# ENGINEERING FOR PEOPLE
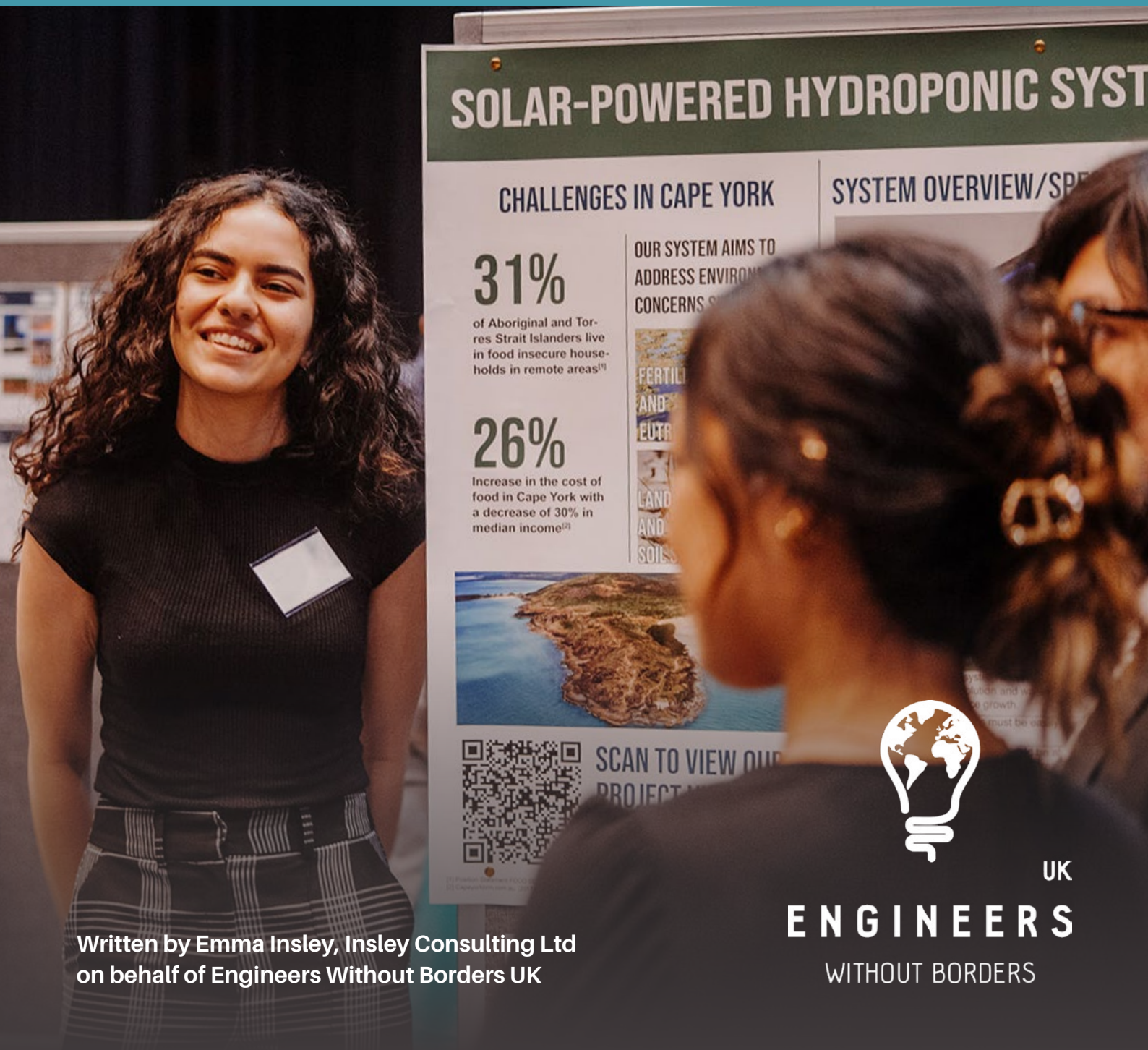
## DESIGN CHALLENGE

# IMPACT REPORT

**Written by Emma Insley, Insley Consulting Ltd
on behalf of Engineers Without Borders UK**

UK
**ENGINEERS**
WITHOUT BORDERS

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This impact report is based on an independent Impact Evaluation of the Engineering for People Design Challenge conducted by Insley Consulting Ltd. Some quotes have been edited slightly for readability. Case studies are based on interviews with students who have participated. Photographs used besides case studies and quotes are not of the people featured.

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# 1. FOREWORD

More than a decade ago, Engineers Without Borders UK launched the EWB Challenge in the UK, building on the already successful programme running in Australia. In its first year, some two thousand students from nine universities took part.

Few would have predicted that these were the first steps on a journey towards an international challenge programme spanning five countries in three continents, engaging more than 12,400 students and 47 universities annually.

Every year, the grand finals are a celebration of learning, a showcase for innovation and creativity and a reaffirmation that engineering can be at the heart of achieving the elusive balance between the needs of people and planet, so that both may thrive.

From its early beginnings, the programme has evolved year on year and now includes an online immersive and interactive brief that simulates real world challenges as never before. It has also spawned another international design challenge, Efficiency for Access, with a focus on off grid appliances.

By 2024, 87,000 had experienced Engineering for People and 12 communities had partnered with us to deliver the programme. This report is their story. It is a story of remarkable impact.

The success of the Engineering for People Design Challenge is thanks to the efforts of many people: hundreds of volunteers who have given their time to act as assessors and judges; hundreds of educators who have embraced the programme and delivered it year after year; the community partners who showed great patience and understanding as we and Engineers Without Borders South Africa developed each year's unique brief with them, and the dedicated staff and trustees at Engineers Without Borders UK.

Together, we have shown what success looks like. But we have to go much further. Today's challenges demand that we mobilise engineering's full potential to do good. For this reason, we are determined to increase the scale of Engineering for People. We welcome expressions of interest from university educators worldwide who want to equip their graduates to be globally responsible engineers.

**John Kraus**
Chief Executive

# ENGINEERING FOR PEOPLE DESIGN CHALLENGE IN NUMBERS

## THE PROBLEM

**37%**
of global emissions are produced by the building and construction sector.
(United Nations Environment Programme, 2024)

**76%**
of UK engineering companies with a sustainability strategy report that additional skills are required to implement it.
(The Institute of Engineering and Technology, 2023)

## A SOLUTION

**87,617**
students have participated in the Engineering for People Design Challenge since 2011.

**47**
universities are delivering the programme in 5 countries in 2023–24.

## INSPIRED STUDENTS

**83%**
of students feel inspired by the principles of globally responsible engineering.

**75%**
of students feel more energised about the potential of a career in engineering and their potential impact as an engineer.

"It's such a well-designed programme, which makes it very easy to bring into our course. They provide such great materials."

**Educator interviewee, Colorado State University**

## UPSKILLED STUDENTS

**76%**
of past participants thought it contributed to their academic attainment.

**91%**
of students had broadened their understanding of the importance of globally responsible engineering.

**83%**
of students felt confident in addressing the SDGs in their learning and practice.

**The programme resulted in significant increases in understanding globally responsible engineering, as well as essential workplace and technical engineering skills.**

# 2. ABOUT ENGINEERS WITHOUT BORDERS UK

Engineers Without Borders started when a group of engineers gave their time and skills to help people in Ethiopia during the famine of the early 1980s. The global Engineers Without Borders movement now operates in 89 countries worldwide.

Our planet is in a perilous position. The depletion of natural resources, the destruction of ecosystems, and the climate emergency are hitting the poorest hardest. The building and construction sector alone is responsible for 37% of energy and process-related carbon dioxide ($CO_2$) emissions (United Nations Environment Programme, 2024). This cannot continue.

**Engineers Without Borders UK believes engineers must play a fundamental role in designing solutions to ensure humanity and the planet thrive.**

This means that engineers must critically reflect on the role of engineering in society and understand the social, environmental and economic impacts that it has.

**To achieve social and environmental justice, we need engineers and others to commit to globally responsible engineering.**

Our 2021–30 strategy sets out four key principles of global responsibility that we want to see adopted across the engineering community and embedded in the culture of how all engineering is taught and practised. Globally responsible engineering is:

- **Responsible.** To meet the needs of all people within the limits of our planet.
- **Purposeful.** To shape outcomes to be equitable and ethical throughout engineering and the life cycle of any project.
- **Inclusive.** To ensure diverse viewpoints and knowledge are included and respected in the engineering process and outcomes.
- **Regenerative.** To maximise the ability of all living systems to achieve and maintain a healthier state and naturally co-evolve.

We aim, by 2030, to have built a movement powerful enough to radically transform the culture of engineering.

We are working towards this goal by **inspiring** and **upskilling** individuals and organisations to put global responsibility at the heart of engineering, as well as uniting professionals, educators, students and community members to **drive change** and address the needs of people and the planet.



## INSPIRE | UPSKILL | DRIVE CHANGE

# 3. HOW WE INSPIRE, UPSKILL AND DRIVE CHANGE

## 3.1 TRANSFORMING EDUCATION

The Engineering for People Design Challenge is at the heart of our aim to transform education by ensuring that engineering students graduate with the determination and competencies to be globally responsible engineers. For this reason, the Challenge develops both technical ability and wider skills. This report focuses on the programme's impact.

While Engineering for People is our largest programme, it is one element of a much wider effort. We run complementary design challenges, for example the Efficiency for Access Design Challenge - a global, multi-disciplinary competition that empowers teams of university students to help accelerate clean energy access. This challenge was based on the Engineering for People model.

We also support and convene University Student Chapters throughout the UK to advocate for globally responsible practice through extracurricular activities.

Our Reimagined Degree Map is a new toolkit for universities to navigate how to positively shape degrees to create globally responsible engineers. The Map was developed with the Royal Academy of Engineering and has been endorsed by the Engineering Council.

## 3.2 BUILDING KNOWLEDGE

Reshaping Engineering is a month-long virtual design challenge that invites student and professional participants worldwide to design solutions that could reshape how engineering is taught and practised to ensure a safe and just future for all.



The Global Responsibility Engineering programme is a 6-hour virtual self-paced course and job simulation for people interested in a job in engineering.

## 3.3 CHANGING PRACTICE

The Global Responsibility Competency Compass is an introductory and action-oriented tool that points engineering practitioners to the capabilities they need to stay relevant in the face of a complex, fast-paced and uncertain future. This product was created by Engineers Without Borders UK, developed with the support of the Royal Academy of Engineering, and is endorsed by the Engineering Council.

The Advocate Programme is a professional development programme that is equipping future Change Makers with the skills required to advocate for positive change in their business.

# 4. ABOUT THE ENGINEERING FOR PEOPLE DESIGN CHALLENGE

## 4.1 THE PROBLEM

**37%**

of global energy and process-related $CO_2$ emissions are caused by the building and construction sector.

(United Nations Environment Programme, 2024)

**76%**

of UK engineering companies with a sustainability strategy report that they need additional skills to implement it.

(The Institute of Engineering and Technology, 2023)

**With the 2030 deadline for meeting the UN Sustainable Development Goals looming, time is running out to upskill people who can enact positive change.**

# 4.2 A SOLUTION



The Engineering for People Design Challenge is a flagship initiative by Engineers Without Borders UK and South Africa that provides engineering students with a unique opportunity to develop crucial engineering skills by designing solutions to problems faced by communities worldwide.

The Design Challenge provides a safe environment that closely replicates the real world, in which students work collaboratively to design context-appropriate engineering interventions. Through the programme, participants broaden their understanding of the impacts of engineering on people and the planet. Ultimately, these skills help to prepare students for the realities of the modern workplace in which engineers require both excellent technical ability and wider skills to ensure their work delivers societal and environmental benefits.

In the 2023-24 academic year, the Design Challenge was undertaken by an estimated **12,416 students across 47 universities** in the UK, the Republic of Ireland, South Africa, Cameroon, and the USA. Since 2011, we have reached more than 87,000 students.

