



Case study:

Tomorrows Engineers workshops and Big Bang

Client: Toyota Manufacturing UK

The Challenge

Toyota Motor Manufacturing (UK) Ltd is committed to supporting education within their local communities and delivers a range of initiatives aimed at engaging with young people and encouraging and inspiring them to be the next generation of engineers.

Toyota is world-famous as the manufacturer of high-quality, high-value cars, vans and trucks that set the standard for long-term resale value and durability. They are committed to the British Automotive Sector achieving a thriving, dynamic and expanding manufacturing and engineering industry, including suppliers, small and medium enterprises (SME's) and infrastructure.

Toyota school's programme has been designed to engage young people to achieve their full potential and help them considering STEM based subjects and their associated careers. They offer a suite of programmes starting with primary, through to secondary and on to sixth form.

These programmes offer an innovative partnership between business and education.

Toyota Motor Manufacturing (UK) reached out to Learn by Design to work with two specific secondary schools, within the key stage three phase of their learning journey. They needed a programme that would inspire young people about the exciting opportunities that STEM, and in particular Engineering, could offer them for their future careers.

Our Solution

The Learn by Design Education Communication team visited a Toyota Manufacturing site to gain an insight into their products, factory, production methods and company ethos. This research enables us to design curriculum content that inspires young people in the principles of STEM learning and highlight future careers and innovation. Presenting learners with a real world insight into engineering in its broadest terms whilst introducing the exciting opportunities UK manufacturing can offer them.

Learn by Design developed a school programme for Toyota Manufacturing UK that was suitable for both year 7 and 8 pupils, within the school environment, aligning with both national curriculum and student ability.

Toyota Manufacturing UK funded Learn by Design to deliver this bespoke Tomorrows Engineers Around the World programme, to year 7 pupils, in two schools in Derby each academic year.



These workshops are made up of three distinctly different but connected hands-on sessions highlighting the skills and opportunities available for the modern engineer, these include:

Engineering X Factor – shattering the myths that surround engineering this session aims to highlight the key skills and qualifications required to follow a career in engineering, using a variety of problems and brain teasers! Learners find out that engineering is the expressive, flamboyant, and creative part of STEM covering everything from automotive technology to ice cream. Learners explore methods of becoming an engineer that can be tailored to meet an individual's learning style. The workshop comes into its own with the use of an award-winning handheld learner quiz response system allowing a fast paced lively head-to-head quiz. The quiz starts off by considering what skills you need to be a successful engineer and finishes off with the range of pathways that are available into engineering.

T- Bots – learners are presented with the opportunity to focus on the technology involved in engineering and how it can help engineers do their job. Learners find out that companies like Toyota have a history of development and developing technology that can solve problems and improve situations. Learners are challenged to be passionate problem solvers and complete a hands-on, interactive engineering challenge with VEX Robots, following the engineering problem solving process. Testing, modifying, and planning their solutions in a competitive team challenge is all part of the experience. Learners get to develop and use their teamworking, technical and analytical, skills coming away with the understanding that technology, and in particular robotics, presents the solution to mobility for all and independence.

Toyota Design and Deliver (Design Room) – learners are taken on a journey enabling them to understand that design is what links creativity and innovation. Learners are encouraged to design or adapt a product, system, or technology that delivers an innovative solution, providing mobility for all, including Toyotas five stage design process. Learners develop an innovative product or solution that should help the engineering industry, working in groups to deploy their creativity to meet a specific end. Demonstrating a common goal, they then pitch their solution to the group demonstrating out the box thinking showing that good design always makes you smile.

During year 8, learners at both schools are offered the opportunity to participate in an 8-week Future Engineers after school club within which they explore a range of Engineering challenges and have the opportunity to plan, test, modify and develop competition entries for the Big Bang competition regional heat that is judged each year at the East Midlands regional Big Bang fair, normally held in Derby.

The sessions are delivered in a fun and relaxed manner, with minimal presenting and maximum 'doing'. All sessions have an automotive/mobility theme and are connected to the Big Bang competition, building, week on week, on the skills and knowledge they need to enter the competition.



