Integrating Industry Engagement Into Tertiary Education to Enhance Graduate-to-Worker Conversion in the Agricultural Sector

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Abstract

There is a perceived difficulty in getting tertiary agricultural graduates to undertake a career in agriculture. Increasing students' understanding of the agricultural industry can be achieved through enlisting industry professionals to build and deliver content. Positive interactions with the industry in a supportive learning environment can further enhance students' engagement and interest, potentially leading to an increased uptake of careers in agriculture. This study uses student feedback collected from various surveys and formative feedback systems by Murdoch University Bachelor of Agriculture undergraduate students in 2023. Data was extrapolated from student responses from one core and one elective subject, selected due to their focus on increasing student exposure to multiple industry professionals and enhancing employability, with the goal of inspiring students to pursue careers in the agricultural industry after graduation. Student feedback highlighted a marked increase in confidence and understanding of the industry due to exposure to industry professionals. This industry involvement in content delivery and module development positively impacted students' confidence and their ability to enter the industry upon graduation. Ensuring flow and consistency across modules within a subject will continue to be a major challenge for subject coordinators when multiple industry professionals are involved in one subject. Improving feedback systems at all levels, from subject, to university and industry, is needed to inform on the key employment sectors graduates are working in, enabling educators to be reflective of shifts in industry trends and ensuring graduates are provided with the necessary skill set for a successful career in agriculture.

Introduction

Worldwide, the agricultural industry faces complex challenges relating to not only management of stock and crops during adverse climatic events and managing increasing input costs, but also attracting and retaining employees (Deming et al., 2020; Eastwood et al., 2019; Winder et al., 2024). Tertiary education plays a pivotal role in shaping skilled and impactful graduates for the agricultural industry. Advanced agricultural education equips students with the critical knowledge and innovative skills necessary for working with modern farming practices, sustainable resource management, and technological advancements (Alston & Pradey, 2014; Pretty, 2008). Skilled graduates are essential for maintaining a thriving and innovative sector

that meets the needs of a growing global population whilst improving industry resilience and sustainability (Wu et al., 2019). Therefore, recent consistent reduction in student enrolments in agricultural programs and a declining appeal of agriculture-related careers in Australia poses a significant challenge to the industry (Pratley, 2017).

Declining enrolments in agricultural courses can be attributed to several factors, with one key issue being the perception of limited career prospects. Many prospective students view agriculture as a low-status, low-earning and labour-intensive career (Pratley & Acuna, 2015; Pratley & Crawley 2018), a perception that is further exacerbated by the lack of awareness and exposure to agricultural careers, particularly among urban populations (Bailey, 2019). Additionally, of the 18 Australian universities offering agriculture-related courses (Australian Council of Deans of Agriculture [ACDA], n.d.), about six have campuses that are located in rural areas, which may further hinder interest in the field. Secondary school outreach programs have been formulated to address this issue, exposing students to agricultural careers, which has been found to increase understanding and interest in the field, particularly in urban areas (Bailey, 2019). This may increase the likelihood of students undertaking agricultural tertiary education. However, providing the right exposure to the diversity of career paths to inform and not overwhelm students is key.

The reduction in enrolments may also be influenced by the curriculum and the perceived preparedness for a career upon graduation. Traditionally, tertiary agricultural education has been characterised by a strong emphasis on theoretical knowledge, where the lack of practical application has often resulted in a disconnect with the industry (Dunne, 2010; Pratley, 2017). The National Report of the Graduate Outcome Survey (Quality Indicators for Learning and Teaching [QILT], 2023) stated that 64% of recent agricultural graduates reported that their course prepared them well for their current occupation. This highlights the need to improve curriculum alignment with industry requirements, which can be achieved through the incorporation of industry-centred content and expert-led teaching. While work-based work-integrated learning (WIL) is widely recognised as an effective approach to enhancing graduate employability (Jackson, 2015), it is increasingly acknowledged that WIL conducted outside the workplace within an academic setting, may have an equal, if not greater, impact on graduate outcomes (Jackson & Dean, 2022). However, if not carefully co-designed with industry, it may not sufficiently expose students to the diverse range of career opportunities within the agricultural sector. The limited scope of experiences available through WIL programs can restrict students' understanding of the full spectrum of potential careers in agriculture (Kay et al., 2019). Disregarding discipline, the addition of classroom-based learning, such as guest lectures from industry professionals and collaborative projects using real-world scenarios, can combat this issue (Jackson, 2015; Rowe, 2017). These approaches ensure that students gain firsthand experience, are provided with up-to-date industry knowledge, are exposed to the latest technological advancements, and develop the practical and innovative problem-solving skills necessary to drive future advancements. These are all required for graduates to efficiently work in and improve agricultural systems (Chancellor, 2023; Pogorelskaia & Várallyai, 2020). Finally, involving industry professionals provides the unique opportunity for networking that is beneficial for both students and industry. Promoting the link between the classroom and real-

world application not only improves employability and career readiness but may also increase attractiveness of agricultural careers.

Despite the viability of a career in agriculture, there are many factors that are influencing graduates from pursuing employment in the sector, such as a perceived lack of opportunities (Esters & Bowen, 2005). This may be due to a lack of awareness of the sector, which could pose a barrier to students entering the industry post-graduation. To bridge the gap, it is essential to expose students to industry-relevant information. One way to achieve this is through industry involvement in content design and delivery. This paper represents the first step in evaluating the success of industry professionals' involvement in teaching of two subjects to undergraduate students undertaking a Bachelor of Agricultural Science at Murdoch University in 2023. It establishes whether engaging industry professionals in tertiary education design and delivery positively influences student experience and understanding of the industry. This is achieved through evaluating survey feedback from students. A broader and aspirational aim is to create an engaging and fulfilling experience in subjects that offer students a comprehensive preview and understanding of the industry, inspiring them to enter the agricultural industry upon graduation.

Methodology

This pilot study focused on student satisfaction survey results for two subjects where industry was involved in curriculum design and content delivery. Data was collected via anonymous surveys and de-identified interviews and use was approved by the Murdoch University Human Ethics Committee (2024/114).