Each year, Engineers Without Borders UK works in equitable partnership with a community partner to develop a real-world design brief, a valuable resource which paints the picture of a local community and the

engineering challenges it faces, and is shaped by local insights and reflections.

During the Design Challenge, students work in teams collaboratively and often across different engineering disciplines to propose a sustainable and practical solution that addresses key issues such as access to essential services, sanitation, energy and infrastructure. The Design Challenge places cultural sensitivity, community engagement and ethical considerations at the forefront, to drive students' technical considerations.

**By encouraging sustainable and community-centred solutions, the Design Challenge aims to nurture the next generation of globally responsible engineers who can contribute to positive and meaningful change in the world.**

It culminates in presentations and evaluations, and the opportunity to compete against teams from other universities at the Engineering for People Design Challenge Grand Finals, a prestigious annual event where judges from industry, academia and the community partner select a winning team design.

# 4.3 HOW UNIVERSITIES DELIVER THE ENGINEERING FOR PEOPLE DESIGN CHALLENGE

Universities choose to deliver the programme in the way that works best for them. Most run it within a single engineering discipline. Some make it a multi-disciplinary activity that brings together students from different engineering courses and in some cases, non-engineering students from humanities, business or computer studies courses.

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**"I think it's one of the only opportunities for students where we really integrate sustainability, ethics and authentic problem-solving."**

**Educator focus group**

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The placement of the programme within the curriculum varies considerably, depending on the university curriculum. Some choose to integrate it within the first year of study, to help students develop a rounded view of engineering from the outset and to excite them about their degree programme. Others place it in the second year (or third year in Scotland).

There are also significant differences in the programme duration – some universities run it as a one-week intensive programme, while others take two semesters. Finally, while some universities make the programme credit-bearing, the majority do not attach credits to the Engineering for People Design Challenge module.

## University of Sheffield

The Design Challenge is one week in duration at the University of Sheffield. It is a multi-disciplinary module that runs in the foundation and first years of study. The university uses a cascade teaching model, whereby materials and activities are designed by staff and delivered by 42 PhD students, each looking after a 'hub' of around seven teams of five students. 1,500 students from University of Sheffield undertake the programme every year. Alumni are invited back onto the programme to offer encouragement to new participants. While the programme remains non-credit-bearing, the university has introduced distinctions, merits and passes as an additional way to motivate students.

## Queen's University Belfast

Queen's University, Belfast, delivers the Design Challenge to second year Software Engineering & Systems Development students and first year Chemical Engineering students (385 students in total). The Design Challenge is used to raise students' awareness of sustainable development and is an assessed part of their degree pathway. The module lasts seven months, with each of the two participating courses launching at the same time, but working on separate timetables thereafter.

# COMPETITION AND GRAND FINALS

The Engineering for People Design Challenge is a competitive programme in which the highest-scoring teams from each participating university are entered into the Grand Finals. During the event, judges from industry, academia and the community partner score the students on their consideration of the social, ethical, environmental and economic impacts and viability of their design. Prizes are awarded to a winning team, runner-up and the 'People's Prize' (voted for by the public).



## 79%

of past participants surveyed were motivated ('somewhat' or 'very') to aim for the Grand Finals of the competition.

Source: Survey for past participants (N=80), see Table 1 in Technical Appendix

## 77%

of students attending the Grand Finals thought that it was important ('somewhat' or 'extremely') for them to attend the event.

Source: 2023 Grand finals student feedback (N=81), see Table 2 in Technical Appendix

"The feeling brought to me by this competition is unparalleled. It is unique; it brings us a more confident spirit, and we will be more optimistic because of it."

**Past participant survey respondent, Temple University**

Although some educators experience logistical and budgetary challenges when getting a team of students to an event that may require significant travel, for students who were shortlisted, the experience of attending the Grand Finals is overwhelmingly positive.

Students responding to our surveys described the experience as a boost to morale and motivation, and an opportunity to sharpen their pitching and presentation skills. They also valued meeting and networking with peers from other universities.

"I was very excited and proud that my team's work was recognised, and that our work was good enough to be shortlisted amongst a large pool of teams nationwide. It reinforced my love for this career and degree."

**Past participant survey respondent, University of Brighton**

# CASE STUDY OF GOVAN DESIGN BRIEF AND WINNING DESIGN



**Govan is an urban community located on the south side of the River Clyde in Scotland. It is an area with a rich history and heritage that has been shaped by its physical waterfront location. It is one of the most historically significant areas in Glasgow that has been transformed over the years. In common with every community featured in the Challenge across the years, Govan has its own very specific – and by no means static – circumstances.**

Govan Community Project is a community-based organisation that supports the diverse communities in the Greater Govan area, as well as refugees and people seeking asylum all over Glasgow. Its purpose is to achieve social justice by building a strong community based on equality, mutual respect, support, and integration.

Students participating in the Engineering for People Design Challenge in 2022–23 were invited to explore the historic significance of Govan and the experiences of refugees and people seeking asylum arriving and living in the community. They were then asked to respond to one of eight challenge areas: food, transport, digital, built environment, waste, energy, water, or sanitation.

Students' solutions were reviewed by over 200 volunteer reviewers, with the top 36 teams invited to participate in the Grand Finals at the University of Strathclyde Technology and Innovation Centre in Glasgow. The winning team came from the University of Greenwich with their concept, 'Health Pod', a dual purpose space that utilises shipping containers to tackle food insecurity and inaccessibility to healthcare in Govan. The judges were impressed with the way that the multidisciplinary team came together, each contributing their own strengths to the project and exemplifying the process that the challenge is designed to encourage.

Tom Whitehead, Programme Manager for Engineers Without Borders UK, said that the project "perfectly represented the ethos of the Design Challenge. The team considered how one space could be used to meet multiple challenges facing the area, giving great thought to the needs of the diverse community in Govan."

# 5. THE IMPACT OF THE ENGINEERING FOR PEOPLE DESIGN CHALLENGE

## 5.1 HOW OUR IMPACT WAS ASSESSED

In 2023, Engineers Without Borders UK commissioned an independent assessment of the impact of the Engineering for People Design Challenge on students, universities, industry and community partners. This report outlines the findings of the study, which was conducted by Insley Consulting Ltd.

## OVER 1,592 PEOPLE CONSULTED

**1474**
**survey responses**
from students who finished the programme in three academic years (2021–2024)

**87**
**survey responses**
from past participants of the programme (2016–2023)

**4**
**focus groups**
with 7 students and 21 educators in 2023, as well as quantitative data from educators through Menti polls

**28**
**interviews**
with educators, students, community partners and industry representatives

See the Technical Appendix for the evaluator's assessment of the strengths and limitations of the study, as well as the survey and interview questions and data tables.

# 5.2 THE REACH OF THE ENGINEERING FOR PEOPLE DESIGN CHALLENGE

**87,617**

**Students**

have participated in the Engineering for People Design Challenge since 2011.

**13,343**

**Students**

participated in the 2023–24 academic year.

**47**

**Universities**

are delivering the programme in 2023–24.

**5**

**Countries**

are currently participating.

| Country | 2023-24 Academic Year (est.) | | 2022-23 Academic Year | | 2021-22 Academic Year | |
|---|---|---|---|---|---|---|
| | Universities | Students | Universities | Students | Universities | Students |
| UK | 35 | 9,718 | 32 | 8,309 | 32 | 7,629 |
| Ireland | 1 | 330 | 1 | 340 | 1 | 340 |
| USA | 4 | 685 | 6 | 1,030 | 5 | 870 |
| South Africa | 7 | 2,600 | 6 | 2,346 | 7 | 2,346 |
| Cameroon | 1 | 10 | 0 | 0 | 0 | 0 |
| **Grand total** | **48** | **13,343** | **45** | **12,025** | **45** | **11,185** |

Table 1 - Engineering for People Design Challenge participation

## Market penetration

- The reach of Engineering for People Design Challenge is impressive in the UK and South Africa, albeit with room to grow.
- The top UK engineering universities (Times Higher Education, 2023) are 1.5 times more likely to participate than others.
- Market penetration in the USA is significantly lower than UK and South Africa, presenting the biggest opportunity for growth.

### UK market penetration

**23%**
of 36,140 first year UK students studying an engineering degree (HESA, 2021/22)

**29%**
of 109 UK universities offering engineering degree (Mitchell J., et. al., 2024)

**46%**
of top 50 UK universities for engineering (Times Higher Education, 2024)

**40%**
of top 50 UK universities for SDGs (Times Higher Education, 2023) that offer an engineering degree

**28%**
of top 50 English universities for social mobility (HEPI, 2023) that offer an engineering degree

### Market penetration in other countries that run the Engineering for People Design Challenge

**8%**
**Republic of Ireland**
of 13 institutions in Ireland offering an engineering degree
(from data provided by Central Applications Office, Ireland)

**2%**
**USA**
of 223 USA institutions offering engineering degree
(American Society for Engineering Education, 2022)

**47%**
**South Africa**
of 15 universities offering engineering degree
(Figure provided by Centre for Engineering Education)

**10%**
**Cameroon**
of 10 universities offering an engineering degree
(desk research from AfricanUniversities.org)

## Engineering discipline

**Most common engineering disciplines for participants from UK, Ireland, and USA**

| Discipline | Percentage |
|---|---|
| General Engineering | 55% |
| Engineering (Multidisciplinary)* | 19% |
| Civil Engineering | 8% |
| Engineering and Construction | 5% |
| Electronic and Electrical Engineering | 4% |
| Engineering and Informatics | 4% |
| Software Engineering and Systems Development | 4% |
| Environmental Engineering | 1% |
| Chemical Engineering | 0% |
| Engineering and Design | 0% |
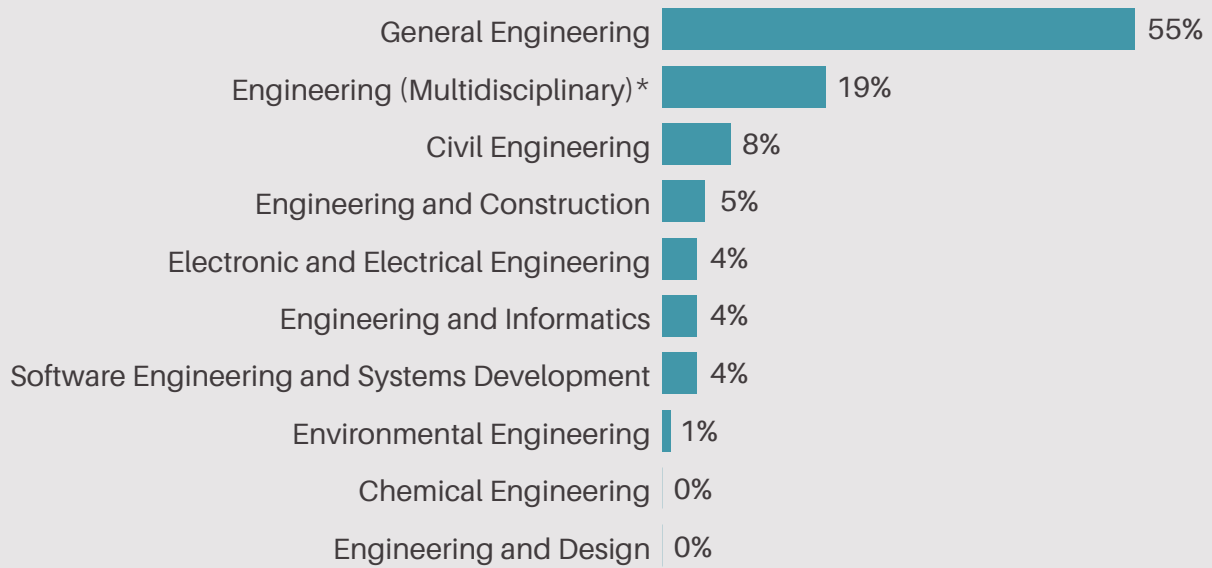
Figure 1. See Table 3 in Technical Appendix.
*Engineering (Multidisciplinary) can include multiple engineering disciplines (for example Mechanical Engineering and Civil Engineering).

