WELSH ENGINEERING TALENT FOR THE FUTURE

TALENT

Issue No. 23

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PROSPECTIVE ENGINEERING STUDENTS AT **EESW'S HEADSTART CYMRU** EVENT AT SWANSEA UNIVERSITY

Celebrating 30 years of inspiring future engineers

ROBERT CATER
CEO, Engineering Education Scheme Wales

Now in our 30th year, the Engineering Education Scheme Wales (EESW) currently engages with more than 8,000 students per year across both primary and secondary sectors. The scheme has grown significantly since it was first established by Austin Matthews in 1989 (see page 2) with funding from the Royal Academy of Engineering.

Mr Matthews and two other helpers established EESW as a registered charity and set up a board of trustees of which I was a member.

In these early days the scheme organised links between teams of sixth-form students and companies to enable the students to tackle real engineering problems.

The numbers involved were quite modest, but a good foundation for the development of EESW was established.

Over the years the scheme grew and developed to involve larger numbers and worked with an increasing number of companies.

Austin Matthews continued to manage the scheme until 2009 and I took on responsibility as chair of trustees somewhere along the way.

When Austin retired the trustees asked me to take over the management of the scheme in 2009.

ROBERT CATER CEO, EESW

My first task was to prepare a business plan to secure funding from the European Social Fund (ESF) through the Welsh Government to support and expand the scheme.

The bid was successful and in 2010 I started recruiting staff to operate the STEM Cymru ESF-funded operation across the Convergence Area of Wales.

The funding was originally granted for three years.

The Welsh Government also provided funding to ensure we could offer the same provision to schools across the whole of Wales. We have continued to meet all targets and our ESF funding has been extended and is currently secure until 2021.

Funding from the government continues to ensure we can continue to operate across the whole of Wales.

The ESF funding allowed us to offer a broader range of experiences to a wider 11-19 age range.

We continued with the sixth-form industry-linked project and added a range of activities for Key Stage 3 under the umbrella of i2E (Introduction to Engineering), Girls' into STEM, the F1 in Schools Challenge, and Headstart Cymru.

EESW is grateful to the Welsh European Funding Office (WEFO) and the government for their support and to the companies, universities, colleges and schools that work with us to give pupils the exciting STEM experiences we offer.

INSIDE

TIM WILLIAMS
EESW CHAIR OF TRUSTEES

Our time to recognise and adapt to change

It has, and continues to be, both a pleasure and privilege to be associated with EESW and an honour to serve as chair of trustees over the past 10 years, writes Tim Williams.

EESW celebrates 30 years' service this year; not only a great achievement but recognition of the hard work and dedication of the staff, consultants and advisers, past and present, who can be so proud of their contribution.

The vision of Austin Matthews, the founder of EESW, and the management and leadership of Bob Cater, EESW chief executive, must be acknowledged and applauded.

Every organisation must recognise and adapt to change.

For EESW we are now looking at the changes to the school curriculum and the needs of industry and commerce.

The digital age is here and will affect the way we work and live in the future.

It is of paramount importance that the role we play in the education of pupils, from primary school to sixth form, reflect these changes, to make sure that the activities we run, inform and prepare students as they make important decisions over career choices.

We encourage greater collaboration between industry and education and ask that employers get in touch with us to offer support and provide students with an opportunity to work on a project.

This has been so successful over the years and must be sustained.

Finally, may I take this opportunity to thank my fellow trustees for their ongoing support and advice, which is greatly appreciated.

NEW PRESIDENT FOR EESW

LORD JONES AND HIS WIFE JANET WITH A SIXTH-FORM TEAM FROM THE ALUN SCHOOL AT THE **NORTH WALES BIG BANG**

The Engineering Education Scheme Wales is very pleased to announce that Lord Barry Jones has agreed to become our president.

Lord Jones was the Member of Parliament (MP) for East Flintshire from 1970 to 1983.

He was also parliamentary Under-Secretary of State for Wales from 1974 to 1979 and became MP for Alyn and Deeside in 1983.

