural towns (9.1%), large rural towns (13.6%), and remote communities (4.5%), while very remote communities are not represented. Among the 40–49 group, students are more evenly spread, with metropolitan students increasing to 30.0%, small rural towns rising to 35.0%, and large rural towns at 10.0%, while regional centre representation declines to 25.0%. The 50–59 group has the highest proportion from metropolitan areas (42.1%), with an equal share from regional centres (42.1%), while small rural town representation decreases to 15.8% and there are no students from remote or very remote communities. The 60+ category (*n* = 3) is distinct, with the majority from small rural towns (66.7%) and the remainder from remote communities (33.3%), with no representation from metropolitan, regional centre, large rural towns, or very remote categories.

Figure 11: Employment type by remoteness

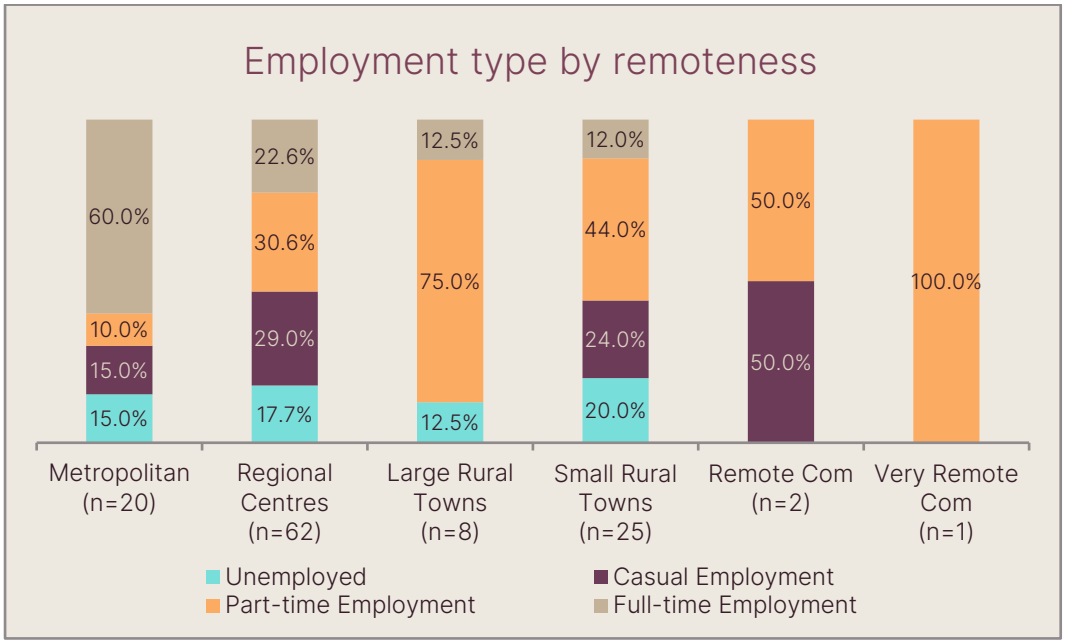


Figure 11 highlights the distribution of employment types across remoteness levels, revealing distinct trends in how employment is structured based on geographic location. Casual and part-time employment are more prevalent in regional centres and large rural towns, suggesting that these areas may have a greater reliance on flexible or lower-security jobs. In contrast, full-time employment is most common in metropolitan areas, reflecting the broader availability of stable, high-income job opportunities in urban settings. Interestingly, unemployment is highest in regional centres, which could indicate economic challenges or

fewer job opportunities relative to the population size—this is particularly true for the cities which fall under this categorisation in Tasmania.[5]

Figure 12: Employment type by socio-economic status

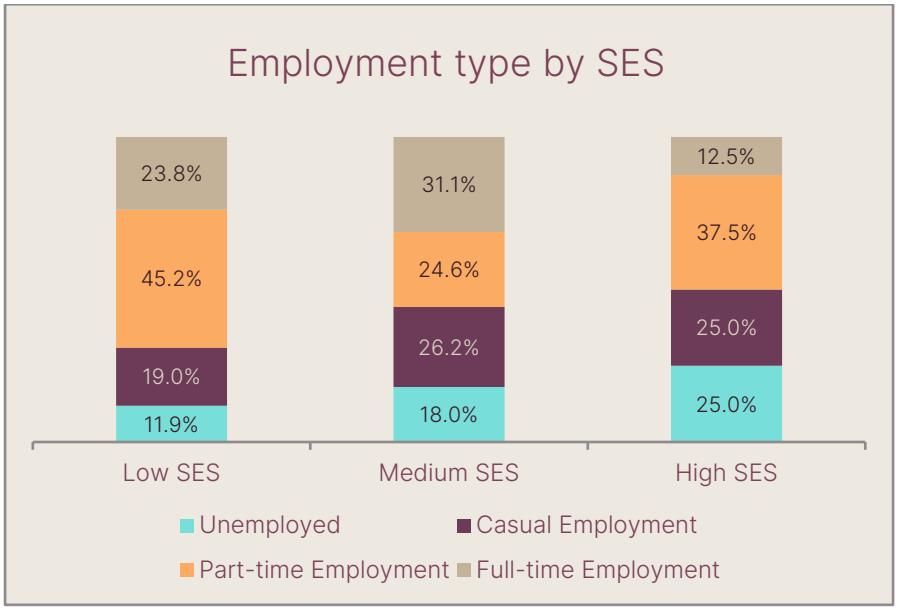
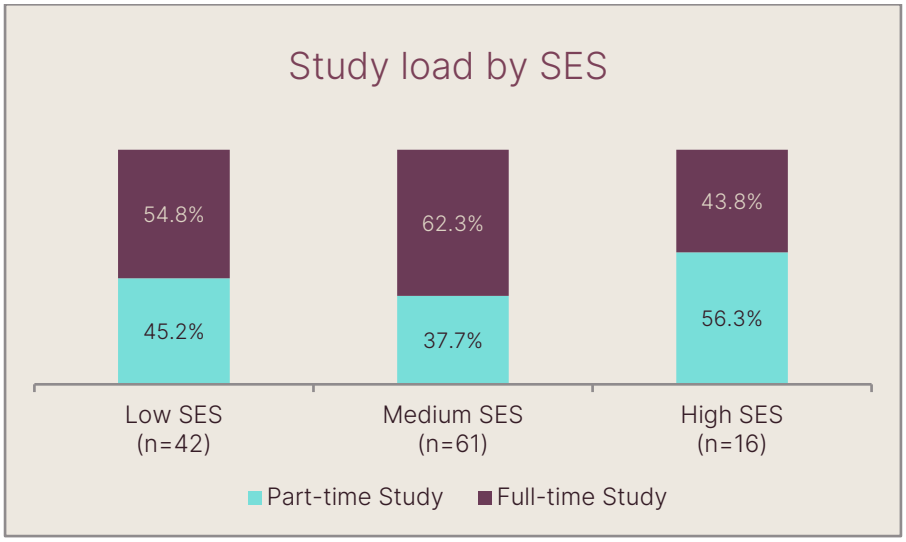


Figure 12 highlights the distribution of employment types across SES categories, revealing a clear trend where students from lower SES backgrounds are more likely to be employed, particularly in part-time or casual work. The higher reliance on employment among low and medium SES students could indicate additional challenges in balancing work and academic commitments, which may impact educational outcomes and long-term opportunities.

Figure 13: Study load by socio-economic status



[5] Burnie and Devonport have traditionally had considerably higher unemployment rates than the remainder of the state—on average, unemployment rates in Burnie have been roughly double the state average over the last decade. Devonport has fared somewhat better, however, it is generally more impacted by the broader economic crisis than the remainder of the state.

Figure 13 highlights the relationship between SES and study load, showing a clear trend where students from lower SES backgrounds are more likely to study full-time, while those with higher SES backgrounds are more likely to study part-time. Figures 12 and 13 provide interesting observations on student choices of how much work and study they take on. Low SES students work more than medium and high SES students, and also take on heavier study loads than the other two groups. In comparison, high SES students work less and are more likely to study part-time than low SES students, potentially benefiting from greater financial stability and family support, reducing the need to juggle study work balances.

Figure 14: Study load by remoteness

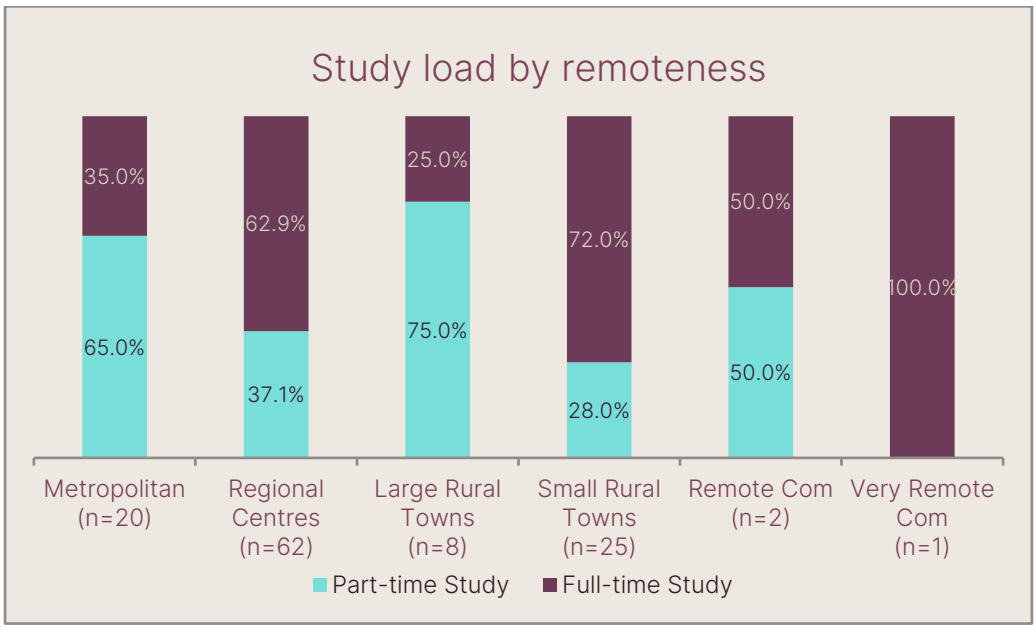


Figure 14 explores the relationship between study load and remoteness, revealing distinct patterns based on geographic location. With the exception of large rural towns (this being largely a function of the MMM categorisation method and its application to Tasmania's geography), there is a trend towards full time study as remoteness increases. Interpreted in conjunction with the previous figures which identified that (a) as remoteness increases, SES decreases and (b) as SES decreases, employment increases, this suggests an interesting relationship where students living in more remote areas both work more and study more.

6.1.1.1 Evolving student cohorts

The interview data add understanding about student diversity and their multiple needs. All of the students who participated in the interviews were identified as both low SES and from RRR locations. One student participant self-identified as a First Nations student. Three of the student participants self-identified as neurodivergent. A support staff member described:

> A lot of students we see will probably have a learning access plan. So, they either have a disability or a health condition, or a mental health challenge that they're facing that affects their study. We'll see a variety of young school leavers that sort of crossover into that (situation) or (are) just general(ly) very confused about what to do with study and how to approach their learning. And I think that's particularly more noticeable with a lot more online learning that that cohort can sometimes struggle to understand what they need to do if they're doing a lot of things online

> and not in a face-to-face environment because they are used to doing that at school. But we also see a lot of mature age students, and a lot of online students that are also mature age, a lot of students that are juggling work, juggling family and they might also be a migrant from a humanitarian kind of background. So, the layers of complexity and challenge for them just grow and grow and grow.

The teacher participants reported observing significant changes in the student characteristics and background in the past few years. When describing the learner cohorts they teach today, the teachers very often mentioned how the learner cohorts have changed over the years. There appears to be a consensus that students nowadays are much more diverse, with increasingly more students choosing to study using online or blended modalities, rather than face-to-face, to suit their diverse needs.

RRR students

All the teacher participants discussed teaching strategies to cater for diverse student cohorts, with an emphasis on teaching students from low SES backgrounds or from RRR locations. In the interviews, a teacher specifically mentioned the needs of students from outer RRR areas of Tasmania, as compared to those of students in Hobart, which is classified as a regional town. She said that, “They [these students] might have more concerns around, like, access to technology, access to computers, even, like, coming into the city, I think is difficult, like, even access and transportation.” She further elaborated:

> If we’re going to have online teaching or kind of really useful online teaching, obviously, like, even, like, internet access is gonna be a really big part of it. And also, if students come from a background where they might not have, like, the full laptop and everything, like, how can we get those students engaged in those spaces.

She discussed her thinking in light of the Universities Accord, wondering how she should cater to students from relatively less privileged backgrounds.

Mature age students

Many of the teacher participants mentioned the need to cater for mature age students who have begun or returned to university study. These students tend to have multiple commitments apart from study, including work and childcare responsibilities, and they often have constraints on the time they have available to devote to university study. This means that they need effective time management and organisation skills to be able to juggle their multiple commitments. This is also a student cohort that is inclined to choose fully online learning to make their university study feasible. A student participant mentioned, “I’m working full-time, I have a family, ideally I’d probably wanna be in class because it’d probably be better for me.” However, when asked if she could make it to the provided Zoom sessions, she mentioned, “I couldn’t make the times. I was either putting children to bed or at work.”

Neurodivergence

Two teachers and three students mentioned the needs of neurodivergent students. The teachers recognised that they have a role to support these students. A teacher mentioned she would encourage all students to talk to her about any needs at the beginning of the semester. She adopts the UDL approach to make the content and presentation as

accessible as possible to students, including the webpage presentation and font colours. She intentionally invites feedback from students on their perception of these elements.

The other teachers showed an awareness that there may be students who experienced difficulties, such as dyslexia, but who do not self-identify or have a formal diagnosis, and that there is a need to cater for students with these difficulties.

One of the students mentioned their study habits and how they are influenced by neurodivergence:

> I will sit here and pump 12 hours out in a day and then I might not look at it again for 3 days … I do get that hyper focus, but that works really well for me because it means I can really, deeply engage with the content rather than just doing a little bit here and a little bit there.

They were also able to relate the needs they attributed to their neurodivergence with their choice to do online study, for example, “I’m not great at social situations. So, I didn’t have to talk to people, so I loved that, it’s just great.”

Another student talked about adapting their study habits and plan to address their ADHD and autistic traits. They explained:

> I aimed to … try and counteract it and study like a normal person or a neurotypical person. And I can’t do it. … One day I went, you know what? I could sit there in front of my computer for three hours again and get nothing done. Or, I could choose this night to relax and then tackle it tomorrow and just write it out in one session, which is how my brain work[s]. I was so relaxed and calm … and then [I] wrote a distinction essay.

6.1.2 Student perceptions on their own engagement

As introduced in the Section 5, online engagement of the low SES and RRR students is measured using two means: the CoI survey and the LMS data. The CoI survey collects students’ self-reported data on their own engagement and experiences. This section introduces the results of the survey data analysis, revealing students’ self-reported engagement patterns from the three aspects specified by the CoI framework: teaching, social, and cognitive.

Figure 15: Teaching, social, and cognitive presence by remoteness

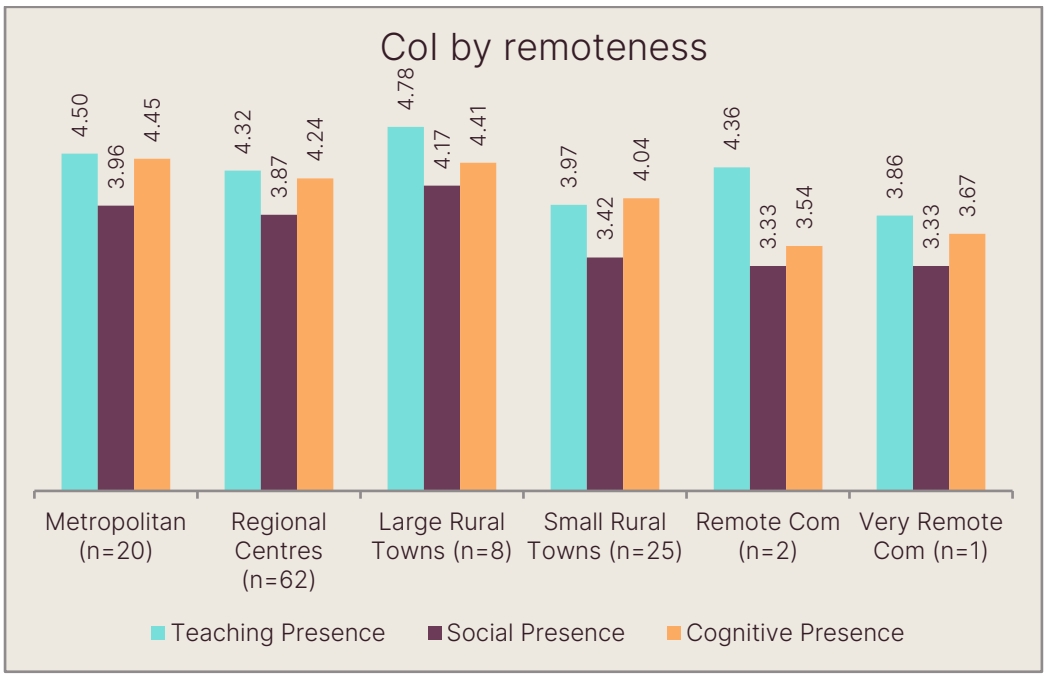


Figure 15 shows teaching, social, and cognitive presence by remoteness category, comparing student engagement across geographic classifications. A consistent pattern is observed across all categories: teaching presence is the highest, followed by cognitive presence, with social presence being the lowest. This may reflect the nature of online learning, where instructor-led teaching and cognitive engagement are more structured and accessible, whereas social interaction is more challenging to facilitate in a virtual environment.

