

Scholar Report

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Title of Scholarship Project:	A Sense of Belonging in Engineering Students

A Sense of Belonging in Engineering Students

I. The research you have conducted

Feeling as though you belong to your degree can be challenging for all students – but this is especially true for those in engineering degrees. There are many studies that centre around this topic as it is seen to be something that affects the vast majority of engineering students. Therefore, this summer, I have undertaken a research project on ‘A Sense of Belonging in Engineering Students’ working under Dr Manoj Ravi and with engineering students from a range of different courses.

The phrase ‘sense of belonging’ can have many different meanings, but this project focuses on whether students feel accepted and valued at their institution of study. However, this research also includes the idea that the feeling of belonging can also refer to a sense of community and a support system as those factors can have, and have seen to have, a great effect. Engineering courses are notoriously some of the most challenging and demanding university degrees, thus improving their student’s support system and sense of belonging will help them to enjoy their course more and in turn feel empowered to scale success.

This project includes all types of engineering and architecture degrees under the Faculty of Engineering at the University of Leeds. Including the architecture and architectural engineering degrees was important to me as I am an architecture student myself, and wanted to make the project slightly personal. Being able to expand this research to architecture students has enabled me to include some of my peers and feel more attached to the research itself. It has also meant a lot as not only would I love to improve the enjoyment of the course for all engineering students but also myself and my course mates, where I can actively see the improvements and impact I have had to their university time in front of my eyes. The architecture course at the University of Leeds includes a mixture of design and engineering based modules and a complete engineering course for the first year. Including both courses enables us to compare the feelings of architecture students to that of engineers, and see if having the additional non-engineering modules and slightly different teaching style affects their sense of belonging.

At the start of the research period I performed literature reviews to gain some insight and background to the topic. I concluded that minority groups - international and female students - struggle the most with feeling as though they belong to their engineering degree. Therefore, we conducted the research on a wide range of students from different backgrounds and degrees.

2. Research being impactful and important

Being an engineering student has many challenges with the intense workload, contact hours and course content. Something that is not widely acknowledged by lecturers - and yet greatly affects the students – is their sense of belonging. By researching this topic, we can pinpoint what factors and things in engineering degrees create or disrupt their students' sense of belonging and make changes accordingly. Engineering degrees are one of the top five subjects for the highest non-continuous rates with it standing at 7.2% - which proves students' dissatisfaction in some sense. (1) By making these impactful changes, we can alter the way engineering courses are run to reduce dropout rates and improve students' satisfaction and wellbeing, which is very important to me. No student should feel this way about their course and the community that they have to spend most of their time at university with, therefore this is a very important topic that needs to be researched at the University of Leeds if improvements are to be made.

Being a woman in engineering can be a very challenging experience. There is typically quite a large male to female ratio in all engineering degrees and in the professional world. At the University of Leeds, the ratio is dependent on the course. We have found that women can feel unheard and undervalued in comparison to their male counterparts, and often feel as though they have to put in significantly more effort to obtain the same help and respect. For example, one female student commented that *'engineering is a very male heavy subject [...] there's been a lot of times over the past four years where I've felt like I've had to fight to be where I am and that doesn't make me feel like I belong'*. There are many comments like this from the female interviewees, which further exaggerates this as a significant problem that needs to be researched into. International students also have a harder time in engineering degrees as they face challenges outside of the course alongside the ones from it. It is already challenging being in a new country and a different culture. If they also feel as though they don't belong to their degree, their time at university may not be enjoyable. Many of the issues faced by international and female students are external or societal, but some stem from the fact that an engineer is typically seen to be a 'white male'. With this stereotype, it can be intimidating for non-white, non-male students to go into an engineering degree, which may explain why all engineering degrees are male dominated, so reducing this stress could be particularly impactful.

3. Activities you've been involved in to disseminate your research

To conduct this research, I started with a literature review. This review began by using the academic search engine, Google Scholar, to collect 40 papers that were all themed around a sense of belonging in engineering students, with each focusing on a different aspect or cause. From this, I was able to identify common themes and reasons as to

why students struggle to feel that they belong in engineering degrees. In addition, I could see the different approaches and strategies that have already been investigated to improve students' sense of belonging and their success rate. From this review, it became apparent that minority groups, such as international and female students, struggle to feel as though they belong to engineering degrees the most. With the majority of the publications focusing on different factors of what helps and what doesn't help an engineering student's sense of belonging to their course, doing this review made me aware of what may be affecting the students at the University of Leeds. This then enabled me to formulate a series of interview questions to use to conduct interviews with engineering and architecture students from a range of programmes and years of studies.

