

GIPPYAg BrainSTEM Student Experience

HIGHLIGHTS

The BrainSTEM Rural Innovation Challenge (BrainSTEM) was part of the GIPPYAg project, an initiative of Food and Fibre Gippsland in partnership with CQUniversity Australia with financial support from the Victorian Government. The BrainSTEM program provides the opportunity for students interested in Science, Technology, Engineering and/or Mathematics (STEM) to engage with industry professionals to undertake a research project over a 12-week period. In 2019, the theme of the challenge was the food and fibre industry in Gippsland.

Eight teams of four students led by an industry mentor embarked on projects from reducing greenhouse gases on a dairy farm, creating QR Codes to provide consumers with more information on where their vegetables had come from, developing a cattle health scanning program, measuring and controlling botrytis in greenhouses, promoting the provenance of Gippsland's produce, making careers in dairy more attractive and an investigative approach to comparative milk pricing.

This case study reports on the student's perspective of being involved in BrainSTEM, including their awareness about STEM within the food and fibre industry, their experiences throughout the challenge and their interest in pursuing a career in the industry.



Students reported they enjoyed the challenge of working on real-life issues and developing essential team work and project management skills not previously experienced within their classrooms. Students increased their awareness of practices and challenges faced by the food and fibre industry and their knowledge on the importance of Gippsland being a major employer in the food and fibre industry increased.

OBJECTIVE

The aim of this research case study was to evaluate if participating in a 12-week industry-focussed program increased student awareness and/or interest in a career in the food and fibre industry.

BACKGROUND

The BrainSTEM Rural Innovation Challenge was designed to provide Year 9 and 10 students with experience in designing, researching and developing a STEM innovation related to a real-world food and fibre industry application. BrainSTEM has been running challenges since 2016, however, this challenge was only the second based in regional Victoria and the first related to the food and fibre industry. Schools and mentors were invited to apply for the program and in doing so committed to participating for the 12 weeks.



In August 2019 the student groups and their assigned mentor attended an introduction day where they discussed challenges faced by industry and the region, and collaboratively decided on a problem to address. In the 12-weeks following, mentors engaged with their student teams on a regular basis to progress their idea into reality. In addition to face-to-face or online meetings, some groups also participated in field trips to gather information and data related to their projects, such as commercial farming operations, research facilities and milk processing factories.