There is also a general downward trend across remoteness categories, with teaching, social, and cognitive presence scores tending to decrease as remoteness increases. The exception to this trend is Large Rural Towns, which report the highest teaching (4.78) and social presence (4.17) scores. In contrast, remote (3.33) and very remote communities (3.33–3.86) report the lowest presence scores, though these categories have very small sample sizes.

Figure 16: Teaching, social, and cognitive presence by socio-economic status

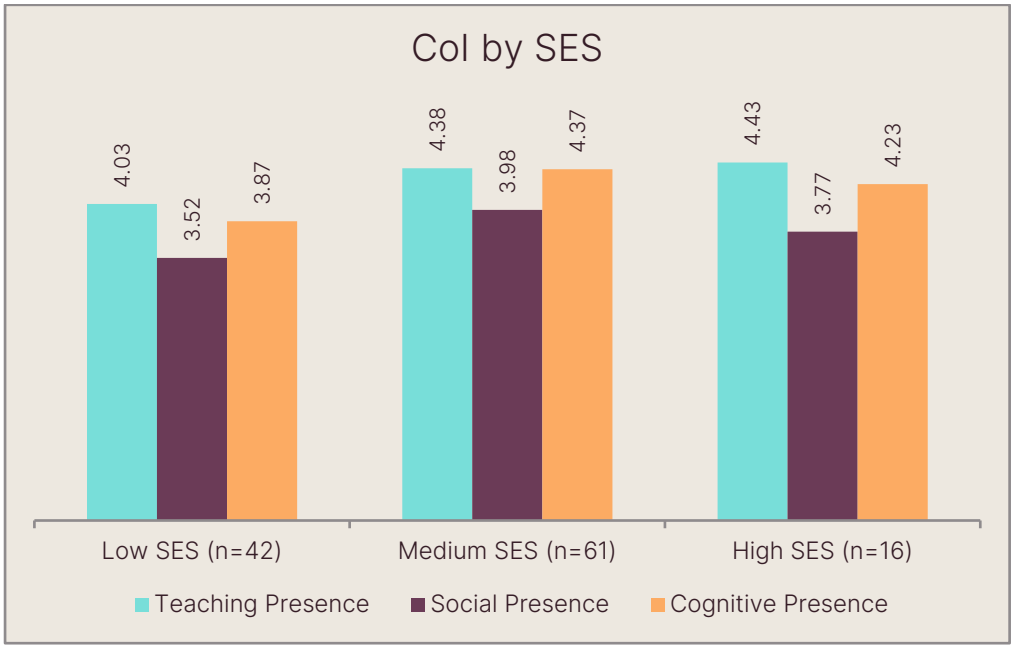


Figure 16 shows teaching, social, and cognitive presence by SES category illustrating an upward trend in engagement as SES increases. Higher SES students tend to report higher levels of teaching, social, and cognitive presence, while lower SES students report lower scores across all three categories. A consistent pattern is observed across all SES categories: teaching presence is the highest, followed by cognitive presence, with social presence being the lowest. This mirrors the trend seen in remoteness categories, where structured instructor-led teaching and cognitive engagement appear to be more easily facilitated than social interaction in an online environment.

6.1.3 Student engagement patterns revealed in LMS

SES and RRR location play a critical role in shaping students' engagement with LMS like MyLO, largely due to disparities in digital access, financial pressures, and competing responsibilities. Research has consistently shown that low SES and RRR students exhibit lower participation and completion rates in higher education, often constrained by technological barriers, including unreliable internet access and outdated devices that make it difficult to engage consistently with online course materials (Farley & Burbules, 2022; Stone, 2017). However, SES-related disparities extend beyond technological access, as financial pressures also influence LMS engagement patterns. Low SES students are more likely to be employed while studying, often in full-time or multiple part-time jobs, which limits the time available for regular and sustained engagement with MyLO (Li & Jackson, 2024). Employment commitments can lead to fragmented study routines, with students relying more heavily on asynchronous content and recorded lectures, rather than real-time interactions within the LMS environment.

6.1.3.1 LMS engagement by remoteness

Figure 17: Patterns of LMS engagement by remoteness

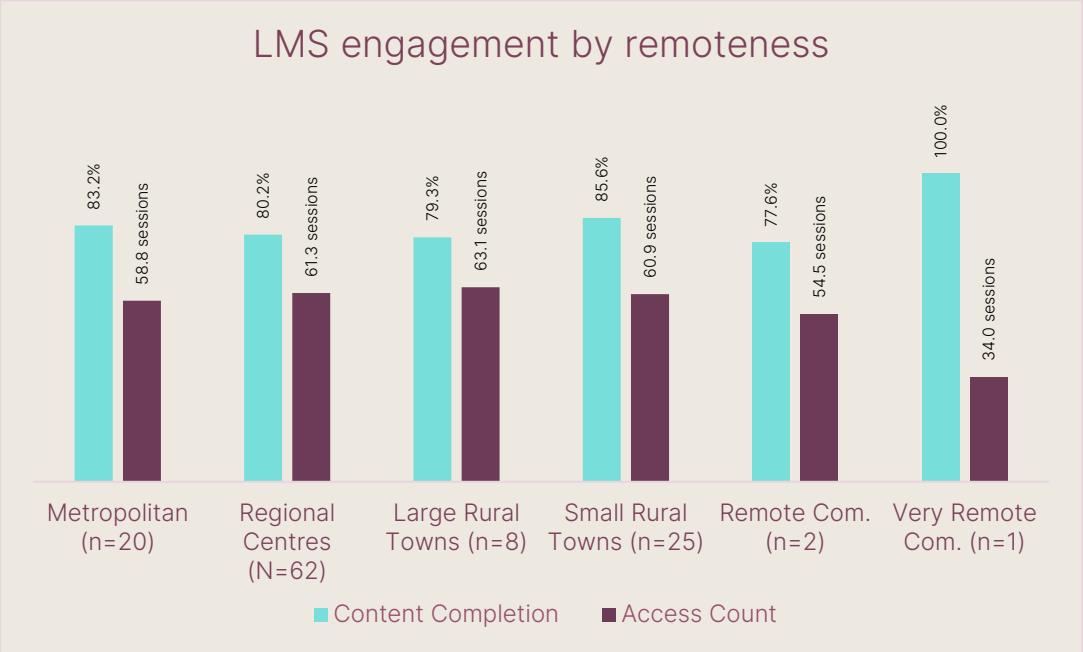


Figure 17 shows patterns of LMS engagement by remoteness, comparing content completion rates and subject access counts across geographic classifications. Very remote communities (100%) and remote communities (77.6%) have the highest and lowest content completion rates, respectively, but both are based on very small sample sizes (*n* = 1 and *n* = 2). Excluding these, content completion remains relatively consistent across categories, ranging from 80.2% (regional centres) to 85.6% (small rural towns).

In terms of access count, there is a very slight trend, with metropolitan students (58.8 sessions) and regional centres (61.3 sessions) showing lower engagement, while large rural towns (63.1 sessions) and small rural towns (60.9 sessions) have slightly higher access counts. However, the differences are minor, and overall LMS engagement patterns remain fairly stable across remoteness categories.

Figure 18: Patterns of LMS engagement by SES decile

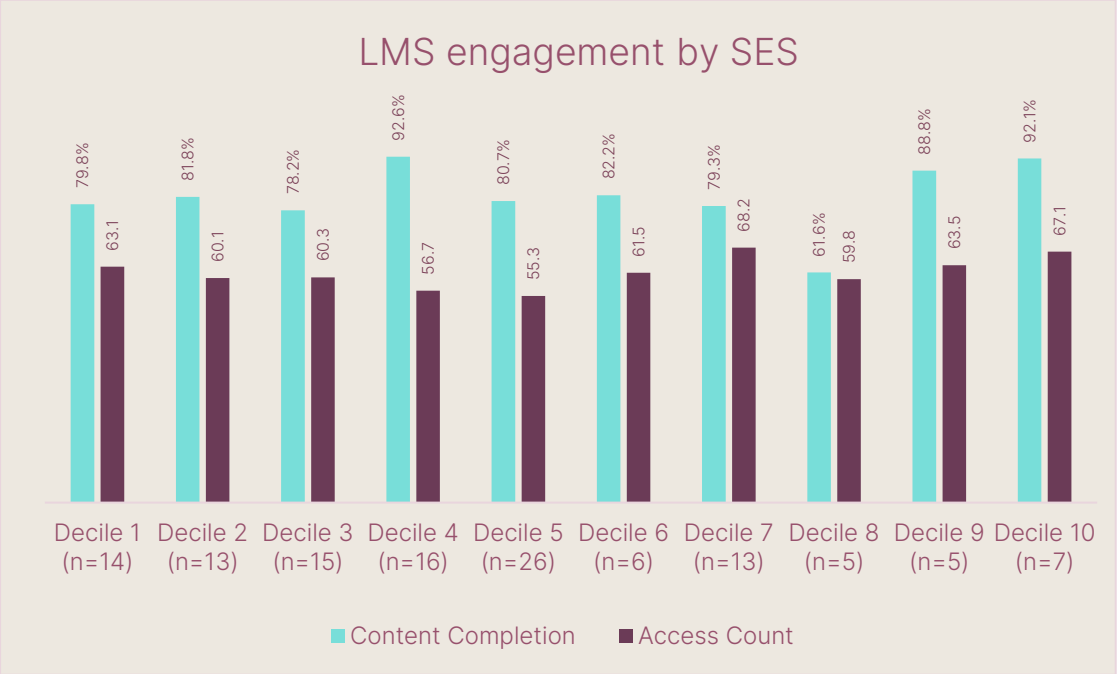


Figure 18 shows patterns of LMS engagement by SES decile, comparing content completion rates and subject access counts across socio-economic groups. Decile 10 (92.1%) and Decile 9 (88.8%) have the highest content completion rates, while Decile 7 (79.3%) and Decile 3 (78.2%) have the lowest. Excluding these, content completion remains relatively consistent, generally ranging between 80.7% and 82.2% across most deciles.

In terms of subject access count, there is a slight upward trend, with lower SES deciles (Deciles 1–5) showing slightly lower access counts (ranging from 55.3 to 63.1 sessions), while higher SES deciles (Deciles 6–10) have slightly higher engagement (ranging from 61.5 to 67.1 sessions). However, the differences are relatively small, and overall LMS engagement patterns appear fairly stable across SES deciles.

6.1.4 Student outcomes

Figure 19: Mean final grade by remoteness

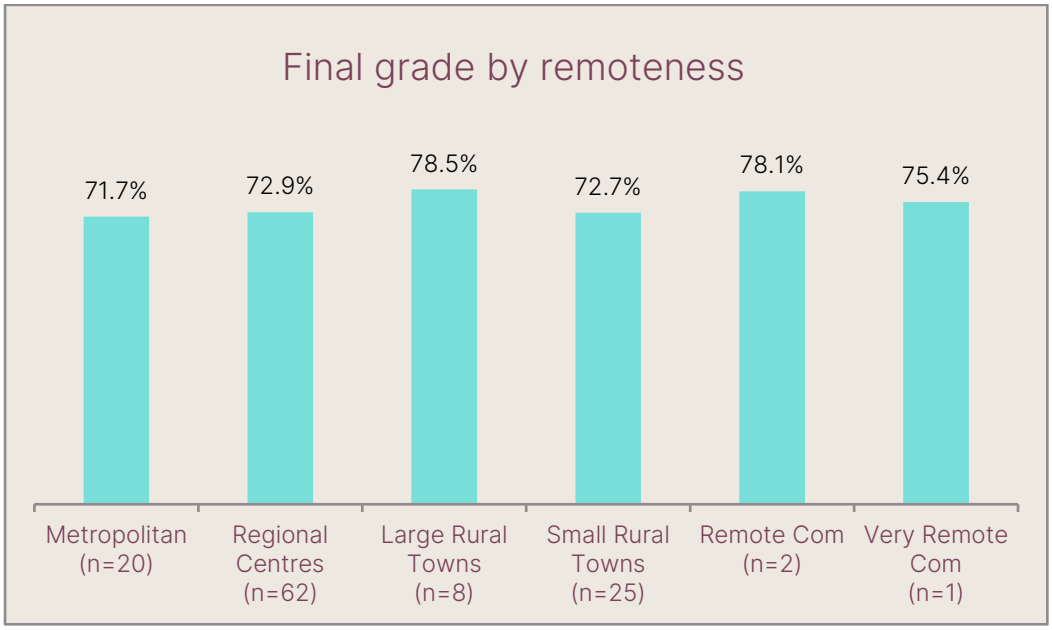


Figure 19 shows the mean final grade by remoteness category, illustrating that there is relatively little variation in student performance across different geographic classifications. All mean final grades fall within the distinction range, with large rural towns (78.5%) and remote communities (78.1%) having the highest averages, while Metropolitan students (71.7%) have the lowest. Regional centres (72.9%) and small rural towns (72.7%) show similar results, with very remote communities (75.4%) positioned between them. When interpreting these results, sample size for each category should be take into account—categories with higher sample sizes demonstrate slightly higher mean grades suggesting that variation may be more a product of sample size as opposed to remoteness.

Figure 20: Mean final grade by SES decile

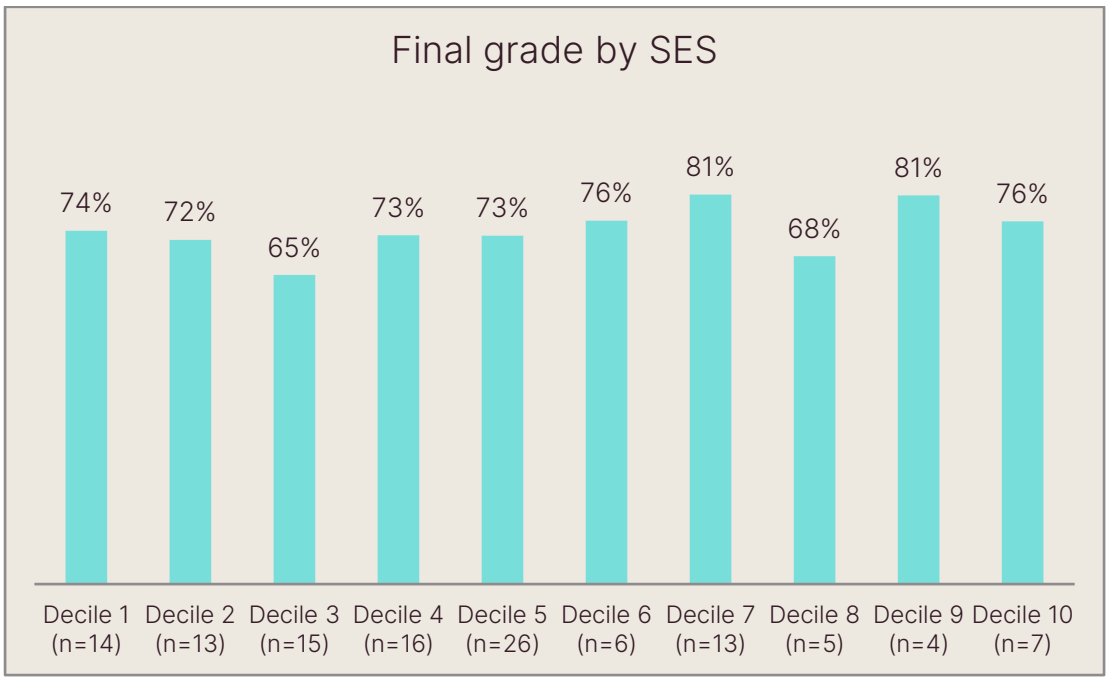


Figure 20 shows the mean final grade by SES decile, illustrating some variation in student performance across socio-economic groups. The highest mean final grades are observed in Decile 7 (81%) and Decile 9 (81%), while the lowest is in Decile 3 (65%). Most other deciles cluster between 72% and 76%, with Decile 8 (68%) being a slight outlier. Despite some fluctuations, the overall range remains within the Credit to Distinction grade levels. Again, sample sizes vary considerably across deciles, with Decile 5 (n = 26) being the largest and Decile 9 (n = 4) the smallest—subsequently, caution should be applied in interpreting these results.

6.2 Pedagogical practices that foster social engagement of low SES and RRR students (Aim 2)

Findings presented in Sections 6.3 and 6.4 were generated based on the semi-structured interview data with teachers and students in selected subjects (n = 7), and a desktop audit of MyLO sites of these subjects (Table 4). Data gathered from interviews with university support staff are also in the generation of findings in these sections. While practices varied based on modality, class size, perceived needs of the student cohort, and type of content being covered, interview participants identified strategies to foster community-building and social interactions and ways to develop group identity across subjects. In addition, relationship-building, informal peer support, collaborative activities and assessments, guest lecturer knowledge and expertise, and supporting diverse learning styles were themes that emerged.