These interviews were each around 30 minutes and contained 13 primary and secondary questions. The secondary questions were designed to be asked to international or female students, or if more information was needed from the response. These questions each focused on different topics and aspects of university life and the engineering courses themselves that have been known to have an effect on students' sense of belonging.

The interview began with asking each student to define what the phrase 'sense of belonging' meant to them personally. This allowed me to understand how each individual defines it and what factors affect them personally. It also allowed me to point them in the correct direction and definition if their's did not align with the one we were using for the interview. Other interview questions were on the topics of inclusivity and support from lecturers and classmates, involvement in societies, and whether there was any correlation between their academic environment and their academic success. The interview was also concluded by asking each interviewee what improvements they would make to better their, and others', sense of belonging to engineering degrees.

The interviews were performed in two equal waves. Once the first half had been done, I was able to edit and refine some of the questions to then use for the second half.

Once the interviews had been conducted, a reflexive thematic analysis of the interview transcripts were conducted. This process started by reading through each student's transcript and making sure that they aligned with the recordings and what they were saying exactly. I then separated the transcripts into each different question and the corresponding response from each student into separate documents to then proceed with the analysis. To perform this, I read through each response and highlighted the key points in their answers. Each of these highlighted sections then became 'codes'; for each different response, a new code was created. When responses were repeated, the same code was used. Once all the questions had been coded, I grouped them into overarching themes.

4. Results

From the analysis, I have been able to conclude that the majority of students do feel as though they belong to the University of Leeds to some extent, and have a stronger sense of belonging to their course specifically. However, most of these students also

feel as though this feeling could be improved, and that changes to their engineering course could be made.

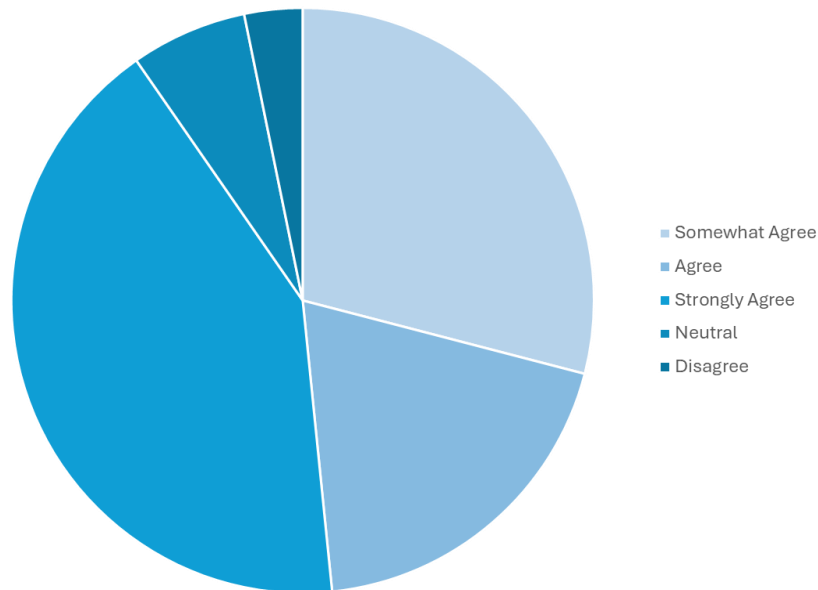


Figure 1: A chart showing the responses to the interview question 'To what extent do you feel that you belong at the University of Leeds?'