Murdoch University Agricultural curriculum

Murdoch University, located in Perth, Western Australia, was established in 1972 and was the second university in Western Australia. It is home to the state's only veterinary school, which opened in 1974, shortly after the introduction of the agriculture program in 1973. With a large portion of the undergraduate cohort from urban and international backgrounds, students enrolled in the Bachelor of Agricultural Science have little connection to the Australian agricultural industry.

Students enrolled in the Bachelor of Agricultural Science at Murdoch University in 2023 selected from three majors: Animal Health, Animal Science, and Crops and Pastures (Figure 1). Many students elected to complete a double major, mainly in Animal Health and Animal Science, with few selecting the Animal Science and Crops and Pastures alternative (Table 1). This is due to many students hoping to transfer to Veterinary Science, with the first double major aligning more closely to the Veterinary Science degree. There are only a few subjects involving industry and career exposure in the course curriculum. One of them is ANS100 (Figure 1), which was a core subject added in 2023 to the course that is foundational but generalist and completed by all students in their first year. This subject provides students with skills which are transferrable to any agricultural and veterinary science career. For those undertaking a major in Animal Science, ANS337 (Figure 1) is a core third-year subject that

incorporates both employability skills and industry and career knowledge. Additionally, students are required to complete three of the Career Learning Spine subjects, which are designed to equip them with practical and transferable skills that will be valuable throughout their careers. Among these, ANS301, ANS302, ANS305 and ANS200 (Figure 1) include industry and career knowledge but are topic specific and based on placements and study tours. Contrastingly, VLS302 and MSP100 (Figure 1), which deploy employability skills, are common across multiple faculties. This paper focuses on ANS337 and ANS303 (Figure 1), with both subjects delivering content on livestock industries at a whole-of-farm level, incorporating both employability skills, industry and career knowledge delivered essentially by agricultural industry professionals.

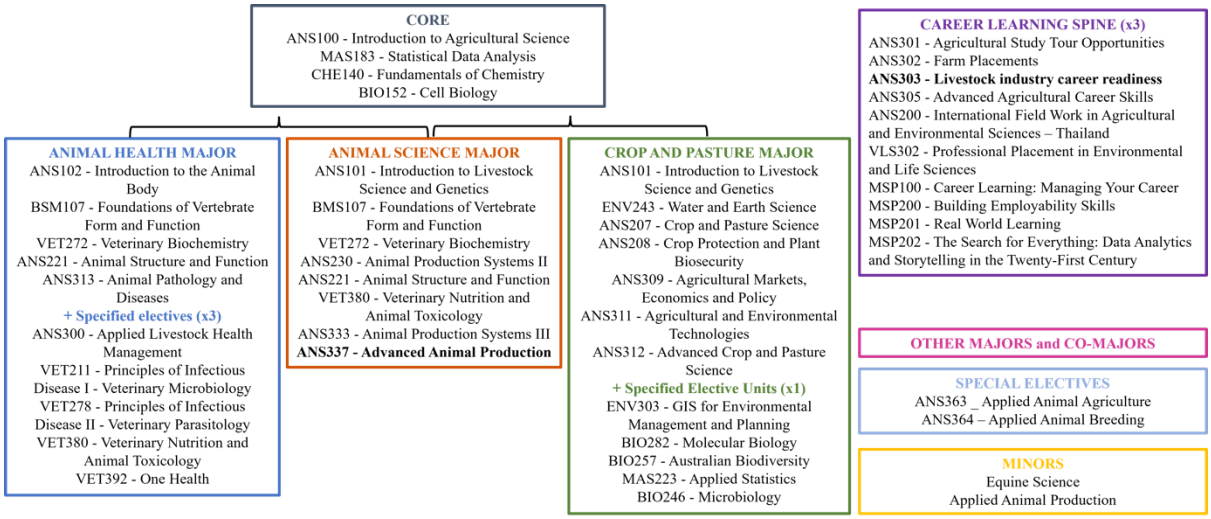

Figure 1. Overview of the Bachelor of Agricultural Science degree at Murdoch University 2023, with the focal subjects bolded.

Table 1. Percentage of students enrolled in single and double majors under a Bachelor of Agriculture

Degree		2019	2020	2021	2022	2023	2024
Single Major	Crop and Pasture	8.3%	8.0%	6.6%	5.4%	9.0%	8.4%
	Animal Science	8.3%	8.0%	7.4%	13.5%	14.1%	19.6%
	Animal Health	8.3%	24.0%	13.2%	9.5%	5.4%	18.2%
Double Major	Animal Science and Crop and Pastures	0.0%	0.0%	10.7%	13.5%	6.4%	2.8%
	Animal Science and Animal Health	75.0%	60.0%	62.0%	58.1%	55.1%	51.0%

Focal units: ANS303 and ANS337

As evidenced from Subject Learning Objectives (SLOs), both ANS337 and ANS303 focus on ensuring students practice job ready skills such as communication and analysis, while critically applying knowledge obtained throughout their degree to problem-solve using real-life scenarios (Table 2). These SLOs address all five of the Good Practice Guide: Threshold Learning Objectives for Agriculture (Botwright Acuña & Able, 2016) which stipulate the fundamental requirements agricultural undergraduate students are expected to meet upon graduation. The subject has been designed to ensure students are exposed to major employment sectors and related careers of the Australian livestock industry. Furthermore, to increase students' understanding of the Industry and the relevance of the content they are taught, industry professionals are engaged to assist in Module development and content delivery.

Table 2. Subject objectives for ANS337 and ANS303.

	ANS337	ANS303
SLO1	Apply and communicate systems-based knowledge gained earlier in the degree to the solution of practical problems	Apply knowledge and understanding of the Australian livestock industry on real-life case studies
SLO2	Share your understanding of the way innovations, management practices and technology is extended and adopted in agriculture	Develop and apply effective networking and communication skills
SLO3	Undertake analysis of interactions between farm management and economics	Engage with networking and career discovery opportunities
SLO4	Apply a range of employability skills to address selection criteria for an agricultural industry position	Demonstrate a range of workplace competencies to further develop employability skills using an agricultural industry position

ANS337

This subject included the following modules: (1) Farm economics; (2) Extension and Adoption; (3) Farm consultancy; (4) Employability; (5) Agriculture technology and (6) Farming systems which have been are all taught by facilitators external to the animal science teaching team (Table 3).

Table 3. Content, teaching team and assessments for the ANS337 modules.

