



Our Journey into Engineering



The Manufacturing Technologies
Association



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From playing with Lego to taking toys apart, many signs can point to a vocation in engineering from a young age. The careers departments in schools don't always encourage students to go down that path, so if you recognise that potential in yourself or in your peers, it's important to understand your options and to explore the endless opportunities available to you within engineering.

Many manufacturing companies offer apprenticeship programmes in various departments, from tooling solutions to customer care and everything in between. Starting as an apprentice is the ideal solution for students interested in the field who don't wish to pursue a university degree, as you will be able to learn hands-on while already earning. In many cases, apprentices are offered a fully fledged position within the company upon completing their training, which adds the prospect of job security.

With that in mind, university is another invaluable way to enter the engineering arena for those interested in pursuing a more traditional higher education. There are so many disciplines to choose from, including mechanical engineering, chemical engineering, civil engineering, computer engineering... Universities usually take a more theoretical approach to learning, which complements the practical aspect of the field.

Engineering can feel intimidating, like an exclusive club, but this is far from being the case. Whatever your strengths are, they can be exploited within the manufacturing sector. And whatever you feel is holding you back — being a woman in a male-dominated industry, failing A-level maths, being better at communicating face to face than in writing, etc. — be confident that you can still find your place within engineering. With a lot of passion, hard work and the right mentors, you will surely thrive: these case studies are the living proof.

Whether you're simply considering a career in engineering or are already on the path to enter the profession, the Education & Development Zone at MACH 2018 is an unparalleled springboard for your future in the industry. You will get a glimpse into what it's like to work for some of the best manufacturers in the world, meeting inspiring people at all levels of the field and witnessing cutting-edge machinery in action.

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Tara Baker

Tier 1 Business Development, KUKA Robotics UK Ltd

My dad and grandad are both engineers — I have fond memories of my dad designing a robot for Robot Wars when I was around 11 years old — so I was always keen to learn. Engineering was never pushed at school, if anything it was discouraged, so I didn't pursue it from a young age.

Every day is different, There are so many things in life I used to take for granted: where they came from or the effort involved to make them. Now I see things starting life as a raw material and ending as a high-end vehicle, for example. Who knew a simple coil of aluminium makes up the majority of a car? I love that Britain is really championing manufacturing and it is clearly going from strength to strength; this offers great job security in the sector. In my role specifically, working with robots makes for great conversation, as they are fascinating to everybody, not just those in the manufacturing world.

The automated manufacturing sector is growing so rapidly that I come across new products and applications almost daily; it's a constant learning curve.

I'm excited to continue to be a part of this growing, changing sector and to witness automation and AI change our world. We are going to see a surge in new job roles that require skills from a variety of backgrounds to make it work: coding, IT skills, engineering, design...

I'd recommend a career in engineering and/or manufacturing to anyone looking for a challenging, interesting role that they can develop into a long and prosperous career.

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Tara Baker



Elizabeth MacLennan

Project Manager, Team Bath Racing Electric

I'm a final year student of Integrated Mechanical and Electrical Engineering at the University of Bath. I lead a Formula Student team which is made up of undergraduate engineering and computer science students. We design, build and test electric and autonomous cars to compete in Formula Student, the biggest engineering competition in the world.

Before university, I loved maths and sciences at school and had always been fascinated with knowing how things were made, how they worked. I played with K'NEX as a kid but didn't realise I wanted to be an engineer until I was 18. In school, I received a lot of careers advice, but was encouraged to consider medicine and pure science degrees. I found engineering in a prospectus by accident.

I took a working gap year and got my first experience of production manufacturing, which confirmed that I wanted to be an engineer. After my second year of university, I spent a year working as a systems engineer at Williams Grand Prix Engineering Ltd., where I first got involved in electric vehicles and the motorsport and automotive industries. Now I have a graduate job lined up in an automotive start-up.

Throughout my short career, I have learned that engineering is a huge discipline with many parts and players. People talk about an engineer being a certain type of person, but actually there is room for every personality in industry. I am a natural leader and I am the first to admit I am no creator. This doesn't make me less of an engineer, and in fact these attributes are what allow me to effectively manage a Formula Student team.

To be an engineer, you need to be endlessly curious, enjoy problem-solving and, if you want to take the higher education route, enjoy maths! My advice to anyone considering engineering at university is to get involved in Formula Student — best decision I ever made.

The social headwind that limits the number of women in engineering is strong but worth battling. I would encourage every woman in engineering to blaze their own trail, however large or small. Being authentically, unapologetically present is how we change.

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Elizabeth MacLennan



Jemma Dighton

Mazak

After finishing my GCSEs in 2016, I decided to start an apprenticeship with Mazak. One of the main reasons I chose an apprenticeship, and more importantly with Mazak, was because I took part in the Industrial Cadets Work Experience programme in 2015. The Industrial Cadets is a scheme that offers young people an opportunity to gain experience of life at work outside of the classroom environment.

I already had an interest in engineering before working at Mazak, but I didn't know which area of engineering I wanted to specialise in. A week into my apprenticeship helped me realise that there was so much more than just the hands-on, practical experience required during my apprenticeship. Skills such as teamwork, problem-solving, planning, self-management and communication were equally important. I can honestly say this was one of the most beneficial weeks I have ever had in my life; I was very fortunate, as it exceeded my expectations. It gave me more motivation to succeed in school and get the grades I needed. I wasn't expected to pass all of my subjects, however, I did pass everything and achieved better grades than I thought I was capable of.

The main advantage of an apprenticeship for me is that I am more proactive and learn better by doing. I personally didn't like the idea of attending sixth form or progressing through the university route, as I couldn't see myself enjoying it. An apprenticeship was what I definitely wanted to do, and after taking the Industrial Cadets programme, I knew I would enjoy it.