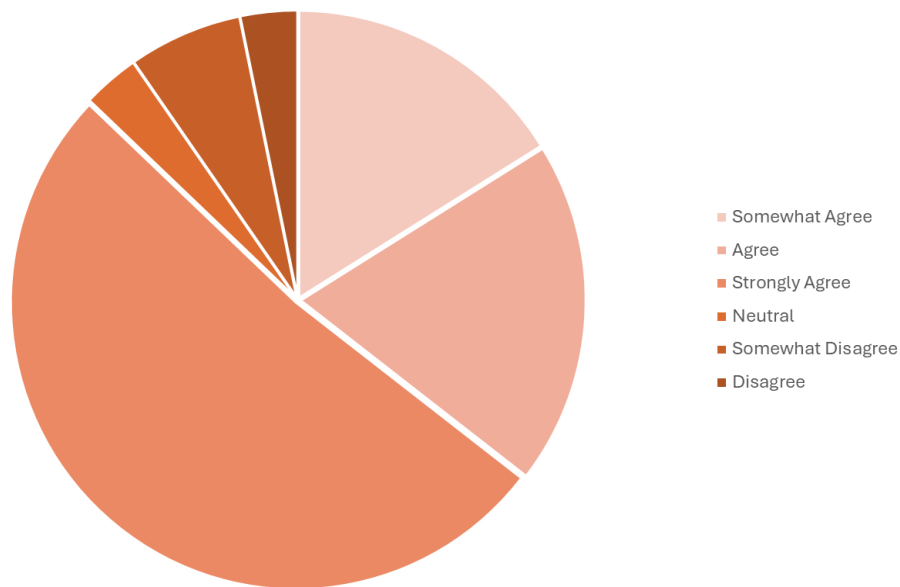


Figure 2: A chart to show the responses to the interview question 'To what extent do you feel that you belong to your engineering course?'

From the charts above, we can see that the majority of students do feel as though they belong to the University of Leeds to some extent, and even more strongly agree to feeling that they belong to their course. However, most of these students also feel as though this feeling could be improved upon, and that changes to their engineering course could be made.

The main thing that helped students feel as though they belong to their course was a sense of community and friendships with their peers. Other reasons that were mentioned included good communication with lecturers, feeling supported and having

an interest in the course itself. On the contrary, there were many reasons stated as to what prevented students from feeling as though they belong. These included: the intense workload, lack of confidence and achieving bad grades, and a feeling of 'friendships being transactional' or not making friends at all.

Listed below are all of the reasons that were stated by the interviewees in response to these questions:

Reasons that enhanced the sense of belonging:

- Support from lecturers
- Making friends / sense of community
- Being part of societies
- Interest for the course
- Good physical spaces
- Seeing staff around campus
- Friendly staff and lecturers
- Diverse societies and course
- Spending a lot of time at campus and with their course
- Family in Leeds
- 'University makes me feel safe'

Reasons that reduced the sense of belonging:

- Lack of support
- University making decisions to benefit themselves and not its students
- Political stands of the University
- International student language barrier
- High workload / Intense course
- Being a minority in their degree
- 'Transactional friendships'
- 'Imposter syndrome'
- Struggles to make friends
- Different cultures for international students
- Takes up too much of their time
- Lack of confidence
- Course is very male dominated

All avenues and reasons were explored in more depth to fully understand what affects them. We found that female and international students face different problems in their degree that other students do not, which also have an effect on their sense of belonging.

Engineering degrees are typically male dominated, so being a female in these environments can be particularly challenging. Some of the comments made by the female engineering students were that they felt as though they had to work harder than their male peers to be heard, it was hard to make female friends on the course due to the lack of female students, and instances were described where male students have made females uncomfortable. From this we can see that changes are needed to ensure that female students feel comfortable and confident enough to perform to the best of their abilities. Implementing these changes will also improve dropout rates and perhaps influence more female students to choose engineering degrees.

International students also face some unique challenges in that they are quite far from home. Many of the international students that were interviewed commented on the fact that feeling as though they belong to the university and their degree is difficult as they are so far from home and living within a completely different culture. Many international students also mentioned the language barrier and how it affected their sense of belonging negatively. However, many commented that having societies really helped them feel comfortable. The societies mentioned were typically not engineering based but rather ones that focused on their specific culture and background. Many international students opted not to go to engineering society socials as they were primarily themed around drinking - which many couldn't / didn't want to participate in. Some changes that they wished for were for societies to include socials that respected their religious and non-religious choices, and didn't just focus on the 'British drinking culture'.

One student commented that *'the University should really invest in some female professors or some professors from a culturally different background'* to enable them to see themselves through their lecturers and feel more connected to their course.

We found that many of the architecture students did feel as though they belonged in comparison to the engineering-only students. The factors that were commented on to help this was the study spaces provided specifically for them, and the involvement of lecturers and group projects.

The interview concluded by asking each student what improvements could be made to build upon their sense of belonging.