## Gender

**24%**
of Engineering for People Design Challenge participants are female, compared to

**16%**
of UK undergraduate engineering students in general (Mitchell J., et. al., 2024).

# 5.3 OUR INTENDED IMPACT OUTCOMES

The intended impact outcomes for the Engineering for People Design Challenge, which are aligned to our 2021-30 strategy, are outlined below.

**Inspire**
Students are inspired to use the principles of globally responsible engineering in their studies and career

→

**Upskill**
Students have broadened their understanding, skills and expertise in globally responsible engineering, as well as their engineering and essential workplace skills

→

**Drive Change**
Students are better equipped to drive change in industry

# 5.4 INSPIRED STUDENTS

**Outcome 1: Students are inspired to use the principles of Globally Responsible Engineering in their studies and career**

## Inspired by globally responsible engineering

Evaluators identified good evidence through multiple sources from current and past participants that the Engineering for People Design Challenge contributes to students feeling inspired about the principles of globally responsible engineering.

"I guess what is so cool about this project is that you have the ability to create ideas that have a resounding impact on other people. And you don't even have to be a company. As a student, you have the ability to have these ideas … We have relevance and our ideas are relevant."

**Student, focus group participant, Strathclyde University**

Although some students may have been familiar with the concept of sustainability and the Sustainable Development Goals (SDGs) before doing the programme, educators indicated that they may seem somewhat remote and intangible without this kind of programme to cement and contextualise them. In interviews and survey responses, students consistently spoke about how **the Design Challenge brought sustainability to life** and helped them see the potential impact they could have on the lives of the people through their engineering solutions.

## 83%

**of students feel inspired by the principles of globally responsible engineering**

Figure 2 (N=409). See Table 4 in Technical Appendix.



"Although we get told about the SDGs … With this project you actually realise that you can change this thing or that thing, and it will have an impact on the rest of the world. So, I guess it's that you don't have to be the biggest thing in the world to actually have a positive change."

**Student, focus group participant, Strathclyde University**

## Changed perceptions about how engineers can contribute to globally sustainable solutions

Educators interviewed and participating in our focus group suggested that students often enter their degree with a narrow focus on engineering as a discipline, more influenced by maths and physics than people and the planet; the Engineering for People Design Challenge is a key tool for broadening their mindset. As one educator from Strathclyde University noted, **"engineering is about more than nuts and volts!"**

# 16 OUT OF 19

educators participating in the 2023 Grand Finals agreed that one of the key strengths of the Engineering for People Design Challenge is in changing students' mindsets.



"Your understanding of engineering is moving away from just maths and physics and applying this prior learning to people and a social situation: the human aspect of design."

**Student, focus group participant, Strathclyde University**

Students' attitudes or mindsets were changed (or in some cases, confirmed) through the programme, after developing their knowledge, understanding and skills in globally responsible engineering through project-based learning (see Upskilled Students). Educators and students indicated that perceptions were developed by :

- Being more aware of and having increased understanding of sustainability and the environment.
- Understanding the importance of keeping the end-user in mind.
- Feeling motivated to bring about positive change through engineering.

"It broadened my horizons and gave me an insight into some of the interesting challenges that communities face around the world and it required me to think outside the box to create solutions for these unique situations."

**Past participant survey respondent, Ulster University**

## Inspired about potential of career in engineering

The Engineering for People Design Challenge has led to **three quarters of students feeling energised about the potential of a career in engineering and their impact as an engineer.** Several students expressed excitement about being at the start of their career at an exciting time for global sustainability.

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"We are looking at these problems from a very unique situation that a lot of big corporations are not … As a student I have value in the engineering sector; we have influence … and we haven't even gotten to the end of our degree!"

**Student, focus group participant, Strathclyde University**

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In surveys and interviews, students described how the hands-on experience through the design challenge had led them to be inspired by engineering, by:

- Giving them a taster of what engineering is like, reinforcing their decision to study and have a career in engineering.
- Igniting a passion for sustainable engineering.
- Understanding the "bigger picture" and the potential impact that engineers can have in the world.
- Shaping their career path.

## 75%

**of students feel more energised about the potential of a career in engineering and their impact as an engineer**
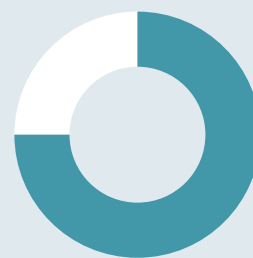
Figure 3 (N=507). See Table 5 in Technical Appendix.

"This hands-on experience has not only shaped my career trajectory but has also fueled my passion for leveraging engineering to address crucial challenges in my community and contribute to sustainable development."

**Past participant survey respondent, The University of Manchester**

# STUDENT CASE STUDY: PAUL DRYBURGH

## IT WAS THE FIRST TIME I HAD TO THINK ABOUT SUSTAINABILITY, AND IT SPARKED AN INTEREST

I studied at the University of Edinburgh and completed the Engineering for People Design Challenge in the 2013-14 academic year.

For the project, we were given the brief that we were working with an extremely small village in East Timor. We were trying to find a product or design a solution that would be the most advantageous to that community. We had the choice of doing something within energy or within transport.

With the Design Challenge the task was open-ended – coming up with our own solutions to a problem, whereas with other modules we looked at the technical aspects of given solutions. Within the design challenge we had to consider the social implications of our designs and how easy it would be to manufacture. It was probably the only time in my undergrad degree when there was something similar to that.

"It was probably the most holistic way that we looked at engineering within my degree. It was the closest to what a design project might be like if you were to do it for a business."

It was also the first time I ever really had to think about sustainability; I didn't have this in mind too much before. At the time, a lot of previous Edinburgh graduates had been employed by oil and gas companies and a lot of the courses were tailored towards that. At that point I also thought that work in oil and gas would be an option for someone like me, although I recognised that it might not be a booming industry in 20 or 30 years.

This project certainly sparked an interest in sustainable engineering, although it took a while for me to realise this. In terms of work, I didn't head into the oil and gas industry. Instead, I went straight from my undergrad degree to a PhD, and now I work as a researcher at King's College.

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"The Design Challenge is probably one of the few things from university that's stuck with me – if I'm doing something in my research, sometimes I even think, 'I wonder how that would play out if we were trying to do it in East Timor?'. I look at the constraints and how easy it would be to get manufactured."

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The Engineering for People Design Challenge is not just another university course. It's different and I think that makes it more memorable and rewarding.

# 5.5 UPSKILLED STUDENTS

## Why project-based learning?

The UNESCO report on Engineering for Sustainable Development (2021), noted that "*more complexity*" is needed in the engineering curriculum, which "*requires adopting a more thoughtful approach that encompasses the social, human, economic and environmental impacts of engineering*".

The Engineering for People Design Challenge uses a project-based learning approach that brings in complexity through real-world challenges that immerse students in an environment that they would experience in industry. Students work in groups through the design cycle, which allows them to develop and refine crucial skills that are highly valued by employers. These skills not only enhance their academic experience but also prepare them for success in their future professional careers.

## 76%

of past students thought Engineering for People Design Challenge contributed to their academic attainment

Figure 4 (N=86). See Table 6 in Technical Appendix.

"Project-based learning as a methodology is actually I think one of the most important things you can teach at university, because this teaches your approach to doing any sort of problem solving."

**Oliver Broadbent, industry partner interviewed - Director, Constructivist Ltd. 1851 Fellow in Regenerative Design**

"Project-based learning in general is difficult. It's difficult to teach. It's very difficult to assess. And it's very difficult to formulate design problems that have a measure of authenticity, which is why the Engineering for People Design Challenge is so fantastic. A lot of the heavy lifting has been done already. I mean, that is spectacular. Year- on-year, it is an absolute treat. It's a delight to work with it because it's multifaceted."

**Anne Fitchett, educator interviewee, Honorary Associate Professor, University of Witwatersrand**

## Outcome 2: Students have broadened their understanding, skills and expertise in globally responsible engineering

Research by Moore, Schneider & Streiner (2019) suggests that, in general, first-year engineering students arrive at college less prepared in terms of their global perspectives than their non-engineering counterparts.

It is essential, then, to develop students' understanding of sustainability and for them to have a holistic understanding of global responsibility in engineering. Students are encouraged to think about their responsibility as engineers in a holistic way, including the ethical implications, by purposely addressing the social and cultural aspects of their work, as well as the environmental and economic factors, and how these factors impact different stakeholders. Students' work is evaluated on the appropriateness of their designs in these contexts. One past participant said that this approach encourages **"disruptors"** and **"radical thinking"**.

For students, discovering these connections was insightful.

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"I'd always had a broad idea of the concept of sustainability in engineering and that's one of the things that drew me to the discipline of it as a university course. But the concept of globally responsible engineering was quite new to me … The interconnections between ethics and social responsibility, and that whole interconnectedness of the discipline became apparent as I went through the process."

**Past participant interviewee, University of Birmingham**

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"Their empathy develops a lot. So, they learn that their own understanding of another person's experience is not the same as that person's lived experience. At the beginning, they often believe it is. Holding space for this difference and this unknowable element is key to developing their empathic engagement with others."

**Dr Elizabeth Hauke, Principal Teaching Fellow, Change Makers Field Leader, Imperial College, London**

Educators told evaluators that the programme fosters inclusivity and empathy among students by encouraging them to understand and connect with the needs and experiences of different communities and stakeholders. The design brief and facilitated discussions on using appropriate language to describe local populations help students to avoid 'othering' people.

These skills are essential for designing solutions that truly address real-world problems.

Evaluators found strong evidence that the Engineering for People Design Challenge increases students' understanding of the importance of globally responsible engineering, with the vast majority both of students who had recently finished the programme (91%, N=409) and of past participants (91%, N=80) increasing their understanding.

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"I think it definitely broadened my awareness of sustainability. It brought it a bit more to the forefront of my mindset when I look into design and realise that every design should be a sustainable solution. It's not an afterthought or an extra bonus if we do something sustainable."

**Past participant interviewee, Strathclyde University**

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Educators said that prior to undertaking the Challenge, engineering students often had a narrow view of sustainability; primarily focusing on the environmental aspects and not the people. Several students told evaluators that this was their first or only opportunity to see how the Sustainable Development Goals (SDGs) are interconnected and should be at the forefront of all solutions.

# 91%

**of students had broadened their understanding of the importance of globally responsible engineering**
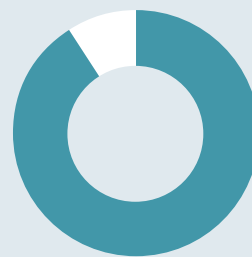
Figure 5 (N=489). See Table 7 in Technical Appendix.

# 83%

**of students felt confident in addressing the SDGs in their learning and practice at the end of the programme**

Figure 6 (N=407). See Table 8 in Technical Appendix.

"We came across the SDGs before but we've not really incorporated them in our work up until that point. And personally, I almost thought of them as 17 separate entities, whereas I think this class is very good at showing the interlinkages between them. The SDGs and how they underpin everything has been a big part of my studies in the two years that followed."

**Student focus group participant, Strathclyde University**

## How we assessed increases in skills

Survey data from student participants in 2021-22 included self-assessed retrospective 'distance travelled' (pretest-posttest) questions on how students rated their skills compared to others. These scores are represented in the column charts.

However, we changed the distance-travelled questions in 2022-23 to retrospective questions asking students to assess the extent to which their own skills had developed (without the requirement to rate themselves before and after the programme and compared to their peers). These scores are represented in the doughnut charts.

The change in question type was intended to increase response rates by minimising the burden on participants to assess their skills in the context of their peers, and enable us to include more questions about skills developed. However, students from one university in 2022-23 completed the distance-travelled survey questions from the 2021-22 survey, so their responses have been included in distance-travelled questions. This report therefore presents both distance-travelled and retrospective questions from the different years, as different students would have used different measures. Both methods show a considerable increase in skills.