I've already gained a lot of knowledge about engineering and manufacturing from my first year at WGTA (Worcestershire Group Training Association), where I completed 5 NVQ Level 2 units. These included manual milling, mechanical maintenance, pneumatics and hand fitting. I also attend HGTA (Herefordshire Group Training Association) once a week, where I study the theoretical side of the apprenticeship towards my Level 3 City & Guilds qualification. Now I am in the second year of my Mechanical apprenticeship, I am enjoying it a lot. With exposure to production, this year has enabled me to understand the different processes at Mazak.

Despite being in a male-dominated environment, I have been treated equally and have had the same opportunities as any other apprentice. I would strongly recommend more women to pursue a career in engineering as it helps to create a more diverse workplace and promotes innovation. Everyone at Mazak has been willing to help and my supervisors are very supportive. People understand that we are still learning and are expected to make mistakes. The important thing is that we learn from those mistakes and understand where things went wrong, so we can learn from our experience and gain new skills. Next year, I will be specialising in one of the areas I have worked in over the past 12 months and will be working towards completing my level 3 NVQ. I'm looking forward to finishing my apprenticeship and progressing in the mechanical field of engineering.

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Jemma Dighton



Callum Whitehurst

Customer Service Engineer, KUKA Robotics UK Ltd

Back when I was in year 9, I started to learn basic electronics for a GCSE. Passing that made me look into electronics more and started to spark my interest. When I saw that in my local area there was a robotics company named KUKA, I wanted to find out more about that sort of industry. I went to college to study electrical engineering, which I found to be very interesting and something I would love to do as a career. In my second year at Dudley College, I was offered to take part in a mentoring scheme; the college asked us to give a company's name and to see if they would be interested in mentoring us. My first choice was KUKA and this started something great for me. I was invited to go to the company for a day to have a look around and see what they did, and it amazed me; I knew then that this was something I wanted to get into.

I was lucky enough to be offered an apprenticeship at KUKA and since day one I have had nothing but 100% support in everything I do. Through a day release at Dudley College, where I am studying maintenance engineering, I am learning mechanical and electrical subjects that are helping me with my work at KUKA, where my main role is maintenance engineering.

I have learnt so much and I am still learning. Having been at the company for just over a year and half, the amount I have learnt is amazing. I have gone from knowing nothing about robots to now knowing almost everything about them; how they work, how they can be programmed, how they can be fixed, and lots more. A part of my job that I particularly love is the travelling: I have been to many different places that I would never have had the opportunity to if it weren't for KUKA.

I want to work on my skills and make them better at KUKA, learning everything there is to know in order to become a successful customer service engineer.

I would recommend doing an apprenticeship to anyone. It gives you the experience of working in an environment that is challenging and hard at times, but it also gives you so many opportunities to further your education in a way that works. As you work through the week, you have a day at a college or a training provider where you learn parts of your job and further your education. The more education you have, the better opportunities you will be offered in the future.

“I want to work on my skills and making them better at KUKA, learn everything there is to know and I want to become a successful customer service engineer.”

Callum Whitehurst

Valerie Iriogbe

Associate Project Management Level 4 apprenticeship at the Manufacturing Technologies Association

Martin Luther King said, “The function of education is to teach one to think intensively and think critically. Intelligence plus character – that is the goal of true education.” This quote has driven me to want to achieve more and continue to learn to aid my professional development.

As an Education and Development (E&D) Assistant at the Manufacturing Technologies Association (MTA) working towards an APMQ (Associate Project Management) Level 4 apprenticeship, I would like to highlight the value of apprenticeships and how vocational training is helping me. In this role, I organise and support the planning of the E&D Zone for the MACH exhibition, the largest and leading exhibition in the UK engineering and manufacturing industry.

Before university, I was inquisitive about chemistry and arts and humanities in school, as well as how architecture related to people. I worked as a youth assistant, but I realised I wanted to be an architect at 17. In school, I received a lot of career advice but was encouraged to pursue the university route.

My summers were dedicated to volunteering at a non-profit organisation, where I got my first experience in project management. At university, I spent my spare time volunteering as a vice-president for the Leadership International Society, where I gained experience organising outreach activities that helped promote character development, self-awareness and leadership within the student body.

Over my short time at the MTA, I have learned that project management (PM) is a crucial discipline that relies on detail and effective communication with stakeholders. I naturally find it easy to communicate verbally, but I must admit written communication is not my strong suit. This does not make me less of a project manager; in fact my time at the MTA is enabling me to develop the skills to succeed in Project Management, especially where stakeholder and communications management, budgeting, cost control and business cases are concerned.

Being a project manager takes an eye for detail, discipline, time management, problem-solving, as well as stakeholder and communications management. My advice to anyone considering project management is to consider taking a Level 4 or higher apprenticeship as it is a great opportunity to learn, practise and earn. I would encourage individuals from every background to give apprenticeships a chance.

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Valerie Iriogbe



Jayne Shimwell BA (Hons)
Sub-Contract Development Manager, KUKA Systems UK Ltd

As Sub-Contract Development Manager, I look after a manufacturing department with six friction welding machines, as well as tool room facilities, a laboratory and heat treatment facilities, with seven members of staff. We take in customers' work, and we friction-weld many different types of components and produce metallurgical evaluations in our laboratory. Our customers come from many different industries and they have many different technical requirements and standards to satisfy; for instance, many components are safety critical. It's a very big responsibility as it's crucial that we follow the correct standards and procedures when completing development and production work for our customers.

At school, I was interested in technical communication. With my A-levels, I completed a Technical Authorship City & Guilds, and my degree is in Communications.