	Teaching team	***Module content***	***Assessment and Feedback***
Farm Economics	Industry and research economist	- *Lectures:* describe key economic concepts and provide examples of application - *Workshops:* practical application of economic concepts understanding and problem solving through using a specifically designed Microsoft Excel worksheet	- *Theoretical Assessment* - Mid-semester exam - *Formative feedback* – practical workbook
Consultancy	Experienced Livestock Consultant	- *Lectures:* describe key communication, relational and strategy building skills necessary for success - *Workshop:* problem solve an industry specific scenario	- *Assessment* - Group presentation on a chosen case study
Employability Skills	Murdoch University employability specialist	- *Online module (pre-reading)*: provides employability basic concept - *Lecture*: builds on concepts and provides skills and advice key to applying - *Workshops*: peer review of draft; assessment and feedback from staff.	- *Assessment* – updated and tailored curriculum vitae and responses selection criteria derived from a real-life livestock related job application.
Extension and Adoption	Agricultural Consultants and Grower Group Alliance	- *Lectures*: describe key components of extension and adoption concepts, stages, and types, and what is key to practice change - *Workshops*: provide example of how to communicate with a	- *Assessment* - written assessment describing the successful (or unsuccessful) adoption of an innovation by a

		farmer and advice to assist with assessment.	farmer (based on interview)
Agricultural Technology	Livestock consultants	- *Lectures*: experts provide history, current and future direction of agricultural technology. - *Workshop*: small group work where students develop a promotional poster for a self-chosen example of current agricultural technology.	- *Formative feedback* – poster and group presentation

ANS303

This subject, new in 2023, focused on livestock industry career readiness for animal science graduates. It was developed and co-funded by Australian Wool Innovation and was designed to equip students with skills to engage with the agricultural industry. The subject comprised of four modules: (1) Networking and Communication, (2) Job application skills, (3) Livestock industry tour and field trips and (4) Industry extension workshops (Table 4). Together, these activities aimed to provide students with the opportunity to engage with industry professionals to build skills and confidence focused on career readiness relevant to livestock industries using real-world scenarios.

Table 4. Content, teaching team and assessments for the ANS303 modules.

	Teaching team	***Module content***	***Assessment and Feedback***
Networking and Communication	Rural and regional industry consultant	Professional skills workshops on networking and communication including group facilitation techniques and individual branding/elevator pitch tailored to livestock industry. This module was developed based on the Ag4U-Career Pipeline Program.	- *Assessment and formative feedback* – engagement with Q&A panels and mentors - *Formative feedback* – entry and exit interviews
Industry Tour and Field trips	Murdoch university teaching team + visit hosts	Visit a range of livestock industries and enterprises in South-West of Western Australia to provide a greater understanding of whole productions systems, the supply chain, and farm business management	- *Assessment* – group presentation on case study based on visits - *Formative feedback* – interview and networking techniques during visits
Industry extension programs	Industry bodies	Participation in two (2) industry extension programs	- *Assessment* – online quizzes
Employment and Job Application Skills	Murdoch University employability specialist	Develop students' professional communication and self-promotion skills to address selection criteria both in writing and orally	- *Assessment* – cover letter and interview to apply for a mock real-life job application

Data collection

All data collected was either anonymous or de-identified. Students' evaluation of each subject was obtained using multiple anonymous or de-identified feedback techniques; Subject surveys, internal student surveys, entry and exit subject interviews (ANS303 only), and in-class student feedback (ANS337 only). The process of collecting subject surveys is convenient for both staff and students, being systematically made available for online completion and feedback provided to staff in system automated reports for both ANS337 and ANS303 (Supplementary Material, Appendix 1). Additionally, a more targeted internal subject evaluation survey was completed

by students in-class in ANS303 to gain further insight to subject expectations and experience and allow feedback to the University and funding body on the first iteration (Supplementary Material, Appendix 2). Surveys collected data via Likert 5-point scale (strongly agree – strongly disagree) and selection question.

For ANS303, entry and exit interviews (Table 5) provided qualitative insight into changes in students' perceptions of the agricultural sector, and their confidence and their preparedness to enter the workforce. To this end, students were asked to rank their confidence on a 5-point scale (least to very confident) across several communication, networking, and career-related questions (Table 5). Students were encouraged to elaborate and comment on their scores; however, for confidentiality reasons and to help build trust, these responses were not recorded. Entry interviews were conducted individually and online before the semester began by the agricultural consultant overseeing the communication and networking module. In addition to recording students' self-assessment of their confidence, the interviews provided an opportunity to capture their hopes and expectations for the unit. This feedback allowed for adjustments to the unit content where possible, such as inviting specialist panellists or guests that aligned with students' interests. Exit interviews were also facilitated by the consultant and conducted individually, but these were conducted face-to-face, a couple of weeks before the semester's end, following the mock interview. While entry interviews were mandatory as a condition for enrolling in the unit, exit interviews were not required. We clarified to students that the exit interviews were an informal check-in to reflect on the semester, and no student requested to be excused from participating. Students' confidence scores were initially recorded against their names to capture changes during the semester and were later de-identified for privacy.

Table 5. ANS303 student entry and exit interview questions.

Entry and exit interview questions – *Ranked responses on a 5-point scale from least confident – most confident*
1. What is your level of confidence in networking?
2. What is your level of confidence regarding your number of contacts in your industry of interest?
3. What is your level of confidence in presenting yourself professionally?
4. How prepared do you feel to enter the workforce in agriculture?
5. What is your level of understanding of career options in your area(s) of interest?
6. What is your level of confidence that you have what it takes to enter your industry of interest?

Formative feedback was obtained from students in ANS337 during a workshop on Extension and Adoption using Mentimeter (Mentimeter, 2024), an online tool that enables word clouds, multiple choice questions, short answer responses, etc... Mentimeter was deployed to gain insight into student understanding before and after content delivery.

Data from all surveys and interviews was consolidated using Excel to allow descriptive and, where relevant, statistical analysis. For the entry and exit interviews, to determine whether student responses differed significantly, a Wilcoxon signed-rank test was performed in SPSS Version 29.0.0.0 (IBM Corp, 2021).

Results and discussion

This study provided the first step towards evaluating whether industry involvement in content design and delivery improved student understanding of careers in the Australian agriculture sector. This was achieved through assessing student feedback from surveys and interviews from two subjects.