## Increased engineering skills

The Engineering for People Design Challenge seeks to increase students' technical and non-technical engineering skills, specifically:

- Understanding the context
- Working in highly constrained or uncertain environments
- Working through the engineering design cycle
- Developing creative solutions

**89%** of students thought they had increased their skills in understanding the context
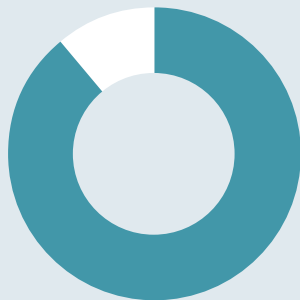
Figure 7 (N=368). See Table 9 in Technical Appendix.

## Increased skills in understanding the context

Before considering technical solutions, the Engineering for People Design Challenge requires students to fully consider and address the social, community, environment, and economic context in designs. This broader perspective is essential for future engineers to operate in a globally responsible way.

"One of the reasons I got started with this so long ago was having students understand that their work as engineers is a social construct. This project is incredible in contextualising engineering because you can see how this is a joint effort between NGOs, local communities, and engineers. It takes all three to make this happen."

**Thomas Siller, educator interviewee, Colorado State University**

Distance-travelled evaluation data (through a retrospective survey at the end of the programme) shows a **significant increase in skills in understanding the context – 39% of students rated their skills in this area as 'above average' or 'excellent' before the programme, almost doubling to 74% after.**

**Increase in skills in understanding the context**



Figure 8 (N=822). See Table 10 in Technical Appendix. Percentages may not add up to 100 because of rounding.
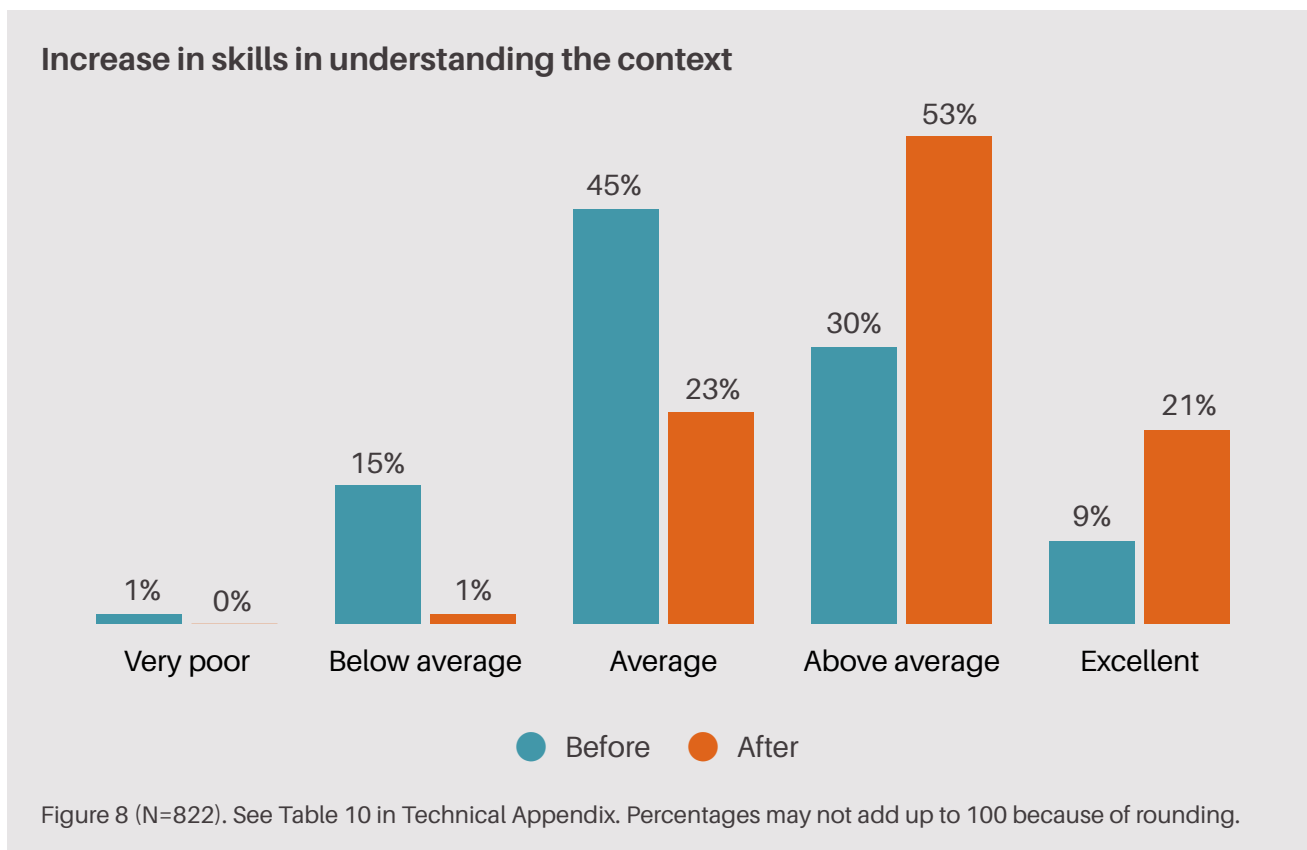
Students and educators noted that the comprehensive design brief provided students their first opportunity to understand the real-world context, rather than relying on theory. Although some resistance is reported amongst more technically-minded students, this emphasis on the holistic context enables students to appreciate engineering as a multidimensional field that goes beyond number-crunching, and provides a more realistic view of how the globally responsible engineering world works **for** people.

Students and educators from various countries also highlighted to our evaluators the benefits of the design brief being rooted in local communities, alternating between different types of countries, promoting empathy and a wider understanding of global sustainability.

"It definitely gave me a further global understanding of how systems work and integrate together, especially in an engineering context. It is useful to reflect back on, to showcase my understanding and skillset and see how I can apply these aspects to my professional career."

**Past participant survey respondent, Aston University**

## Increased skills in working in constrained environments

Once students understand the social, economic and environmental context, they learn how to work with limited resources and make the most of what is available to them. This could include financial and time constraints and access to specific materials.

Through the Engineering for People Design Challenge, students learn to think critically, evaluate options and make informed decisions to optimise resources.



# 81%
**of students thought they had increased their skills in working in highly constrained / uncertain environments**

Figure 9 (N=368). See Table 9 in Technical Appendix.

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"A lot of what we learn at uni is centred on engineering in a developed society where you have access to so many more techniques, so many more materials, so much more money. This class strips it back to what is necessary; 'what can you do to improve life within a set of boundaries that you don't normally work within?'"

**Student, focus group participant, Strathclyde University**

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### Increased skills in working in highly constrained / uncertain environments

Distance-travelled evaluation data shows a significant increase in students' skills of working in highly constrained or uncertain environments – with **double the proportion of students who rate themselves as having 'above average' or 'excellent' skills in this area after the programme than before** (66% after, compared to 33% before).
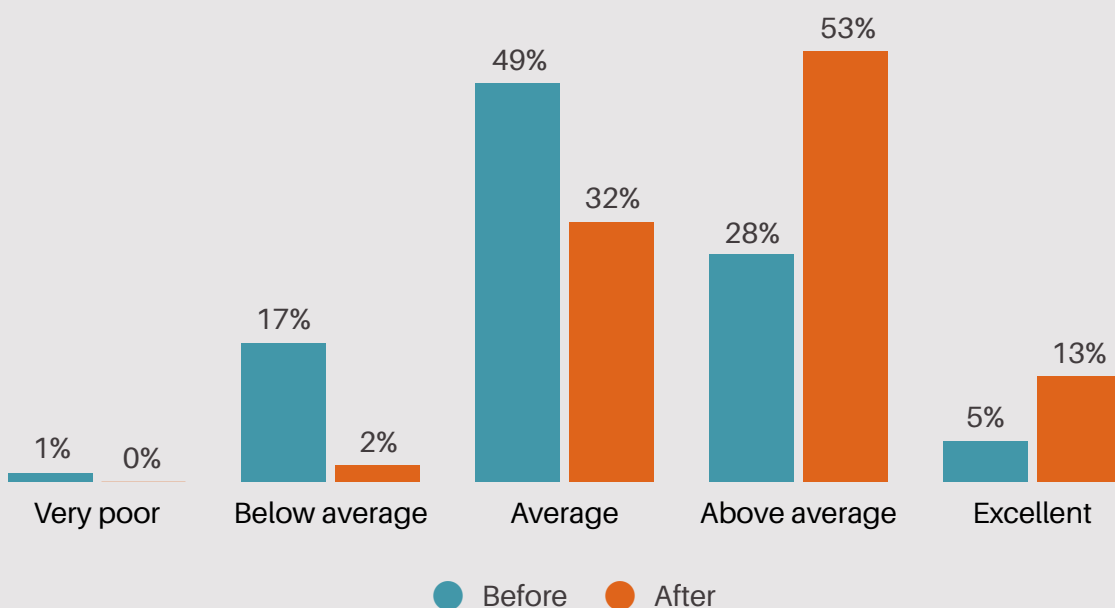


Figure 10 (N=821). See Table 11 in Technical Appendix.

## Increased skills in working through the engineering design cycle

For many students, the Engineering for People Design Challenge is their first opportunity to work through the whole engineering design cycle. One educator explained to our evaluator that **"this sets the scene for the rest of the degree"**.

Real-world problems are dynamic and may evolve over time. Students therefore learn the importance of adaptability in their designs; the design cycle is not linear, but an iterative cycle. The more students learn through the programme, the more they find themselves back at the beginning, re-defining the problem statement and design criteria.

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"I got a wider insight on design in general, and learning the four steps to designing a project helped to sharpen this skill in particular."

**Student survey respondent (2021-22 end survey), University Of Bristol**

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# 88%

of students thought they had increased their skills working through the engineering design cycle
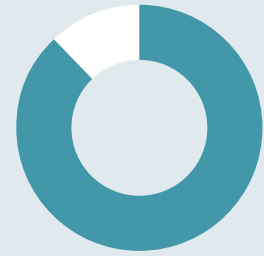
Figure 11 (N=368). See Table 9 in Technical Appendix.

## The design process

Analyse the context

Define the problem

Justify your final design

Explore lots of options

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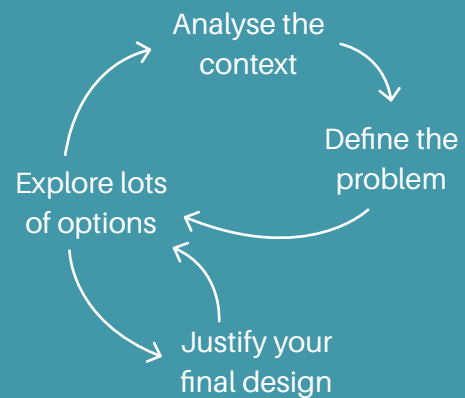
### Skills in working through the engineering design cycle

Distance-travelled evaluation data shows a significant increase in students' skills in working through the design cycle – from 24% rating themselves as 'above average' or 'excellent' in this competency before the programme, compared to 64% after.

|  | Very poor | Below average | Average | Above average | Excellent |
| --- | --- | --- | --- | --- | --- |
| Before | 4% | 30% | 42% | 19% | 5% |
| After | 0% | 2% | 34% | 51% | 13% |

● Before   ● After
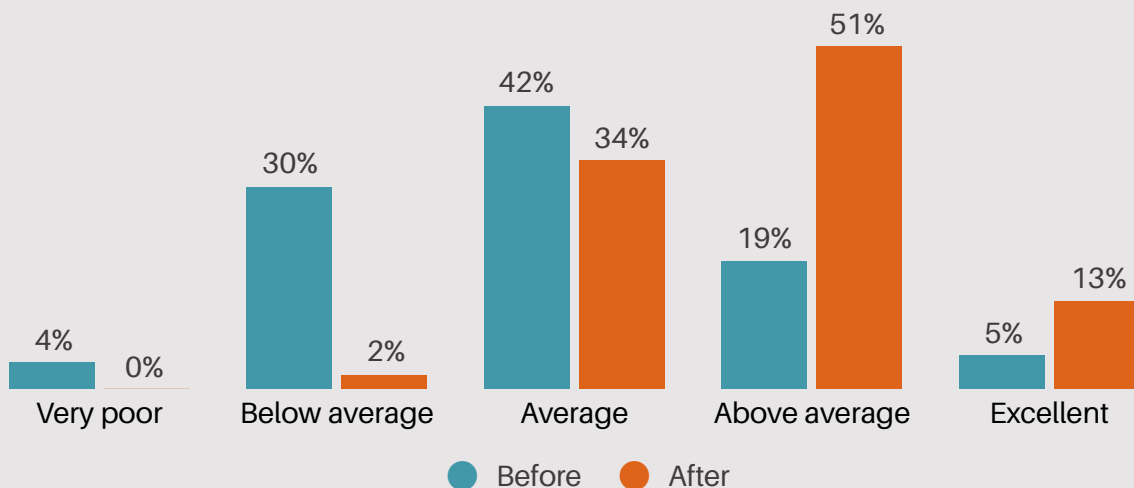
Figure 12 (N=819). See Table 12 in Technical Appendix.