I have been working for KUKA for 24 years; I came on a short-term contract for 5 to 10 days, attached to the spares department... 24 years later and it's been a long 10 days!

During my time at KUKA, my role has developed and changed considerably. Initially, I was contracted to catalogue the machine layouts and parts lists, which were on microfilm back then — now everything is on CAD. KUKA kept me on and I developed a very deep knowledge of how the business works, working in the spares and service department, the purchasing department and now looking after the sub-contract department at KUKA UK, which is the largest sub-contract friction welding department in the country. My progression has been like following an advanced informal apprenticeship program.

I use many different skills in my role: production management, sales, quoting and estimating, customer service, research and development, problem-solving, purchasing, accounting, budget planning, forecasting and quality management.

Every day is different, with different challenges, but the best part of the job by far is the people, colleagues who are bright, passionate and the very best at what they do. Customers too — not every job would bring you into contact with a rocket scientist! You get to meet people who have amazing ideas at the top of their game and make you feel part of something that has a real impact in the world.

Friction welding is a niche bonding process, which few have heard of, yet nearly everyone comes into contact with friction welded

components every day without realising it: your car's axle, drive shaft, cv joint or the hospital's MRI scanner's cooling fin, or the electrical connectors on the rail network. The time displayed on your sky box is beamed in from a timepiece on a satellite which has a friction welded component in it.

I am the only female manager at KUKA Systems UK and one of only two women employed in engineering roles out of approximately 100 people on-site. I can only think of one customer meeting I have had where the lead was a woman. But I do see that this will change. I have two daughters, one doing GCSEs and the other at A-level stage, both very strong in mathematics and science-based subjects. They and their peers seem not to even consider if a job or industry is predisposed to employing women or men. It simply doesn't seem to compute that there would be any such convention or barrier. This is a huge step forward.

My mum couldn't understand why I wanted to pursue a degree and not be a hairdresser! The careers advice from school at the time was pretty similar. Only about 20% of the population at that time completed a degree, and of that 20% how many were women I don't know. I believe the advice not to pursue a degree belongs in the 1980s with big shoulder pads, ra ra skirts and Adam Ant!

Engineering has never been so exciting and progressive. My advice to any girls with an interest in problem-solving who are practical and have passion is to go for it. There are many opportunities in engineering, great apprenticeships and very good degree courses. It doesn't matter if you are male or female; if you have the right attitude, you will succeed, and you will have a very fulfilling, profitable and exciting career. Who knows where you will end up? The possibilities are endless.



Adam Webb

Applications Engineer, KUKA Robotics UK Ltd

During my time at university, I studied towards a degree in computer science – which consists of a range of subjects within the field of computing, including artificial intelligence. I also explored the field of robotics, in which a range of vision techniques were developed in order to apply intelligence to a robotic system.

I have been working at KUKA for two years, a year of which was my internship, wherein I took a year out of university in order to spend time in a graduate environment and learn more about the robotics industry.

I like to start my day by completing admin work before working on my ongoing projects, and my days can vary depending on how many projects we are dealing with. Some days, I could be at a customer site, such as BMW, programming an LBR (KUKA's collaborative robot LBR iiwa). Other days, I could be at a trade show introducing our products to potential customers. In parallel to this, I would also be on standby to answer any technical questions from customers and provide ongoing support for the sales department.

The most enjoyable part of my role is the opportunity to work on unique and groundbreaking projects. I enjoy the process of starting a project, of finally reaching the end goal after finding solutions to difficult problems brought in by customers. My background in computer science makes technical aspects of my job extremely interesting, in that I am able to work on challenging yet rewarding projects in which the next generation of collaborative robots are being introduced into industry.

During my teenage years, I became heavily involved in the field of games development, in which I enjoyed the process of developing a project from the ground up. Initially, I developed experience within the field of 3D modelling, producing 3D art for use in a range of environments. I also explored the field of programming, developing behaviours to determine how the user would interact with these 3D assets.

The most effective advice I can give would be to utilise the contacts you have. In this sense, it is important to make the most of the opportunities presented to you during your time at school or university towards developing these contacts. These contacts could potentially present you with initial experience within the industry, which will ultimately lead to a career. As suggested, it is important to gain as much experience as possible, as this will show potential employers that you possess the skills that they require.

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Adam Webb



Melissa Kaner

Autodesk Student Ambassador/Freelance Consultant

I'm a Student Ambassador and Freelance Consultant at Autodesk and will be starting a Technical Consultant graduate scheme with Autodesk in July 2018..

I studied systems engineering at Warwick University and graduated with my masters in June 2017, then worked on a project with the Future of British Manufacturing Initiative with Autodesk. In my freelance consultant role, I am producing a predictive maintenance system using the "Internet of Things" (IoT). My greatest achievement so far in my role is that I am currently producing a prototype system with the potential to turn it into a system for real industrial deployment.

On average, I start my day by carrying out administrative tasks, which involve contacting clients, suppliers and managers. I take part in circuit, product design, testing, product research and coding. My experience with coding enables me to work better at night, leaving room for inspiration, and allows me to work at my own pace. I have loved having the ability to work on and have ownership of different types of projects, as well as overseeing my own schedule. This means I can work effectively and efficiently.

In school, I chose the following A-Levels; maths, further maths, physics and electronics. Prior to this, I took triple science and D&T at GCSE level. As a kid, I invented things all the time! Half of my room turned into a craft station and workshop, filled with cardboard and Sellotape.

To the student considering a career in engineering, do not be afraid to follow your passion. So many people I have met have been afraid to be "nerdy" because of their subject choice. At secondary school, I spent my leisure time at the D&T, Electronics and ICT lab to learn as much as I could, and it helped me so much! There will always be

like-minded people, so don't be afraid to reach out and have fun. In primary school, I knew what I wanted to do, and my school was instrumental in showing me opportunities available through competitions and schemes.