Subject surveys for ANS337 and ANS303 (including ANS303 internal student survey)

The deployment of subject surveys is a well-established form of feedback used by universities worldwide. Nevertheless, extracting feedback from students is well established to be difficult (Alderman, Towers & Bannah, 2012; Richardson, 2005). Completion rates of both subject surveys was low, with a 29% completion rate for both ANS337 (n=13) and ANS303 (n=5) achieved in 2023, which was not unexpected (Alderman, Towers & Bannah, 2012). Feedback on student satisfaction importantly informs whether changes to assessments, delivery and accessibility, and relatability of Module content is required. Deploying the ANS303 internal survey during class time resulted in a 100% completion rate (Figure 3). This outcome aligns with findings by Kordts-Freudinger and Geithner (2013), who reported that in-class evaluations typically achieve higher response rates. Conducting the survey in-class also allowed for an explanation to students of the purpose and use of their feedback (Kember & Ginns, 2012). This likely enhanced the students' perception that their feedback was highly valued, a factor emphasised by Spencer and Schmelkin (2002) as crucial for obtaining meaningful and engaged responses. Overall, feedback across subject surveys received indicated high levels of student satisfaction with both ANS337 and ANS303. Mostly, >70% respondents generally agreed or strongly agreed with questions on the suitability of assessments, feedback provided, support, and learning activities for both subjects (Figure 2&3). ANS337 did have between 23.1 – 46.2% of respondents disagreeing with the questions, which highlights areas of improvement that coordinators can focus on. Viewing these survey results in isolation is however limiting. As detailed by Alderman, Towers and Bannah (2012), these subject surveys only provide one type of student feedback that needs to be evaluated in conjunction with other feedback systems. This then provides educators with objective and equitable feedback that enables continued academic development. This is especially important where module content and delivery is reliant on the input of industry professionals. Misinformed changes can haemorrhage resources and time and could dissuade industry involvement in tertiary education.

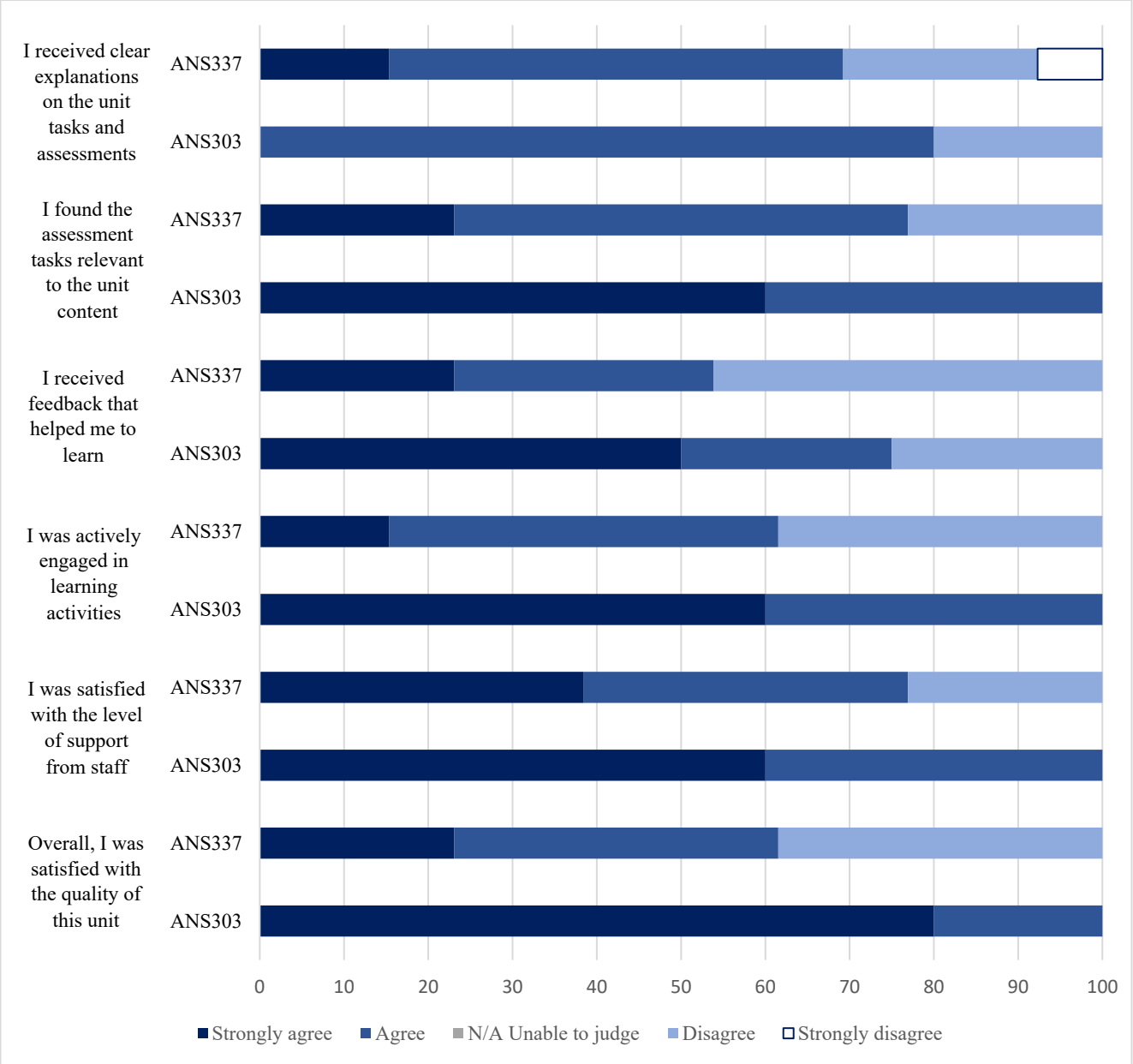

Figure 2. Subject survey responses for core subject Likert questions for ANS337 (n = 13) and ANS303 (n = 5).