# Increased skills in developing creative solutions

The Engineering for People Design Challenge encourages students to define the engineering problem themselves and design creative solutions that are judged on their focus on community and social considerations, as well as the economic context and environmental impact.

"When you're at uni, you learn your theory, and you just follow a nice example of a problem and that's it. Whereas with this class we're starting with a blank canvas. It's not just solving a problem; it's solving a problem that works for the people. It takes problem-solving to the next level."

**Past participant interviewee, Strathclyde University**

## 92%

**of students thought they had increased skills in developing creative solutions**
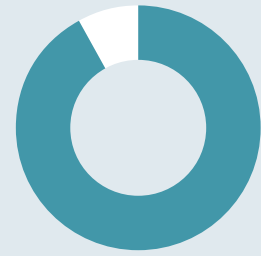
Figure 13 (N=368). See Table 9 in Technical Appendix.

Although students are encouraged to think beyond traditional engineering approaches, rather than prioritise innovation for the sake of inventing something new, students are encouraged to utilise sustainable solutions from other settings, and adapt them for the context presented in the brief.

## Skills in developing creative solutions

Distance-travelled evaluation data shows a significant increase in students' skills in developing creative solutions – with **twice the proportion of students rating themselves as 'above average' or 'excellent' in this skillset after the programme (69%) compared to before (35%).**

|  | Very poor | Below average | Average | Above average | Excellent |
|---|---|---|---|---|---|
| Before | 0% | 11% | 54% | 28% | 7% |
| After | 0% | 1% | 29% | 54% | 15% |

● Before  ● After

Figure 14 (N=822). See Table 13 in Technical Appendix.

# CASE STUDY: GRACE HEMSWORTH

## THE CHALLENGE GAVE ME AN APPETITE FOR HOW ENGINEERING COULD BE APPLIED IN THE REAL-WORLD

I was at London South Bank University and did the Engineering Challenge in 2016-17. I completed my High National Diploma (HND), then I did a Bachelor's Degree in Chemical Engineering with Environmental Engineering at the University of Nottingham.

The Challenge we were given was finding solutions for drinking water, using sustainable and easily accessible methods for people in South America. It was run in a way where we each had to design our own product before coming together as a group to choose a product to develop further together.

I don't think I was looking into sustainability very much before the project. I originally wanted to get into Chemical Engineering because I was interested in pharmaceuticals.

*"Through the Design Challenge, I developed an interest in the sustainable management of water and went on to become a graduate technology consultant at a small consultancy specialising in innovation and technology in the water sector, where sustainability is key."*

I would say it was this challenge that started to give me an appetite for the other ways engineering can be applied in the real world and the impact you can have on someone's life. Water felt like the starting point for everything – for building schools and hospitals, even for pharmaceuticals.

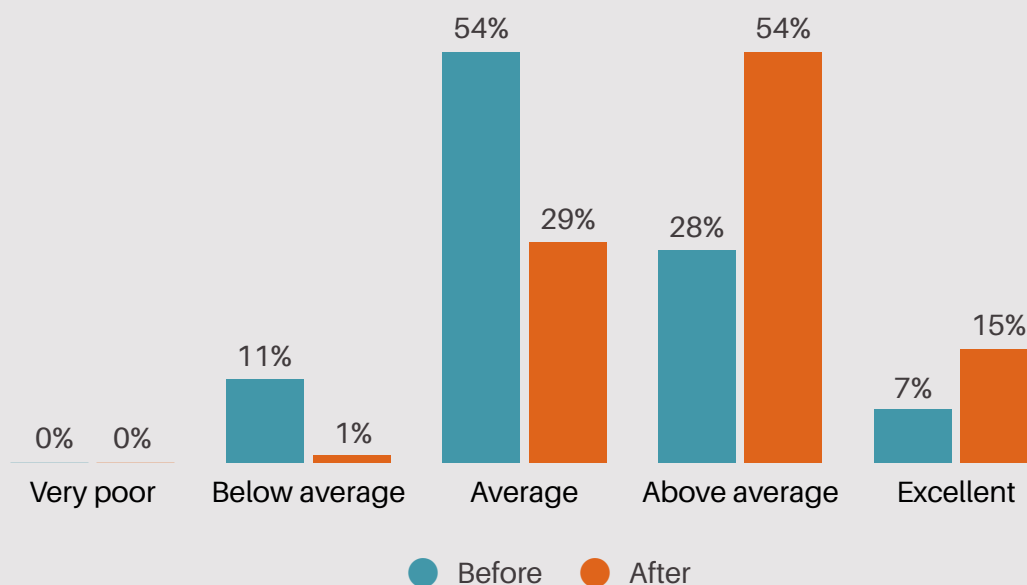The project came at a point where I was starting to make decisions on what my next step was going to be after the HND. I had the option to stay at Southbank and to do a Bachelor's Degree in Engineering, which is more geared towards petroleum engineering, but by this point, I had learned I wanted to get more involved in environmental engineering and Nottingham was the only university at the time that offered a mixture of chemical with environmental.

The Challenge was also my first real experience in design, using things like AutoCAD to do drawings and sketching out ideas, but what I enjoyed was the research – it was like desk research mixed with strategy and planning, working out what is feasible. A lot of what I do now is due diligence and market research in innovation and technology.

*"The challenge, through working on designing a product, gave me that perspective of what's important."*

## Increased essential workplace skills

Project-based learning gives students an opportunity to improve competencies that will equip them for an engineering career. The key workplace skills that Engineering for People Design Challenge seeks to develop are:

- Project management
- Teamworking
- Communication
- Decision-making and leadership

Educators and students indicated to evaluators that this was the first opportunity in their degrees and in some instances the only opportunity to develop workplace skills.

"It gives you a good opportunity to develop really good skills in managing teams. It's also the first opportunity that you get working on a long term project, so you're actually doing time and project planning."

**Student interviewee, Strathclyde University**

## Increased project management skills

Project-based learning within the Engineering for People Design Challenge gives students an opportunity to develop practical project-management skills, including project planning and organisation, time management, and allocation of responsibilities according to team members' strengths.

**86%**

**of students thought they had increased skills in project management**
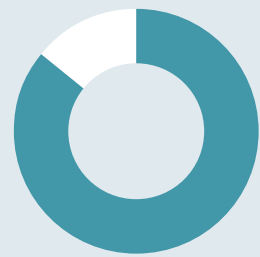
Figure 15 (N=368). See Table 14 in Technical Appendix.

### Increase in Project Management skills

Distance-travelled evaluation data (through a retrospective survey at the end of the programme) shows a significant increase in project management skills, with **71% of students rating themselves as 'above average' or 'excellent' after the programme compared to 33% before.**



| | Very poor | Below average | Average | Above average | Excellent |
|---|---|---|---|---|---|
| Before | 2% | 16% | 48% | 27% | 6% |
| After | 0% | 1% | 27% | 53% | 18% |

● Before  ● After
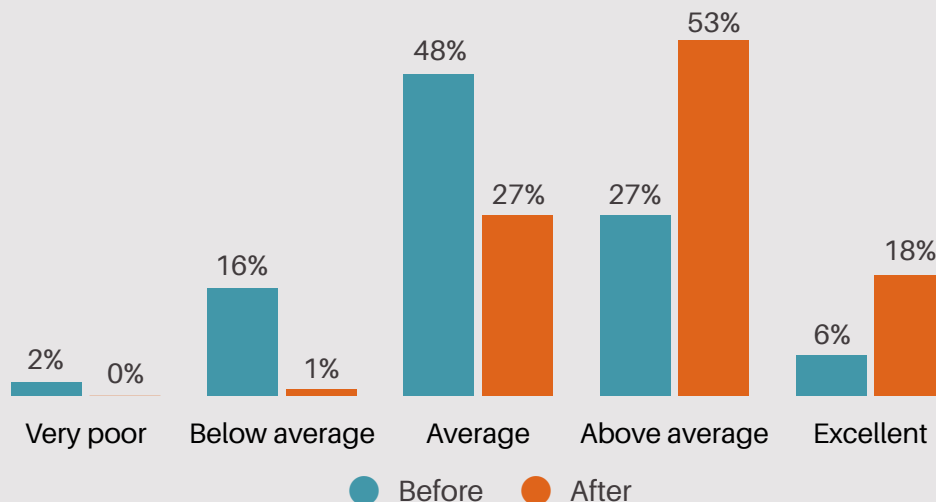
Figure 16 (N=822). See Table 15 in Technical Appendix.

## Increased skills in teamworking

Educators are asked to ensure that students work in groups for the Engineering for People Design Challenge.

This not only teaches students essential teamworking and communication skills, but also provides an opportunity to work with people from different backgrounds and disciplines, depending on how groups are arranged.

Teamworking was raised by many students as the most challenging aspect of the Engineering for People Design Challenge, particularly if a team-member is not pulling their weight; educators agreed that some teams struggle. However, learning to identify and appreciate the strengths and contributions of each

# 89%

**of students thought they had improved skills in teamworking**
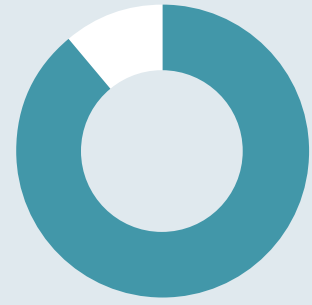
Figure 17 (N=368). See Table 14 in Technical Appendix.

team member, look out for each other to see if something is going wrong, and using negotiation and conflict-resolution skills to work through any challenges enables students to develop skills that will last a lifetime.

**Increase in self-rated teamworking skills**

Distance-travelled evaluation data shows a significant increase in students' self-rated teamworking skills, with **84% of students considering their skills 'above average' or 'excellent' after the programme compared to 48% before.**



Figure 18 (N=821). See Table 16 in Technical Appendix.

"This programme helps them see how being an engineer is more than number crunching. You're not just sitting alone in your office all day; it is a field where you work together as a team so that you can get a lot of different inputs to come up with designs. It's not silo work."

**Erica Marti, educator interviewee, University of Las Vegas**

Students participating in focus groups reflected that, despite the challenges, working in diverse teams – with people from different countries, different disciplines and with different strengths – helped to bring in new ideas and approaches, with group reflection contributing to making adjustments to designs and overall growth.

"From the beginning of the assignment, my team immediately worked well together. Our diverse backgrounds and strengths allowed for each person to get a chance at contributing … I enjoyed working on the assignment and built up a good relationship with the team. I definitely was able to refine these skills for the future. It was a good experience and certainly worth the time."

**Student survey respondent (2022-2023 end survey), University of Sheffield**

## Increased communication skills

The Engineering for People Design Challenge helps students to develop communication skills such as report-writing, effective presentations and pitching their work in a clear and concise manner, as well as defending their ideas in front of an audience.