Over my short career, my parents have been incredibly supportive. Like I mentioned with my "craft station," my parents always gave me crafting supplies like old cereal boxes and would always encourage me to do more. They took me to STEM events like the Big Bang Fair, which was amazing, and they never tried to steer my career aspirations in any way. They saw what I was interested in and let me do my thing, so to speak!

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Melissa Kaner

Leigh Worsdale

AMRC Training Centre's Apprentice of the Year Winner 2017

Success is all about the right attitude for multi-award-winning Apprentice of the Year Leigh Worsdale.

From media appearances to job offers from around the world and starting the journey to becoming a young apprentice ambassador, the last 12 months have been a whirlwind for the AMRC's first female Apprentice of the Year and heavy duty diesel engine builder, Leigh Worsdale.

Leigh, who is from Chesterfield, applied for an apprenticeship after her GCSEs because she wanted to gain experience while getting paid. She was inspired by the facilities at the AMRC Training Centre after attending one of the centre's open days with her school.

She was awarded an apprenticeship under the Close Brothers SME Apprentice Programme, which contributes to the cost of apprentices, to help SMEs recruit and train a new generation of advanced engineers.

When asked what the highlight of her year has been, she will tell you that what gives her the most satisfaction is knowing she is contributing to Chesterfield company Foxwood Diesel, her employers', success:

"Seeing my company grow and the changes I've been able to make to a small developing business has been my highlight, I feel like I've played a big part in building the business up.

"I started off improving health and safety standards, ensuring the working environment was clean, and went on to change manufacturing systems to make them more efficient and effective; cutting cost, reducing waste, improving stock control and time management. Employing these kinds of process improvements really affects not just the working life of the staff, but productivity as well."

It is this kind of forward-thinking and dedication to her workplace that landed Leigh the coveted title of "Apprentice of the Year" in the AMRC Training Centre's 2017 ceremony, held at the University of Sheffield.

The judges were "overwhelmingly" impressed by Leigh's confidence, and spoke about how she continuously seeks ways to improve her workplace and its processes.

Leigh's achievements also led to her being awarded "Chesterfield's Apprentice of the Year" in the North Midlands and South Yorkshire Apprentice Awards and "Highly Commended Advanced Apprentice of the Year for the East Midlands" in the National Apprenticeship Awards.

The crown jewel of her award-winning year was her trip to the USA hosted by Boeing, where Leigh enjoyed a tour of the aerospace giant's sites in Los Angeles, Portland and Seattle, learning more about the world-renowned manufacturer as her prize for winning Apprentice of the Year.

Leigh never expected her award to bring her so much attention: "The awards just kept on coming this year; it's been an amazing experience! It's great to have your achievements recognised in that way, especially by Boeing.

"I was also invited to demonstrate Industry 4.0 technologies to Members of Parliament at a High Value Manufacturing Catapult event at the House of Commons; it's a big honour to be seen as a representative for the AMRC Training Centre."

Leigh is now an experienced ambassador; she has appeared throughout print and broadcast media, becoming the face of successful apprenticeship training in the Sheffield city region.

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Leigh Worsdale

"Do it! Anyone can be successful, my story isn't unusual, I just work hard and I am given the right focus. I still feel like there is still a stigma to undertaking an apprenticeship, but now things are changing and the benefits, not just for the young people but for their companies and UK industry, are finally being seen. Apprenticeships really do make a difference to the lives of young people, I am evidence of that!"

Leigh Worsdale

Leigh's apprenticeship has given her grand plans for the future and she is now furthering her higher education by completing her Level 4 HNC studies. She is also pursuing training opportunities to diversify her skills and knowledge of modern engine technologies:

"I would like to travel, so gaining more qualifications will be imperative to allow me to take advantage of opportunities abroad; having all those contacts from job offers will come in useful!

"I would simply not be able to have that experience with a purely academic degree; my apprenticeship training allows me to gain real valuable skills that are in demand from industry. When you learn something new, you can apply it to your job straightaway, therefore gaining more of an understanding for what you are doing."

For Leigh, doing an apprenticeship was all about getting the experience and the opportunities for career development she needed, whilst being able to earn a wage. She encourages anyone considering an apprenticeship to go for it:

"Do it! Anyone can be successful, my story isn't unusual, I just work hard and I am given the right focus. I still feel like there is still a stigma to undertaking an apprenticeship, but now things are changing and the benefits, not just for the young people but for their companies and UK industry, are finally being seen. Apprenticeships really do make a difference to the lives of young people, I am evidence of that!"

Leigh Worsdale

AMRC Training Centre's Apprentice of the Year Winner 2017

Nina Cataldo

Sandvik Coromant

I decided to do an apprenticeship because it better suited my way of learning. I like the whole hands-on experience approach. The idea of learning whilst you work was a definite pro, gaining that experience to use later in life and earning money as you go.

I am a quotation engineer at Sandvik Coromant and I have been with the company for six years, four of which as an apprentice. I thoroughly enjoy my work and my advice to anyone considering a similar path is: do it. If you like design, maths or science, then engineering is an option to look at.

My apprenticeship at Sandvik Coromant has set me up with a full-time job and I have six years of experience which I can add to my CV at the age of 24, an opportunity that I might not have had in another setting. It runs in the family: my brother is now pursuing an engineering apprenticeship as well. Lego was a creative influence on both of us when we were younger. I enjoyed creative things, Lego and similar stuff. At the time, I never put that together with engineering, but now looking back and talking to others, it's a common thing to be interested in within an engineering environment.