The results were:

- Introduce more society and social gatherings to meet more people
- More support from staff
- More interactive lecturers
- Better workload
- Better physical spaces / more study spaces dedicated to specific course
- More / better ethic lectures
- More diverse lecturers
- Lectures on how to interact with female students

Now that we have this knowledge, we are better able to hopefully make some changes to the engineering courses at the University of Leeds. Most of the students that were interviewed mentioned societies. Nearly all mentioned that there is a lack of socials, especially non-drinking socials, that involve everyone. Therefore, going forward, discussions will be had with engineering society leaders to introduce more socials and make sure that they are able to include everyone. Hopefully, this research can go even further to begin making some changes to the actual courses themselves.

5. What impact conducting research has had on you

As a female architecture student, I resonated with this project as soon as I read about it. Personally, I feel as though I do belong to my course, but that it comes to me a lot harder than my male peers. To me, a sense of belonging derives from a sense of community with my peers and lecturers alongside the feeling of being valued and heard.

Compared to civil engineering, and other engineering degrees, I feel as though there is a good sense of community. I think that some of the factors that may affect this are the much smaller course size, the amount of group projects and the ease with which we see and talk to the lecturers. However, there are some challenges that I have faced. As it is still a male dominated course, it can feel as though I have to work harder than my male counterparts to be as heard as them. I feel as though I am listened to and respected the most, especially by my male peers, when I grade better than them and/or achieve top of my cohort. Therefore, I wanted to be part of this research project as I feel as though I have already experienced what it feels like to belong to an engineering degree and some of the challenges that students may face, and wanted to know if others felt the same.

Now that I have completed this research, I feel more validated in my opinions and feelings knowing that I am not alone in them. However, what has impacted me the most is the feeling that I can make a change and improve other student's lives. With now having an idea of changes that could easily be implemented into each engineering course at the University of Leeds, and what factors that are currently in place that affect a students' sense of belonging, I feel empowered to go to higher ups to make some of these changes happen.

6. What leadership skills you have gained from the research period

Over this period of research, I feel like I have gained many leadership skills with the main ones being organisation and confidence. The main portion of the research involved interviewing over 30 engineering students. This has thus forced me to become much more organised, as I had to find and communicate with each person, allot interview times and keep all of their documents and transcripts in an easily accessible and neat arrangement. This also coincided with improving my time management skills as I had to plan the interviews, analysis and meetings accordingly so that I worked efficiently and completed all tasks by their set deadlines.

Over this six-week interview period, I have gained much more confidence in myself and my ability to manage this project. At the start, this seemed very daunting as it was all a very new experience for me, but I am very happy with what I have achieved throughout the project.

7. What your future career, educational plans or continued research plans are

Completing this research has shown me that I am extremely passionate about my degree but that there are some changes that need to be made to improve not only mine, but other engineering students' experiences. With the data I have collected, I hope to meet with and discuss some of my findings with the engineering department leaders to enforce some of the changes that their students have suggested.

The skills I have gained through this Laidlaw research project will be further utilised throughout the final two years of my degree with coursework pieces, design projects and especially dissertations. To become a qualified architect, I must finish my part 1 masters degree at the University of Leeds, followed by a Part 2 in industry and Part 3

back in university. I hope to go to London for industry years and perhaps continue there for the final years of my education. The Laidlaw research project, and the scholarship as a whole, has enabled me to gain new academic and personal skills which will support me throughout the rest of my degree and future career. In particular, the gained confidence and leadership skills will push me to achieve great things in my career and challenge myself by reaching for opportunities I would not have been confident enough to otherwise.

In my future career, I am committed to becoming an architect, but I am still unsure of the specialisation. Through the design projects in my degree, I have found that my interest does not lie in designing contemporary, high rise structures that are appearing all over the big cities of the world, but rather in public spaces and social housing. This research has also made me realise that I want to make an impactful change to people's lives, and by focusing my career on designing hospitals, schools and council housing, I am confident I can make a difference.

Supervisor

Leilani was very dedicated in her work during the research period. She was meticulous in designing and executing the research methodology. She also demonstrated a curiosity to learn and was keen to gain exposure to new research methods. The project was successfully undertaken and the data generated will be useful to inform changes and measures for the future.

Signature of Scholar Leilani King

Date: 30/09/2024

Signature of Project Leader Manoj Ravi

Date: 30 / 09 / 2024