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The Immersive Placement Experience: Sink Or Swim?

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THE IMMERSIVE PLACEMENT EXPERIENCE: SINK OR SWIM?

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ABSTRACT

To excel in their respective engineering fields, engineering students need to be equipped with a combination of technical and interpersonal skills. Central to excellent interpersonal skills is good communication. The aim of the study is to evaluate how well-prepared mechanical and design engineering students felt entering into their industrial placements, using a UK university as a pilot case study. For the study interviews were carried out with final year students who had previously completed an industrial placement year, focussing on communication, workplace diversity, technical working methods and university teaching styles. Reponses were anonymised, coded and analysed using quantitative and qualitative methods. Nine

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engineering students were interviewed regarding their placement experience and were asked to rate how well they thought their engineering programmes helped in developing these skills. Two key findings were: 1) students on average spent 60 % or more of their placement work using their communication skills and 2) students felt more could be done to prepare them for individual presentations and individual projects before placement. On average the students felt marginally more prepared with the interpersonal skills element compared to the technical skills element. The survey also highlighted that the students' understanding of what falls under the umbrella of workplace diversity was narrow, and they did not classify skill differences as a component of diversity. The student's honest feedback allowed a collation of proposed recommendations for both the mechanical and design engineering courses.

1 INTRODUCTION

1.1 Background

A person's personality and ability to contribute in a work environment, branded by experts as 'human engineering', accounts for 85 % of commercial success in industry[1]. The engineering workplace also seek interpersonal skills such as time management, customer orientation and, in particular, good communication[2]. In almost every industry it is evident from the job specifications there is a heavy weighting on these specific competencies. Within the UK engineering industry, 60 % of engineers said they valued good communication skills[3]. The challenge at university is preparing students to enter a workplace that is intergenerational and cross-disciplinary, which suddenly opens students to the diversity of different workplace cultures, technical language barriers and different working processes, something that is not easily simulated in the classroom, despite team-based learning and other active learning approaches widely adopted.

Diversity is more commonly known as the extent of human differences[4]. Equality, diversity, and inclusion are all aspects that employers embrace through their employment policies under the UK Equality Act 2010. By UK law, there are nine protected characteristics: age, gender reassignment, marital status, pregnancy, disabilities, race, belief, gender, and sexual orientation. However, diversity is a subject that is much broader and includes many other aspects such as culture, working styles, experiences and so on. This phenomenon has been coined in various articles on diversity and inclusion as the "Iceberg of Diversity". Organisations are now monitoring how diverse their workforce are and are striving to make their departments more diverse[5]. A diverse employee directory results in staff with varying 'cultures' mixing together and so, methods of communication within a department, or even a team can be very broad – something which engineering students will need to have a firm grasp on to ensure they are able to work effectively and efficiently.

Teams which are diverse are also 87 % better at making decisions[6].As engineering is a field in which collaboration is a common workplace practice, it is vital that engineering students are well equipped with the tools to communicate across disciplines prior to entering the workforce. Good interpersonal skills increase workplace productivity and group contribution[7]. However, studies show that engineering students are spending a mere 5 % of their time preparing for this[8]. Conflict is also inevitable in team-working environments, which tend to increase within diverse teams and requires appropriate conflict management skills, another key interpersonal skill. However there is such thing as an optimal level of conflict, which has proven to boost individual performance, increase team efficiency and encourage healthy competition within teams. A positive byproduct for companies in cases where diverse teams are managed well.

The research question for this study: are students who have completed year 1 and 2 in an engineering programme and entering their placement well equipped with the skills to work in an engineering working environment?

The aim of the study is to evaluate to which extent the university prepares mechanical and design engineering students for industrial placement using the authors' host institution as a case study. Interviews will be used to focus on communication, diversity, workplace conflict and the university's teaching methods to evaluate student perception on their development of technical and interpersonal skills at university.