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Engineering wasn't really talked about at school; the main thing we were told was go to sixth form or college, get our A-levels and then go study at uni. I was lucky to have a teacher who had worked for an engineering company before becoming a teacher and who put the idea in my head. My school was really good at setting me up with an engineering college, but only once I told them that is what I wanted to do.

Engineering is a massive industry that needs new, young people to develop and grow. Apprenticeships need to be given more attention. Children need to know about apprenticeships as a way into a career and it's not just "going to university" that will get you places.

"I decided to do an apprenticeship because it better suited my way of learning. I like the whole hands on experience approach. The idea of learning whilst you work was a definite pro, gaining that experience to use later in life and earning money as you go."

Nina Cataldo

Katie Baxendale

Apprentice Mechanical Engineer at Holroyd's Precision Technology Group

There is a big stigma around engineering being a predominantly male sector and people often make statements like "you're a girl though..." or "don't you find it hard to keep up with the lads?" when they learn I'm a female engineer. I think other girls should understand there is nothing stopping you or making you less capable of doing the job except yourself. If engineering is something you're interested in or enjoy, there is nothing that says your abilities are limited because of your gender.

I've worked for Holroyd for nearly a year and a half and was initially attracted to the company for their prestige amongst the local engineering community and their reputation of turning out well-trained and successful apprentices. My day starts at 7:45am and ends at 4:30pm and I spend the majority of my time 'shadowing'. This is where I'm paired with a skilled engineer and placed on one sector on the shop floor to develop my skills through observing others who can then assist me in eventually being able to run the machines on my own. Once I am able to do so, I'm moved to a different sector to broaden the skills I am getting from my apprenticeship.

Growing up I had a keen interest in taking things apart to see how they work and spent time playing with Meccano trying to build bigger and better structures than the last time. I also spent some time in engineering workshop environments alongside my dad where I would sketch a design I had and we'd create it together whilst he taught me the different processes behind making them. I learnt how to weld and work with sheet metal which was something I can remember always being interested in and enjoying.

Initially an apprenticeship wasn't the direction I saw myself going in – whilst at school, we were led to believe that apprenticeships were what you did if you weren't capable of getting the grades you needed to get into college or university, when in fact they open up so many doors and future opportunities along with providing options for progression both on the job and education wise.

I wish someone had taken the time to explain what is actually achievable through an apprenticeship – I think knowing about the apprenticeship opportunities that were available after I left school could have greatly impacted my decisions prior to leaving. If I had known this information aged fifteen when I made the decision to go to sixth form I probably would have applied for an apprenticeship straight from school. As I came to the end of my time at the local sixth form college where I studied Psychology, Biology and English Language I realised university wasn't the best option for where I

wanted my career to go at that moment in time, that the best thing for me would be to gain skills-based experience as well as furthering my education, and that's when a friend suggested an apprenticeship might be an ideal option.

I can always remember my parents being supportive in my choices growing up however when I told them I was thinking of abandoning my university offers and taking an apprenticeship in engineering they were a little sceptical. I think the main issue they had was that I would be in a predominantly male environment and either would be incapable of achieving the same as a male would, or that I wouldn't fit in well with the other employees and I must admit it was nearly enough to put me off the idea.

I haven't faced any tasks that I've been unable to carry out because I'm a girl – female engineers are becoming increasingly common and in today's society are greatly encouraged from training centres and employers. Although there are many people that still believe engineering is a man's job there are hundreds of girls like me proving them wrong on a daily basis.

The part of the job I enjoy most is probably being part of a production line and having an impact on each final product we produce in some way or another – you get a great sense of achievement once you have learnt a new skill and can work on your own.

My greatest achievement in the workplace so far has to be picking up a machine and running it on my own for a week whilst having to meet tolerances and having other people rely on your work to carry out their own. By doing this I gained a lot of confidence in my abilities and it also became evident just how much knowledge and skill I was gaining on the job. Once I finish my apprenticeship I'm hoping I get the opportunity to complete a higher national certificate and maybe go onto university so I have the options to progress as much as possible through the business either as a highly skilled machinist or a production engineer.



Charlotte Hall

Siemens

Even from the age of seven, I was interested in engineering. Growing up, I spent a lot of time with my granddad, who used to work for Finning Caterpillar. I was always helping around the house and working with him in the shed. I also spent a lot of time with my uncle, who used to fix cars in his spare time. This is what I mainly wanted to do, become a car mechanic!

When I started secondary school, I was keen to join after-school clubs like Shell-Eco team and bike club. Through these, I got more engineering experience, which I really enjoyed. The teachers who ran the clubs were always really supportive of me being the only female present. After I finished school, I chose to study my A-levels at the Black Country UTC, since this type of school offered engineering as an A-level. I studied maths and engineering and I enjoyed every moment. All of my teachers were ex-engineers and offered advice about going into the industry. I always knew that I preferred to work with my hands, but during this course, which was fully academic, I realised I was still good at this theoretical side of engineering too.

I had many great experiences while at the UTC; I competed within the World Skills show for PLC programming and I was also awarded with a Gold Duke of York Award. During year 13, I applied to university, but I wasn't sure this was the right move for me. I spoke with my maths teacher and she said that the best move might be to complete an apprenticeship, since I would gain the academic knowledge but also the practical experience, which I would miss if I chose to go to university. I applied to lots of apprenticeships and was offered positions at many of them, but I chose to take the offer from Siemens Healthineers.

I joined Siemens when I was 18. I attended college for a year to learn the practical skills that were needed for my job and also to learn the theory behind electrical and electronic engineering. During college breaks, I went to work and started to get a feel for my daily job. Every day was something different, from the sites to the systems and the problems we were facing.