The programme also helps students to communicate with team members and actively listen to their ideas. For some students, this is their first experience of speaking publicly, and it helps to build their confidence going forward, although for some it is a nerve-wracking experience. Past participants said that these new skills served them well in industry, giving them confidence to express themselves and speak up in meetings.



# 88%

**of students thought they had increased their communication skills**
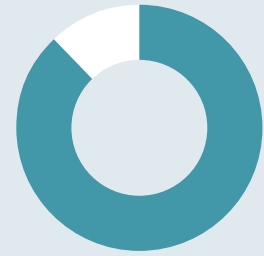
Figure 19 (N=368). See Table 14 in Technical Appendix.

"I have learned a lot about communicating with new people out of my comfort zone and being more confident about my ideas and opinions."

**Student survey respondent (2022-2023 end survey), University of Sheffield**

### Increase in self-rated communication skills

Distance-travelled evaluation data shows **a significant increase in students' self-rated communication skills, with 77% of students considering their skills 'above average' or 'excellent' after the programme, compared to 41% before.**
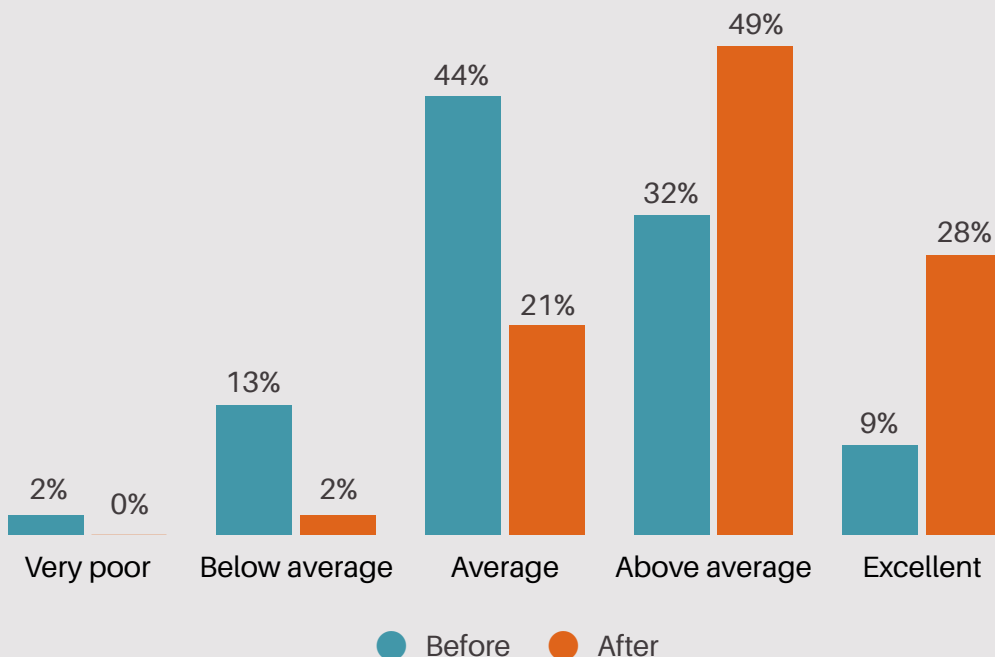


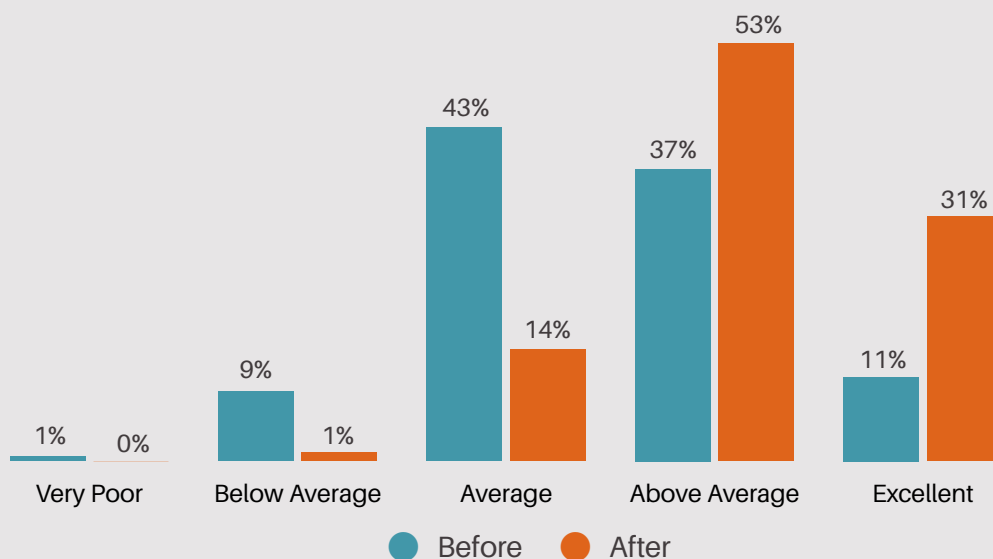Figure 20 (N=821). See Table 17 in Technical Appendix.

# Increased skills in decision-making

Student groups are required to question their assumptions, as well as critically evaluate and make informed decisions about their designs.

They are encouraged to consider the ethical implications of their decisions, balancing economic and technical considerations to develop globally responsible engineering solutions.

"Learning to trust my teammates on decision-making allows for a more cohesive process. Assigning roles can be a lot more stress-free, and this means that there will be more productivity in the whole process."

**Student survey respondent (2021-2022 end survey), University of Sheffield**

## 87%

**of students thought they had increased skills in decision-making**
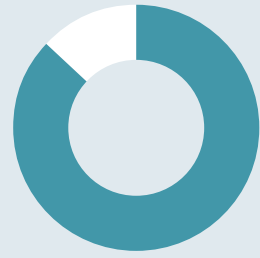


Figure 21 (N=368). See Table 14 in Technical Appendix.
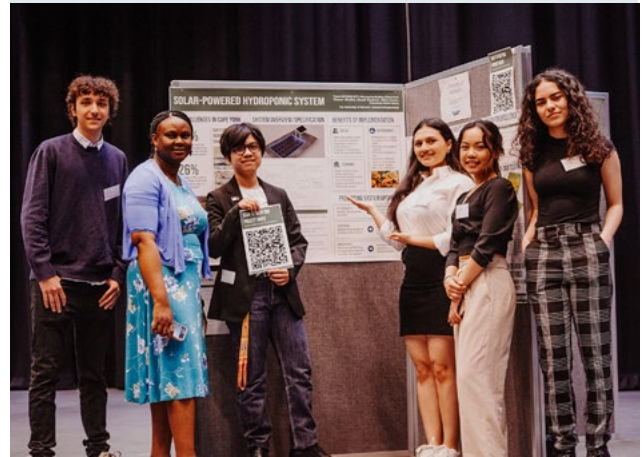


## Skills in decision making

Distance-travelled evaluation data shows **a significant increase in students' self-rated decision-making skills, with 72% of students considering these skills 'above average' or 'excellent' after the programme compared to 42% before.**
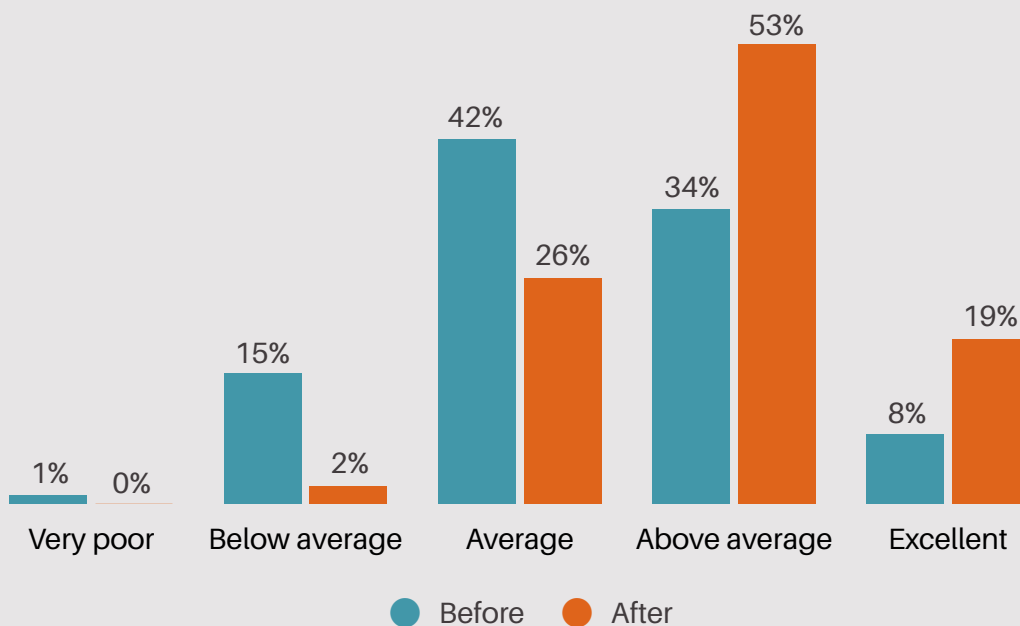


Figure 22 (N=822). See Table 18 in Technical Appendix.

# CASE STUDY: LAURA HALLIDAY

## THE CHALLENGE GIVES YOU REAL-WORLD ENGINEERING EXPERIENCE AND CRUCIAL SKILLS FOR THE WORKPLACE

I did the Engineering for People Design Challenge in 2017 at Strathclyde University, then I graduated from university in 2019 and I went straight into industry from there. I've been in design work since I've graduated, working in design consultancies now for four years.

The Challenge I was involved in was about the community in Lobitos in Peru that is quite remote and gets affected by the El Nino and La Nina, so they're getting drastic climate change effects. The community didn't have a regular water supply and had poor access to transport. My team looked at sustainable water management and we designed a rainwater harvesting system focussing specifically on the health centre. We won the Grand Finals that year.

*"So much of uni is theory. Doing this class gives you a practical project, a bit of real-world engineering as such, which is really valuable."*

I think the biggest thing from the programme was the non-technical skills that you develop in the process. It gives you a really good opportunity to develop teamwork skills. You're learning time management and project planning. There's also communication in all the different forms, because there is the written report that you submit, but then at the finals you're presenting your solution demonstrating your oral communication skills.

*"I think the Challenge definitely gave me the chance to develop those crucial soft skills – a lot of people come out of uni without them if they've just done the technical aspect and nothing else."*

The Challenge also broadened my awareness of sustainability. Typically, the first thing you think of is the environmental aspect when sustainability is mentioned. When I started the Challenge, I realised there are so many other aspects to sustainability.

A lot of people go into an engineering degree because they like numbers, but actually people are at the heart of what we do. You could design something, but if it doesn't work for the person who's going to use it, then there's absolutely no point doing it.

*"That's probably one of the biggest things that the challenge taught me – the social and human context of engineering and the implications it has on a project. There weren't many other classes early on in uni that focus on this."*

## Outcome 3: Students are better equipped to drive change in engineering

Students are well-prepared for and energised to drive change in industry, although many students that evaluators spoke to either weren't yet in a senior enough position to change organisational culture or were coming up against powerful market forces that hindered change. Nonetheless, our evaluators found evidence of ripple effects achieved through the programme, with students actively seeking out opportunities to use their new found skills to help drive change in engineering.

"The Engineering for People Design Challenge opened up my way of thinking to become a more responsible engineer which has helped inform my decision-making ever since and throughout my career."

**Past participant survey respondent, University of Birmingham**

## Wider impact on studies and research

**81%**

**of students agree that the skills learnt during the Engineering for People Design Challenge were (or will be) of benefit in the rest of their studies or research**

Figure 23 (N=454). See Table 19 in Technical Appendix.

**77%**

**of students could think of examples where they applied the principles of Globally Responsible Engineering in their studies**
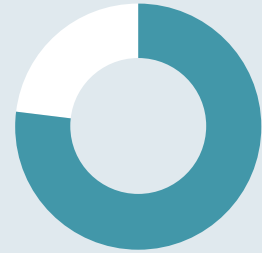
Figure 24 (N=409). See Table 20 in Technical Appendix.