Table 4: Overview of subjects involved in this study

Subject	Topic/discipline	Size	Delivery mode	Year level
Subject 1	Academic literacies / Education	253	Online (asynchronous)	First-year undergraduate
Subject 2	Motor development / Education	290	Online (asynchronous)	First-year undergraduate
Subject 3	Screen cultures / Media	59	Online and blended (synchronous)	First-year undergraduate
Subject 4	Oceanography / Science	214	Online and blended (synchronous)	First-year undergraduate
Subject 5	Human anatomy and physiology / Health sciences	171	Blended (asynchronous)	First-year undergraduate
Subject 6	Design thinking / Design	66	Online (synchronous option)	First-year undergraduate
Subject 7	Understanding science / Science	70	Online (synchronous option)	First-year undergraduate

6.2.1 Strategies to foster community-building and social interactions

Several people spoke about fostering community-building and social interactions. Interview participants identified strategies perceived to be effective, which they used as teachers or experienced as students, including using group activities, encouraging students to turn on the camera in synchronous sessions, using group assignments, and compulsory participation in online discussions. The group activities were generally well received by students. However, students had split views on the use of group assignments. Examples of group activities were as simple as the interactive activities organised at the beginning of the semester for students to get to know each other, as mentioned in previous sections. For instance, in the first week of the semester, one of the subjects shared a Google map that marked all students' geographic locations with pins coloured-coded by the courses the students were studying. The lecturer then used that as a discussion point and helped the students to introduce themselves and get to know each other. This provided a visual representation of the class and provided students with a sense of place, an overview of the diversity of the class, and established the foundation for the learning community.

In that same subject, another example of a simple group project used a timeline to present scientific discoveries over the course of history. One week, students were asked to build their own timeline to explore scientific discoveries over time and discuss within a small group. The next week, the students were asked to take one event from their timeline and contribute it to a shared timeline that the class built together. The activity was scaffolded over two weeks and allowed students to learn individually and also contribute to a larger group project. Because the contribution to the shared timeline was asynchronous, students were able to contribute on their own schedule while still being part of the larger community

project and collaborating with their peers. This was also well received from the student perspective. One student in that subject explained:

> We all had to add something to a little timeline about like a scientific topic. And there was five people in that group, and we talked about it a little bit in the Zoom meeting and then throughout the week, we all contributed to one piece of work, which was nice because, like, we're all collaborating on this one thing which goes towards our portfolio in the end. So, we're kind of working together to create a good activity [and] communicating with each other.

The use of discussion boards was not widely identified as a strategy for community-building or encouraging social interaction. There were several students who did not respond well to compulsory discussion activities. In general, students found the discussion board activities to be "forced and it wasn't genuine. And I don't think you were genuine [in your response]. … It felt forced because it was an assignment." Another student explained that they found discussion boards overwhelming and a time sink:

> The discussion boards are always an issue for me because I find like … I get stressed out because there's like 64 new messages there and then I'm like, do I need to know any of it and then I scroll too and mostly they are like frequently asked questions like oh, such and such already asked that why you're asking this again. So, I find that takes a lot of my time. Just to see what's important there and what's not. … It can get a bit messy there with the talking and stuff and asking questions.

Other students explained that they did not like the discussion board activities because they preferred to stay as quiet or passive learners. This is a reflection of their preferred learning style rather than an accurate reflection of their engagement in learning. A student in one subject that used discussion board-based assessments, for instance, received better results on the other aspects of the assessment, but relatively lower marks on the engagement on discussion boards. They commented:

> Yeah. And I don't think that's an accurate reflection of my capability and that's fine. I get that. You know that's part of, you know, you study online there are, you know, pros and cons, but yeah, the collaboration was really difficult.

Teachers in an education subject used peer review activities for students to review each other's work and provide feedback with the aim of boosting their understanding of the subject content. Teachers in a media studies subject did something similar, using an online journal assessment, where students contributed to a blog that was visible to all students in the class. This way the students could read each other's work, provide feedback, and observe a variety of ideas and writing styles. The lecturer explained:

> It gives them the opportunity for being able to read each other's work, to comment on each other's work if they want to, which I've always found has been quite effective as a way of getting students to kind of understand that there are many ways of learning. There's many ways of writing. There's many ways of kind of

> putting ideas together. So that kind of works as another kind of learning tool. I think, you know, even having students access to look at each other's work.

Students were able to interact with each other's work without the pressure of having to be engaging directly with each other.

Being able to see the students in Zoom sessions was also discussed by staff interview participants. One teacher participant encouraged students to turn on cameras in synchronous sessions. They commented:

> Just through simple explanation of why it's important to share in camera, I said. "Because I keep asking questions. Oh, can you hear me?" And I said, "Oh look, I don't know if anyone can hear me because there's no cameras on. I can't see the response on your faces like I would if we're in a classroom. Can you give me a thumbs up or type in the comments. Right. OK. Well, again, no one's got cameras on, so I don't know if you're getting this information.

And a lecturer in another subject described how she encouraged her students to create avatars that they could use if they did not want to turn on their cameras. This created a virtual classroom of faces rather than a Zoom classroom full of black boxes. Because the avatars were personalised to reflect each student's appearance and/or personality, students and staff felt like they were more familiar with each other.

Strategies to foster community-building and social interactions did not only occur in online spaces, but also offline. A tutor in one subject explained:

> I'm sort of mindful of saying to students. Look, you guys can connect and talk about design thinking as a project process that should be shared. There is nothing wrong with collaborating and thinking in groups. You guys can meet up and talk about this if you're in the same area.

The subject coordinator in another blended subject also spoke about how facilitating face-to-face connections with students was important. This participant explained that the media studies students in her blended class would benefit if they had a physical space to connect. She mentioned:

> I think the [campus] is primarily a music space, like it's [about] music and theatre and media, but there are little spaces for media students to hang out. So, if you're looking at that kind of social aspect, I think that there's a slight issue in terms of once the class ends, they [students] leave, so it's not like they can all kind of hang out. There are some spaces, there are physical places, but it feels like from my perspective, kind of teaching and working spaces. The music students are like, they've finished practising and are coming out, having lunch, using those spaces. Whereas for us [media studies students], we do have media students that hang out, but they're not sure what to do while they're waiting between classes.

6.2.2 Learning about students' characteristics and needs

At the beginning of the semester, the teacher would usually design activities to learn about the geographic locations of the students, learning modes of the students if the subject is not offered in a single mode, and academic disciplines of the students. These activities provide an overview to the teachers about their students' characteristics and also provide students with an opportunity to build a sense of community and a sense of belonging. The activities to find out about students' locations can sometimes foster an interest among students to form study groups offline. Students may voluntarily reveal information about themselves as well which may further encourage a sense of belonging. For instance, students may introduce themselves as school leavers or mature age students with a family, or if they are studying full-time or part-time, or working a job as they study. Students find common interest through these conversations. One teacher recalled:

> Some people have found that I think in a couple of cases there was, I know there was one instance, where there were two students in the tutorial were like, "Oh yeah, I'm in Brisbane, I'm in Brisbane too. Oh, where do you live?" And then they got together. They're like "I'm doing sustainable living. So am I." And they had no idea they were just down the road from each other."

6.2.3 Developing a group identity

Another theme that emerged from the interviews was the need to foster community-building and develop a group identity. In some cases, this was achieved by finding common characteristics or interests from students' self-introductions at the beginning of the semester.

A teacher participant in Subject 3 commented:

> It's hard because when teaching media, in many ways it's a combination of different disciplines. We've got people that are interested in journalism, people that are interested in comms, people that are interested in film making, and people that are interested in media theory. And so, we do have every kind of separate elements brought in together. And so, for us, it has always been a challenge of how you can create a strong media identity for students.

In other cases, a group identity was developed based on the tone set for the subject by the lecturer. One lecturer described how they created a relaxed feel for the singular online tutorial section of their large class:

> From the very beginning I created a very relaxed atmosphere. I used to call them "family". I said, "Oh hello family. How are you?" And then I learned their names. Then [the students] started using the same phrase. So, they normally emailed the group—we created a group email list—so then the students started [their emails] normally saying "Oh hello family, I found this link, maybe you would like to learn this?"

The students' use of the same phrase "family" that the lecturer used showed that they were embracing it and identifying as part of that learning group. They used the email group to

share items of common interest that they came across during their days as one might with their family.

And in other cases, still, the students felt an immediate connection due to a shared interest in the topic of the subject. One student explained they felt there was a shared interest among students in the group: “I feel like everybody had the same sort of intention going into the subject, like we’re all there to learn about this one topic, I don’t [feel] I’m doing [this subject] as an elective. So, everybody was there for the same reason, I guess.”

6.2.4 Relationship-building

The theme of relationship-building was identified as being important. The teachers invested time to build relationships with the students and between students themselves. For these academics, spending time to build relationships is an intentional approach. Strategies used for relationship-building appeared on two levels: subject group and individual. Examples of the subject group level included activities organised at the beginning of the semester, for example, ice breaker activities that helped the teacher and students learn each other’s names and about their backgrounds, geographic locations, disciplines, personal interests, etc. These activities helped to develop a generally positive and welcoming context for the subject. One teacher gave the example, “we used to make jokes and comments at the beginning … From the very beginning I created [a] very relaxed atmosphere.”

Relationship-building also appeared at individual levels. As mentioned earlier, although it is a recognised challenge for the teacher to work with every individual student in a cohort of hundreds of students, the teachers were able to build positive and constructive relationships with individual students wherever possible. This appeared to be more critical when students reach out for help or came to the teachers with questions. A tutor in one subject shared their observation on the teaching approaches used by the subject coordinator:

> But I think just her [subject coordinator’s] understanding when she replies to emails, I think like I said, even though lots of content is online, the fact that we don’t just direct them there like we let them know where it is, but we give them the answer as well. So, it’s really it, it is really scaffolded and kind and friendly and to give them that sort of I guess welcome to uni … So like holding their hand, it feels like holding their hand a little bit.

6.2.5 Informal peer support

The teacher and student participants expressed an awareness of informal peer support among students outside of the teacher created spaces. For instance, the subject coordinator in one subject mentioned:

> They have a Facebook group and so they’ll engage in that community as well and they can sort of get study buddies and that sort of thing. I don’t know if I’ve got one this semester. Normally it will pop up, and someone will sort of mention it in a thread [on the online discussion board].

These spaces are usually owned by students, without involvement of the teacher. Students use this as an additional, less formal space to interact with each other.

A student in another subject mentioned, “During holidays if I go up to Hobart, I’ll find myself like communicating with the art students up there … and we did a group study session [at the] Tasmanian library. We just talked about things that were going on”

Apart from the Facebook groups, WhatsApp groups, and small-group offline gatherings, some teachers also encouraged students to share resources using available online platforms. For instance, the subject coordinator of one subject mentioned:

> I’ve been using this app called Letterboxd. It is a kind of screen platform where you can kind of just log what films you’ve watched. Basically, you can put up the movies you like. You can create reviews. So, I actually kind of posted like, “Here’s my Letterboxd page.” You know, “Here are the films I’m seeing.” This is a really interesting way of, like engaging and using screen content. “You might be interested in this.”

6.2.6 Collaborative activities and assessments

Interactive tools, such as online discussion boards and Padlets, were mentioned as ways to facilitate collaborative activities. Adoption of online discussion boards differs significantly between disciplines. In this study, subjects in the education discipline used the online discussion boards more often than in the other disciplines. In particular in fully online subjects and blended subjects where the majority of students chose to study asynchronously, the online discussion boards were used as the dominant space for learning activities and student interactions.

Students had different levels of expectations on teachers’ involvement and support in the discussion board. In some of the subjects in this study, the discussion boards were actively led by the teachers, and in these spaces, students would expect to see much presence of the teaching team. Conversely, it was made clear in other subjects that the online discussion boards were used as a supplement and additional space for students to connect with each other in between on campus or synchronous sessions, and conversations happening in these discussion boards were more likely to be student initiated, rather than led by the teacher.

It is also interesting to note that staff and students reported both positive and negative experiences with online discussion boards. Some staff considered the discussion boards in the LMS system to be difficult to navigate for students, and the interfaces offer limited options and are unattractive. They have therefore, sought alternative spaces for student interactions, such as Padlet. Some students, on the other hand, felt overwhelmed by the compulsory participation required in online discussion boards.

In addition to collaborative activities, the teachers used a range of assessment types, including reports, posters, presentations, quizzes, group assignments, self-assessment, essays, and online journals. One of the subjects asked students to reflect on their key strengths and weaknesses around their own study skills. This assignment provided an opportunity for students to reflect on their own learning, as well as insights for the teachers about their students.

Group assignments were used in some of the subjects involved in this study. Teachers design these assignments based on sound pedagogical purposes, for instance, to enhance

collaboration and social interactions. However, group assignments were not always appreciated by students, and teachers were aware of their misgivings. One of the teachers mentioned:

> For next year, I think the students will hate it, but in terms of scaffolding and the social [aspect], I'm thinking for their essay plan, I actually put them into groups to do the plan … so they can search for literature together and help each other … [and] actually collaborate.

Students involved in the interviews called for better communication between subject coordinators regarding the assessment due dates. Having multiple assignments due at the same time makes it challenging for them to organise their assignment completion.

6.2.7 Guest lecturer knowledge and expertise

One subject used high-profile guest lecturers to facilitate social integration and community-building. The teachers designed the activity with multiple goals in mind. They used the opportunity to expand on the general content being taught, they used the high-profile visitor to attract participation, and they used the eight weeks in the lead-up to the event to have students work together to prepare questions for this person, creating a strong sense of community and social integration as they worked together to prepare for a special event. One teacher mentioned:

> I get them to interact and share the questions with each other and further develop them and further improve them … I think they get the sense of community through the fact that I've set up these online spaces for them to interact and they vote on each other's questions. So, it's like competitive. That's how the questions get selected for the panel and for our guest.

This strategy was well received by the students and contributed to the success of the guest speaker session. This was mentioned as a highlight by the student interview participants from this subject as well. One student explained:

> I also really loved the guest speaker who came on. [He] was really interesting. We had a few people asking him questions on the Zoom meeting. It's very concise, very informative, and that was pretty amazing, like that, this subject could offer that platform where people could ask questions to someone that highly regarded.

6.2.8 Supporting diverse learning styles

Online learning has widely been seen as a means to overcome geographic barriers that have traditionally made access to higher education difficult. Being able to access materials and participate fully from any location with internet access has made it easier for many low SES and RRR students to complete tertiary studies. However, distance is not the only challenge low SES and RRR students encounter. Trimble (2023) describes the compounding nature of the challenges facing online students in terms of age, gender, family, work, and study load. This was also evident in our interview findings. Student interview participants

described how having online learning as an option helped to overcome other barriers. For example, one student described:

> [I am] married and have my own family - my kids are ten and eight - I'm working as a teacher as well, so face to face lectures and things will just be far too difficult.

Staff interview participants recognised the importance of supporting diverse learning styles within their online cohorts and this was appreciated by the students. One student explained:

> For me, as far as my learning style goes, generally I'm a hands-on learner which is a little bit trickier in an online space. I'm an avid note taker so I know I actually caught up with [the subject coordinator] at the end of the subject and he loves the fact that I had nearly two notebooks full of notes because I really love that connection between writing and thinking.

6.3 Pedagogical practices that foster cognitive learning of low SES and RRR students (Aim 2)

6.3.1 Teachers being approachable, encouraging, and proactive

There is clear consensus that a strong teacher presence is critical in supporting diverse student groups. Words such as "approachable," "encouraging," and "proactive" were mentioned numerous times by both the teacher and student participants. The teachers not only made themselves available for student contact but also reminded students throughout the semester that they were available to help students.

Providing students with support early in and consistently throughout the semester was highlighted as critical by the teacher participants. Establishing a teacher presence in Week 1 of the semester is important. The teachers interviewed used a range of strategies, including providing a webinar to introduce themselves to students, providing links to manuals and guidelines or a virtual tour on how to use the LMS. A teacher in Subject 3 mentioned the importance of having a weekly teacher presence. She mentioned, "I do normally try and give weekly, [for instance] 'Welcome to Week 1, here is the learning folder,' that kind of thing and I try and signpost all of the information that they need."

When asked about highlights in their learning experience, a student mentioned about the warmth of the subject coordinator and described how:

> I felt like she cared about the subject and what she was teaching. I would believe if I did have feedback that she would definitely … listen to it and understand it. I'm not sure how much control she has over it, but I assume that I would at least be listened to.

Another student, although they did not need to contact the teacher individually for help, believed that it gave them a sense of security knowing that the teacher was available: "I

would have had access to that support if I had needed it. What's coming to mind now is if I was having trouble, their phone numbers and their emails were directly on the MyLO site."

The teacher participants emphasised that successful learning outcomes require a proactive mindset from both teachers and students, and for some students, this mindset needs to be explicitly taught and developed. A teacher explained, "I do a lot of 'for anything please reach out'. We're not mind readers. We're not gonna know if the wheels start to fall off. If you contact us sooner, we can help before things grow."

In addition to a willingness and awareness to reach out for help when needed, the teachers in this study also taught students appropriate approaches to seek help. A teacher in Subject 1 guided students on how to ask questions in appropriate forums. She directed students to ask any general questions about the subject content in the discussion board so that the other students can benefit from seeing the answer, but send questions related to personal issues via emails or phone for privacy.

6.3.2 Scaffolding

All the teachers interviewed mentioned explicitly the concept of scaffolding, and how they designed both learning activities and assessment tasks to scaffold students' learning. Evidence of constructive alignment is observed in these subjects, where assessment tasks and activities were integral parts of the pedagogical design (Biggs et al., 2022).

In first-year undergraduate subjects with diverse learner groups, assessments appear in a variety of forms, including reports, posters, presentations, quizzes, group assignments, self-assessment, essays, and online journals. As some assessment types require a unique genre of writing, presentation, or technology skills, students should not be assumed to have the knowledge and skills required to complete the assessment. The teachers in this study recognised that students need to be prepared for both learning the subject content as well as developing the skills to be able to demonstrate understanding through the particular assessment type.

The teachers in this study carefully thought about how to integrate the weekly activities with formal assessment tasks. In one subject, the teacher ensured natural progression in knowledge-building over the semester and alignment between the assessment task and questions proposed in weekly activities. The teacher used synchronous tutorials to brainstorm ideas and to unpack the assessment tasks. For a later assignment in this subject, students were allowed choices on how they would present their assignment, either as a blog, a post, or a journal. Scaffolding is intentional and explicit in the subject design, evidenced in the order of assessment and students' development in their academic proficiency.