In 1994 he was appointed by the Prime Minister as a member of the then new Intelligence and Security Committee, on which he served until 2001; when the committee was dissolved at that year's general election, Jones retired from the House of Commons and was made a life peer with the title Baron Jones, of Deeside in the County of Clwyd.

In 1999 Queen's Birthday Honours, he was made a member of the Privy Council of the United Kingdom.

The EESW trustees feel that his patronage will be very helpful to the scheme.

Tim Williams, chair of trustees added: "Lord Jones was very impressed when he first saw the activities of EESW and instantly wanted to help.

"Given his background, stature and considerable experience, we are very fortunate that he has agreed to be our president and we look forward to working with him to increase the profile and value of this great scheme."

'Blank canvas, seed funding and the whole of Wales ahead of me'

AUSTIN V MATTHEWS MBE
Retired director, Engineering Education Scheme Wales

FROM LEFT: CARON JONES, JOHN GRIFFITHS AM, SIR ANTHONY CLEAVER AND **AUSTIN MATTHEWS**

Funding from the government continues to ensure EESW can continue to operate across the whole of Wales.

Throughout my teaching career and as an education adviser to a county authority, I strived to link what is now known as STEM, to the actual process of educating young people and then introduce them to the real life experience of working with industry.

My efforts came to the attention of The Royal Academy of Engineering (known, at that time, as The Fellowship of Engineering) which had started a scheme in England known as The Engineering Education Scheme.

It involved linking with enlightened companies in the engineering manufacturing and research field and solving real live problems for them.

Many of the projects saved large sums of money for their linked companies.

This obviously was 'win-win' situation for all concerned and when The Royal Academy invited me to start a similar scheme in Wales, being a Welshman, I jumped at the opportunity!

A blank canvas, a small amount of seed funding and the whole of Wales ahead of me!

Where do I start? By the way, all this was in 1989!

Through the excellent support of a few industrialists, who thought the same way as myself, and the unstinting support of local education advisers, a small number of schools fielded project teams, resulting in some astounding successes for their link companies. Word spread, more funding was hard won and gradually the scheme grew and grew.

Today, the scheme we know as EESW thrives and encourages thousands of young people throughout Wales from primary, secondary and tertiary education to understand the marriage of the STEM subjects to real life in engineering and manufacturing, the lifeblood of our nation, leading to highly rewarding careers with substantial earning potential.

I was fortunate enough to work, for 22 years before retirement, alongside many talented young people and see them develop.

That would not have been possible without the help of many friends in the engineering industry and the Welsh Assembly who also believed in the scheme.

Bob Cater assumed the mantle of director after I retired and has grown the scheme to its highly successful present position on its 30th birthday.

Through the pages of this excellent publication I would like to propose a huge thank you to all those in education, industry, staff of EESW, Welsh Assembly, trustees of EESW, et al, for all their generous support at the 30-year watershed, and hope that they will feel able to continue that support in the future.

EESW/STEM Cymru
Waterton Centre
Waterton
BRIDGEND CF31 3WT
Tel: 01656 669381
info@stemcymru.org.uk
www.stemcymru.org.uk

On behalf of the Engineering Education Scheme Wales (EESW) I would like to thank all those who have contributed to Talent.

Any suggestions or comments that will help to improve the quality and content of this magazine will be gratefully received.

We are also grateful to all the companies, colleges and universities that work with us to provide pupils with a greater understanding of the importance of STEM subjects to the prosperity of Wales and for helping to develop better employability skills.

The Engineering Education Scheme Wales (EESW) has once again received funding from the European Social Fund through the Welsh Government for the STEMCymru II Project until June 2021.