By the third year of my apprenticeship, I felt like I was becoming part of the team. I was trained on two of our systems and started to take the smaller jobs from the more experienced engineers. During this year I was awarded Siemens Rising Star of the Year 2017. This meant everything to me; it showed I was doing something right with my work and that others could see this and appreciate it.

“During college breaks, I went to work and started to get a feel for my daily job. Every day was something different, from the sites to the systems and the problems we were facing.”

Charlotte Hall



Ben Miller

Sandvik Coromant

My current job title is Project Engineer – I studied mechanical engineering at university and have been working for Sandvik Coromant for 6 years. My greatest achievement so far has been the input I provided in a previous role to new product development for the aerospace industry. Being permanently based onsite at a customer production facility now, an average day's work means meeting with customers looking at specific challenges and problems they are facing during the manufacture of their components. This can be either office-based or on the machine shop floor. I most enjoy the customer-facing part of my role and the variety of challenges this presents.

At school, the subjects that I was most interested in and chose to study all supported an engineering-based career; mathematics and science-based courses such as design and technology, resistant materials at GCSE level and mathematics and engineering at A-level. When I was in school, there wasn't much in the way of careers advice unless you proactively searched for it.

My only advice to young people who are interested in engineering and manufacturing as a career is to choose something you will most enjoy. To assist your choice, find out as much information as you can regarding potential job roles and companies you would like to work for. Engineering is a very broad term covering many different industries and job roles; in reality, a job role with the same job title can completely differ from one company to the next. I would highly recommend undertaking as many work experience placements as possible.

My parents were always completely supportive of the choices I made for education towards a career in engineering. There's very often a misconception of what engineering or manufacturing is, but there are many career options available, whether you are a school leaver or wish to continue further education all the way to the doctorate level.

“Engineering is a very broad term covering many different industries and job roles; in reality, a job role with the same job title can completely differ from one company to the next. I would highly recommend undertaking as many work experience placements as possible.”

Ben Miller



Molly Jones

Siemens

At age seven, I truly developed a curious nature with science. At that age, the experiments that took place in the classroom really caught my attention: big bottle rockets and methane bubbles, amongst a colourful array of others we tried ourselves. I gained a curiosity for old planes and pretty cars – I wanted to know how they worked. Having a couple of engineers already in the family certainly helped in answering my questions.

High school opened up a world of possibilities. I had enthusiastic teachers and people willing to push me forward and help me get to the places I wanted to be. I wanted to be a pilot or a paleontologist or a politician or... at this point I didn't really know. I began delving into the "steampunk" subculture. I began learning about Manchester and the rise of Cottonopolis, of the growth of my home city as a giant of manufacturing.

Joining the Air Cadets tapped into my old love of anything with wings or blades and fuelled my desire to know more. There was a wealth of knowledge around me and people willing to share what they knew. I went gliding twice and was lucky enough to be given all of the information I needed behind the science of flight and how the little gliders we put all of our faith into worked.

The beginning of college was a little bit of a bumpy patch in my road. I'd selected options I thought would get me into the places I wanted: maths, physics, history and English. Over the course of the first year, my confidence in maths dwindled until I dropped it. Luckily, the remaining three subjects were things I loved; I have a wild imagination in English and an adoration of history that knows no bounds. College ended on a high: I'd gone to London, seen the Freud museum and met Philip Zimbardo, the man behind the Stanford Prison Experiments.

I realised towards the end of my college career that academic learning just wasn't going to cut it for me. I wanted to meet people who were doing incredible things on a day-to-day basis. I took matters into my own hands and applied for places that I thought would be a challenge. I never thought a big company like Siemens would give me a chance. It was a surprise to me when the interviews rolled around; they didn't quiz me purely on my college results, they wanted to know who I was as a person and how much I was willing to learn and develop in the workplace. They wanted to know what they could do for me. I was ecstatic!

I'm a year and a bit into my customer care apprenticeship with Siemens and, to date, I've seen most parts of the business – no area is safe from my nosy self. I'm seeing our innovations in everyday life, even when I'm not at work. I finally have the answers to the questions my seven-year-old self was both fascinated with and dumbfounded by. I'm gaining the knowledge and tools to answer my own questions in the future.

Admittedly, I'm not set on where I want to be in the future. No matter my role, I want to be engaged by what I'm doing and doing something different frequently. I want to travel and see places and people that can only inspire me further. I'm excited for my future at Siemens, no matter what it brings.

"No matter my role, I want to be engaged by what I'm doing and doing something different frequently. I want to travel and see places and people that can only inspire me further. I'm excited for my future at Siemens, no matter what it brings."

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Jonathan Palmer

Sandvik Coromant

My interest in engineering was born from taking toys apart and trying to put them back together – unsuccessfully – as a child. Following in my father's footsteps, my younger brother and I took the path towards an engineering apprenticeship. I have been with Sandvik Coromant for nearly five years and have studied for a Technical Apprenticeship in Machine Tooling Solutions.

During school, I wanted to become a PE teacher. I studied physical education, ICT, history and additional science, which were all unrelated to the career I have now. The careers advice I had at school was very driven by the sixth form at the school I attended. They were essentially just trying to get as many students into their sixth form as humanly possible. At college, I studied an Advanced Level 3 Engineering diploma, which incorporated maths and science; this is when the engineering field came into my education. College was more focused, as they knew what our thoughts were and didn't try and force us down a route that we did not want to take.

Now fully trained by Sandvik Coromant, I find I really benefit from my job. Meeting new people, learning from others and mainly being able to see a project from the very start to the very end, I can then see that my work has been worthwhile.