Explicit preparation for assessment tasks includes instructions about the particular assessment type. For instance, in one of the subjects which includes a reflective piece as one assessment task, the students are provided with a summary of different reflective types, along with an online presentation and activities designed on reflective practices. For this reflective piece, students would undertake two activities that involved interacting with peer students and then reflecting on whether their views about science had changed as a result of undertaking these activities, and whether they considered themselves scientists.

6.3.3 Demonstrating relevance through content

Deep learning and positive learning outcomes occurred when students could see the relevance of the learning to their everyday lives, or when students had opportunities to apply theoretical content to practical scenarios. A teacher in Subject 7 mentioned:

> I would like to bring industry into the classroom [to] talk about how science works for industry, and this year, I had Dr. [name], who's a global leader. I brought him in to talk about … how science is communicated, and how science is used to make decisions and how decisions can be made based on disinformation and misinformation. I know they're [students] gonna turn up. And when they turn up, it's great because the students have these moments of, wow, that was an organic way [in which] that topic turned up.

The students who attended this guest lecture commented positively about how stimulating this learning experience was and of its relevance to their life. One of them said, “It definitely could be applied to real life situations. So, the effects on what’s causing this, the climate, the warming, and the greenhouse gases and stuff.”

Where students were motivated by content of relevance to them, evidence of deep learning was observed by the teachers and realised by the students themselves. This was signified by exploring resources and material outside of what was provided by the teachers, critical thinking about the content, reflections on one’s own practises and understanding, and applying knowledge into practical contexts. A student in Subject 3 mentioned:

> So it [the subject] was supposed to just introduce basic concepts and ideas. But I was interested to go a little bit deeper and into more like niche and novel ideas that [the teacher] had brought up. So, yeah, [I] definitely was delving deeper into the stuff that was taught.”

This was consistent with what was shared by the teacher of the same subject: “[I] always get really amazed by what students can produce when I read over their assessment. Sometimes I find engaging ideas that show a relatively sophisticated kind of engagement with ideas and learning.”

6.3.4 Content organisation and presentation

6.3.4.1 Flexible pacing and options

Student engagement and experiences are not only impacted by the quality of the teaching content, but also how it is presented. The teachers mentioned up-to-date content as fundamental to quality online teaching. However, they also emphasised that the way in which the content is presented is as equally important. To cater for online students with diverse backgrounds and needs, it is imperative to organise content in ways that allow them to navigate and digest it at their own pace. Flexible options are important in catering for online students, whether the options be synchronous or asynchronous. Where synchronous Zoom sessions were organised, students appreciated that the sessions were not all at the same time on the same day during the week. One student commented, “The Zoom meetings were

pre-advertised ... There were four or five throughout the semester and … they were at different times and days, which was quite good."

It appears to be a common need among fully online students to manage their study in small chunks of time and between their other commitments. In one of the subjects, quizzes were initially only open on the weekdays of the week. The availability was changed to include weekends upon receiving student feedback. A student described:

> Time frame did cause me quite a bit of anxiety and stress, especially when I realised I've just missed [a quiz] … 9:00am on Saturday [I was] going "oh gosh, I totally forgot this subject's not available on the weekend", and it was the only one not available on the weekend.

6.3.4.2 Consistency

One facilitating factor to these students' learning was the consistency in the presentations between different online subjects. While students appreciated that different academics could and should be able to design their teaching spaces differently, they believed that a sense of consistency in how the online subjects were organised could help lessen the cognitive load in navigating between learning spaces. In particular, students liked administrative aspects of a subject to be in the same place, for instance, the subject outline and information about teaching patterns and assessments. One student commented:

> The different lecturers and course designers have enough freedom. It doesn't all feel the same, but like how you do your assignments, how you check your plagiarism, … what do I have to look at this week, it's all very consistent. I think consistency is the big thing.

6.3.4.3 LMS presentation

UTAS, the university involved in this study, adopts an institution-wide LMS system, namely My Learning Online (MyLO), which is based on the Desire2Learn platform (D2L, 2025). At UTAS, all subjects are required to have a site on the LMS, therefore support on how to use this system is relevant to all students at the university, regardless of their study mode, whether it be face-to-face, blended, or fully online.

Learning designers at UTAS have developed templates for use across subjects, courses, and schools. This appears to have contributed to a sense of consistency in the content organisation and presentation. Table 5 provides an overview of the general layouts and designs for the subject sites on MyLO. This is summarised from a desktop audit of the MyLO sites of the 16 subjects involved in this study. The Desire2Learn platform shares many functionalities with other commonly used LMS systems, such as Blackboard and Moodle. Therefore, these layouts and designs offer insights to institutions that use other similar LMS systems.

Table 5: Range of layouts and designs for MyLO sites

Type of content organisation	Characteristics
Linear/Weekly	• Organised chronologically, with a clear week-by-week breakdown. • Each week contains readings, recorded lectures, activities, and assessment tasks. • Often includes weekly checklists or "to-do" lists to guide students. • Content is generally released on a weekly basis.
Modular/ Thematic layout	• Content is divided into thematic modules rather than weeks. • Encourages self-paced exploration, allowing students to move between topics flexibly. • Often used in multidisciplinary or self-directed courses. • Content is generally released in bulk (i.e. module by module).
Resource/ Repository layout	• Functions as a central repository for readings, lecture slides, videos, and external links to resources or websites. • There is usually minimal structure, students can navigate the resources as needed. • Often used in subjects that involve blended learning.
Links to external platforms	• Takes on layouts/forms that are most relevant to the discipline/content being covered (highly flexible from a development perspective). • Takes learners outside of the LMS environment to an often more “polished,” aesthetically pleasing, or more fit for purpose space. Examples include H5P and Padlet.

The teachers in this study noted the importance of navigating students through the subject LMS site in the first week of the semester. They also suggested additional functions, such as the option to do a keyword search to look for particular content, which is not currently an option in MyLO.

6.3.4.4 Aesthetically pleasing organisation and presentation

Another facilitating factor mentioned is aesthetically pleasing online space presentation. A teacher in the area of design thinking brought their discipline expertise into the online presentation of content. They were devoted to making the learning space professional looking and described this process as their own “little indulgence.” This teacher designed the online space with a logical flow to minimise potential interruptions while students navigated through the space. They described:

> It might be the illustrator in me and the storyteller, but I always think of it … like a movie. As soon as you pause the movie and go off and do something else, you can forget about it. So, if you send someone out of your content, or if it looks different, then that can [become] an interruption to the concentration. … We’ve heard from students across [subjects], that when it’s aesthetically pleasing and there’s continuity visually, [students] don’t have to waste that time re-orienting themselves and looking around. And it’s a time sink for them when it’s not.

6.3.5 Inviting student feedback on teaching

The teachers in this study recognised the importance of inviting student feedback on teaching and using student voices to inform pedagogical design. Both formal and informal evaluation strategies were used by these teachers. One formal evaluation strategy used centrally within the university is a subject evaluation survey distributed at the end of each semester. All the teacher participants in this study used this survey as one way to inform their teaching. One teacher mentioned that this survey is often completed by students at both ends of the satisfaction spectrum; those who had really positive experiences in the subject, and those who were unhappy about the subject. This teacher described the feeling of having a butterfly in her chest when opening the survey comments. And, over time, she developed the skills to focus on constructive comments that she can action. When she saw comments that she felt needed further clarification, she would obtain further suggestions through conversations with students in on-campus tutorials or via synchronous online sessions. She has found that, in those contexts, students feel freer to express their ideas.

The other teacher participants have other additional ways to invite student input and evaluation to inform future teaching. For instance, the teaching team in Subject 5 collected feedback from students on the online discussion board and via emails. Students requested for higher consistency in the presentation of content, which is taught by teaching team members who operated on multiple online teaching sites. While maintaining some academic freedom, the teaching team members were able to make the online sites look more similar. Students responded positively to this change.

6.3.6 Preparing students with first-year experience

The teacher participants in this study recognised the importance of their first-year subjects in preparing students' entry into the course, helping them develop positive perceptions towards university study, as well as skills to pursue their studies in the remaining years of their selected course. This is consistent with literature that reveals that student dropouts are the most significant in students' first year of study (Ferrer et al., 2022).

6.3.6.1 Developing a positive and growth mindset

A teacher in Subject 2 specifically discussed with students the link between engagement and success in the subject. Discussions like this help raise students' awareness of the level of engagement expected of them during university study.

The teacher in Subject 1 helped students develop a positive mindset, presaging the subject as enjoyable and valuable. They prided themselves on the friendly nature of the teaching team, which encouraged students to stay on track and ask any questions that came to their minds. The teaching team in the same subject also helped students to reposition themselves in the professional role, as the subject is taught in the first year, first semester of an initial teacher education course. These teachers emphasised to the students the importance of using the languages and terminologies relevant to the discipline. A teacher in initial teacher education mentioned:

> I'm kind of hoping [students], by using the language of pre-service educator, [this would] trick their brain into kind of thinking "I'm a professional now, I'm not just a student." … A few [students] of mine last semester kept calling it [the university]

> school, and I said, “You’re no longer at school …. You’ve chosen to be at uni. And when you say ‘school,’ I would assume you’re [talking about] working in a school [as part of] your work.”

Teaching students skills on how to reflect on their own thinking was perceived to be important by the teachers. Metacognition is intentionally taught in the subjects involved in this study (Rivas et al., 2022). Opportunities for reflection are designed as part of the assessment in some of the subjects. A student gave an interesting reflection on their own thought process when completing their assignments:

> You have an idea in your mind. It's very clear [in] your mind and you can direct and function with the idea. But as you try to explain the idea, you find that step between mental concept and verbal clarity mentioned or excluded. So, I was trying to seek clarity. I think that’s probably because also my internal fear of failure is quite high in that [I tend to think] if I don’t work out how to pass this, I’m going back to welding, which was not going to happen.

6.3.6.2 Developing strategies for learning at university

All the teachers involved in the interviews provided preparation for their students to learn about navigation of the LMS, to learn about referencing, and some point students to resources to help with their academic writing. Subject 1, which focuses on academic literacies, offered a range of skills on academic writing and referencing that can be transferable into a range of other subjects for students’ further study in the course. A student from that subject who was interviewed confirmed the teaching approach used resulted in her positive experience. She commented, “it definitely helped develop my skills for universities specifically because I've got diplomas and stuff, but obviously, they're [study at the different levels are] very different.”

A teacher in Subject 3 also recognised the importance of academic literacies. They had modules embedded in the subject on how to do references, how to set up an essay, and how to research information. This content appeared to be well received by students in the subject, who were a cohort of learners from multiple disciplines.

Making students aware of the relevance of the subject and expectations on what they should aim to achieve by the end of the semester gives students a broad vision of the discipline that they are entering. For instance, in Subject 5, assessment tasks were designed to focus on the key concepts that students would need to understand to study in the discipline, and assessment tasks were purposely designed not to be very difficult, which also helped to develop a positive mind among students about their university study.

The teachers recognised the need to send regular reminders to keep students on track. The same need is also mentioned by students. A teacher in Subject 2 built in email reminders to be sent in the LMS when a new module was opened. This helped students prevent missing new content and track their own learning progress. Importance of regular reminders was agreed by students. A student from Subject 4 commented, “I believe a lot of fresher students, either they're not coming straight from school … [or] coming from other backgrounds, [they] will struggle with getting back into that study habit.”

6.3.6.3 Navigating the university support system

All the teachers and some of the students interviewed mentioned the need for students to be aware of the university's central support services. Both teachers and students agree that teachers in individual subjects are usually seen as the first point of contact by students. The teacher participants reflected that most of the enquiries that they received related to learning and teaching aspects, and therefore they were able to answer the majority of the questions from students. However, there were times when it became more appropriate to refer students to the university's central support services, for instance, when the reported issue was separate to the subject content and could impact on the student's study overall rather than in an individual subject. There are also occasions when teachers have not had specific training to deal with the issue encountered, especially in some disciplines or areas of study, where students may have more complex needs (Barnes et al., 2024). One support staff member explained:

> It's an awkward, kind of weird place that we've landed with that where we do have to acknowledge the distress that students are going through, but we still haven't really got a great way of us dealing with it when we're not actually professionals from that sort of counselling or psychology background….And like you know that they might need referral elsewhere, but sometimes the student doesn't want to go and see someone else, and they're there with you and they just want to talk to you. … Recognising that even though our job is so focused on academic skills and learning, that before a student can actually engage with that component, they might have a lot of their other basic needs that need to be addressed first, and we can't ignore those other needs.

Examples of these issues include information technology issues, personal or family circumstances, financial hardships, disability, or mental health issues. Many of the teachers have referred students to central support services, such as those available through library staff, IT support staff, student advisors, and learning advisors.

The teachers, students, and support staff involved in this study were all aware of the central support services offered by the university. This study observed increased awareness among students of these services in comparison with research findings from five years ago, which saw little awareness among online students (Kember et al., 2023). The students interviewed in this study were open and willing to discuss their personal needs and challenges.

In interviews, three teachers and two students mentioned support provided by the university through a process called learning access plan. This is a centralised university support strategy, whereby students can talk to one of the student advisors about their individual needs and obtain a learning access plan, if appropriate. A learning access plan outlines the student's particular needs, such as neurodiversity, disability, or any other personal circumstances. The purpose of learning access plans is to provide a formal record of the student's needs that are able to be made transparent to any staff teaching the student. The teacher participants in this study showed awareness of this process, and were mindful that, in some learning areas within the university, there are higher numbers of students with learning access plans, reflecting student characteristics and needs.

The teacher participants shared their experiences of accommodating flexible learning options, such as extensions on assessments, with consideration of learning access plans.

They have used the learning access plan as one way to get to know about their students. The transparency brought by this process also allowed the teachers in individual subjects to work closely with student advisors who were a part of the university's central support team. A student participant was provided extra support, including downloaded lectures and scripts, reflecting their needs as stated in their learning access plan.

This awareness in recognising one's own needs and seeking support when needed is critical to a positive university study experience. How to navigate the university support system needs to be explicitly taught to students starting university study, as part of their first-year experience.

6.3.6.4 Technology and generative artificial intelligence (GenAI)

Overall, the teachers in this study believed today's students to be more advanced in using technologies. However, particular characteristics were observed of the RRR and mature age student cohorts. One teacher shared her considerations on the needs of students from RRR areas of Tasmania, as compared to those of students in Hobart, which is a regional centre. She mentioned, "They might have more concerns around, like access to technology, access to computers, even like coming into the city I think is difficult, like, even access and transportation."

A teacher in Subject 6 described her student cohort, which had a significant group of mature-aged students, as:

> They can be divided into cohorts, which is: one, industry people trying to gain certification or update experience; or people who are coming back to education for the first time in a long time, so mature-aged students and some of those have virtually zero skills apart from checking emails and Facebook. I know the professionals tend to [have these skills], because they're in the work environment now ... But the returning to study cohort who are mature, quite often are behind that ball and [lack] the willingness to engage with some technology.

The interviews revealed GenAI use by both teachers and students to support their teaching or learning. For instance, in one of the subjects, as part of the learning activity GenAI was used to generate answers to a scenario question. Students were then guided to analyse and critique these answers and consider ways to improve them, based on their knowledge and their learning materials. Another teacher was impressed by the rubric generated using GenAI, with input about the subject, such as assessment descriptions, the intended learning outcomes, and the subject description. They thought the rubric was clear and specific.

Students use GenAI as a tool to support their own learning. For instance, one student who had dyslexia mentioned, "I struggle to read, write, and most things. So, I would use some GenAI [tools] to simplify some questions to help me better understand … My biggest struggle is just understanding questions and reading my phone."

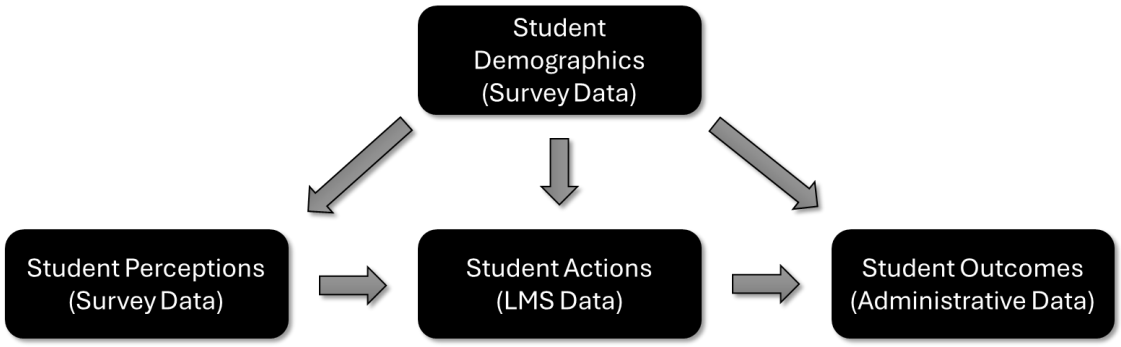
6.4 Bringing it all together—Developing a holistic model of online engagement for low SES and RRR students (Aim 3)

One key outcome of this project is a holistic model showing demographic factors, including remoteness, SES, age, and study load, and how these factors interact with student engagement. This study used both students' self-reported data (generated through a survey) and LMS data. This combination of data sources and methods allowed a holistic portrait of student engagement to be drawn. These factors indicating engagement are incorporated in the model, including the three aspects of the CoI framework (teaching, social, and cognitive presence), as well as students' LMS subject access and online subject complexity. Students' final grade was included as an outcome of their learning. This model is presented in Figure 23 in Section 6.4.3.