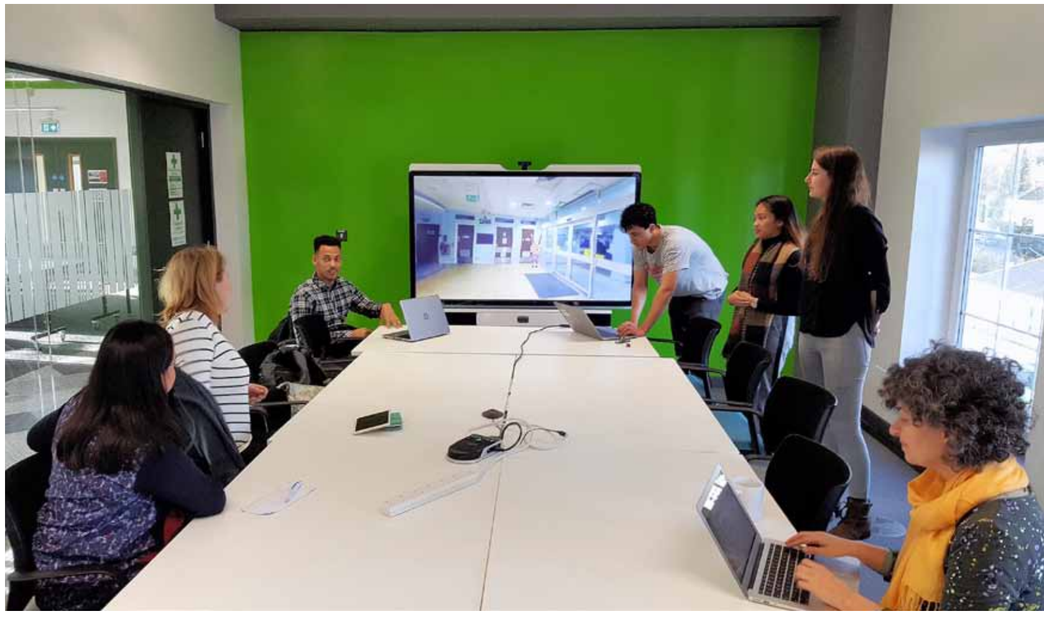
This will enable us to continue our work in the west, north Wales and Valleys area. EESW also receives funding from the Welsh Government to ensure it can offer activities for the benefit of students in schools in other areas of Wales.

Bob Cater, Editor

Cronfa Gymdeithasol Ewrop
European Social Fund

University addressing shortfall of industry-ready software engineers

MATTHEW TURNER
Industry and external engagement manager, Cardiff School of Computer Science and Informatics, Cardiff University



NATIONAL SOFTWARE ACADEMY STUDENTS WORK IN CLOSE PARTNERSHIP WITH INDUSTRY

Cardiff University's School of Computer Science and Informatics has a longstanding reputation for its applied research activities.

Over the past four years the school has worked to integrate industry working practices into its taught degrees.

This activity has built upon the research-informed teaching to improve the employability of students studying within the school and to respond to the needs of industry, particularly companies based in Wales.

The school offers a year-in-industry option on its computer science degrees, and this is proving increasingly popular with students. Importantly, the school has seen a welcome rise in the number of local companies engaging with the year-in-industry programme and also providing shorter placements for students during the summer break.

The school launched the National Software Academy (NSA) in September 2015 in partnership with the Welsh Government and industry leaders to address the shortfall of qualified, industry-ready software engineers.

The software engineering degrees taught at the NSA provide a focus on the skills, knowledge and hands-on experience required to be effective as a commercial software engineer.

Based at purpose-designed premises at the Information Station in Newport, the NSA aims to mimic the workplace as far as possible within a higher education environment.

A key feature of NSA degrees is the emphasis on project-based learning.

During each semester of their studies, students undertake a team-based project intending to address a challenge presented by an external organisation.

During the most recent academic year, organisations that have provided projects have included Natural Resources Wales, Cardiff City Council, Transport for Wales and Fujitsu.

The goal of working in partnership with industry to deliver industry-relevant degrees has paid huge dividends.

More than 200 different companies have visited the Newport site since the NSA opened in September 2015.

The academy's project-based approach to learning has enabled companies and third-sector bodies with a wide range of technical competence to sponsor student projects.

Client-facing projects allow the students to have an extensive and highly practical learning experience with a particular focus on developing team working, communication and project management skills.