"This whole class definitely underpinned my dissertation and then I did a research project last summer, which was looking at SDG six – the sustainable management of water, rather than just accessing it."

**Student, focus group participant, Strathclyde University**

Students explained how the Engineering for People Design Challenge **"underpinned"** their degree, and **more than three quarters could think of examples where it had been applied in their studies.**

## Influences on career aspirations and direction

There is also emerging evidence from the small sample size of former participants who responded to our survey that the programme has influenced students' career, aspirations and direction:

- Several were inspired to pursue careers that prioritise sustainability in engineering and look for a company that **"is looking to create a brighter and more sustainable future"**.

- Some were inspired to find an employer who could give them the opportunity to improve sustainability within engineering.

- It broadened their understanding of the career opportunities and varied disciplines within engineering.

- Several sought out opportunities for interdisciplinary collaboration within their careers.

- It instilled confidence in their own ability to tackle real-world problems and think creatively to find solutions.

## 61%

**of previous participants surveyed were inspired to find an employer that has a good track record of sustainability**

Figure 25 (N=69). See Table 21 in Technical Appendix.

*"It made me try and find industries where it is not as sustainable and try to improve the sustainability in that field."*

**Past participant survey respondent, Manchester Metropolitan University**

# Employability: Use in employment search

The Challenge was used as evidence in job searches by more than three-quarters of past participants who responded to our survey. They explained that project-based learning and experience with real-world projects gave them:

- A **"hook"** and a **"talking point"** in interviews to help them stand out to employers.
- Those who attended the Grand Finals events benefited from networking with industry professionals and peers.
- Real-world examples to use on CVs.

**65% of past participants who referred to Engineering for People Design Challenge in their degree thought that the employer was interested in or impressed by their participation in the Challenge**, although 29% said that they didn't know (N=49).

___

"It becomes a great opportunity when you're starting out in interviews ... Although it's not a professional job, you've had practical experience that gives you a head start."

**Past participant interviewee, Strathclyde University**

___

## 78%

**of past participant respondents referred to their participation in their job search**

Figure 26 (N=63). See Table 22 in Technical Appendix.

Industry partners interviewed said that the challenge provides an excellent pipeline of graduates with the skills they are looking for.

"I would be looking for a graduate who, as a minimum, had done something like this. Particularly if they had seized the initiative to try and change something around them."

**Oliver Broadbent, industry partner interviewed - Director, Constructivist Ltd. 1851 Fellow in Regenerative Design**

## Inspiring others

Past participants who responded to our survey gave examples of how they had inspired others, including:

- Being involved in a series of engineering campaigns in secondary schools and technical colleges to encourage more students to read science and engineering.

- Supporting 2nd-year students on their team projects and guiding them through the course.

- Switching careers: One educator we interviewed said that about 15% of the supervisors who worked with students on the project changed their career path to go into full time teaching.

# 61%

**inspired others to use the principles of globally responsible engineering**

Figure 27 (N=478). See Table 23 in Technical Appendix.



"It was an introduction to an alternative model for education for engineers. I went from working in the engineering sector (and being frustrated by the culture and the lack of motivation to evolve) to working with Engineers Without Borders UK delivering the Design Challenges and aiming to shift engineering education to prepare a generation of engineers to be ready to solve the unknown problems of tomorrow."

**Past participant survey respondent, The University of Edinburgh**

# 5.6 OVERVIEW OF OUTCOMES ACHIEVED – FROM QUALITATIVE DATA

The hierarchy chart below shows the proportional number of times each outcome was coded by evaluators in responses to open questions in surveys and interviews about the skills gained or what they most value from the programme. It shows that increased workplace skills were coded almost four times more frequently than engineering skills and considerably more than other outcome areas. Educators participating in our workshop in the 2023 Grand Finals also agreed that the biggest value was in developing critical workplace skills.

**The proportion of qualitative excerpts coded according to the programme's outcomes**



- 🔵 Upskilled students
- 🟠 Inspired students
- 🟣 Better equipped to drive change

Figure 28. Note: more than one code may have been applied to each excerpt. See Table 24 in Technical Appendix.

# 6. PROGRAMME FEEDBACK

## STUDENT FEEDBACK ON THE PROGRAMME

**77%**

of students trust Engineers Without Borders UK as a primary source of knowledge on globally responsible engineering (N=396). See Table 25 in Technical Appendix.

**77%**

of students said the Challenge contributed to their enjoyment of their degree (N=455). See Table 26 in Technical Appendix.

**81%**

would recommend Engineering for People Design Challenge to others (N=822). See Table 27 in Technical Appendix.

> "I think that this was a huge part of my university satisfaction … I loved being able to evolve in that space."
>
> **Past participant interviewee, The University of Edinburgh**

### Standard of teaching

Students also had high satisfaction with the standard of teaching in their respective universities.

**Student feedback on the standard of teaching**

| | |
|---|---|
| The content was relevant to my career aspirations | 72% |
| I was given ample opportunities to share my views in sessions | 80% |
| The length and pace of the teaching was appropriate | 70% |
| Tutors were inspiring | 77% |
| Tutors were knowledgeable about Globally Responsible Engineering | 89% |
| Sessions were well organised and managed | 88% |
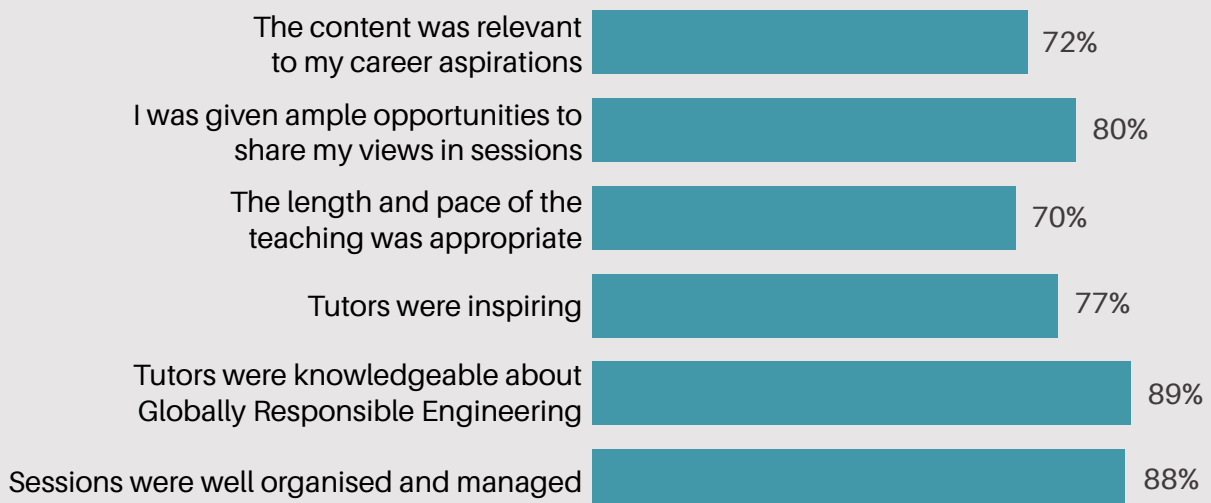
Figure 29 (N=409). See Table 28 in Technical Appendix.

## What students valued

- **Creative problem-solving:** The chance to develop creative solutions and get input from others.

- **Real-world application:** The chance to put learned theory into practice in a real-world situation.

- **Collaborative learning:** Exposure to new disciplines, working together with new students and meeting new people.

- **Opportunity for skills development:** Increasing essential interpersonal and engineering skills.

- **Global perspective:** A good insight into issues across the globe, and very clear and concise information given about social issues and environmental problems.

- **Career benefits:** It looks good on the CV and is helpful when networking for future jobs.

## Student challenges with the programme

- **Teamworking:** The most commonly raised challenge by students, which educators agreed with, was working in teams, particularly when one team member was not contributing as effectively as others. However, there was agreement that the benefits of learning and honing teamworking skills outweighed the challenges and helped to prepare students for the workplace after graduation.

- **Grand Finals designs not being widely used by communities:** The programme does not set out to produce projects that will be implemented in the short term; rather, the Design Challenge is intended to build lifelong skills for a career in sustainable engineering. Nonetheless, there was a disappointment amongst some community partners and students that few solutions have been implemented within communities.

# 7. UNINTENDED OUTCOMES AND WIDER VALUE

## 7.1. FOR UNIVERSITY DEPARTMENTS AND EDUCATORS

Although the primary intended outcomes of the programme relate to students. Evaluators found good evidence of the programme's wider value to educators and partners.

### An enjoyable way to teach the curriculum

The Engineering for People Design Challenge is a unique offer for most universities – an opportunity to move beyond theory and bring real world learning into the curriculum.

## 18 OUT OF 19

educators participating in the 2023 Grand Finals focus group agreed/strongly agreed that the programme is an enjoyable way to teach the curriculum.

"It's been a wonderful addition to my career at a time when I needed something new. I love the design challenge and I'm thrilled to have been involved."

**Thomas Siller, educator interviewee, Colorado State University**

## Professional development and networking

As a platform that brings educators together to reflect on their work, the Engineering for People Design Challenge encourages collaboration and continuous improvement in teaching practices.

## 13 OUT OF 19

educators participating in the 2023 Grand Finals focus group agreed/strongly agreed that the programme's value lies in enhancing their own professional development and network.

"The programme provides a space where academics can come together and reflect on their work and try and improve. The learning community it creates is really powerful. It's a space where they can ask questions of other academics, reflect on the questions they're getting from students and continue to evolve what they do."

**Alison Stoakley, EWB Australia, country partner interviewed**



## High quality materials that save staff time and resources

Having a ready-made design brief that focuses on real-world projects means that universities save time on creating their own resources.

## 13 OUT OF 20

educators participating in the 2023 Grand Finals focus group agreed/strongly agreed that the programme's value lies in saving time and resources in developing real-world projects.

Some educators said that they would like a "series of guidelines" on how to run the programme, such as best practice for helping students with group work.

"I think if we didn't have the resources that come with the Challenge, we'd have to come up with something from scratch. There's no way I'd be able to go to some distant part of the world to get all the information we'd need, so it would either be a local project or we'd just make something up."

**Dr. Deborah Sims, educator interviewee, University of Greenwich**

## Attracting a diverse range of students

Students and educators explained that the programme is attractive to students with an interest in sustainability and/or who are less interested in maths and the technical aspects of engineering. Some thought it was attractive to international students, whilst projects about sustainability are well-suited to students from different departments.

# 11 OUT OF 19

educators participating in the 2023 Grand Finals focus group agreed/strongly agreed that the programme's value lies in attracting a diverse range of students.

## Supporting accreditation with multiple professional bodies

Accreditation is the process of reviewing an engineering degree programme to judge whether or not it meets the defined standards set by the Engineering Council. Accredited engineering degrees offer students and employers an important mark of assurance that the programme meets the high standards set by the engineering profession.

There is emerging evidence that the Design Challenge supports accreditation. When considering the wider value of the Design Challenge, several participants in the educator focus group and one interviewee indicated that the focus on sustainability, ethics and essential workplace skills enabled the Design Challenge to be used as evidence for accreditation by their engineering departments.

"In terms of the graduate attributes that professional registration bodies are looking for, the design challenge ticks pretty much all the boxes."

**Anne Fitchett, Educator Interviewee, Honorary Associate Professor, University of Witwatersrand**

## Summary of opportunities for educators

In a 2021 workshop, educators summarised the key opportunities that the design challenge brings them:

cross discipline exposure

context

exciting for students

broadening learning

service oriented

new

social

global perspective

student induction

practical application

teamwork

fun and creativity

empathy

expansion

sustainability

networking

reflection

awareness

context rich project

skills

student mindset

collaborate

self learning

learning

broad understanding

purposeful project

exposure

responsible

respectful

cross-fertilisation

Source: 2021 Educator workshop; responses to the open question 'What are the opportunities with running the design challenge?'