6.4.1 Theorising a model

In this project we used SEM to establish relationships between key factors in students' learning progression, including contextual factors such as student demographics, how these contextual factors are linked to student perceptions, their actions in learning, and ultimately their learning outcomes. This framework is outlined in Figure 21.

Figure 21: Theoretical framework



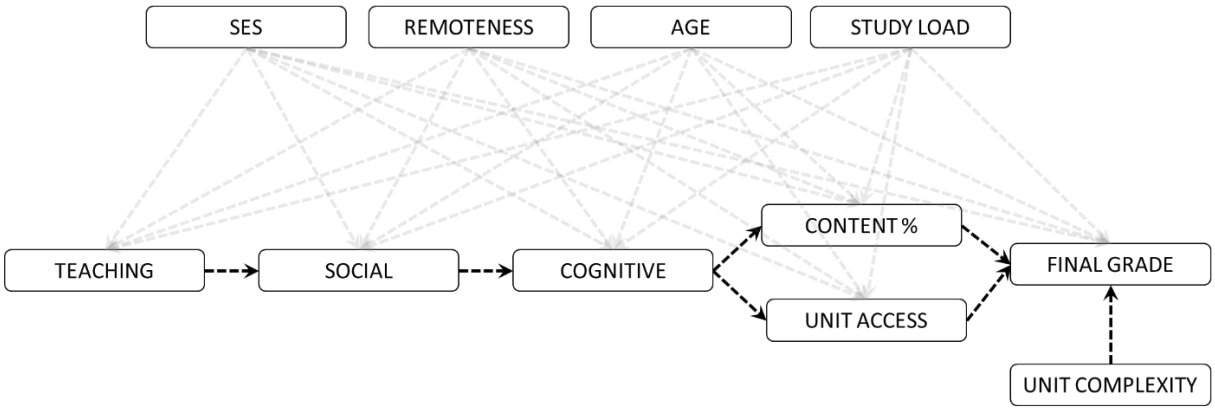
The proposed framework captures the interconnected relationships between student demographics, perceptions, actions, and outcomes in the online learning environment, aligning with established research on engagement and retention. Student demographics, including SES and RRR backgrounds, are central to understanding disparities in access and success in higher education (Farley & Burbules, 2022; Stone, 2017). Research has consistently highlighted that students from disadvantaged backgrounds face additional barriers that impact engagement, such as financial strain, digital inequities, and a lack of academic capital, that ultimately impact engagement (Li & Jackson, 2024). These factors shape students' perceptions of their learning experience, influencing their sense of belonging, motivation, and ability to persist in online courses (Pedler, et al., 2022). The framework illustrates how student perceptions, shaped by their demographic realities, inform their engagement behaviours, aligning with student engagement theories that emphasise the emotional, cognitive, and behavioural dimensions of participation (Kahu, 2013; Redmond et al., 2018).

The link between student perceptions and student actions reflects a well-established relationship in the literature, particularly within engagement and learning analytics research. Studies have shown that students who perceive greater institutional support, a strong teaching presence, and opportunities for meaningful interaction are more likely to participate actively in online learning (Garrison et al., 1999; Hopwood et al., 2023). Conversely, students who feel isolated or unsupported may disengage, leading to lower levels of participation in LMS activities such as discussion forums, assignment submissions, and content engagement (Goode et al., 2022). These engagement behaviours are strong predictors of student outcomes, with research consistently finding that students with higher LMS interaction and course engagement are more likely to complete their studies successfully (O'Shea et al., 2015; Tinto, 2014). The framework also acknowledges the direct pathway between student demographics and outcomes, capturing the reality that systemic inequities persist even when engagement levels are controlled (Australian Department of Education, 2024). Taken together, this model presents a structured approach to understanding how demographic characteristics influence students' online learning experiences, reinforcing the need for targeted interventions to support equity group students.

6.4.2 Specifying the model

SEM requires causal relationships to be explicitly specified, such as when variable *x* influences variable *y*, which in turn influences variable *z*. Apart from specific models, such as reciprocal or non-recursive models, causal relationships in SEM are generally assumed to be unidirectional. This means that feedback loops—where variable *x* influences variable *y*, which influences variable *z*, which then influences variable *x*—are typically not permitted in standard SEM due to issues of model identification and estimation. As a result, although causal inference in SEM is inherently imperfect, the model must reflect theoretically or empirically supported directional relationships between variables. These inferences are displayed in the a priori model shown in Figure 22.

Figure 22: A-Priori SEM model demonstrating relationships between proposed variables (Note: Paths between demographic variables have been displayed in grey do aid in legibility)



Student perceptions were measured through the three CoI domains: teaching presence, social presence, and cognitive presence. Following the theoretical framework proposed by Garrison et al. (2000), these were specified in the following order: teaching presence influences social presence, which in turn influences cognitive presence. This ordering reflects the assumption that effective instructional design and facilitation (teaching presence)

shape social interactions and engagement (social presence), which ultimately support deeper learning and meaning-making (cognitive presence).

Student actions were measured through two behavioural engagement indicators: (a) the percentage of content completed and (b) subject access, defined as the number of times a student accessed MyLO. Consistent with research on online learning engagement, cognitive presence was specified as directly influencing these behavioural measures. However, no causal relationship was specified between the two behavioural indicators, as their temporal precedence was not established.

Student outcomes were positioned at the end of the model, reflecting their role as dependent variables influenced by engagement and perceptions. Specifically, student actions, measured through percentage of content completed and subject access, were specified as predictors of student outcomes, while perceptions—teaching presence, social presence, and cognitive presence—were modelled as influencing these engagement indicators. This approach aligns with prior research demonstrating that CoI factors indirectly shape student performance through behavioural engagement.

Demographic and equity variables were included as exogenous variables influencing all constructs in the model, with the exception of subject complexity. This is because subject complexity is externally determined—while cohort demographics may have some indirect influence on course design, the primary decision-making authority rests with the subject coordinator or lecturer. In SEM, exogenous variables are typically assumed to influence all relevant endogenous variables unless strong theoretical justifications suggest otherwise.

6.4.3 Estimating the model

The a-priori model was estimated using maximum likelihood estimation in Stata (Version 14). Clustered robust standard errors were applied to account for possible variance due to potential clustering effects among subjects.

The initial model demonstrated poor fit based on common SEM criteria. The Root Mean Squared Error of Approximation (RMSEA) = 0.134 exceeded the acceptable threshold (< 0.08), with a confidence interval of [0.105, 0.163], indicating poor model fit. The Comparative Fit Index (CFI) = 0.742 and Tucker-Lewis Index (TLI) = 0.659 fell below the commonly accepted threshold of 0.90, suggesting inadequate fit. The Standardized Root Mean Squared Residual (SRMR) = 0.096 was above the acceptable range (< 0.08), indicating that the model did not fully capture the variance in the data.

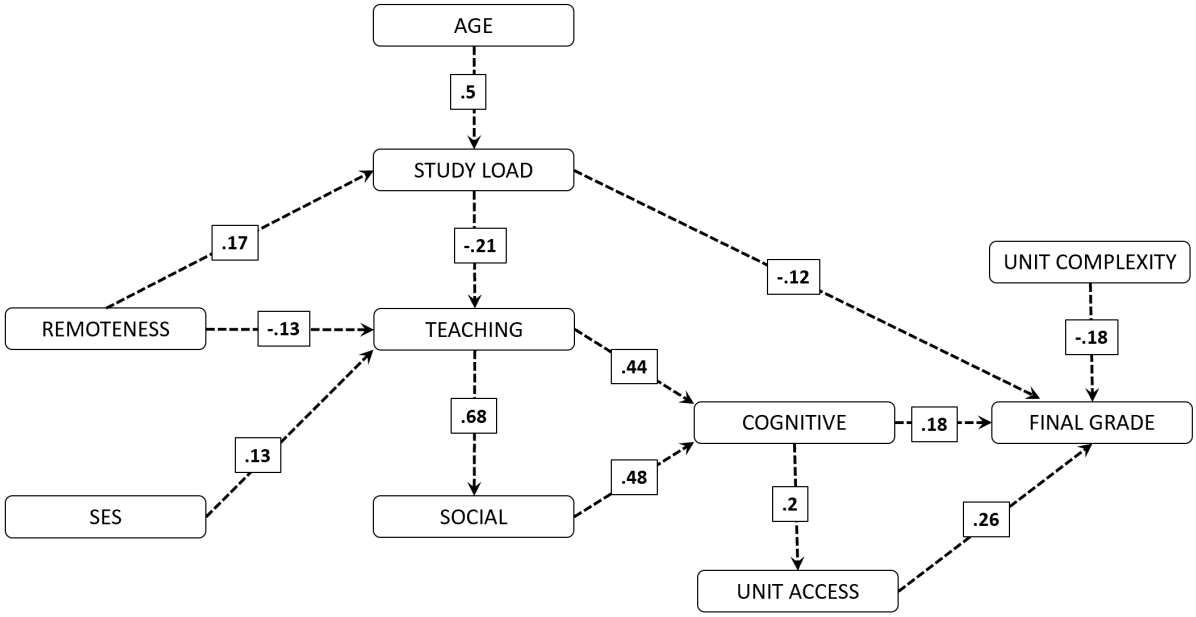
To address model misfit, modification indices were examined, identifying several potential improvements:

- A direct path between remoteness and study load, indicating that remoteness influences study load (MI = 30.3, EPC = 0.38).
- A direct path between age and study load, suggesting that age influences study load (MI = 30.1, EPC = 0.43).
- A direct path between teaching presence and cognitive presence, bypassing social presence, implying that teaching presence independently influences cognitive presence (MI = 23.6, EPC = 0.58).

In addition, percentage of content completed showed no statistically significant relationships with other variables in the model and was subsequently removed. While few statistically significant relationships were found between demographic variables and other model variables, all demographic paths were retained to account for their potential influence.

The model was then re-specified and re-estimated, the results are displayed in Figure 23.

Figure 23: Re-specified SEM model (Note: Non-statistically significant paths between demographic variables and other variables are not shown to enhance ease of model interpretation)



The re-specified model demonstrated good fit based on common structural equation modeling (SEM) criteria. The Root Mean Squared Error of Approximation (RMSEA) = 0.066 fell within the acceptable range (< 0.08), with a confidence interval of [0.010, 0.106], suggesting reasonable model fit. The Comparative Fit Index (CFI) = 0.955 and Tucker-Lewis Index (TLI) = 0.932 indicated good fit (values above 0.90 are typically considered acceptable, with > 0.95 being excellent) and the Standardized Root Mean Squared Residual (SRMR) = 0.065 is within an acceptable range, indicating that the model effectively captures most of the variance in the data.

Both SES and remoteness influence student engagement and outcomes. SES has a small positive effect on teaching presence (β = 0.13), suggesting that students from higher SES backgrounds perceive instructional delivery more favourably. This may stem from differences in prior educational experiences, access to study resources, or familiarity with academic expectations. In contrast, remoteness has a small negative effect on teaching presence (β = -0.13), indicating that students in more remote areas perceive lower instructional quality. This could reflect challenges associated with distance education, including reduced access to face-to-face interactions with instructors.

Teaching presence plays a central role in cognitive engagement, with a strong direct effect on cognitive presence (β = 0.44), highlighting the importance of instructional quality in fostering deeper learning. Additionally, teaching presence has a substantial effect on social presence (β = 0.68), which in turn strongly predicts cognitive presence (β = 0.48). This

suggests that students who perceive higher teaching quality are more likely to engage socially, which subsequently enhances their cognitive engagement. These findings reinforce the interconnected nature of instructional quality, social engagement, and cognitive engagement, emphasising the importance of a well-structured and supportive learning environment to both social and academic engagement. Cognitive presence influences subject access (β = 0.20), and subject access in turn predicts final grade (β = 0.26). This suggests that students who are more cognitively engaged with their learning materials interact more frequently with the LMS, which contributes to academic success.

Age and study load are also interrelated. Age has a strong positive effect on study load (β = 0.50), indicating that older students are significantly more likely to be enrolled full-time, possibly due to different lifestyle factors. Study load itself negatively affects both teaching presence (β = -0.21) and final grade (β = -0.12). This suggests that full-time students perceive lower instructional quality and achieve lower grades compared to their part-time counterparts. The cognitive demands of managing multiple subjects may lead to more surface-level learning and reduced engagement with individual subjects.

Finally, subject complexity has a small negative effect on final grades (β = -0.18), suggesting that more complex course structures may lower student success rates. This may indicate that courses with higher cognitive demands require additional scaffolding or pacing adjustments to support student achievement.

6.4.4 Qualitative evidence from interviews to support the model

The interview data supports the negative impact of remoteness on teaching presence, as theorised in the model. Remoteness has a direct negative effect on teaching presence suggesting that students in remote areas perceive lower instructional quality. Teaching staff and students noted that geographic isolation often led to a lack of immediate access to support services and fewer opportunities for peer interaction. Participants highlighted that students in regional and remote areas often faced technological barriers, reduced access to physical spaces for socialising, and challenges in forming study groups. Teaching staff emphasised the difficulty of identifying student needs, particularly for online learners who may be struggling but do not proactively seek support.

The interviews provided strong support for the theorised mediating role of both teaching presence and social presence in fostering cognitive engagement. The model specifies that teaching presence directly predicts both social presence and cognitive presence, with social presence also strongly influencing cognitive presence. This highlights an important indirect effect, where stronger teaching presence enhances social presence, which then contributes to cognitive engagement. Teachers consistently emphasised the importance of building relationships with students, making regular contact, and scaffolding learning experiences to ensure students remained engaged. Multiple strategies were identified, including early and frequent teacher presence, explicit scaffolding of assessments, and email reminders and checklists—all of which contributed to students' sense of engagement with the subject. The concept of "scaffolding" emerged repeatedly in discussions, particularly in first-year subjects, where lecturers designed courses to provide structured guidance for new students navigating university expectations. These findings reinforce the model's structure, where higher perceived teaching presence and social presence significantly enhance cognitive engagement through direct and indirect pathways.

Moreover, the qualitative data suggest that social presence is particularly critical for fostering engagement in blended subjects, where students who attend in-person sessions feel a stronger sense of community. Teachers in blended subjects reported that peer interactions—whether through group assignments, informal study groups, or in-person labs—enhanced student motivation and deepened learning. Conversely, fully online students often lacked these forms of social reinforcement, leading some to describe themselves as “lurkers”—students who engage cognitively but not socially. This suggests that social presence may operate differently depending on the modality of the course, an aspect that could be further explored in future research.

The qualitative findings strongly align with the model’s theorisation that cognitive engagement influences both subject access and final grades. Cognitive presence is a direct predictor of final grades as well as an indirect predictor through its effect on subject access. Student participants frequently described engagement not only in terms of direct interaction with learning materials but also in terms of self-directed and reflective learning behaviours. Some students, particularly those who self-identified as neurodivergent, reported engaging deeply with content outside of formal study time—exploring related materials, applying concepts to their everyday lives, or reflecting on their learning in ways that extended beyond direct subject access. This aligns with the theorised direct and indirect paths from cognitive engagement to final grades, suggesting that engaged students may achieve success through multiple mechanisms beyond LMS interactions alone.

The negative path between subject complexity and final grades in the model is well-supported by the qualitative findings, particularly in discussions about cognitive load and course design. Teachers and students emphasised that courses with excessive or poorly structured content could create barriers to engagement and success. One theme that emerged was the need for greater consistency in online subject design—students reported that variability in course layout and navigation across different subjects added to their cognitive burden. This aligns with cognitive load theory (Sweller, 2020), which suggests that extraneous cognitive demands—such as complex or inconsistent learning environments—can reduce students' ability to process core content effectively.

Furthermore, teachers reflected on the challenge of balancing course depth with accessibility, particularly in multidisciplinary subjects. Those subjects designed based on UDL principles, allowing flexibility in how activities and assessments are conducted (Dyment et al., 2019), were well received by students. Some teachers designed assessments that allowed students to approach content from their own disciplinary perspectives, helping to reduce the perceived complexity of material while maintaining academic rigour. This suggests that the negative effect of subject complexity on final grades may be moderated by instructional design choices, such as scaffolding, personalisation, and adaptive learning strategies.

Finally, it is interesting to note that the positive relationship between age and study load in this SEM model goes against the common assumption that older students are expected to balance university with work and family, making part-time study the more practical choice. Although this was not explicitly addressed within the qualitative data (as this was not the focus of interviews), it is possible that older students in the sample may be pursuing a career change, either due to job loss, industry changes, or personal reassessment, especially given the relatively recent impact of the COVID-19 pandemic on the economy and labour market. With more financial stability than younger students—whether from savings, redundancy

payouts, or partner/family support—they may have the flexibility to commit to full-time study to complete their degrees as quickly as possible and subsequently make the transition between careers smoother and more financially viable.

7. Discussion

7.1 Understanding online engagement of low SES and RRR students

The findings of this project highlight the significant changes in student profile over the past few decades, calling for reconsideration of student equity groups. To date, the equity groups defined by Department of Employment, Education and Training's (1990) equity policy document continue to be influential and guiding discussions and support for students in these groups:

- First Nation students
- students from low SES locations
- students who report a disability
- female students in non-traditional disciplinary areas
- students from regional, rural, and remote locations
- students from non-English speaking backgrounds.

These six groups continue to be used in Australian Government policy now (Department of Education, Skills, and Employment, 2020). More recent research, however, portrays a more complex picture of students' equity profile with students coming into higher education with multiple challenges. For instance, Ajjawi at al. (2025) used the metaphor "house of cards" (p. 1), to describe how students with complex backgrounds are having to study in unstable or fragile situations, which often involve institutional structural barriers. In this study, we use a term proposed by Trimble (2023), "multiple associated challenges which act in concert" (p. 93), to describe the compounding and the multiplicity of challenges that impact on students' study in tertiary education.