The School of Computer Science and Informatics now hopes to build upon this foundation by introducing a new degree apprenticeship in applied software engineering in September 2019, working in partnership with local companies.

The school, in collaboration with the university's School of Mathematics, will also be launching a Data Science Academy (DSA) in September 2019.

The DSA will incorporate postgraduate degrees in data science and analytics, cybersecurity and artificial intelligence.

These degrees will all seek to address the demands of employers for skilled graduates in these rapidly growing areas.

The DSA aims to work in partnership with industry, much like the NSA model, to give students real insights into the practical application of these skills in an industrial environment.

The school is an active partner in the Institute of Coding, a UK-wide initiative to promote digital skills and digital careers.

Part of the school's efforts has included working in partnership with primary and secondary schools and colleges in South Wales to deliver coding clubs and curriculum support.

The school has also worked to provide training in several community settings including libraries and community centres.

All this activity aims to encourage more people, of all ages, to think about undertaking a career in computing and technology and the opportunities that might be available as a result.

In line with this aim, the school has engaged with a number of EESW initiatives over the past academic year.

A girls into STEM day was hosted at the National Software Academy with a focus on cybersecurity. The school also engaged with the EESW sixth-form project scheme to work with two Cardiff-based secondary schools which was a valuable and enjoyable experience for all participants.

For further information about the research, taught degrees or outreach activities undertaken by the School of Computer Science and Informatics at Cardiff University then please contact the school via comsc-office@cardiff.ac.uk.

NSA DEGREES EMPHASISE THE IMPORTANCE OF TEAMWORK IN A PROFESSIONAL ENVIRONMENT

The academy's project-based approach to learning has enabled companies and third-sector bodies with a wide range of technical competence to sponsor student projects.

Engineering Education Scheme Wales

The EESW Student of the Year award is a celebration of the students who participated in the EESW sixth-form project last year, in memory of Dr Tom Parry Jones, entrepreneur, inventor, and trustee of the scheme for more than 20 years.

More than 500 Year 12 students who participated in the scheme last year were invited to apply to become the EESW Student of the Year, and 7 students who were interviewed in North and South Wales were invited to attend this year's awards ceremony, which took place at the Welsh Automotive Forum's annual networking dinner at the Vale Resort Hotel on Thursday, November 29. Their places at the dinner were kindly sponsored by Dr Raj Jones and BPU Accountants.

This year's winner of the £800 prize, Daniel Clarke from Ysgol Gyfun Gymraeg Plasmawr, worked with Jacobs on a project to solve overheating in transformers, and intends to study physics at university.

His teacher said: "Daniel has been a model pupil for all those who have had the pleasure of teaching him.

"He is a wholly committed, well-rounded and gifted student; yet he is incredibly modest and humbled by praise."

The worthy runners-up, Elin Mair Evans from Ysgol Glan Clwyd who worked with Knitmesh Technologies and Neve Parker from Hawarden High School who worked with Raytheon UK, will each receive £400 towards their future studies.

STUDENT OF THE YEAR **DANIEL CLARKE** RECEIVES HIS AWARD FROM THE RT HON ALUN CAIRNS MP SECRETARY OF STATE FOR WALES

LEON BUCK
Runner-up, Student of the Year 2018

When I participated in the sixth-form team project in Year 12, I saw that the EESW is a brilliant organisation which is working hard to get students like me to think about a career in STEM.

The Student of the Year award was a brilliant opportunity for me to practice for writing my personal statement ready to be entered through UCAS. Being invited to interview for the award was an exciting boost and helped me see what I could expect in my university interviews several months later. The interview also gave me a chance to see the EESW centre in Bridgend and meet some of the interesting people who had worked to organise both the sixth-form team projects and the Student of the Year award.

Finally, going to the Welsh Automotive dinner was a whole new experience for me and it was really interesting to hear the speakers, who spoke so clearly about their worries on how the uncertainty of Brexit may affect the automotive industry in Wales. Since becoming a runner-up for the Student of the Year award I have received university offers and will hopefully be studying mechanical and electrical engineering at Bristol University this September. In the future I hope to work as an engineer, designing manufacturing methods for new and existing products.