2 METHODOLOGY

2.1 Data collection

Prior to starting the study, an ethics application was submitted and approved by the Engineering and Physical Sciences Research Ethics Committee at Aston University. A risk assessment was also submitted to ensure the safety of the interviewer and participants. This included how to mitigate potential cases where the interviewee may divulge company secrets or describing conflict which may have been traumatic et cetera. Interviews were conducted with students who have completed an industrial placement. The inclusion criteria of the participating students final year mechanical and design engineering undergraduates between the ages of 21 and 24 at Aston University who had completed a minimum of 25 weeks' placement experience. Interviewees were contacted via word of mouth, internal Microsoft Teams chats, email invitations, and through social media messaging. Once the students had agreed to participate, they were provided with the participant information sheet, signed a consent form before proceeding with the interview. The interviews were carried out online via Microsoft Teams and their responses were

recorded and transcribed through the software. The participants were made aware through the consent form that the audio and transcription would be recorded to allow the researcher to refer to any comments made for the post-analysis and that they will remain unidentifiable. The participants were asked the same series of questions in four categories: communication, diversity within the students' team, workplace conflict, and whether students thought their engineering programme succeeded in developing their technical and interpersonal skills in preparation for their industrial placement.

2.2 Post-interview analysis

Post-interview analysis was a mixed methods approach extracting quantitative and qualitative data from the interviews to evaluate findings. Quantitative data was conducted by coding the information collated using an open code method to extract key topics covered. This was manually conducted by the researcher. Two questions were also quantitative where students were asked to rate on a scale of 0-5 how their university programme had prepared them with the interpersonal and technical skills for their placement The codified quantitative responses were presented graphically. Qualitative data explored the experiences of the participants, where anonymised quotations were used to illustrate trends found.

3 RESULTS

3.1 Diversity within the team

A total of nine students were interviewed who were subjected to twenty-one questions regarding their industrial placement. When asked what diversity they could identify in their workplace and what would constitute diversity, students identified heavily with race, gender and religion as identifiers. It was also clear that students were not fully aware of other diversity identifiers within the nine protected characteristics and beyond (fig 1). However, 5 repondees did cite a characteristic beyond the 9 protected by law. These five includes: culture, different walks of life (2 students), education background and countries.

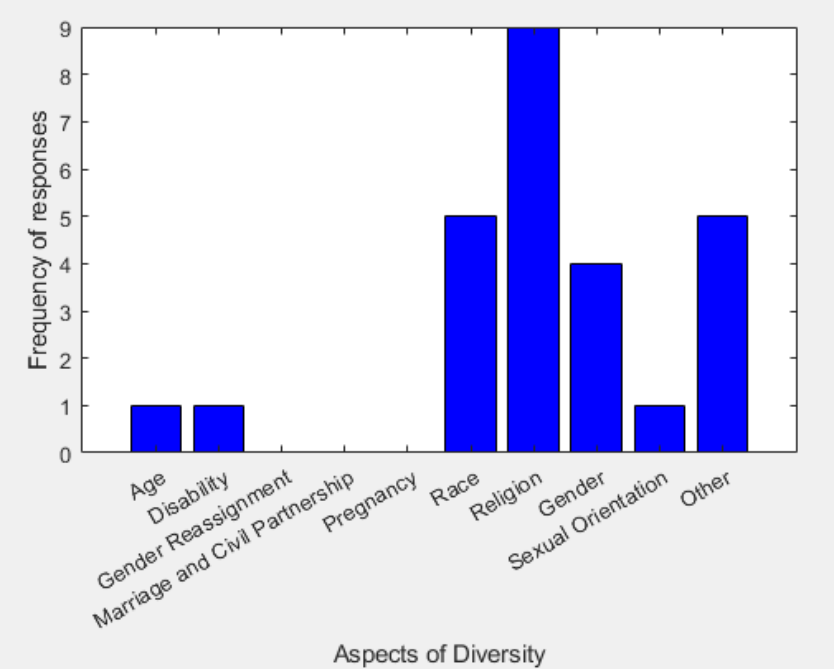

Fig. 1. Frequency of responses relating to the nine protected characteristics students associated with diversity showing a limited awareness of all characteristics and heavy emphasis on religion, race and gender.

3.2 Communication

A considerable proportion of the students' time was spent in communication during their placement. Of the nine participants interviewed, all but one student produced and collaborated on technical engineering work during their industrial placement. The survey results revealed that on average, the amount of time students spent communicating was 62.78 % +/- 24.12 SD with numbers exceeding 60 % for 5 of the 9 participants (see fig. 2).