For those online students who enter university study with multiple associated challenges, this study calls for a reconceptualisation of engagement as well as holistic approaches to teaching and supporting these students. Previous research provides evidence that, with appropriate support, online students can achieve positive outcomes for engagement online (Stone, 2017, 2019). This research further unpacked online engagement for low SES and RRR students as learners with multiple associated challenges. This project used Garrison et al.'s (2000) Community of Inquiry (CoI) framework as the underpinning theoretical framework to analyse and understand student engagement in the selected online and blended subjects at the target university. The three key aspects of engagement identified in this model, including teaching, social, and cognitive presence, were a useful framework for the examination of online engagement of low SES and RRR students in this study.

The holistic model developed and presented in Section 6.4 provided a comprehensive picture of the interconnected relationships between student demographics (for example, remoteness, SES, age, and study load), their perceptions, actions, as well as study outcomes in the online learning environment (for example, final grade). The students participating in the interviews in this study were open in discussing the challenges they face. While only SES, remoteness, and online learning mode were used as inclusion criteria for

selecting interview participants, these students openly shared other challenges that affect their learning, including mature age status, other family responsibilities associated with their life stages, First Nations background, neurodivergence, and mental health issues.

Online and blended learning offers these students the affordance to participate in higher education, which they would not have been able to access otherwise. The role of online learning in creating education accessibility and eliminating barriers is well documented in the literature (for example, see Stone & O'Shea, 2024). These barriers include geographic locations for those living in remote areas, having limited transportation choices, or having physical disabilities that limit the ability to travel; and time barriers for those mature age students who have other work, family or childcare responsibilities (Stone, 2017, 2019). Findings from this study add to existing literature on how online learning helps these students to overcome geographic and time barriers.

In addition to geographic and time barriers, this study highlights the accessibility to higher education opportunities created by online learning for those who are neurodiverse or live with mental health issues. For many of these students, studying online is their preferred method and a thought-through choice, as it allows them to learn in the style and patterns that suit their needs, and in some cases gives them a sense of safety.

The findings of this research also provide further evidence of the diversity in age groups of these online students, which is also linked to students' aspirations for university study and their choice of studying online. While among the students there were school leavers who had just completed Year 12, there were a large proportion of online students who were above the age of 25 years. These mature age students choose to do their study online for various reasons, including getting qualifications for employment, change of career pathways, personal interests, and advancing skills relevant to their workforce. These students may or may not have the academic and technology skills required upon entering their university study.

In recognising the increasing diversity in student characteristics and needs, this report recommends that teachers should learn about the characteristics and needs of their learner cohorts and continuously inform their pedagogy by reflecting on what students say they need (see Recommendation 1). Those teaching in large online subjects, or blended subjects that have a significant online component, should use Universal Design of Learning (UDL) principles to cater for the needs of the diverse cohort (see Recommendation 3). In supporting teachers to cater for the increasingly diverse cohort, institutions should align support and resources to match the needs of the cohort and staff supporting them (see Recommendation 8).

7.2 Toolkit to support engagement of low SES and RRR students

The findings have also contributed to the development of a toolkit (see Table 6), demonstrating effective pedagogical practices in supporting and engaging low SES students and RRR students in fully online and blended courses that have a significant online component. These tools were collated from the effective pedagogical approaches the teacher participants revealed in this study, which had a focus on low SES and RRR

students, although it is important to note their relevance to wider online student cohorts and large online subject offerings. These approaches were designed or adopted by the teachers in anticipation of large student cohorts with diverse backgrounds and multiple associated challenges, including low SES and RRR students as significant groups.

These pedagogical approaches are categorised according to the purpose teachers would hope to achieve, including: 1) social engagement/integration, and 2) cognitive engagement/learning. This structure is guided by the theoretical framework we have chosen to use in this study—that is, the CoI framework—as well as a focus of the project which is to examine the impact of teachers' pedagogical approaches on students' social and cognitive engagement (Aim 2). In this project, we recommend that teachers in online and blended subjects should select and adopt approaches presented in the toolkit, based on their understanding of their learner cohort (see Recommendation 4).

In developing the toolkit, teachers are recognised as one important and essential step within the holistic approach for student support. The teachers involved in this study clearly had a non-academic/pastoral role to play in supporting students. Students often saw their subject teachers as the first point of contact when seeking support. This requires teachers to be familiar with institutional level support that is available and how to assist their students to access this support (see Recommendations 2 and 7). This expectation for online teachers to take on a pastoral support role appears to be stronger and more significant than what has been observed in on-campus environments (Kember et al., 2023).

Another point that is significant in the toolkit is about the organisation of the teaching content. How the content is presented in the virtual space is just as important as the quality of the content to student experience. The findings of this project reveals that the low SES and RRR students very often belong to more than one equity group or background. Therefore, they should be recognised and supported as students with multiple associated challenges. With this recognition, in the design and layout of their online teaching spaces, teachers should organise content in ways that help reduce remand on cognitive load for students, and therefore, students will be able to focus their time and energy on understanding the content and retaining knowledge (see Recommendation 6).

Table 6: A toolkit with pedagogical practices to support students with diverse backgrounds

	Purpose	Pedagogical approaches	Explanations/examples
Social engagement/integration	**Fostering a sense of belonging**	Creating a sense of place	• Using a virtual map to show students the geographic locations of the group members, developing a sense of both physical place and the online group as a sense of virtual place.
		Creating online identity	• Encouraging students to turn on cameras during Zoom sessions. • Having introductory activities for students to introduce themselves to the group.
	Community-building	Creating group identity	• Finding commonalities amongst group members. • Encouraging students to gather offline where possible.
		Collaborative activities/ assessment	• Getting students to engage with their peers as part of assessments. • Students have split responses on group assessments; not all students are in favour of this approach.
		Discussion boards	• Can be a double-edged sword. • Can work for online community-building but needs to be done in a way that is not forced.
		Padlet	• Can be used as an alternative to online discussion boards. • Can be embedded into the LMS or linked as an external tool. • Provides more presentations allowing more diverse means of interaction and engagement.
		Consultation time on zoom	• Staying five minutes after a Zoom session, allowing students to ask questions. • Providing virtual or physical spaces for students' "fireside chats."
	Feeding into overall support	Providing pastoral care	• Being proactive in reaching out to students where signs of distress is detected. • Being responsive when students reach out when they are in challenging situations. • Communicating with other teachers teaching the same student who is experiencing challenges, with awareness of the need to protect privacy.
		Including co-curricular content on support	• First-year subjects to provide co-curricular content to equip students with academic and non-academic skills for the next stage of their university course. • Teaching students to be more aware of their own needs. • Teaching and encouraging help-seeking behaviour and culture.
		Linking to central support services	• Having clear awareness of the structure of central university support services. • Acting as conduit to triage students to university central support services.

	Purpose	Pedagogical approaches	Explanations/examples
Cognitive engagement/learning	**Providing updates**	Announcements and bulk emails	• Can be effective in information sharing, especially when used as a consistent approach across subjects, e.g., subjects taught in the same semester all use weekly announcements for updates.
		FAQ space	• A repository with a collection of information, reflecting anticipated questions from students, or based on questions received from students in previous deliveries.
	Content delivery	LMS layout	• Content can be delivered in a variety of ways, following UDL guidelines. • Allowing flexible pacing is crucial, catering for students who learn at different times of the day or week, and with different learning styles.
		Interactive platforms	• External platforms (e.g., H5P) offer additional functions and presentation options, which can be more aesthetically pleasing or more fit for purpose.
		Scaffolding	• Relevant to students from any backgrounds and studying at any stages. • Crucial for students in first-year subjects. • Important to ensure constructive alignment between the subject's intended learning outcomes, activities, and assessments.
		Guest lectures	• Having input from someone outside of the teaching team enhances student motivation. • Can be inspiring when national experts in the teaching area visit as guest lecturers. • Preparing students before the guest lecture on how to interact with guest lecturers further enhances the learning experience.
	Content organisation	Logical flow	• Easy to navigate; minimise interruptions; focusing students' efforts on understanding content.
		Consistency	• Templates can be used to allow some degree of consistency across LMS subject spaces.
		Aesthetics	• Visually appealing interfaces to enhance student motivation.
	Assessment	Summative	• Need to be relevant to the student and their discipline. • Students need to be prepared for the type of assessment, e.g., how to write in the particular genre required.
		Formative	• Reflective tasks to consolidate content for the week. • Earlier assessments to allow for preparation of later/larger assessment tasks.
		Alternative tools	• PebblePad can be used as an alternative to LMS assignment dropbox, providing a space for evidence collection over the course of study.

7.3 Enabling social integration through community-building, sense of belonging, and sense of place

The findings show that teachers play an important role in supporting the social integration of online students, including low SES and RRR students, through community-building and creating a sense of belonging and a sense of place. While Tinto's (1975, 2014) work has shown the importance of early social and academic integration for on-campus students and Kember and Hicks (2023) among others have extended this to online students, there is still a dearth of research on the importance of academic and social integration for online *equity* students. Our research builds on the previous research and adds to it an equity lens.

In terms of social integration, in addition to engaging with the subject materials, other students and teachers, the qualitative findings show that a sense of belonging is important to students as well as teachers. However, as previously described for social presence (see Section 4.4.2), this may not be uniform across delivery modalities nor across learning styles. Creating a sense of belonging may require a multifaceted approach that considers students' diverse preferences and learning styles, emphasising meaningful, interactive, and flexible opportunities for connection. For example, the use of personalised avatars in Zoom sessions helped recreate a classroom atmosphere by allowing students to express their identity and "see" each other while maintaining a presence in the virtual learning space, whether or not their cameras were turned on. The development of parasocial relationships—one-sided social connections often formed in virtual spaces—also played a role. As students repeatedly interacted with teachers and peers through discussion boards, video lectures, video announcements, and synchronous meetings, they began to develop a sense of familiarity and personal connection, even with individuals they had never met in person. These strategies helped to transform online platforms from neutral, impersonal spaces into dynamic learning environments where students felt seen, acknowledged and connected.

A strong virtual sense of place also contributed to student engagement and a feeling of belonging in online learning environments. The use of interactive mapping tools, such as a Google map marking students' geographic locations and courses, provided a visual anchor that helped students feel connected to their peers despite physical distance. The simple act of showing this to students in the first session allowed students to see that no matter where they were geographically located, they were part of the group and they belonged. By providing intentional opportunities for identity-building and interaction while allowing for students to participate in their subjects in a manner that best suits their learning style, teachers can create an environment where students experience a sense of belonging and place (see Recommendation 5).

In addition to virtual place, physical place also plays a role in relationship-building and developing a sense of belonging. Students studying online and staff teaching blended units found that having a physical space on campus had the potential to provide opportunities for socialising, studying, and accessing support from peers and staff. Regional University Study Hubs are one example of how physical spaces can be extended to RRR students (Davis & Taylor, 2019). These hubs allow RRR students studying online to access university

resources, including academic and non-academic support services, as well as face-to-face interaction with their peers without having to travel long distances to main campuses.

Apart from teachers taking on an active role in supporting social integration, this project also recommends that these teachers should be supported by the university. Universities should prioritise improving online pedagogies and fostering interactive and socially engaging virtual environments and how students from various equity groups respond to these approaches (see Recommendation 14). In addition, universities should explore ways to understand and track students' social presence/engagement in online learning (see Recommendation 13).

7.4 Calling for a whole-of-institution support system

The findings of this research indicate a need for a whole-of-institution support system to support students in equity groups, including low SES and RRR students. A holistic system within universities, which recognises and includes the overlapping and connected layers that comprise support, is key to providing robust and effective support. These layers include: (a) support provided to students by teachers and support staff from central services, (b) support that teachers and support staff provide to each other, and (c) support that university administration provides to teachers and support staff. In the case of this research, many layers were already connected, however, support for teachers and support staff and strong connections between support staff and teachers could be strengthened.

This study has observed improved awareness among students about university central support services, as compared to previous research (Kember, Ellis, et al., 2023). While the students involved in the interviews in this study were generally aware of the university's central support services, the teachers in individual subjects remained the first point of contact for students. This study reveals a need to better support teachers and equip them with skills and time to support their diverse student cohorts. Teachers being seen as the first point of contact was a result of the positive relationships and trust that they were able to build with their students. However, this also meant that, in many cases, the teachers felt underprepared for dealing with complex issues brought about by students' multiple associated challenges. This was experienced particularly in areas of the university where more complex needs of students presented (for example, first-year subjects).

Teachers were challenged by the complex types of issues students experience, including family and health issues, financial hardship, and technology access. Some of these require specific knowledge and training to be able to provide assistance. For instance, providing pastoral care to students experiencing hardship is crucial (Crawford et al., 2018), however, work like this requires significant emotional input to show empathy, to analyse the situation, and to provide suggestions and/or solutions (Lynch & Klima, 2020). Teachers working in higher education also need mentoring and counselling support (Barnes et al., 2024). Even where the teachers do have the knowledge and skills to support students in need, they may not have the time to do this. Their work is guided by workload relevant to teaching, which generally has limited allowance for providing other types of assistance to students. When determining workload for teachers, universities should factor in time for pastoral care in addition to relevant teaching.

The findings of this research support the suggested approaches mentioned in previous research, that is, teachers provide a triage system for students who need additional assistance (Kember, et al., 2023) and developing relationships between support service staff and teaching staff (Fischer & Kilpatrick, 2023; Kilpatrick et al., 2023). Previous research has shown that when support service staff know each other and work together, support services are more effective. This research indicates that developing stronger relationships between teachers and support service staff could further strengthen the support system. Institutions should make learning and teaching data more accessible, allowing leaderships at different levels and teachers in individual subjects to understand their student cohorts better (see Recommendation 11). Teachers and universities should design a co-curricular support framework to support each key stage of study and help students to move on to the next stage of their university course. This co-curricular support framework should be informed by learning support services requested by equity students for successful progression (see Recommendation 9).

This research also calls for more effective preventative and proactive approaches in identifying and supporting at-risk students (see Recommendation 12). Current approaches at the subject level are mostly reactive—teachers in individual subjects have limited abilities to identify at-risk students before these students reach out to the teacher. It should be noted that students who chose to seek support received the support they sought, however, it was harder for teachers and support staff to identify the need for support in individual students who did not reach out for assistance.

This study found two possible solutions to help with this situation. First, students should be encouraged to actively seek support, and institutions should work with students to develop the skills to identify when assistance is needed and, importantly, to take action once students realise they need assistance (see Recommendation 2). Second, this study calls for more innovative ways of data integration to reveal student engagement patterns. This project is an attempt at using a combination of student self-reported data alongside LMS data to reveal student engagement patterns. The results demonstrate the value of such an approach. Another example is the initiative at the target university that integrates student demographic data and LMS data to identify dis-engaged students. Therefore, in this project we call for more innovative approaches of data integration, to better understand student engagement and to support early identification of and intervention for students who are disengaged (see Recommendations 12 and 13).

7.5 Lessons learned that could inform future research on student equity in higher education

Universities are increasingly relying on data-driven decision-making to shape policies, allocate resources, and inform teaching practices. The rise of learning analytics, institutional data systems, and predictive modelling has led to a growing emphasis on metrics to assess student engagement, success, and risk factors. While data can provide valuable insights, they also introduce several challenges, particularly in the categorisation of students and in their suitability to measure levels of engagement (for example, via the use of LMS data). Existing classification methods often fail to capture the complexities of student experiences,

leading to potential misidentification and ineffective policy interventions. LMS data “overall” is an unreliable measure of student engagement beyond the subjects within which it has been captured.

7.5.1 Challenges of LMS data

LMS data are frequently used as a proxy for student engagement, with metrics similar to those explored within this project (for example, login frequency, time spent on the platform, discussion board activity, and content completion) employed to assess learning behaviours. However, there are fundamental issues with these measures that must be acknowledged. There is often a level of professional autonomy in the design of online content within higher education. Subsequently, the online presence of a subject can look quite different both between subjects and disciplines leading to inconsistencies in how students interact in the online space and subsequently, difficulty in determining which metrics (if any) evidence student engagement.

Even the most (seemingly) logical metrics can be a poor reflection of student engagement. For example, as noted within the project methodology, LMS data often tracks total time spent on a subject’s site as an indicator of engagement, but this measure does not distinguish between active engagement (for example, reading materials, watching lectures, and completing activities) and passive presence (for example, logging in to check a deadline and leaving the tab open). In addition to this, within the MyLO environment employed by UTAS, students may also download materials and study offline, meaning their actual engagement is invisible in LMS records. It is worth noting here that this issue is likely to be prevalent across most Australian universities.[6] Similarly, certain LMS activities may be mandatory for course completion. These activities will artificially inflate engagement metrics, making it appear as though students are highly engaged when, in reality, they are simply completing required tasks—nothing more, nothing less.