Sessions include:

- 1. Electric Car and Mobility of the Future** – learners construct and charge their own electric cars. Learners investigate their cars, getting to know their behaviour and characteristics, utilising tables and graphs demonstrating how their cars behave with different charging voltages. Learners construct bodywork to give their cars style and improve their performance. Learners finish the session by discussing the importance of designs looking good as well as performing well.
- 2. Research and Robotics** - after competing in some head-to-head challenges re-enacting how robots are used within a factory environment, learners design their own robot attachment. Using strong cardboard as a frame, learners design and build their own attachment to attach to a VEX robot before testing it out on the challenges again. They then see if their design is better than the one they started with.
- 3. Renewable Energy (Wind Turbines)** - learners discuss the idea of sustainability, renewable energy and Toyota's links with sustainability is explored i.e., Toyota Environmental Challenge 2050, car recycling, sustainable mobility etc. Learners look at the principles behind building, design, and structure, considering the requirements for wind turbines that meet the needs of geographical areas. Using their newfound knowledge learners compete in teams, designing and building their own freestanding wind turbine that can withstand winds (i.e., a fan) recording their designs' electric generation potential.
- 4. Designing for Mobility** - learners take part in a series of teamwork / communication challenges which simulate different disabilities. The idea of mobility is discussed and some of Toyota's solutions shown e.g., Project Blaid, iBOT, i-ROAD, Exo-Wheel, Human support robot, research, and robotics. Learners are challenged to come up with a new idea-something novel, interesting, and revolutionary that they could present to Toyota.
- 5. Prototyping and Bridge Building** - before any discussions take place, learners are challenged to construct a bridge only using the resources provided. Learners look at the successful designs comparing them to bridges in the real world. Learners are set another challenge to build a miniature keystone bridge as quickly as possible but this time with the benefit of planning and prototyping.
- 6. STEM Quiz** - learners compete in pairs utilising handheld quiz remotes answering Toyota centred questions around engineering and science general knowledge. Other questions include puzzles, lateral thinking, riddles etc., to challenge all types of student and keep the quiz fun and entertaining.
- 7. Problem Solving** - learners consider the question "what is a problem?" Understanding that a problem is an obstacle which hinders the achievement of a particular endpoint, objective, and purpose. Problems may need to be considered, solved, or even answered. Learners are presented with a whole range of problems from large to small, utilising mind mapping, spider diagrams, star charts and creativity games. They have to come up with solutions considering available time, money, and human resources.
- 8. Presenting and Competition Entry** - learners go through the Big Bang judging criteria taking the knowledge and skills gained over the previous seven workshops to demonstrate how they have developed their project concept, project process, project outcome, and personal skills. Learners start to complete their competition entries.

Both schools attend the Big Bang regional fair that is held annually in the City of Derby currently, to explore hands on interactive STEM activities, workshops and shows, to highlight some of the exciting careers that are open to them in the future.

The schools involved

Murray Park school
Littleover Community school

Comments

Learn by Design has had a fantastic working relationship with Murray Park School for a number of years now which has brought many exciting STEAM opportunities for our students for both KS3 and KS4.

In order for Murray Park to work towards achieving the Gatsby Benchmarks, Learn by Design has helped enrich and add value to our Careers programme to ensure that ALL students across ALL year groups have the opportunity to take part in meaningful encounters with local STEAM employers and activities.

Collaboration with local employers like Toyota have linked in with Learn by Design to provide a number of bespoke STEAM workshops and events for our students which has seen a great increase in student engagement in STEAM subjects.

Working together with Louise and her Learn by Design team has been a real success, often it's quite difficult to justify the short-term impact of activities and much easier to measure the impact being made in the long-term which is what we've seen from our student's outcomes.'

We would like to thank Learn by Design for all their support over the years with our students and look forward to the continued partnership working moving forward.

Tim Taylor
Aspirations Careers Employability (ACE) Coordinator - Murray Park School

In 2016, we commenced our educational journey with Learn by Design, our aim being to inspire and excite young people to enjoy and investigate the possibilities of STEM subjects via future study and then potentially long-term careers. By supporting young people, we are inspiring our future workforce whilst filling the engineering and manufacturing pipeline for local businesses. Our partnership is built upon excellent communication, trust, respect, and mutual understanding of how our businesses operate.

Mandy-Jayne Evans - Senior Specialist - Young People Education – Technical Skills
Human Resources Division - Toyota Manufacturing UK Ltd

Links to Gatsby Benchmarks?

2. Learning from career and labour market information
4. Linking curriculum learning to careers
5. Encounters with employers and employees
7. Encounters with further and higher education