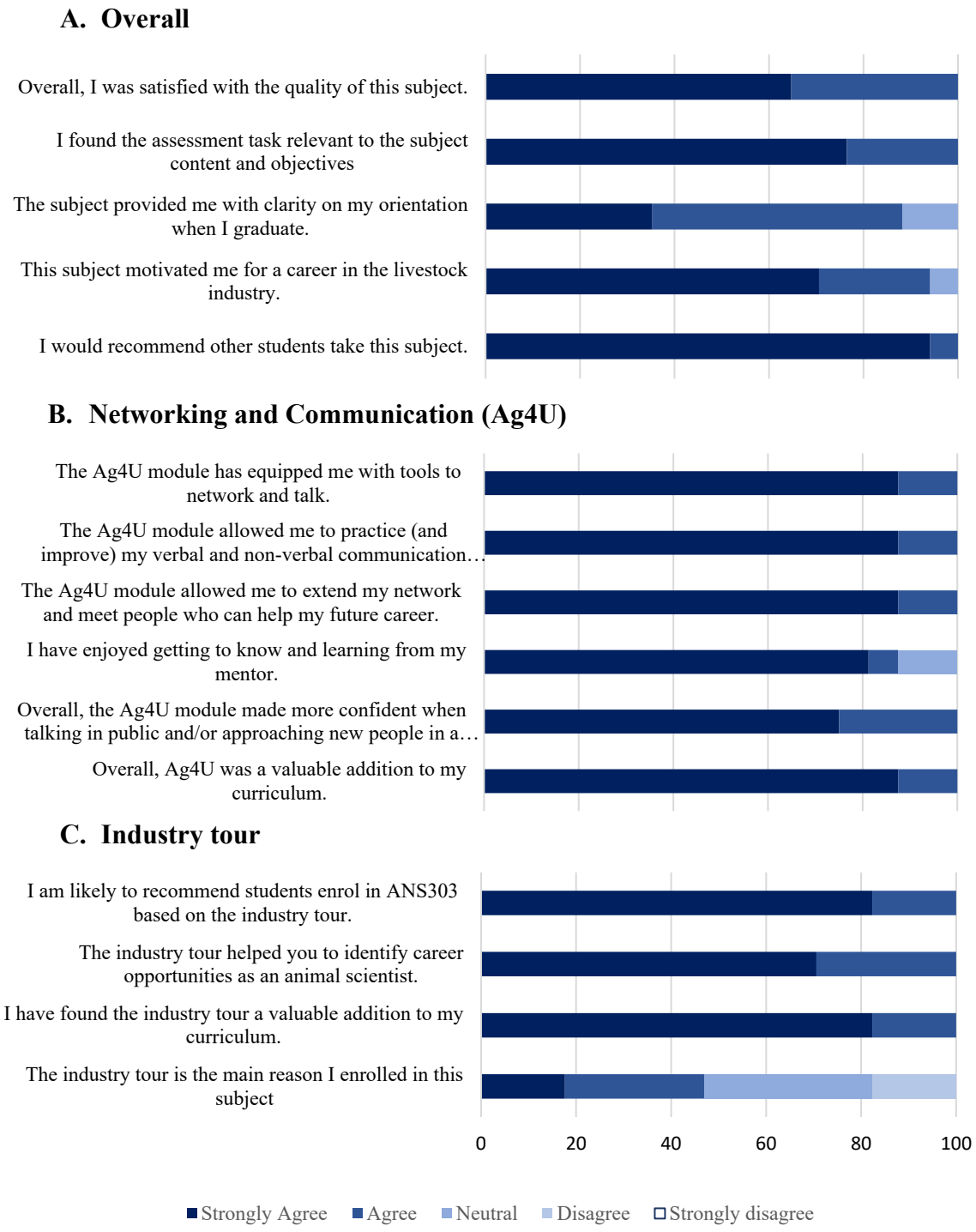

Figure 3. Survey responses for the internal ANS303 student survey (n = 17).

Student feedback highlighted that the two best-ranked aspects of each subject were, for ANS337, the concepts/topics and practical aspects, and for ANS303, the class, and course/subjects (Figure 4). In conjunction with the open-ended responses (Table 6), industry involvement in both subjects was key to subject success and positively impacted student's

understanding of the agricultural sector. For ANS337, a student stated: *"I appreciated getting experts in to show the real-world application of what we have been learning…"*. Such feedback provides confidence to educators that this path of content delivery and pedagogy in the classroom is worthwhile. For ANS303, content was taught in-class and during visits, where a student stated that this *"…[subject] gave us the tools to enter the workforce"* and another one "*The connections we had the ability to make through this programme was really beneficial",* supporting the hypothesis that direct industry engagement enhances career readiness. Organising an industry tour takes large amounts of staff time and dedication which is required to be absorbed into already overloaded workloads. Occupational stress in Australian academia is well known (see Lee et al. [2022[) and pressure could result in staff selecting less time-consuming methods of teaching. However, obtaining such feedback provides the confidence that efforts are warranted and beneficial to students.