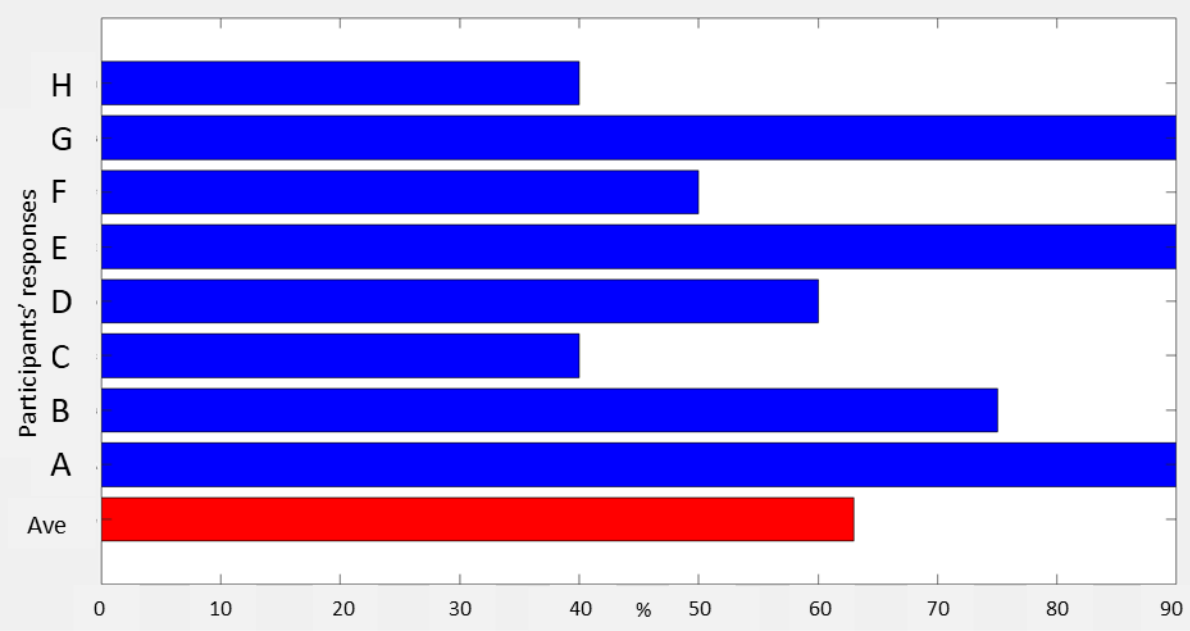

Fig. 2. Five out of nine students spent more than 60 % of their time communicating in their roles, with an average +/- standard deviation of 62.78 % +/- 24.12 across the group (red)

The students also highlighted that a wide range of communication types were used during their placement. This included face to face communication, emails, presentations, phone calls, meetings, Microsoft (MS) Teams, and WhatsApp Messenger. Most students (67 %) quoted that their workplace utilised MS Teams chats as the most common form of communicating followed by emails, face to face and meetings each constituting 11 %.

3.3 Preparation for interpersonal and technical skills in the workplace

Five students thought that the university could have prepared them better for individual communication skills with all students recommending how the university could have enhanced them. Students also quoted that they were very well prepared for technical aspects relating to CAD and manufacturing, although one student still thought CAD could have been improved.

Students were also asked to rate the university's efforts on instilling technical and interpersonal skills on a scale of 0 to 5 where 0 equated to the university providing no effort and 5 corresponding to the university helping immensely. For the interpersonal section, students gave an average score of 2.56 +/- 1.88 SD and an average of 2.28 +/- 1.72 SD for technical skilling. Interestingly, on average students thought that the academics succeeded in teaching and developing interpersonal skills better than they did at technical skills. This is noted from the higher average on interpersonal skills preparation, although it is also important to note the increase is marginal with a widespread and therefore may not be significantly different.

It is worth noting that the examined cohort of students were those who had primarily spent their university studies online due to the Coronavirus pandemic completing their year 1 and 2 during 2019-20 and 2020-21 respectively. Therefore, four students, such as participant B, thought university offered little to “no support” as students “spent most of the time working online” and claimed that they had the “soft skills already from previous experience.” Participants C and G also stated that their interpersonal skills were gained from previous employment rather than university development. The switch from in person to online based learning affected students’ people skills. This observation is supported by Participant F’s experience who commented that they thought their interpersonal skills did not excel as a result of online classes. The responses from the technical skills development aspect revealed that students thought the university partially succeeded in their transmission of technical skills as they mentioned 3D CAD as being particularly useful.