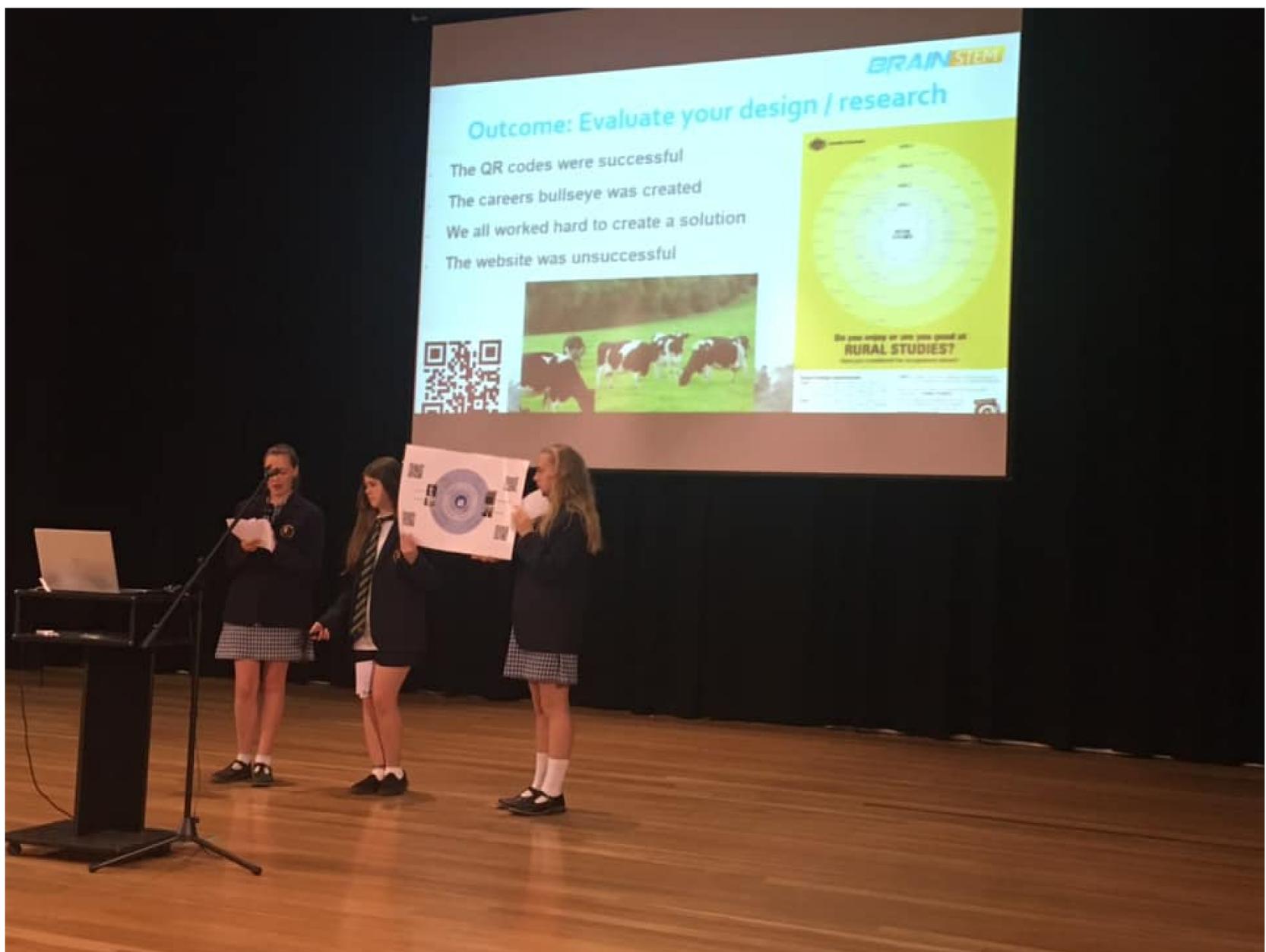
The challenge concluded in late October 2019, when the groups presented their innovative projects to a captive audience of other schools, teachers, parents and the general community. The presentations encompassed the student's journeys throughout the challenge, including their initial approach, successes and challenges along the way concluding with a summary on their findings. Students completed pre- and post-evaluation surveys and were interviewed during and after the challenge. The evaluation aimed to understand students' level of knowledge and interest in STEM, their thoughts of the program and interest in pursuing a career in a STEM related field, with additional questions specifically focused on the food and fibre industry. A thematic analysis was used to categorise students verbal and qualitative responses.



PARTICIPANTS

The schools that participated in the challenge, the number of teams per school and the mentors area of expertise are detailed below.

School	Number of teams	Students	Mentor industry sector	Number of mentors
Gippsland Grammar	3	12	Horticulture Dairy Communications and Engagement	3
Korumburra Secondary College	1	4	Biosecurity	1
Leongatha Secondary College	1	4	Dairy	1
Lowanna College	2	6	Dairy Horticulture	2
Maffra Secondary College	1	4	Dairy	2
Total students		30	Total mentors	
			9	