These issues are particularly problematic if LMS metrics are to be employed as a way to flag disengaged students—something that is becoming increasingly popular both in Australian universities and more broadly. In essence, those who prefer offline study methods or engage with materials in non-traditional ways may be incorrectly flagged as disengaged. Conversely, students who frequently log in but do not meaningfully interact with content may be overlooked. In addition to this, there is also potential for significant bias against students from a range of equity groups—the groups that these big data approaches often claim to support. For example, students from remote areas with unreliable internet access may log in less frequently but still be actively engaging with their studies. Similarly, mature age students with work and family commitments may engage differently from younger students, yet LMS data do not account for these contextual factors. Finally, at least in the context of UTAS, it is common for students with disability (for example, visual, print, and auditory) to be accessing content entirely outside of the LMS (for example, transcripts and recordings provided by disability services)—these students are often almost entirely invisible within LMS records. In essence, we risk first identifying students from equity groups as “at risk” based on broad institutional discourse, only to flag them again when their online behaviour—shaped by their unique circumstances—doesn’t align with conventional engagement patterns. At what point

[6] There are four main brands of LMS in operation across Australian universities: Blackboard, Moodle, Canvas, and D2L (Brightspace). As far as we are aware, there is an option in all LMS systems for students to download content and work offline. Subsequently, the same data distortions are likely to plague all LMS analysis in Australian universities. Even if there is the capacity to register whether content has been downloaded, it is impossible to assign a metric to a student who has done this—you can’t measure what you can’t observe.

do these repeated flags stop signalling concern and start becoming the very barriers they claim to dismantle?

7.5.2 Complexity of remoteness in HE

The classification of remoteness in education has traditionally relied on frameworks such as the Accessibility/Remoteness Index of Australia (ASGC-RA). However, this model has been found to be inadequate in circumstances where relatively short distances can mask significant disparities in access to services. For instance, as discussed earlier in the report. In the Tasmanian context, under the ASGC-RA model, both Melaleuca, a remote settlement accessible only by light plane or an eight-day trek, and Swansea, a coastal town with essential services, are classified as "remote," despite their vastly different levels of accessibility. This rigid classification system fails to reflect the lived realities of students, creating challenges for equity policies that rely on geographic indicators. In this respect, the MMM method of classifying remoteness is better albeit still imperfect. Within the Tasmanian context, it is significantly distorted by Devonport and Burnie (Tasmania's 3rd and 4th largest cities) and the almost complete absence of MM4 (medium rural town) Classifications.

7.5.3 Shifting nature of SES

SES classification is far more complex than simply identifying where a student lives. Broad geographic areas are a particularly poor indicator of an individual's SES, as they often encompass a diverse range of population demographics within the same region (Wilks et al., 2019). This issue is especially pronounced in locations with significant student populations.

In the Tasmanian context, for example, the suburb of Sandy Bay includes a mix of university students living in rental accommodation and some of the wealthiest individuals and families in the state. While many students in the area struggle with rising rent costs and financial insecurity, Sandy Bay is also known for its high-value real estate, with median house prices currently sitting at $1.35 million and continuing to rise (Pitman et al., 2017). Using geographic classifications alone provides no meaningful insight into a student's actual financial circumstances, as areas can contain stark contrasts in wealth and opportunity.

Compounding these classification challenges is the fact that SES itself is not static. Inflation and rising cost-of-living pressures have dramatically altered what it means to be low SES. The financial struggles experienced by low SES students 15 years ago—such as limited access to housing, the necessity of working multiple jobs to support study, and an inability to afford essential resources—are now becoming the reality for middle-class students. This issue will only become more pronounced as the current economic climate endures. Many students who might previously have been considered financially stable are now experiencing significant economic stress, forcing them to make difficult trade-offs between study and basic living expenses.

8. Recommendations and conclusion

Based on the findings and discussions, this report provides the following 14 recommendations. Recommendations 1 to 7 are relevant to subject-level pedagogical approaches. Recommendations 8 to 14 are relevant to institutional-level support for universities. Recommendations for future research are also provided at the end of this section.

8.1 Recommendations for subject-level pedagogical approaches

1. Teachers should learn about the characteristics and needs of their learner cohorts and continuously inform their pedagogy by reflecting on what students say they need.
    - **Rationale:** Teachers in higher education nowadays are catering for increasingly diverse cohorts with complex needs across their candidature. Student backgrounds differ between disciplines, courses and subjects, and between offerings across years. To achieve positive outcomes and experiences, it is vital for all teachers to learn about common and unique diversity needs in their learner cohorts at key stages of their degree, and use this information to use an increasingly more informed pedagogy that addresses the impediments students face.

2. Teachers should embed links between the formal curriculum and co-curricula support and resources in subject level design to help students understand what help is available for their studies.
    - **Rationale:** While it is important to recognise the range of capitals equity students bring to higher education (Yosso, 2005; O'Shea, 2016), it is also important to identify gaps in their academic knowledge and skill sets and provide support to bridge these gaps. Pathway programs and first year subjects have an important role to play in preparing these students for university life and the network of co-curricular support that is available to them. Awareness of the academic, pastoral and social services and support available in a university's co-curricular framework should be embedded in gateway subjects of the student's degree (Ellis, 2024).

3. Teachers in large online subjects, or blended subjects that have a significant online component, should use Universal Design of Learning (UDL) principles, to cater for the needs of the diverse cohort.
    - **Rationale:** It is becoming increasingly common for online subjects to have multiple learner cohorts, from multiple disciplines, different year groups, and with diverse backgrounds. While simultaneously recognising that diversification is important, activities and assessments can be designed in ways that are flexible and allow students to explore their diverse interests.

4. This report provides a toolkit with a range of tools that can be used to foster student engagement. Teachers in online and blended subjects should select the tools suitable for their learner cohorts.
    - **Rationale:** The toolkit presented in Section 7.2 of this report includes a range of pedagogical approaches and tools that have been summarised from those used and proven to be effective in the subjects that participated in this study. It is evident from this study that equity students can learn online effectively and achieve equally positive learning experiences as their peer students.

5. To foster social integration, teachers should aim to create a sense of belonging and a sense of (virtual) place through online community-building.
    - **Rationale:** Creating a sense of belonging and a sense of place is conducive to fostering social integration among students. It is possible to create a sense of belonging and a sense of (virtual) place among online students, including low SES and RRR students studying online. The teachers in this study have used a variety of activities, which have been effective in fostering online community-building. Through these activities, students have been able to develop a sense of belonging, a sense of place, and group identity, and thereby achieved social integration into the learning environment.

6. Teachers should aim to reduce cognitive load for students through the design and layout of their online teaching spaces.
    - **Rationale:** Students' learning experiences are not only impacted by the quality of the teaching content, but also the organisation and presentation of the content. Teachers should present their subject's online spaces with a logical and clear flow, allowing easy navigation. Teachers teaching in the same course or discipline should design online spaces with streamlined and consistent layouts across subjects, helping reduce students' cognitive load. Aesthetically pleasing presentations can also help enhance students' motivation for learning and thereby enhance their learning experience.

7. Teachers should be familiar with institutional level support and how to assist students to access them.
    - **Rationale:** Online students would often turn to their teachers as the first point of contact when experiencing difficulties, either academic-related or non-academic. While teachers are able to answer some of these queries, in many cases, the students would benefit from institutional level support and support staff with specialised knowledge relevant to the issue. Teachers should be familiar with the university central support structure in order to triage students to the most appropriate support channel.

8.2 Recommendations for institution-level support

8. As access expands and cohorts become more diverse, institutions should align support and resources to match the needs of the cohort and staff supporting them.
    - **Rationale:** Institutions should recognise that an expanded student intake indicates the need for more diverse teaching approaches. They should recognise the level of

pastoral care and emotional labour demanded in supporting diverse student cohorts, the amount of time required to provide UDL approaches and create learning communities, as well as the technology support required to conduct teaching online.

9. Learning support services requested by equity students for successful progression should inform the design of a co-curricular support framework that supports each key stage of their degree in order to help them to move on to the next stage of their university course.
    - **Rationale:** While it is important to recognise the range of capitals equity students bring to higher education (Yosso, 2005; O'Shea, 2016), it is also important to identify gaps in their academic knowledge and skill sets and provide support to bridge these gaps. These gaps will change depending on the equity group and on the stage of the candidature. For example, co-curricular support through orientation, peer mentoring and workshops on key issues such as academic literacies, academic integrity, how to navigate the LMS, how to complete assessments and career exploring should be embedded in students' first year experience (Ellis, 2024).

10. Universities should prioritise improving online pedagogies and fostering interactive and socially engaging virtual environments and how student from various equity groups respond to these approaches.
    - **Rationale:** While SES backgrounds and remoteness impact students' university experiences, teaching quality and social presence have a far greater influence. Instead of focusing solely on student engagement patterns, universities should prioritise improving online pedagogies and fostering interactive and socially engaging virtual environments and how students from various equity groups respond to these approaches.

11. Institutions should explore ways to understand and track students' social presence/engagement in online learning.
    - **Rationale:** A finding of this study challenges the traditional notion that learning is a social construct and students must interact with other students in order to learn. While it is clear that learning communities can occur online, and that online/virtual learning communities are a facilitating factor in students' social integration and learning, students do not always participate in the way teachers expect. Compulsory discussion board participation, for instance, is disliked by some students. Some students can appear as quiet observers but achieve positive learning outcomes. Institutions should understand their student cohorts and encourage ways of engagement that are most conducive to learning.

12. Institutions should seek higher accessibility and presentation of learning and teaching data, allowing leaderships at different levels, and teachers in individual subjects, to understand their student cohorts better.
    - **Rationale:** Teachers seek to understand their student cohort and have effective methods to track student engagement and progression. University leadership at institution, school, and course levels can also benefit tremendously from effectively using learning and teaching data dashboards. Allowing staff access to relevant data according to their level of responsibilities and roles needs to be coordinated at the institutional level. It is also important to note that the quality of the LMS data available

is also affected by the platform adopted. Therefore, the harvesting and storing of chronological LMS data, allowing the revelation of patterns over time, are an investment at the institutional level.

13. Institutions should have more preventative approaches in supporting equity students and identifying at-risk students.
    - **Rationale:** Teachers feel reactive and powerless when it comes to identifying at-risk students from large online subjects. Students are expected to approach the teachers when they need help. However, students from equity groups can feel reluctant to seek help or disclose the difficulty they face. They may also not know who to contact. Using demographic information alone for identification may not be sufficient or effective. More preventative approaches, such as using a combination of student demographic data and engagement data in LMS, can be effective ways to allow early identification and intervention.

14. Institutions should seek innovative approaches of data integration, to better understand student engagement and to support early identification of and intervention for students who are disengaged.
    - **Rationale:** Combining LMS data with students' self-reported data presents great potential in revealing student learning and engagement patterns. However, LMS data appear very differently between individual subjects, and the quality and clarity of the data depend largely on how individual subjects are designed in the LMS. When using LMS data, institutions should interpret the data in light of the academic context and be aware of the varied quality and reliability of the data available. Understanding the pedagogical design and the academic context is crucial for accurate interpretation of the LMS data.

8.3 Recommendations for future research

This study offers the following recommendations for future research directions:

- Explore more effective ways to understand the shifting nature of SES and interactions of low SES with other factors, such as neurodiversity, remoteness, and mature age.
- Explore better ways to categorise remoteness and examine how remoteness is defined at universities.
- Explore other ways in which LMS data analytics can be used to reveal engagement patterns of equity students studying online and to support their learning experiences.
- Explore the implementation of co-curricular activities in first-year experiences and in pathway programs and examine the effectiveness of these activities.
- Examine the effectiveness and good practice of university central support systems in supporting students with multiple associated challenges and teachers teaching these students.
- Examine other ways in which online content can be organised and delivered to reduce students' cognitive load and improve aesthetics of online learning environments.
- Examine the level of awareness among teachers of neurodiverse students, exploring pedagogical approaches to support these students.

- Examine perceptions of teachers and equity students learning online on the use of GenAI, and barriers and opportunities being brought by GenAI to students in equity groups.

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10. Appendices

10.1 Appendix A—Instrument validation

10.1.1 Sample size

Recommendations for sample size in factor analysis vary widely (for example, $n > 100$; $n > 250$, > 3 per item, > 10 per item, it depends on the communalities, etc[7]). Although there is little consensus (and little empirical evidence) in the literature regarding specifics, there is a clear consensus that larger sample sizes are likely to yield better results. Subsequently, for the purpose of validation, the survey data collected for the current project were combined with data collected from a previous project employing the same survey resulting in a sample size of $n = 304$.

10.1.2 Dimensionality

The data were then assessed for their suitability for factor analysis. Results for both Bartlett's test of sphericity (Chi-Square = 9991.702, Df = 595, P < .001) and the Kaiser-Meyer-Olkin test for sampling adequacy (KMO = .962) suggested that the data were a good candidate for exploratory factor analysis. Subsequently an exploratory factor analysis was conducted. Factors were extracted using the principal factor method. Based on the Kaiser criterion (Eigenvalues > 1) this revealed a clear three-factor solution in the data, which accounted for approximately 70% in the variance of responses (see Table 7—note table has been truncated to preserve space).

Table 7: Factor extraction

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor 1	20.27313	17.56824	0.5792	0.5792
Factor 2	2.70489	1.11411	0.0773	0.6565
Factor 3	1.59078	0.72049	0.0455	0.702
Factor 4	0.87029	0.06035	0.0249	0.7268
Factor 5	0.80995	0.10849	0.0231	0.75

The factor solution was then obliquely rotated[8] (Promax). This revealed a clear pattern of factor loadings that, in almost all instances, considerably exceeded traditional heuristics[9] aligned with the theorised constructs (see Table 8). However, "Discussions in this subject were valuable in helping me appreciate different perspectives" within the cognitive presence construct demonstrated both a low loading (.39) and a high cross loading (.37) with the social presence construct. We theorise that this is likely to be a result of the item's wording and the specific context of learning and teaching at UTAS. In essence, as identified within

[7] For a full discussion regarding the variation in recommendations see Zhang and Hong (1999).
[8] This method was employed as it was theorised that these factors were highly likely to be correlated.
[9] Again, there are a diverse range of recommendations in the literature regarding cut-off points for factor loadings and cross-loadings. In this instance, we have applied one of the more stringent of these—factor loadings > .5; average communality > .05; cross loading <75% of the factor loading.

the report, “discussion boards” are a prominent feature of many units in both online and face-to-face modalities[10], which are often colloquially referred to by staff and students as discussions. Subsequently, it is likely that this created a level of ambiguity in interpretation.

Table 8: Rotated factor solution

Construct	Item	F 1	F 2	F 3
Teaching presence	The teaching team clearly communicated important topics in this unit.	.78	.23	-.18
	The teaching team clearly communicated the Learning Outcomes for the unit.	.77	.18	-.18
	The teaching team provided clear instructions on how to participate in the unit’s learning activities.	.84	.05	-.05
	The teaching team clearly communicated important due dates/time frames for learning activities.	.78	.11	-.13
	The teaching team was helpful in identifying areas of agreement and disagreement on course topics that helped me to learn.	.71	.01	.17
	The teaching team was helpful in guiding the class towards understanding topics.	.79	.10	.01
	The teaching team helped me clarify my thinking around important topics.	.79	-.01	.13
	The teaching team helped to keep students engaged and participating in productive dialogue.	.82	-.01	.12
	The teaching team helped keep students on task in a way that helped me to learn.	.82	-.02	.14
	The teaching team encouraged students to explore new concepts in this unit.	.68	.19	-.03
	The teaching team’s actions reinforced the development of a sense of community among students.	.72	-.06	.30
	The teaching team helped to focus discussion on relevant key concepts in a way that helped me to learn.	.70	.14	.11
	The teaching team provided feedback that helped me understand my strengths and weaknesses relative to the unit’s goals and objectives.	.65	.05	.19
	The teaching team provided feedback in a timely fashion.	.62	.11	.04
Social integration	I felt a sense of belonging in this unit.	.37	-.05	.63
	I was able to form distinct impressions of some students in the unit.	.10	-.16	.84
	Online or web-based communication is an excellent medium for social interaction.	.01	-.03	.76

[10] Naturally, their use differs between units and modalities—e.g., they may be used to answer questions about assessments, as a medium for online interaction between students and teachers, or between students themselves.

Construct	Item	F 1	F 2	F 3
	I felt comfortable conversing through the online medium.	-.02	.21	.65
	I felt comfortable participating in the unit discussions.	.02	.27	.61
	I felt comfortable interacting with other students in the unit.	-.10	.24	.76
	I felt comfortable disagreeing with other students in the unit while still maintaining a sense of trust.	-.14	.12	.77
	I felt that my point of view was acknowledged by other students in the unit.	-.01	.10	.78
	Discussions in this unit helped me to develop a sense of collaboration.	.17	-.01	.77
Cognitive engagement	Problems posed increased my interest in unit issues.	.08	.73	.05
	Unit activities piqued my curiosity.	.14	.75	-.04
	I felt motivated to explore content related questions.	.25	.69	-.02
	I utilised a variety of information sources to explore problems posed in this unit.	.07	.77	.00
	Brainstorming and finding relevant information helped me resolve content related questions.	.12	.66	.13
	Discussions in this unit were valuable in helping me appreciate different perspectives.	.16	.39	.37
	Combining new information helped me answer questions raised in unit activities.	.13	.58	.24
	Learning activities helped me construct explanations/solutions.	.29	.54	.15
	Reflection on unit content and discussions helped me understand fundamental concepts in this unit.	.24	.55	.16
	I can describe ways to test and apply the knowledge created in this unit.	.08	.72	.05
	I have developed solutions to problems that can be applied in practice.	.00	.79	.08
	I can apply the knowledge created in this unit to my work or other non-class related activities.	.02	.80	.06

10.1.2.1 Convergent and discriminant validity

A confirmatory factor model was then estimated to assess convergent and discriminant validity. In its initial specification, fit indices were mixed (RMSEA = .12, CFI = .91, SRMR = .05) with absolute metrics demonstrating adequate fit and comparative metrics demonstrating mediocre to poor fit. Subsequently modification indices were calculated to assess whether model fit could be improved by the addition of parameters. This revealed the presence of several correlated errors within the model between variables (see Table 9).