DANIEL CLARKE – STUDENT OF THE YEAR 2018

EESW has played a pivotal role in my experience of sixth form and the last two years of my life. I'd like to thank EESW for the eye-opening opportunity that was the sixth-form project.

It was a fantastic experience to utilise the ideas and concepts taught in physics lessons in school and apply them to real life scenarios. I would highly recommend taking part in this extracurricular activity to anyone who enjoys science and is interested in a career in engineering.

It is great to see that twice as many students are taking part in the year below me in my school, Ysgol Plasmawr!

Working on this project with four friends, I was able to improve on a number of skills, including reasoning, teamwork, communication, computing and practical ability.

All of these will be vitally important as I progress with my STEM studies.

In November 2018, I was lucky enough to attend the Welsh Automotive Forum dinner as a finalist for the Dr Tom Parry Jones Student of the Year Award.

I will never forget that evening. It was a chance to get to know other finalists from all across Wales, as well as an introduction to networking with large companies. I also had the honour of winning the Student of the Year Award, which made the evening all the more special.

I am eternally grateful to EESW and Mrs RW Jones for their continuing support of young people and STEM in Wales.

Since that evening, I have been kept very busy with a number of things, including university applications, continuing to practice for my piano diploma, working at two jobs and, of course, revising for my A-level examinations in maths, further maths and physics.

I intend to continue my STEM studies, and I'm glad to say that I've accepted an offer from Durham University to read physical natural science.

EESW is a truly excellent scheme that benefits a huge number of Welsh school students. I believe everyone should be making the most of them!

SAMUEL ROBSON BROWN and ANNE EVANS
Runners-up, Student of the Year 2018

My experiences with EESW, and of course my A-levels, have stimulated my interest in a variety of aspects of STEM. From joining the engineering team and combating our brief, my appreciation of science has flourished. I have come to realise that our ever-changing world is calling for the skills that are developed from studying any STEM subject while working with EESW.

Exploring concepts allows individuals to enrich their knowledge and strengthen skill sets which will be used in facing problems of our generation. The use of the Welsh language in engineering is also key to its success, and EESW stimulates the growth of learners to develop identities which will allow them to contribute to the welsh economy.

My future goals include studying a medical degree, where I aim to utilise and enhance my skill base of not only science, but teamwork and communication.

During the Ucas process, I searched for a degree which combines scientific understanding and interpersonal skills. EESW allowed me to gain an insight into allied fields, including medical engineering on the taster week at Swansea University.

Time spent at the university and at events including the Automotive Forum dinner, in the company of experts and leaders in a variety of fields demonstrated to me the importance of inclusion and encouragement from members of the EESW.

These sessions and the whole process, including gaining my golden crest award, has most given me confidence to go forward and achieve my aspirations and dreams.

This EESW industry challenge was a chance for me to explore the world of engineering and helped me decide to study it at university.

It brought me closer to my teammates, taught me valuable lessons in teamwork, and gave me an insight into the types of problems that engineers have to solve. Our challenge was set by Eastman Chemicals which wanted to separate a fine powder that had settled at the bottom of barrels of liquid.

We brainstormed different options and ended up designing a device that lowers into the barrel and sections off the base, so the liquid above can be pumped out. I loved being able to create a prototype in Cardiff Metropolitan University's workshop, where we were able to use a laser cutter.

I found the report writing challenging, but was proud of the result, and the day at the Big Bang fair was very enjoyable.

The Student of the Year competition was another opportunity to challenge myself, through the interview and written application, where I wrote about engineering in Wales.

I was delighted to be a finalist and was pleasantly surprised at the invitation to the awards evening. I enjoyed talking to some of the engineers who worked with the other entrants, and got to meet Wales' Education Minister Kirsty Williams, who was very supportive

I have a conditional offer to study civil engineering the University of Bath in September, which I am excited about. I would like to thank the EESW for this opportunity and would recommend it to anyone considering engineering.