SURVEY RESULTS

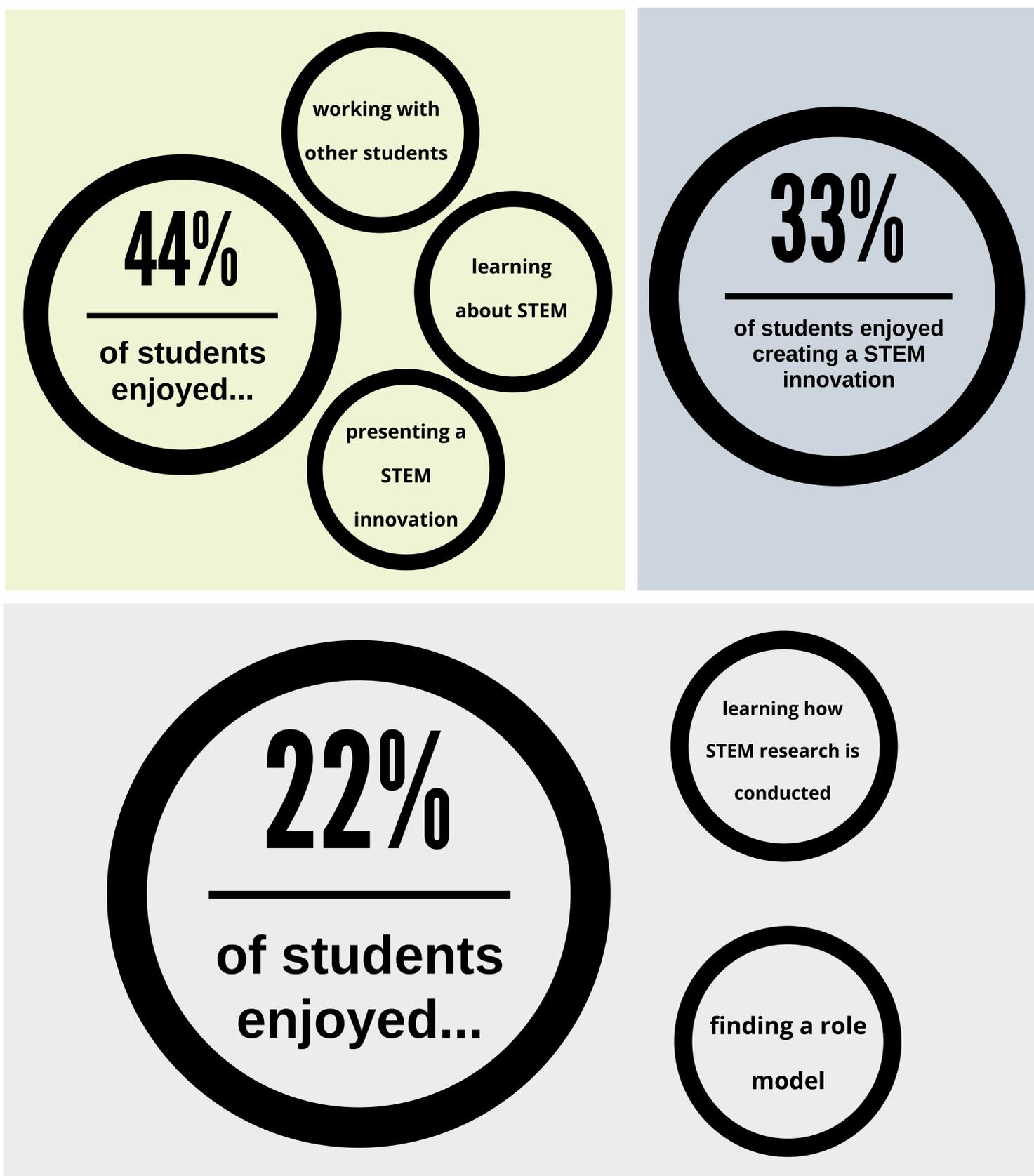
A total of 28 students completed the pre-challenge survey and 11 completed the post-challenge survey, with 9 students completing both pre- and post-surveys. All students who attended the initial meeting at the commencement of the challenge completed the pre-survey, however, only 40% of students completed the post-challenge survey. The number of students per team changed during the challenge for some teams, and some students were unavailable to attend the initial meeting when the pre-survey was completed.

The low response rate is a weakness of the research and changes to the timing and delivery of the survey are suggested, such as including time during the presentation evening for students to complete the survey, to ensure a maximum number of students respond.

The results below were collected in a survey completed **before** the challenge by 28 students.



The results below were collected in a survey completed **after** the challenge by 9 students.



At the beginning of the challenge students nominated what they were most looking forward to (expectations), which was compared against student responses at the end when they nominated what they enjoyed most about the challenge (outcomes). A greater number of expectations than outcomes were reported, with students reporting an average of four expectations and only reporting an average of 2.5 outcomes. Of these outcomes, 61% were nominated as expectations prior to completing the challenge and included aspects such as working with a STEM mentor and learning about different careers in STEM, while 35% of students reported unanticipated benefits not previously nominated, namely presenting a STEM innovation (33%), finding a role model (22%) and working with other students (22%). These results demonstrate the inter-personal skills gained throughout the challenge that were not initially anticipated at the outset of the challenge.