# 7.2. FOR COMMUNITY PARTNERS

Community partners interviewed by evaluators outlined the benefits of the Design Challenge to them:

- **Raising profile:** The programme provided exposure to the work of community partners to a global audience. This allowed community partners to showcase their achievements and cultures on an international platform.

- **Giving a voice to local communities:** People featured in case studies within the design brief and others living in the featured communities were given a chance to be heard, share their stories and feel valued on a local and global scale.

- **Interns and volunteers:** One community partner shared that some Engineering for People Design Challenge participants were so inspired by their work that they became volunteers several years later.

"It put Govan on the map … As people seeking asylum, our community members are living a life where they're not allowed to work; they're not allowed to be entitled to the same things as everybody else. So, to be that involved, and feel like their skills, knowledge and experience are valued on a global and local scale was an amazing experience for community members, helping them to feel recognised and valued."

**Traci Kirkland, Govan Community Project, community partner interviewed**

- **Design ideas:** The Design Challenge encourages creative ideas that meet the community's needs, although not all may be feasible due to complexity, funding and other considerations. However, the winning projects sometimes serve as a starting point or inspiration for further development.

"All the ideas needed funding behind them … But local councillors were definitely interested in a few proposals."

**Traci Kirkland, Govan Community Project, community partner interviewed**

- **Design brief as an organisational asset:** Partners valued the research that goes into the design brief, using the information in it such as demographics and history of the area in funding applications.
- **Financial support:** Community partners are remunerated for their time, which is valued by smaller organisations and contributes to their growth and sustainability.
- **Professional development:** Public speaking and opportunities to extend their network contributes to partners' professional skills development.

## 7.3. FOR INDUSTRY

Industry partners interviewed by evaluators suggested that the programme's strength is in training a pipeline of well-rounded engineers by:

- **Inspiring, upskilling and providing an opportunity for practical real-world application** to complement students' academic learning.
- **Broadening graduates' mindset and equipping them with skills to think holistically, promote sustainability, and consider ethical aspects of engineering.** One industry partner said that as an employer they will look for individuals who

use their Engineering for People Design Challenge experience as a foundation to initiate further impactful projects.

- **Fostering essential workplace skills** that are highly valued by employers and contribute to a more well-rounded engineer.
- **Project-based learning is a great introduction to the role of a professional engineer.**
- **An opportunity for volunteer reviewers to develop their own learning about globally responsible engineering and participate in activism.** Research by Bryce Neuman (2020) reports that the contributions and experiences of around 200 professional engineers who volunteer their time to review student reports benefit personally from their participation. Their contributions "construct a detailed image of GRE" (globally responsible engineering) …"moving reviewers, at all stages of their careers, to enact and promote in return a more responsible engineering future".
- **Helps to attract top talent** in the engineering profession.

———

"I think for me in particular being able to support and be directly involved in this kind of initiative is really important, and the culture at Jacobs promotes nurturing new talent.

As a judge, the Grand final event enabled me to meet and interact with engineering students, connect with them and tell them about Jacobs. This creates a more organic relationship when we look to attract smart graduates with the right mindset, with the right values, and transversal skills coming through."

**Lloyd Walker, Jacobs, industry partner interviewed**

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# 8. EVALUATORS' CONCLUSIONS

## THE DELIVERY

The Engineering for People Design Challenge is a far-reaching undergraduate programme that teaches globally responsible engineering through project-based learning.

The design brief and accompanying resources, developed by Engineers Without Borders UK and South Africa in collaboration with community partners, are considered to be excellent learning assets that enable students to develop a rich understanding of the social, cultural and economic challenges faced by the featured community and the people who live in it. This underpins the design process and gives students an opportunity to apply learned theory in a practical and holistic way.

The programme's flexibility is one of its key strengths in the eyes of educators. Engineering departments deliver it in a way that works best for their curriculum – some within a week, others throughout a semester. Educators enjoy delivering it with student teams and find it benefits their department in multiple ways, including their own professional development, supporting evidence for accreditation, and attracting a diverse range of students.

Some students are unnerved by the fact that the Design Challenge pulls them out of their comfort zone, focusing more on people than equations, and requiring collaboration with others in teams. However, students and educators alike agreed that the benefits of group work far outweigh any downsides, with the Design Challenge contributing to students' enjoyment of their university experience and academic attainment.

## THE DIFFERENCE

The programme makes a significant difference to the skills, knowledge and mindset of students who participate. They gain an in-depth understanding of globally responsible engineering, and develop the skills required to bring sustainability to life within their practice.

For the students who are more comfortable with numbers and technical calculations than the human side of engineering, the challenge changes their mindset by helping them to realise that people must be at the heart of engineering. For those already sustainability-minded, it helps them to deepen their understanding of how the Sustainable Development Goals (SDGs) are interlinked and should underpin engineering at all stages, giving them a framework for putting globally responsible engineering into practice.

Through the programme, students learn to empathise with people and develop a deep understanding of the day-to-day challenges faced by communities, as well as how engineering can solve complex global problems. They are inspired by the potential impact they can have as engineers.

Creating solutions to real-world problems outlined within the design brief is, for most students, their first opportunity to work through the full design cycle, encouraging

curiosity and creativity, broadening horizons and developing practical engineering skills.

Through project-based learning, the programme is shown to have the biggest increase in developing essential workplace skills, such as teamwork, project management, communication and decision-making. Group and interdisciplinary collaboration allows students to work with peers from different backgrounds and disciplines. This mirrors workplace settings, giving students experience and enhanced workplace competencies that employers greatly value.

The programme helps to prepare students to drive change in the future by nurturing disruptive and radical thinking and an understanding of complex systems. Some participants have been inspired to take a different career path towards sustainable engineering, although others may be held back by external market forces and a lack of influence within industry. Engineers Without Borders is well placed to forge a pathway for more students to become the changemakers of the future.

## THE CONTRIBUTION

Qualitative evidence, through interviews and focus groups with a wide range of stakeholders, indicates that the Engineering for People Design Challenge has made an important contribution to the observed results in students. Educators and students indicated how the programme's assets and the pedagogical approach through project-based learning were important contributions to the knowledge and skills gained by students.

One of the questions we consider as evaluators is, 'What would happen if this project didn't exist?' Without the Engineering for People Design Challenge, educators indicated that they would be required to teach students about sustainability and would likely create some sort of design challenge themselves (and some

universities do). However, educators consulted suggested that it would be almost impossible for them to develop a design brief to the same standard. Without the research and community partnerships that Engineers Without Borders UK brings, the module would be unlikely to have an integrated focus on sustainability through real-world situations.

Furthermore, educators and students indicated to evaluators that the Design Challenge was the first opportunity in their degrees – and in some instances the only opportunity – to develop essential workplace competencies that are highly valued by employers and prepare them for a career in engineering.

# THE OPPORTUNITY

2023 marked the halfway point to the deadline for achieving the Sustainable Development Goals (SDGs) by 2030. The UN has warned that progress on the goals has stalled (The Sustainable Development Goals Report: Special Edition, 2023). Engineering has a key role in providing practical solutions to help meet the SDGs, yet the engineering industry is under-prepared for the challenge.

With growth and time to reach more students who are entering the profession, Engineers Without Borders UK is well-positioned to help fill a skills gap in the profession and develop a workforce of engineers who are equipped with the skills, knowledge and mindset to become the changemakers of the future who put global responsibility at the heart of engineering.

The students participating now are likely to have power and influence in the decades to come with ongoing professional development from organisations like Engineers Without Borders UK. However, the Engineering for People Design Challenge needs to grow considerably to have wider penetration within the engineering industry and make a noticeable change to the profession globally so that more engineering projects are globally responsible, and ultimately developed for people.

## THE RECOMMENDATIONS FOR ENGINEERS WITHOUT BORDERS UK:

1. By working in partnership with similar global organisations, **increase the reach of the Engineering for People Design Challenge**, particularly focusing on the universities who have the most engineering students.

2. Keep in touch with participants after graduation **to offer opportunities that ensure their continuous professional development has a focus on globally responsible engineering** (recent changes to personal data collection should make this much easier).

3. **Maintain a focus on disrupting harmful systems and practice** within industry to prepare the pathway for participants to affect change.

4. **Work with participating universities to agree on a standardised way to evaluate the programme** so that data can be compared between institutions, and educators can learn from others about what works to change students' mindsets and increase their skills.

5. **Provide more resources for educators** to help overcome any challenges that they and students may be having with the programme – for example best practice guides on effective group work, as well as how to integrate the challenge within the curriculum.

# 9. THANKS AND ACKNOWLEDGEMENTS

We could not have achieved any of this without the people and partners who are the driving force behind the Engineering for People Design Challenge:

- Educators within 47 universities who expertly inspire and upskill tomorrow's engineers through this programme, particularly those who participated in interviews and workshops for this report.

- Community partners for co-producing the design briefs and working tirelessly to make life better for the people you support. We are inspired by your work and privileged to share your stories. Special thanks goes to those who participated in interviews for the impact study.

- Engineers Without Borders South Africa, who have been co-delivering the programme with us since 2019.

- The 87,000+ students who have participated in the Engineering for People Design Challenge since 2011, particularly those who completed our surveys and participated in interviews. Get in touch to find out how we can support you in your career and help you to drive change through your practice.

- The industry partners who have generously supported our work and participated in interviews.

- Volunteer reviewers who give up their time to review submissions and participate in judging panels.

- Emma Insley and Insley Consulting Ltd for leading the impact study and writing this report.

# 10. REFERENCES

American Society for Engineering Education. (2022). *Engineering & Engineering Technology by the Numbers, 2022*. Available from ira.asee.org/wp-content/uploads/2023/12/Engineering-and-Engineering-Technology-by-the-Numbers-2022-1.pdf

HESA. (2021/22). *Table 52 - HE student enrolments by subject of study and domicile 2019/20 to 2021/22*. HESA. Available from www.hesa.ac.uk/data-and-analysis/students/table-52 [Accessed 9th March 2024]

Higher Education Policy Institute & London South Bank University (LSBU). *2023 English Social Mobility Index*. Available from https://www.hepi.ac.uk/2023/10/19/2023-english-social-mobility-index/ [Accessed 9th March 2024]

The Institute of Engineering and Technology. (2023). *IET Sustainability Skills Survey 2023*. Available from: https://www.theiet.org/media/zeoid452/sustainability-skills-survey-2023-summary.pdf

Moore, B. R., Schneider, J. A., & Streiner, S. (2019). *Global Perspective Development in First-Year Engineering Students: Determining Educational Impact*. Penn State University.

Neuman, B. (2020). *Visioneering Globally Responsible Engineering*.

Mitchell, J., Direito, I., Fowler S., Bellingham, K., and Sutcliffe, M. (2024). *Current state of engineering higher education provision in the UK*. Royal Academy of Engineering. (Forthcoming publication)

Times Higher Education. (2023). Impact Rankings 2023. Available from https://www.timeshighereducation.com/impactrankings?page=2#!/length/25/locations/GBR/sort_by/rank/sort_order/asc [Accessed 9th March 2024]

Times Higher Education. (2024). *Best universities for engineering degrees in the UK 2024*. Times Higher Education (THE). Available from https://www.timeshighereducation.com/student/best-universities/best-universities-engineering-degrees-uk [Accessed 9th March 2024]

United Nations. (2023, July 10). *The Sustainable Development Goals Report: Special Edition*. Sustainable Development Goals. Available from: https://unstats.un.org/sdgs/report/2023/

United Nations Environment Programme. (2024). *Global Status Report for Buildings and Construction: Beyond foundations: Mainstreaming sustainable solutions to cut emissions from the buildings sector*. Available from: https://www.unep.org/resources/report/global-status-report-buildings-and-construction

# "WE ARE ACTUALLY ENGINEERING NOW. WE HAVE RELEVANCE AND OUR IDEAS ARE RELEVANT. WE HAVE VALUE AND INFLUENCE IN THE ENGINEERING SECTOR … AND WE HAVEN'T EVEN GOT TO THE END OF OUR DEGREE!"

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