On a project I would begin by collating the information I have. From then I will begin to plan how to machine the component given; putting together a tooling proposal for the customer so we can then discuss the best route of machining with the customer. This can take over a day depending on the size of the project.

Apprenticeships can take some of the financial constraints away from higher education; for me, "earning while you learn" is the best way into engineering.

If I could've given myself any advice when I was attending school, it would have been to watch F1 and imagine being able to help these teams with components on their cars. These are components I have seen and worked on.

The world of engineering can provide many opportunities for career growth and opportunities. I'd like to become an engineering manager and make a difference in the company at a higher level. I have the ambition to get to this position and I believe I'm going in the correct direction to get to the level I want to be at.

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Jonathan Palmer



Abyl Kaium

Jaguar Land Rover, Electrical Integration Engineer (degree apprentice)

I initially wanted to do a sponsored degree with Jaguar Land Rover (JLR), as the apprenticeship didn't exist when I first looked at the company, but the high university tuition fees put me off. I also saw that companies preferred for applicants to have experience, which you can't get on a degree without a placement year. When I saw the apprenticeship advertised, I favoured it due to the practical experience, degree and salary offered.

I have been at JLR for about two and a half years. The start of my day is spent in group briefings and mechanical problem-solving. For example, we discuss any new changes to pending issues made during the previous day and then tie them together. Then, I start to pursue solutions. Problems usually revolve around electrical faults on prototype vehicles that cannot be root-caused, vehicles that cannot be moved, manufacturing issues related to software and electrical processes on the track. My experience in solving issues with vehicles requires me to get onto the vehicles and extract data using my laptop, Vector tools and even a multimeter. I then liaise with engineers to determine fault sources, allocating and requesting engineer support based on the data I have captured. Once we identify a fix, I implement it, or offer advice to the person who should. This is just a fraction of what I have been and will be involved in.

I enjoy the variability of the work and wide exposure to the business at JLR. I get to see a lot of different processes and work on a lot of different vehicles, so most days are not the same for me. It would probably take me quite a long time to describe the various sorts of work I am involved in, as I am still learning, which I really enjoy.

At school, I took lots of subjects: all the compulsory things and more. I did 14 GCSEs and 5 A-levels, and subjects I particularly enjoyed were D&T systems and control, computing, physics and drama.

After studying D&T systems and control, I realised I wanted to get into electrical and electronic engineering. I found electronics very interesting and really enjoyed my time crafting pieces in the workshop. This prompted me to get involved in a lot of related opportunities at school, including building sets and making a remote control car from scratch. These only reinforced my decision.

To anyone who wants to be an engineer, you have to pursue it with everything you can. If you are not sure what you want to be yet, then try to get involved in anything related at school (this doesn't just apply to engineering!) or research internship or training placements. Another great idea is to try and attend free, open lectures that some universities offer, as this can also offer insight. I'd really encourage girls to think about engineering from a younger age too (from 10 years old onwards, or even earlier if you'd like). I think it's easier to inspire a genuine interest if you start early. From what I've witnessed, it's not so much that there is a resistance to having girls in the engineering workplace, it's that most young women either don't want

to enter the field by the end of college, or have been turned away from, or had their interest changed, at younger ages. My hope is that, by encouraging women to go into STEM when they are in primary or secondary school, this will increase the number of enthusiastic engineers in the future. It's good to find a job you love; it's not the best to have to learn to love the job you've got yourself into.

I did not receive much advice at school, but most of the advice I did receive was focused on going to university. We had a careers officer, but we had to contact them on our own initiative. My knowledge came out of personal research on the internet and my D&T teacher. In addition, I wouldn't say school advice had much influence on my decision to pursue this path. One thing I would change about schools' approach to careers is the idea that you don't need to know what you want to do as late as year 13. I don't think this is true, as the decisions you make as early as your GCSEs can influence your ability to pursue a specific career. If I hadn't realised I wanted to be an engineer, I would not have studied maths and, as a result, I wouldn't be able to do what I am doing. I think schools need to encourage exploring what students want to do much earlier, and help them to get to that decision. My parents are quite happy that I am in an industry that I chose to be in and enjoy, and so am I.

"I get to see a lot of different processes and work on a lot of different vehicles, so most days are not the same for me. It would probably take me quite a long time to describe the various sorts of work I am involved in, as I am still learning, which I really enjoy."

Abyl Kaium



Roxanne Pollard

Mechanical Design Engineer, Renishaw

I developed an interest in engineering at school and consolidated it with the work helmet that I designed, which was entered into a series of competitions.

I won first place in the Young Innovator Competition held by the Chipping Sodbury Rotary Club and first place in the MTA's Technology, Design and Innovation (TDI) Challenge. I was then awarded the Product Development and Marketability award and named South West Regional Finalist in The Big Bang Competition at the University of Bath.

I also represented the South West at The Big Bang National Science and Engineering Competition in London. I was awarded the Scientific Instrumentation Makers Young Engineer award by Professor Brian Cox and was subsequently promoted from an Apprentice to a Freeman of the Worshipful Company of Scientific Instrument Makers.

In 2010, I began working as a technical apprentice in mechanical and electronic engineering at Renishaw. During my time in this role, I was named Apprentice of the Year in the Gloucestershire Women in Business Awards 2014.

Following my apprenticeship, I began a part-time degree in mechanical engineering at the University of South Wales, spending four days a week working at Renishaw and the other day at university. I qualified with a first-class honours degree in 2017 and was awarded the TATA prize for being the highest achieving part-time student at the University of South Wales.

I now work as a mechanical design engineer in one of Renishaw's additive manufacturing research teams, specialising in the development of new products.