In the pre-challenge survey, 71% of students reported they would like to know about the food and fibre industry, which decreased to 64% in the post-challenge survey. Initially, 14% stated they were not interested in learning more about food and fibre and 4% reported they did not know if they were interested in the food and fibre industry or not, however, there were no students reporting either of these responses in the post-challenge surveys, with 36% reported being neither interested or not interested in learning more about how their food is produced. While the number reporting having an interest in knowing more about the industry did not increase, the positive or neutral responses suggests that the challenge increased students' awareness and knowledge about the industry and were thus less inclined to have a negative outlook on learning more about the industry.

PROGRESS INTERVIEWS

Six of the eight groups were interviewed mid-way during the challenge to find out how they were finding the experience and to identify any challenges they encountered. Seventeen students listed a range of benefits received from undertaking the project. The most common outcome mentioned was the overall satisfaction gained from creating a project from scratch and being able to explore their own ideas in a different format than the school curriculum allows (47%). While many found the flexibility of having to choose a topic challenging, they also reported that it was a good challenge to take on. Students also mentioned enjoying the team work aspect of the program, working towards solving a real-life industry issue with practical benefits, participating in field visits and working with a mentor (12% of responses, each), while one student enjoyed learning more about the industry (6%).

'It's quite challenging too which is really nice, it's good to have a strong challenge.'

'It's more challenging than I thought initially, but it's been good. Having to create like a project from scratch is like really working my brain and stuff.'

'No matter what it was that we're going to do, we had to understand it fully before you could really create an effective solution. But that's, yeah, that's been our biggest challenge.'

While many enjoyed the challenge of choosing their own industry topic, many also found this frustrating. Of the 29 responses about what student's found the most challenging, 38% related to issues around setting a topic, primarily because the lack of guidelines and flexibility provided an overwhelming scope of possibilities and required them to spend time exploring various avenues before eventually deciding on a topic to complete. This was experienced by many groups who changed the scope of their project during the 12 weeks, either because they found out their project had already been done by someone else, their idea wouldn't work in practice, or having to scale down their initial idea to fit within their capabilities and time frame. Other issues with topic choice included student disappointment that their project scope was limited by their mentor's area of expertise.

Students found organisational aspects of the project equally as challenging, with 38% of responses identified issues with communication, either between the groups and the mentor, within the groups themselves or using the projects preferred communication method, which was an app-based social media platform called Slack. This required students to take ownership of the project and initiate meetings themselves, which for some proved challenging against competing priorities, such as other school work, extra-curricular sports and giving up their lunch time to work on the project. Some groups also found it difficult to find a suitable time to meet with their mentor, who also had their own competing priorities.

Embarking on a project in an unfamiliar industry was also seen as a challenge, with 24% of responses reporting they found it difficult to understand the processes and phrases used within the industry. Having to understand how the industry works, which for some required a lot of background information to be learnt, added another layer of complexity to the project, as well as then having to collect data and understand what that means not only for their project but also for the greater industry.



POST-CHALLENGE INTERVIEWS

Seven groups were interviewed at the conclusion of the challenge to find out what they had learnt during the challenge, what they enjoyed the most and what was the most challenging.

All students reported gaining new knowledge and awareness about the food and fibre industry, in particular the breadth of issues faced by the industry.

'We learned that there's a lot of problems and challenges, and we could only handle one.'

'This made me really empathetic towards the farmers because it showed me that struggle that they go through and not being able to get the amount of money you deserve for all the work you've put in is really not fair for the farmers.'

'(The challenge) made me realise, like, this needs to change, that we need to do something about this.'

Students also learnt about the complexity of food and fibre production, as well as an overall greater understanding of the food and fibre produced in Gippsland.

'There is a lot more food and fibre than we realise in Gippsland.'

'I think it's an industry that has a lot of uncertain parts to it, on the outside we get lovely food on our tables, but when you look on the inside you see the really intense work that the farmers have to go through to get food on our tables, it's much more complicated than we really think.'

'(The challenge) helped us learn a lot about farmers and their struggles.'

Students reported a range of new skills developed as a result of the challenge, the majority of these related to personal development and acquiring skills in team work, communication, organisation, perseverance and computer skills (81% of 21 responses). For some, this was a huge accomplishment with students commenting on the challenging nature of the project and on the immense learning outcomes. Students said they are not often exposed to these kinds of experiences and learning opportunities within schools.