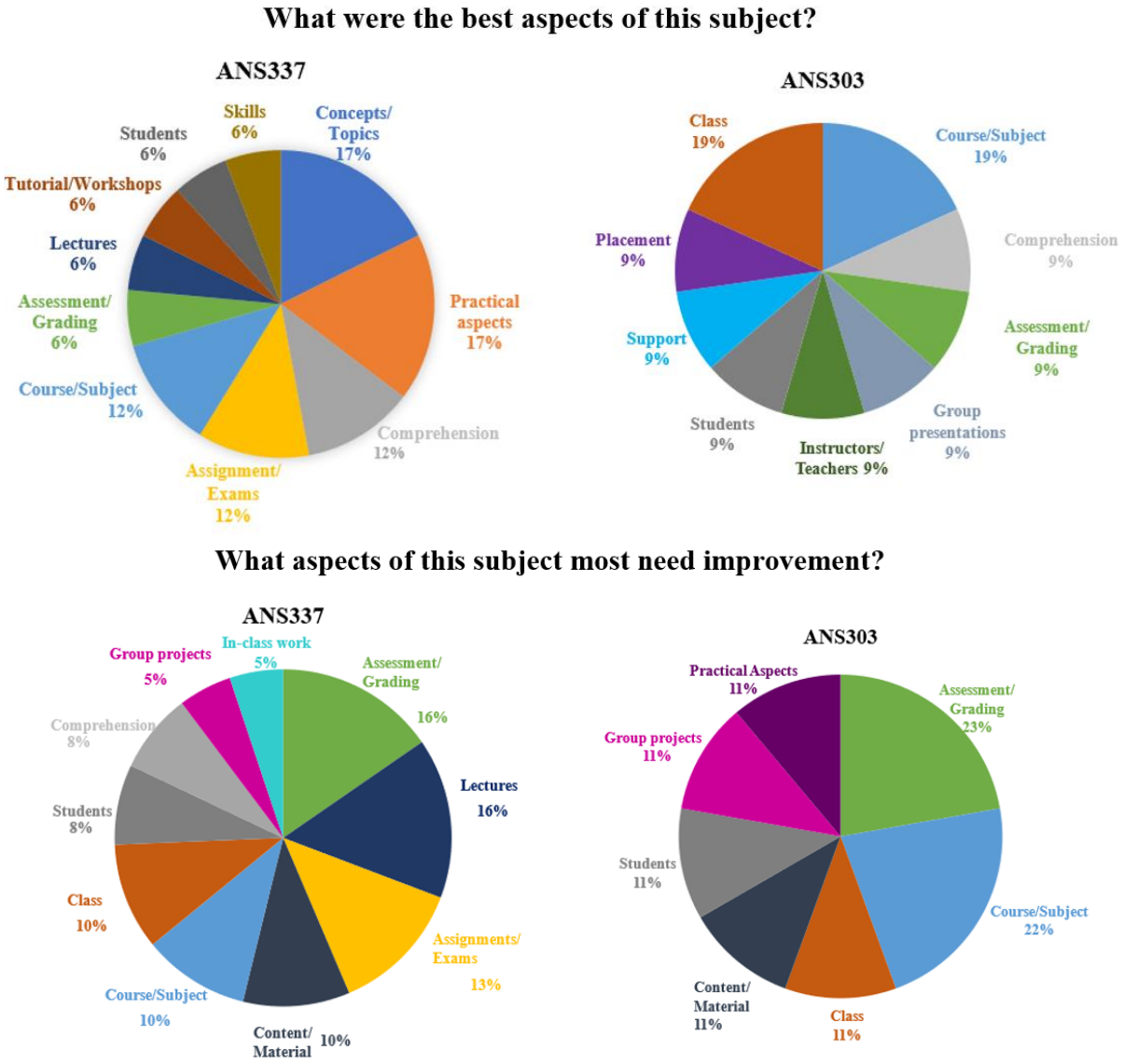

Figure 4. Subject survey responses for core comment selection questions for ANS337 (left; n = 13) and ANS303 (right; n = 5) divided into 'best aspects' and 'areas of improvement'.

There are limitations to surveys developed at the university level, such as the lack of discipline- or subject-specific questions (Alderman, Towers, & Bannah, 2012; Johnson, 2000; Knapper, 2001). For example, both ANS337 and ANS303 surveys do not include questions focused on career awareness and job readiness, key elements of the SLOs. Another limitation is that contradicting views can emerge. For instance, the top areas indicated for improvement were identified to be 'assessments and grading', 'lectures', and 'assignments and exam' for ANS337, and 'assessment and grading', and 'course and subjects' for ANS303 (Figure 3 and 4). For ANS303, this is contradictory as the area 'course and subjects' was also identified to be one of the best aspects of the subject. Such contradictions may stem from biases or the varying ability of students to form objective judgments on effective teaching, which can ultimately undermine the validity of student surveys (Boring, 2017; Capenter et al., 2020; Spooren et al., 2013). Nevertheless, giving students the opportunity to provide feedback and educators to evaluate the responses provides a needed starting point to facilitating open discussions.

In conjunction with the open-ended responses (Table 6), for ANS337, the delivery of some content from industry professionals was less engaging due to '*the lecture(r)s that talked were boring and didn't give half of the information that was needed.'*. Industry professionals who are engaged to teach university students often have a passion and drive to impart their expertise. However, these professionals often do not understand current pedagogy practices. Many professionals would have been exposed to teacher-centred learning practices when they completed their tertiary education. Recently there has been a paradigm shift towards using student- and learning-centred practices (Whetten, Johnson & Sorenson 2009; UNESCO, 2021), and incorporating active learning techniques (Johnson, 2021). These practices have been well established to increase student engagement, understanding and retention of taught content and overall higher satisfaction with their learning experience (Blumberg, 2019; Whetten, Johnson & Sorenson, 2009). Therefore, a challenge for subject coordinators is to assist industry professionals in trialling and adopting such teaching practices. This requires subject coordinators to remain up to date with current teaching practices through continuous professional development. An adjustment phase is needed as these practices often place educators out of their comfort zone and time is needed to adjust. Therefore, retention of industry professionals needs to be balanced with the effectiveness of their teaching styles.

Table 6. Subject survey responses for core comment open-ended questions for ANS337 (n = 13) and ANS303 (n = 5).

What were the best aspects of this subject?	
ANS337	**ANS303**
Industry involvement *"I appreciated getting experts in to show the real-world application of what we have been learning over the past three years."* *"The networking practicals"* *"The agricultural economics aspect was very helpful!"* ***Subjects / Module content*** *"It was an easy-going course. All topics were relevant to developing skills for the industry."* *"I liked how most of the lectures and workshops were interactive, allowing me to get out of my comfort zone."* ***Staff support*** *"Coordinator was a really good, and supportive. She was really clear, and helpful."*	***Industry involvement / Tour*** *"Industry experience"* *"Overall I loved this [subject]. It gave us the tools to enter the workforce as well as expose us to the industry that learning at university hasn't done yet."* *"Tour was amazing and should be continued to exactly how it was this year."* *"The connections we had the ability to make through this programme were really beneficial."* *"AWI Industry Tour was definitely the highlight of the trip."* *"The industry tour was amazing"* ***Subjects / Module content / Classes*** *"I LOVED the career readiness…"* *"The inclusiveness and smaller class sizes allowed this course to be as successful."* *"I enjoyed having a small class to really get to know everyone in the class and form some really good bonds with fellow students."* ***Staff support*** *"Coordinator was an absolute highlight. She was down to earth which made her approachable."* *"Lecturer was another person I thought made the [subject]. She really helped with stepping out into the industry and made our whole course relevant."* *"I thoroughly enjoyed the teaching staff involved in this [subject] and gained a lot from interacting with them so often and getting to know them."*
What aspects of this subject most need improvement?	
ANS337	**ANS303**