I have a passion for producing something and seeing the difference that it can make to people's lives, to the environment and to the technology industry. It's very satisfying to see an idea develop from a sketch to a real-life product. The best thing about my job is the variety; every day is different and presents a new problem to solve.

Engineering is a very vast industry. People considering a career in engineering need to make sure they research the many opportunities available and consider what will enable them to make the best use of their skill sets. I believe passion, determination and enthusiasm are key.

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Helen Brindley

Second-year higher DF PD Apprentice, Siemens

At age seven, my brother left home to study aeronautical engineering at university. This ignited my passion for engineering as, when he was home, he would show me drawings explaining why a change of a few millimetres in the angling of the wing meant that the plane wouldn't fly. I wasn't interested in engineering planes, so I needed to find what I was passionate about.

Throughout high school, I was greatly supported in my quest to discover what engineering had to offer. I was chosen to be part of an enterprise engineering challenge, The Make It Challenge, which a team from my high school took part in and won, not only our heat but the final.

When I was in year 10, we were given the opportunity to do a two-week work placement. I was lucky enough to do this in a small engineering firm in Cheshire, where I developed a love for CAD and seeing what can be developed on a computer, negating the need for paper drafting. Later on that year, I was given the opportunity to do a placement at Jaguar Land Rover aimed at getting women into engineering. I spent the day repairing one of the robots used to build the cars.

I was sure that I wanted to be an engineer, so when the time came to choose my A-level options, I decided to take maths, computing, physics and chemistry. All was going well until I started to really struggle when undertaking assessments within my physics lessons and I began to fail. This was when I was told I wasn't going to be an engineer, as I would be unable to get the grades. At this time, someone came into my college to talk about the finance and commercial academy at Siemens. I mentioned this to my dad and he said Siemens are a big engineering firm and that they control most of the train signals in the country. So then I looked at roles with Siemens, which lead to my current job. I was lucky that Siemens look for individuals who show passion and a willingness to learn, meaning my less-than-perfect physics score didn't hold me back.

I am currently a second-year higher DF PD apprentice. In my role, we undergo a number of placements throughout the departments within DF PD and direct what the future will hold. Last November (2017), I was awarded runner-up in the North West for the EEF first-year higher apprentice of the year award.

As of yet, I am undecided as to what the future will hold. I currently think I want to go into projects, as this will allow me to have a hand in both the CAD and the more practical aspect of the business. However, I am still only at the beginning of my career, so I am unsure as to what the future will hold after completing my placements.

“Later on that year, I was given the opportunity to do a placement at Jaguar Land Rover aimed at getting women into engineering. I spent the day repairing one of the robots used to build the cars.”

Helen Brindley



Shannon Lynch

Chassis Engineering Degree Apprentice – Suspension Systems Architecture (SSA), Jaguar Land Rover

After taking part in a Jaguar Land Rover JLR Young Women in the Know experience week in year 11 at school, I was convinced I wanted to do an apprenticeship. I never fancied university and this seemed like a great opportunity to get into work, but also to continue learning and get a degree. I studied chemistry, physics and maths at A-level and joined the degree apprenticeship in September 2014.

My current role specialises in Chassis Associative Vehicle Architecture (AVA), which combines the skills of Computer Aided Design (CAD), Computer Aided Engineering (CAE) and Scripting to automate design processes that save time and increase robustness. Communication is a huge part of my role and I do this at 7am primarily through my emails. This involves understanding technical elements of designs and how users interact with the tools and software used in engineering. Then, I usually spend a few hours developing CAD or coding for projects I am working on.

As well as being involved in large-scale projects, I also run personal “Quick Win” projects. I have had the opportunity to mentor a fellow chassis apprentice, from brakes, in an AVA project to create a parameterised brake disc model to speed up the initial design phases. At the end of the day, I take some time to work on my university projects, which I enjoy as it enables me to apply theory to real examples at work. My extracurricular activities include planning apprentice events and school visits as a STEM ambassador.

As well as my day job, I have had the opportunity to become a STEM (Science, Technology, Engineering and Mathematics) ambassador and WISE (Women in Science and Engineering) role model, volunteering in schools and at career events that focus on inspiring young people to consider careers in STEM.

I love the problem-solving side of my job; I am challenged every day, so I never get bored. I enjoy working on both individual projects and in a team, as it is a good mix of personal responsibility and teamwork. I also enjoy the fact I am constantly learning. Whether it is new skills, or learning about other departments and how the business works, at the end of the week I feel like I have achieved a lot.

Above all, my parents are really supportive of me doing an apprenticeship within engineering, especially for JLR. At school, I was discouraged from apprenticeships: “If you're smart, go to uni.” But it has been the best option for me; I can work and study at the same time, getting lots of experience, my degree is paid for, and as I earn my own wage I have been able to move out and become financially independent. I am passionate about changing perceptions of apprenticeships and making young people more aware of the

options so they can make more informed decisions about their futures. To the student considering a career in engineering, I would like to reassure you that exam results aren't everything. Skills such as communication, presentation, time management and organisation are essential to success and you should take any opportunity to work on these. If possible, identify mentors. This has been so valuable in aiding my personal development and my confidence, and most people are happy to take the time to share their experience with you.

I am aiming for a first in my degree and hoping to achieve my 6 Sigma Black Belt and a Masters in Engineering and Process Excellence in a few years. I am also aiming to work towards my incorporated engineer IENG Chartership with the IET on the completion of my degree. I can see myself having a long and successful career with Jaguar Land Rover and I am excited about my future in engineering.

“As well as my day job, I have had the opportunity to become a STEM (Science, Technology, Engineering and Mathematics) ambassador and WISE (Women in Science and Engineering) role model, volunteering in schools and at career events that focus on inspiring young people to consider careers in STEM.”

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