'I'm personally am not an organised person at all. So I think this (has) genuinely helped me to be more organised and communicate better. And so, I think it was just really good, a really good learning experience.'

'Compared to the projects that we've done in the past our falls have been the hardest of any projects, we really fell hard towards the middle couple of weeks. And I think perseverance and resilience... was a skill that we really learnt, it was really great.'

'A lot of the lessons we've learnt are good for our life, such as perseverance and other things like that, and I think that we don't really learn that in school, it's good to learn in a practical sense.'

The remaining responses (19%) related to gaining insight into career opportunities within the food and fibre industry, which for some was timely and others highlighted that it's not something they get exposure to.

Students listed nine different aspects that they enjoyed the most, undertaking a research task and seeing the project come together was reported the most (23% of 13 responses). One student commented that their favourite part was 'The actual challenge. It's definitely not something we normally do. It's a chance to experience new things and the STEM program'. Other highlights mentioned included the program's initial meeting, experiencing hands on science, working on a project with real-life application, working with their team and mentor, testing out new technology and learning about other group's journeys at the presentation evening.

'I was kind of looking into like what we've been doing at the moment, as a career, so I thought, for me personally, that was like really cool to like get insight into that career job.'

'We don't have many opportunities to be able to do that, so I think it was really special that we got to experience that.'

'I thought it was pretty fun, bringing everything together. I think that was pretty cool when we all got to really see everything come to life at the end.'

Almost 70% of students would recommend the program to others, with one student stating 'For sure, you learn a lot about community as well as yourselves,' and another highlighting 'Yeah 100%. You think it's quite localised, like it's for South Gippsland, it's for Leongatha but, you know, if you think locally you can act globally because the big things don't happen without the little pieces all coming together.'

For others, their experience of the program was not as resoundingly positive, with 23% stating they would possibly recommend the program but with modifications, such as selecting another topic or industry or condensing the program into a shorter period, as evidenced by the comment 'I don't know if food and fibre is kind of our thing but like I think doing another topic would be really fun to do,' and 'It's good if you want to know more about how to conduct a research task and get better with real team communication but it's a long process. In my opinion, a shorter program would be better. At like 14 and 15 (years old), you kind of want to go and do stuff and like, go have fun.' Only one student (8%) stated they would not recommend the project.



SUMMARY

The challenge was successful in developing students' inter-personal skills and exposing them to aspects of the food and fibre industry, such as an awareness about how sectors of the industry operate, what challenges they face, and the difficulties faced in addressing these challenges. Most student groups communicated and interacted well with their mentor and gained great benefits from working with experienced industry ambassadors. Overall, the general aim of increasing awareness about the food and fibre industry was met.

Despite gaining a greater awareness and understanding of the food and fibre industry, both in terms of learning more about businesses and career opportunities, the challenge was generally not successful in increasing student interest in pursuing a career in this field.

Many students found the open-ended topic choice overwhelming and their mentor's area of expertise restrictive. Future challenges may consider tailoring groups to align mentor talents with student interest. Similarly, providing greater guidelines about what teachers and students should expect in term of mentor engagement would ensure a consistent level of mentor involvement across groups, as was evidenced in the results with some groups praising their mentor while others were disappointed in the mentor's level of contact and involvement.



Only a small number of students completed the post survey, making overall inferences about the challenge limited to these students only. Changes in the timing and delivery of the survey are suggested, such as allowing students time at the presentation evening to complete the survey or changing the structure of the presentation evening to a similar format as the introduction day to not only allocate time to complete the survey but to also avoid conflict with extracurricular activities.

The challenge provided students with insight into the real-life processes and challenges faced within the food and fibre industry, however, the greatest benefits gained by many students were unexpected and not related to the industry per se. While the knowledge learned about food and fibre is beneficial to student's awareness of food production, the inter-personal skills gained throughout the challenge will remain with these students for the rest of their lives and provide a solid foundation for future workplace success.

CONCLUSION

In conclusion, this project was successful in increasing student awareness and/or interest in a career in the food and fibre industry. The results of the pre- and post- challenge surveys show the application of STEM and agricultural ideas to real-life industry issues through this mentor-led challenge has increased students' awareness and interest in the food and fibre sectors. Further research is required to determine if these outcomes would also lead to students actually pursuing these careers once their secondary schooling was complete.