Table 9: Modification indices for CFA model

Path	Modification index	Expected change
cov(e.TEACHING_1,e.TEACHING_2)	42.51	0.13
cov(e.TEACHING_3,e.TEACHING_4)	73.99	0.21
cov(e.TEACHING_8,e.TEACHING_9)	46.57	0.13
cov(e.TEACHING_13,e.TEACHING_14)	49.57	0.24
cov(e.COGNITIVE_2,e.COGNITIVE_3)	54.87	0.19
cov(e.COGNITIVE_4,e.COGNITIVE_5)	44.07	0.15
cov(e.COGNITIVE_11,e.COGNITIVE_12)	54.60	0.16

The model was subsequently respecified allowing these errors to co-vary and re-estimated. The resulting model was a good fit to the data across both absolute and incremental fit indices (RMSEA = .04, CFI = .97, SRMR = .02). Average variance extracted (AVE) and squared correlation coefficients (SCC) were than calculated. Based on the recommendations of Fornell and Larcker (1981), the instrument demonstrated strong convergent and discriminant validity with all AVE values exceeding .5 and no SCC values exceeding AVE (see Table 10).

Table 10: AVE vs squared correlation coeffcient (Note: AVE values are in Bold on the diagonal)

Construct	Teaching presence	Social presence	Cognitive presence
Teaching presence	.676		
Social presence	.490	.621	
Cognitive presence	.518	.476	.673

10.1.2.2 Internal consistency

Table 11: Alpha values for constructs and overall

Construct	Alpha
Teaching Presence	.96
Social Presence	.93
Cognitive Presence	.96
Overall	.97

10.2 Appendix B—Justifying the use of the MMM of remoteness

Introduced in 2015, the MMM was developed as an improvement on the Australian Standard Geographical Classification – Remoteness Areas (ASGC-RA), which primarily measures remoteness based on distance from major service centres. These limitations are particularly evident in Tasmania, where geographical distances may be relatively short, but access to essential services varies significantly between towns.

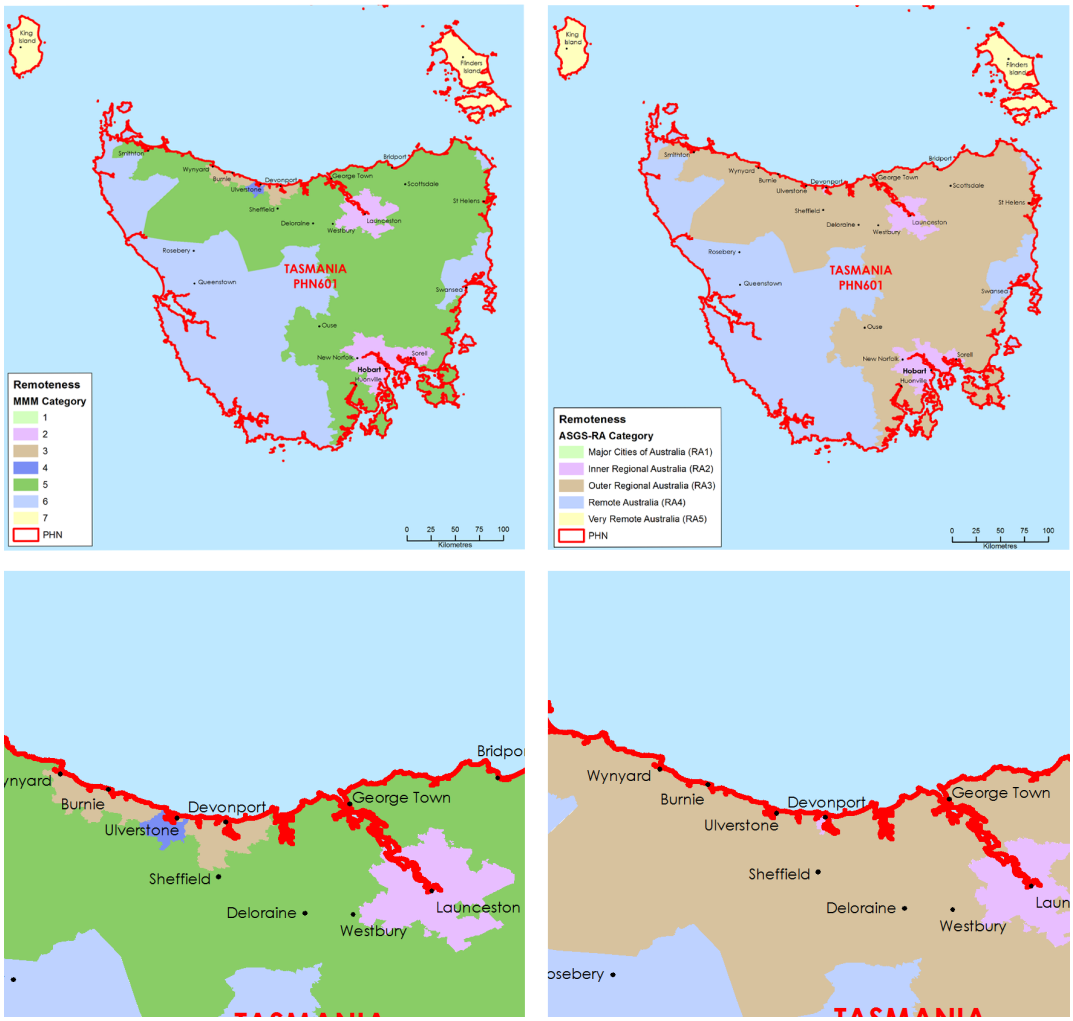
For example, under the ASGC-RA model, both Melaleuca, a remote settlement accessible only by light plane, boat, or an eight-day trek through Southwest National Park, and Swansea, a bustling town on Tasmania's East Coast with multiple services, including a bank, a general practitioner, and a primary school, are classified as "remote," despite their vastly different levels of service accessibility. Similarly, Sandy Bay, an inner-city suburb within walking distance of the Hobart CBD with a population of 12,000, and Black Hills, a rural area about an hour and a half's drive from Hobart with a population of 179 and no services beyond residential dwellings, are both classified as "inner regional" under the ASGC-RA.

To better address these disparities, the MMM classifies locations based on both remoteness and population size, ensuring a more accurate reflection of service accessibility. The model follows a population-based structure:

- **MM 1:** Metropolitan areas: Major cities accounting for 70% of Australia's population. All areas categorised ASGS-RA1.
- **MM 2:** Regional centres: Areas categorised ASGS-RA 2 and ASGS-RA 3 that are in, or within 20km road distance, of a town with a population greater than 50,000.
- **MM 3:** Large rural towns: Areas categorised ASGS-RA 2 and ASGS-RA 3 that are not in MM 2 and are in, or within 15km road distance, of a town with a population between 15,000 and 50,000.
- **MM 4:** Medium rural towns: Areas categorised ASGS-RA 2 and ASGS-RA 3 that are not in MM 2 or MM 3 and are in, or within 10km road distance, of a town with a population between 5,000 and 15,000.
- **MM 5:** Small rural towns: All other areas in ASGS-RA 2 and 3.
- **MM 6:** Remote communities: All areas categorised ASGS-RA 4 and islands that are separated from the mainland in the ABS geography and are less than 5km offshore. Islands that have an MM 5 classification with a population of less than 1,000 without bridges to the mainland (2019 Modified Monash Model classification only).
- **MM 7:** Very remote communities: All other areas that are categorised ASGS-RA 5 and populated islands separated from the mainland in the ABS geography that are more than 5km offshore.

The MMM also provides a more precise representation of the distribution of educational services, particularly in relation to UTAS, the state's sole HE provider. UTAS operates across three main campuses in significantly different population centres. The primary campus is in Hobart, Tasmania's capital, with a population of 253,654. The second-largest campus is in Launceston, Tasmania's second-largest city, home to 107,000 people. The third campus is in Burnie, Tasmania's fourth-largest city, with a population of 20,463.

Figure 24: Modified Monash Model (MMM) vs ASGS / ASGC-RA remoteness classification for Tasmania



10.3 Appendix C—Overview of subjects involved

Table 12: Overview of subjects involved in this study

Subject	Topic/discipline	Size	Delivery mode	Year level
Subject 1*	Academic literacies /Education	253	Online	First year undergraduate
Subject 2*	Motor development / Education	290	Online	First year undergraduate
Subject 3*	Screen cultures / Media	59	Online and blended	First year undergraduate
Subject 4*	Oceanography / Science	214	Online and blended	First year undergraduate
Subject 5*	Human anatomy and physiology/Health sciences	171	Blended	First year undergraduate
Subject 6*	Design thinking / Design	66	Online	First year undergraduate
Subject 7*	Understanding science / Science	70	Online	First year undergraduate
Subject 8	Classroom management / Education	143	Online and blended	Second year undergraduate
Subject 9	Reflective strategies for professional learning / Education	50	Online	First year postgraduate
Subject 10	Inclusive education / Education	64	Online and blended	Second year postgraduate
Subject 11	Inclusive education / Education	170	Online and blended	Third year undergraduate
Subject 12	Foundations of teaching / Education	135	Online and blended	First year postgraduate
Subject 13	Sustainability / Science	137	Online	First year undergraduate
Subject 14	Computer networks / Computing	28	Online	First year undergraduate
Subject 15	Programming principles / Computing	42	Online	First year undergraduate
Subject 16	Chinese language / Humanities	32	Online and blended	First year undergraduate

**Teachers and students in these subjects were invited to semi-structured interviews.*

10.4 Appendix D—Semi-structured interview questions

10.4.1 Semi-structured interview questions (subject coordinators)

Introduction/opening – overall

1. Can you tell me more about your teaching experiences and this particular subject you are teaching?

Technology – overall

2. How comfortable do you think the students are with learning new technology skills?
3. Do you think they have access and support to use the technology needed for this subject? What are your observations?

Teaching engagement – subject specific

4. How important do you think it is for lecturers/tutors to understand the characteristics and needs of the students they teach? Why do you think this is important (or not important)?
5. In the context of [subject code and name], can you tell me more about the students' characteristics and needs in this subject? How do you find this information, do you use any strategies for needs analysis of your student cohorts?

Cognitive engagement/curriculum – subject specific

6. The earlier survey indicated an overall positive experience among your students in the subject. Can you share with us more about the strategies you use to support the diverse student groups and their needs?
7. How do you scaffold students' different learning needs?
8. Do you think that your students would dig deeper into the content being taught, for example, do they seek out more information on concepts and ideas that interest them?

Social engagement/sense of community/peers – subject specific

9. How would you describe the social interaction among students in your subject? Do you feel there was a learning community?
10. Do you use activities to try foster the formation of learning communities among students? For instance, online forums, discussions, or group projects?
11. Would you use any student-led or peer-led activities in course design?

Feedback/student voices – subject specific

12. How would you invite and consider student voice in course design, including both content and activities?
13. Through what ways do you collect student feedback on the subject? How important do you think it is to reflect on this feedback and make changes to the subject?

Support networks – overall

14. If the subject is a first-year subject—Do you think first year subjects in a course, such as yours, are particularly important in supporting and retaining students? Why?
15. What strategies are you using currently to identify at-risk students? Do you use data analytics in any way to help you with this?
16. How well do you think students are currently using the available support services? Do you have students coming to you to seek access or advice on who to contact? How do you see your role in making this connection?

GenAI use

17. We are interested in knowing more about the role of GenAI in student's learning and how we could support students in our teaching. Can you share your thoughts on this?
18. Have you considered how the current GenAI development can play a role in your subject? If yes, how would you help your student to better understand GenAI as a tool and use it in ethical ways?

Closing – overall

19. Is there anything else you would like to share about your teaching in this subject or about your students' needs and experiences?

10.4.2 Semi-structured interview questions (tutors)

Introduction/opening – overall and subject specific

1. Can you tell me more about your teaching experiences and your role in [subject code]?

Technology – overall

2. How comfortable do you think the students are with learning new technology skills?
3. Do you think they have access and support to use the technology needed for this subject? What are your observations?

Teaching engagement – subject specific

4. How important do you think it is for lecturers/tutors to understand the characteristics and needs of the students they teach? Why do you think this is important (or not important)?
5. In the context of [subject code and name], can you tell me more about the students' characteristics and needs in your tutorial group(s)? Do you have diverse learner needs in your group(s)? How do you find this information?

Cognitive engagement/curriculum – subject specific

6. Can you share with us more about the strategies you use to support the diverse student groups and their needs in your group(s)?
7. How do you scaffold students' different learning needs?

8. Do you think that your students would dig deeper into the content being taught, for example, do they seek out more information on concepts and ideas that interest them?

Social engagement/sense of community/peers – subject specific

9. How would you describe the social interaction among students in your subject? Do you feel there was a learning community?
10. Do you use activities to try and foster the formation of learning communities among students? For instance, online forums, discussions, or group projects?
11. Would you use any student-led or peer-led activities in course design?

Feedback/student voices – subject specific

12. How would you invite and consider student voice in course design, including both content and activities?
13. Through what ways do you collect student feedback on your teaching? How important do you think it is to reflect on this feedback and make changes in future teaching?

Support networks – overall

14. If the subject is a first-year subject: Do you think first year subjects in a course, such as the one you are teaching in, are particularly important in supporting and retaining students? Why?
15. What strategies are you using currently to identify at-risk students?
16. Do you have students coming to you to seek access or advice on who to contact? How do you see your role in making this connection?

GenAI use

17. We are interested in knowing more about the role of GenAI in student's learning and how we could support students in our teaching. Can you share your thoughts on this?
18. Have you considered how the current GenAI development can play a role in your subject? If yes, how would you help your student to better understand GenAI as a tool and use it in ethical ways?

Closing – overall

19. Is there anything else you would like to share about your teaching in this subject or about your students' needs and experiences?

10.4.3 Semi-structured interview questions (students)

Introduction/opening – overall

1. Can you tell us more about yourself? For instance, stage of your study, learning mode you choose? Why did you choose this learning mode? (Use survey data)

2. How do you think your learning has gone in this subject, and your study in the course overall?

Technology – overall

3. Can you tell me a little about your experience with learning online?
4. Is this the first online subject you have taken?
5. How comfortable are you with learning new technology skills?
6. Did you need to use any new technology or online platform for this subject?
7. Did you have access and support to use the technology you needed for this subject?

Teaching engagement – subject specific

8. Did you collaborate with your peers and/or teachers in this subject? If so, how? Examples?
9. How do you feel the instructor's involvement in the online class contributes to your motivation and engagement in the learning process? Do you feel they are readily available for questions or guidance?
10. How helpful and timely is the instructor's feedback on assignments and discussions? How does the instructor communicate course content and interact with students online (e.g., lectures, discussions, feedback)? Do you find their communication style clear, engaging, and fosters a sense of connection with the instructor?
11. Does their feedback feel personalised and encourage further learning?

Cognitive engagement/curriculum – subject specific

12. What were your study habits like? Did you attend any live sessions? How would you describe your participation in this subject?
13. Did you find yourself thinking about the content of the subject when you weren't studying. For example, how it links in with other subjects? How it links in with your prior knowledge?
14. Do you find yourself digging deeper into the content being taught, for example, do you find yourself seeking out more information on concepts and ideas that interest you?
15. In this subject, how do you think the way the content was taught and organised influenced your engagement in the subject? Did you like the way it was taught? Can you share some examples?

Social engagement/sense of community/peers – subject specific

16. How do you feel or what is your experience about the social interactions with other students? How do you feel a sense of belonging in your subject? Do you feel there was a learning community?

17. How effective are the online forums, discussions, or group projects in facilitating communication and collaboration among students? Do you feel comfortable and encouraged to share your thoughts and ideas with your peers? Are the online communication tools (discussions, chat rooms, etc.) user-friendly and promote effective interaction among students and the instructor?
18. Does the online subject create a sense of community and belonging among students? Do you feel comfortable reaching out to other students for support or collaboration?
19. Did you feel understood and supported in your learning in this subject? If yes, in what ways do you think the teaching team helped support your learning? For instance, exploration of knowledge, critical thinking, and problem-solving. If not, what is the support you would like to receive but didn't?

Feedback/student voices – subject specific

20. Do you feel that you can have a voice in making the subject better? In what ways have you provided feedback, or would you hope to share feedback?

Support networks – overall

21. Who would you contact first if feel like getting some help?
22. Do you know of any of the support services available at the university? Do you use them?
23. What support do you think is particularly important for you as a first-year student? Are you getting what you need?
24. What support do you think is particularly important for your fellow students from XXX background (use data from survey)?
25. Do you participate in any extracurricular activities at UTAS or in the wider community?

GenAI use

26. We are interested in knowing more about the role of GenAI in student's learning and how we could support students in our teaching. Can you share your thoughts on this?
27. Have you considered how the current GenAI development can play a role in your learning? If yes, what help would you need to better understand GenAI as a tool and use it in ethical ways?

Closing – overall

28. Can you name one thing that you liked the best about learning in this subject? Can you name one thing that can be improved in this subject?
29. Would you have any other recommendations for ways to improve the online learning experience in this subject or your course overall?

10.4.4 Semi-structured interview questions (support staff)

1. Can you tell me about your role at the University? What does your role generally involve?
2. What are some other people/roles that you usually engagement with, in your role?
3. Can you share with me some general observations of student cohorts/characteristics at the university?
4. Have student cohorts/characteristics at the university changed in the past few years? If yes, in what ways?
5. What are some strategies that we use at the University to support student engagement and success?
6. Have student support strategies changed in the past few years? If yes, in what ways?
7. We know one of the latest initiatives at the University to support student engagement and retention is the StREAM project. Can you tell me more about the StREAM project?
8. Is there anything else you would like to share about your experience supporting students or about students' needs and experiences?