4 DISCUSSION

4.1 Diversity in the workplace

Students identified a narrow scope in their workplace diversity, which was largely focused on race, gender and faith. All interviewees were generally unaware or did not mention of most of the nine protected characteristics. However, five students did mention a characteristic beyond the nine protected by law, which indicates an awareness of the wider scope that diversity includes (the diversity iceberg). The students that identified as being from a minority group listed more diversity characteristics compared to other students, although this finding is speculative due to the small numbers. This finding may indicate a heightened awareness of their own positionality in society and that of others they work with. It was evident that students’ knowledge on diversity is limited and highlights a potential gap to address at university. It can be said that by studying in Birmingham, a city with an ethnic minority majority[9], students have spent their last 4 years interacting, socialising, studying and carrying out group work with people of different races which gives a rationale as to why these aspects were mentioned the most. Diversity is known to spark innovative solutions which is a desired component of any team, particularly a team of engineers. Knowing that companies would benefit economically with more diverse teams, it would be interesting to explore how companies define and capture diversity.

4.2 Communication

On average, students found over 60 % of their role was linked to communication with Microsoft Teams chats being evidently very popular amongst industry professionals as two thirds of students said it was the most subscribed form of communication at their placement. Students mentioned that their company opted for an agile remote working policy to reduce the exposure and spread of COVID-19. However,

participants also mentioned that this practice remained in use well after the pandemic restrictions were lifted. Students A, F, H and J all reported that their workplace was very friendly and that everyone was “approachable” in the office as they would not hesitate to approach colleagues if they needed any help. However, they continued using Microsoft Teams as a form of communication despite the close proximity and friendly nature between colleagues. It is therefore evident that today’s engineers were accustomed to the Microsoft Teams software as they found this to be an efficient, practical, and comfortable method of communicating, and so remained as their primary method of communication.

It was the student which utilised face to face meetings the most who did not witness friction or elements of conflict during their placement year. Every other student (with the exception of Participant E) mentioned that they experienced some workplace conflict. Although the sample size is small, one can speculate that specific modes of communication are preferred for reasons unrelated to productivity or ease of use but rather a way to avoid social interactions that could lead to conflict. In a literature review, Kahlow et al. (2020)[10] comments on the use of email as a conflict avoidance strategy and online working reduces the opportunity for colleagues to address and discuss problems, something that can lead to changes in values and preferences. On the one hand, technology may assist organisations in reducing levels of workplace conflict by removing face to face onsite work. On the other hand, the reduced frequency of face-to-face interactions employees have can pose a problem as it may be detrimental to employees accepting diversity. This reflection is speculative and would require further study.

4.3 Preparation for technical and interpersonal skills

The average scoring obtained from the questions pertaining to the university’s methods of technical and interpersonal skills development, were comparable with students responding more positively towards interpersonal skills. This is surprising given that the university course is split 50-50 in terms of the theoretical knowledge and application through experiments, group work, laboratories and individual assignments. The responses from the interpersonal skills aspect highlighted communication is a key area in which students required more assistance. Over a third of students (4/9) thought that “more presenting” was needed in the course, specifically “individual presentations, not group presentations”. Presenting was a huge proportion of their job role with all participants mentioning that they presented to someone (superiors), which included managers, directors, and board regulatory members, so a high level of professionalism was required of them. This explains why all the 4/9 students expressed that they wished their degree had more “individual projects” and presentations.

5 SUMMARY AND ACKNOWLEDGMENTS

Engineering industries look for employees that not only possess the technical knowledge required for the role, but equally the interpersonal skills needed. The study highlighted the key points that a wider understanding of diversity is needed, widing the communication training is also needed so it is not limited to team working but includes individual ownership through presentation practice, and how to deal with workplace conflict. Although these factors are addressed in the final year when students return from placements, this study reveals some of these skills should be introduced earlier in the programmes.These recommendations are driven through the student experience and will better prepare students for industrial placements. This study was approved by the university's Engineering and Physical Sciences Research Ethics Committee.

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