Industry involvement *"The lecturers that talked where boring and didn't give half the information that was needed half the time."* ***Subjects / Module content*** *"The economics component needs reworking. I understand the importance of the economics however, it wasn't presented well and the workshops were confusing."* *"Wasn't ever sure of the actual content of the [subject] or what we were suppose to get from this [subject], it was a bit all over the place and the assessments didn't relate to what we were learning."*	***Industry involvement / Tour*** *"Having an opportunity to meet with our mentor would have been really great for a [subject] wrap up, along with other industry people involved in the [subject]".*

4

Entry and exit ANS303 survey

Overall, and for all questions, student confidence was observed to significantly increase to *more confident – very confident* in the exit interview responses compared to the entry responses (Figure 5). During the exit interviews, only one student reported a lower confidence level in response to questions Q4 and Q6 compared to their entry interview responses (Table 4). This student had initially rated their confidence very high but discovered throughout the course that their knowledge was not as extensive as they had presumed. This realisation likely stemmed from an initial lack of awareness about the agricultural industry and career options. The interviews were instrumental in assessing each participant's progress and yielded invaluable feedback. Specifically, it provided early validation of the subject's format and modules, as well as insight into the subject's effectiveness in boosting student confidence in their ability to enter the industry. Furthermore, they provided a crucial opportunity for discussing the results with the students, facilitating instant formative feedback. This process is essential for fostering successful learning outcomes, as it allows students to reflect on their learning journey and identify areas for improvement (Brown & Race, 2021; Race, 2020; Sadler, 1989). It is important to recognise that having a member of the teaching team conduct these interviews may limit students' willingness to openly share their perspectives. However, because these are informal conversations, they may also encourage more honest and comprehensive feedback, offering specific and contextualised insights, and providing an additional avenue for students to give input (Borch et al., 2020). Furthermore, Borch et al. (2020) suggest that dialogue-based evaluation methods can foster reflection and discussion between students and educators, making them particularly well-suited for a unit that emphasises open communication and aims to improve student confidence.

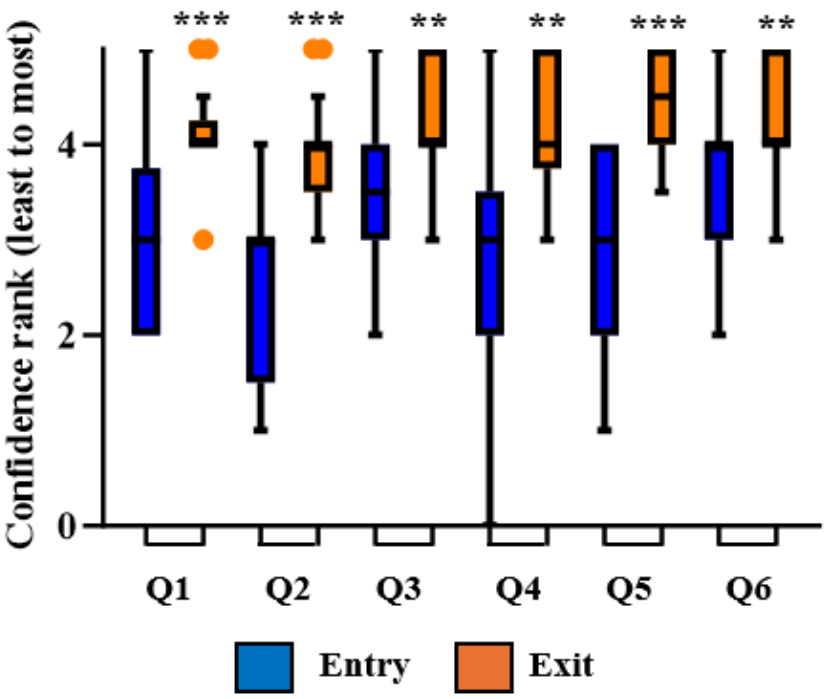

Figure 5. ANS303 Entry/Exit interview responses of self-assessed student confidence on a 1- scale (1 = low confidence; 5 = high confidence). 95% Confidence Interval Tukey's Box Whisker plot used, with Wilcoxon signed-rank statistical significance indicated, with * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Other feedback tools

Engaging anonymous online feedback platforms, such as Mentimeter (Mentimeter, 2024), in order to enable students to provide formative feedback was found to have high participation. The feedback during ANS337 Extension and Adoption workshop had an 88 – 92% participation rate and informed educators on the level of prior knowledge and key areas of understanding gained (Figure 6). Deploying this form of formative assessment enables real-time feedback to educators, where student understanding of content can be established and addressed if required, and can encourage open dialogue (Brown & Race, 2021). Adoption of an improved feedback system where students have multiple opportunities to provide and receive feedback was identified to be needed for ANS337. A more formalised feedback system suits the subject design and delivery of ANS337, which has a large cohort and content delivery, such as formal lectures, which do not facilitate open conversations and informal feedback to be collected. Adopting an effective feedback system with well participated formative feedback will encourage more in-class discussion, which would also improve the learning experience for both students and educators. This will likely increase retention of industry professionals within teaching roles, where a positive experience will improve the subject coordinator experience.

	Before today, what did you know about adoption?
1	Nothing
2	not much just that it can sometimes be difficult to achieve
3	Assignment
4	Practices or innovations could either be adopted or not adopted
5	Lots of effort needed
6	Very little, understood it as the adoption of new technologies and practices and thats about it
7	That it involves starting a new process/ using a new product to improve your production and business profitability, as well as potentially environmental impacts.
8	not a whole lot
9	many factors affect the farmers' decision
10	taking something for your own use
11	Not much
12	It’s the research that is taken in by farmers
13	Adoption is slow and that many factors can come into play and influence it as well as decisions
14	vague understanding e.g. adopting a dog; knew what the word meant but nothing specific
15	It is a slow process
16	That there we some people that were active in adoption but it is a limited space
17	when you take on kids that aren’t your own
19	nothing
20	Nothing
21	Nothing
22	Interaction
23	Adopting some form of new process
24	mass of modules

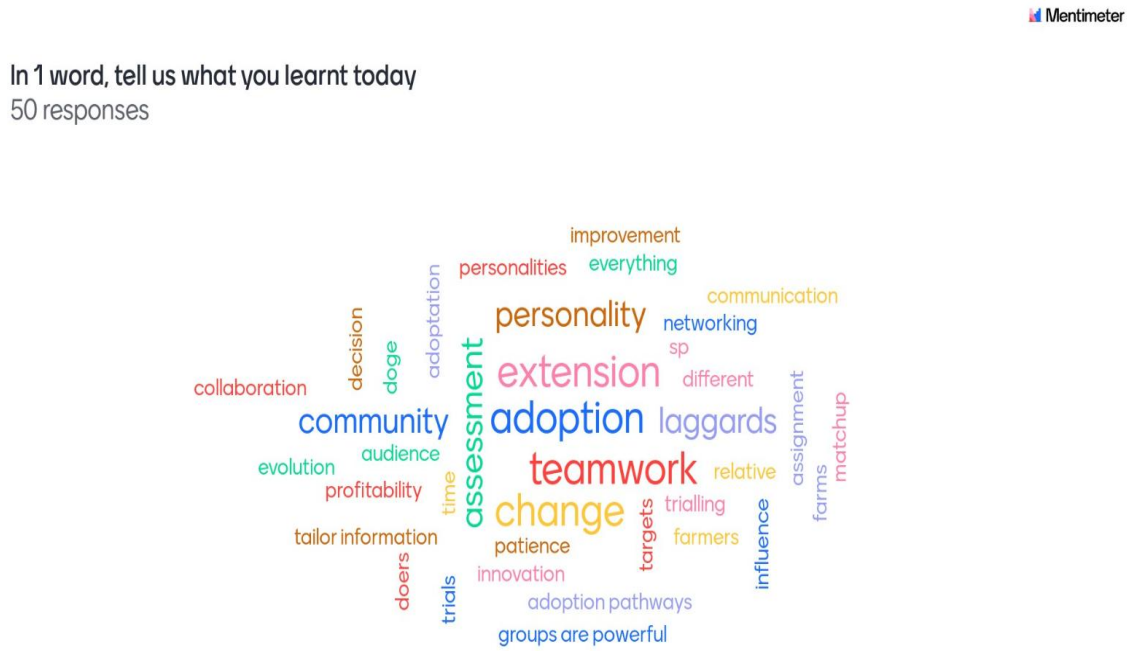

Figure 6. Mentimeter responses for ANS337 Extension and Adoption workshop (n = 25 participants).

Reflection

This project has highlighted a few key areas that need to be addressed moving forward. Educators need to know which sectors of the agricultural industry their graduates are employed into, informing on whether key areas of employment are shifting. This will ensure students are provided the opportunity to develop the necessary skills for career success. The difficulty is in collecting such information from recent graduates. Currently, graduate surveys do not have a high completion rate nor is the data specific to agricultural students. For Murdoch University graduates, the full-time employment rate 6 months after graduation was 63% in 2022, but this included graduates from Agricultural and Environmental Science. Subsequently, educators are reliant on personal communication with recent graduates, which also often provides information only on a proportion of the cohort. Therefore, steps are needed to increase graduate participation in feedback and to enable differentiation between disciplines to occur.

Other than their established and often specific research network, academics are at risk of being disconnected from the changing needs and direction of the industry. Firstly, having open communication with industry to inform on their shifting needs will enable educators to adjust content taught to ensure students possess the necessary skills for entry into agricultural employment. This may be achieved by adopting a formal process such as a survey completed annually/biannually by businesses employing graduates, whereby the skills and knowledge that graduates are required to have by industry is communicated back to tertiary educators. However, we anticipate that the success of such an initiative could be limited by relatively poor response rates, such as those observed to occur for the Graduate Outcome Survey (QILT, 2023). Therefore, incentives to encourage engagement and responses are required. Secondly, engaging professionals that are actively involved in industry to teach in subjects provides another avenue for students to be exposed to industry and facilitates networking. Selecting industry professionals who are engaging communicators, relatable and prepared to impart an honest view of working in industry can increase student participation. However, enlisting multiple industry professionals to teach into a single subject poses a risk to consistency in the delivery and pedagogy. Some of the open-ended responses received for ANS337 highlight this difficulty

(Table 5). Therefore, subject coordinators have the important role of clear communication to students of the connections between modules and the expectations of subject assessments and content. Despite the challenges subject coordinators face when managing this, the exposure and increased understanding of industry that students can achieve are thought to outweigh these issues.

The environmental, economic and sustainability challenges that the agricultural sector is currently facing will mean that the need for tertiary educated workers will continue to increase. Despite high job vacancies, encouraging students to undertake a career in the agricultural industry will continue to be a challenge. Exposing students to industry professionals throughout their degree where appropriate can successfully increase understanding of what a career in agriculture can be and the diverse opportunities available. In an industry where networking is key, contact with industry presents the opportunity for students to build such a network prior to graduation. Providing engagement with industry professionals improves student confidence and awareness of industry. However, educators are still unaware of student employment outcome(s). Successful conversion of graduate to worker will be more achievable when educators are provided with the necessary feedback from students, graduates, and industry on their goals, employment, and needs, respectively.

Conclusion

This study explored the integration of industry professionals into tertiary agricultural education and its preliminary impact on student perceived understanding, confidence, and employability. Involving industry professionals in content design and delivery appears to enhance students' understanding of the industry. Students reported gaining valuable insights into real-world applications, fostering a stronger connection between academic content and industry needs. Additionally, engagement with industry professionals positively impacted student confidence and preparedness for entering the workforce, with feedback highlighting the value of networking and communication skills gained through these interactions. These experiences also showed potential to influence students' career readiness and decisions to pursue agriculture-related careers by offering clarity on diverse pathways and required skills.
It is important to acknowledge that these findings, while promising, are preliminary, reflecting the first year of data from newly implemented or redesigned units. As such, they should be interpreted with caution. This study is the first step needed to tackle the aspirational aim of establishing long-term improvements in graduate employability and industry integration. Continued data collection and monitoring of students and recent graduates over the coming years will be essential to validate these observations and refining the approach. Nonetheless, integrating industry professionals into agricultural education shows significant potential to enhance student learning, better prepare graduates for the workforce and improve graduate conversion.

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