Student of the Year 2018

LOREN MOLYNEUX
Student of the Year 2017

I am incredibly grateful for the opportunity to have been a part of the EESW and for the invaluable experience of being a part of a team while working on our photonics project.

Since receiving the Student of the Year Award in 2017, the skills, knowledge and understanding I gained have been discussed at many of my medical interviews.

I have recently completed my first year of a six-year degree studying medicine at Cambridge University.

Looking back on a very busy and incredibly rewarding year, I feel I have overcome challenges and pushed myself academically.

In doing so, I have gained valuable skills, including time management, increased organisation, and a greater understanding of how I learn.

I am excited to delve into neuroscience next year as I am fascinated by the intricate inner workings of the brain.

I also look forward to clinical years and learning more about how the way in which we diagnose and treat disease is changing.

I believe advances in engineering to be fundamental to the enhanced efficiency and efficacy of our healthcare system, and my year of study has left me with even greater enthusiasm and a sense of excitement as I look to the future.

LOREN WITH HER MOTHER AT THE AWARDS DINNER

FROM LEFT: EDWARD UPTON, CARYS BILL, LEON BUCK, SAMUEL ROBSON-BROWN, ELIN MAIR EVANS, NEVE PARKER, DANIEL CLARKE, ALAN CAIRNS AND BOB CATER

NEVE PARKER
Runner-up, Student of the Year 2018

EESW is a fantastic and enlightening scheme and I'd like to express my sincere thanks. It was an honour and a privilege to be part of its Student of the Year competition.

I have always had a passion for STEM-related subjects ever since I started at high school, following on from my love for maths, physics and product design, it was natural for an interest in everything engineering to just fall into place.

People don't naturally associate engineering with females and this makes me more determined to be involved with engineering.

Some people may think it strange for a girl to show a fondness and a love for typically boys subjects and specifically engineering, but this only inspired me even further.

I guess I'm not what people would call a typical engineering student but that is one of the things I am keen to help change, the fact I was successful enough to receive an award as recognition for all that I have undertaken and completed within the STEM environment was, and still is, I consider my greatest achievement, so far.

Having had the best experience with the EESW engineering project, I was given the opportunity to work with Raytheon UK. This allowed me to obtain an even greater insight and to gauge and experience what my future may well be like, while at the same time gaining further knowledge and achieving a gold Crest award.

I, along with others from my high school team, were fortunate enough to be able to experience what it is like to be inside the top-secret MOD shadow fighter jet as well as work on one while engaging with Raytheon. The skills I have gained throughout the Raytheon project, as well as the various other projects I have completed such as those run by Airbus, Sumbusters, The Rotary Club and Engie are invaluable.

This has further enhanced my desire and aspiration to be a design engineer when I am older. After completing my A-levels, I would love to complete a sponsored degree or degree apprenticeship in design engineering business management.

NEVE PARKER RECEIVING HER AWARD FROM ALUN CAIRNS

As I progress through my A-levels I have discovered just what an amazing career choice this will be as there is such a variety of fields I can work within. There is also a vast range of different companies, from working with the MOD and armed forces, to companies that work with nuclear or renewable energy, household appliances and services or even banks or the secret service, all hopefully giving me the opportunity to travel the world and make a valuable contribution and a difference, to show females can aspire to be whatever they want to be.

Since receiving this award, I have been given a platform within sixth form and the wider school, to spend time developing and encouraging all students to have an interest in STEM.

I will forever be grateful for the time and effort that EESW put in to providing me with this opportunity, along with the help and support I received during the sixth-form competition and throughout the whole process and finally achieving runner up in the Dr Tom Parry-Jones EESW Student of the Year 2018 competition.

I am so thankful for the continued support from EESW. I am impressed with how dedicated it is at providing a platform and support to ensure I and fellow students succeed. This award has given me a valuable springboard, enhanced my skills and changed my life for the better, giving me an even more determined approach and driven me further in my ambitions. It is also incredible to see how Wales as a country is driving and developing further its engineering heritage and is providing young people across Wales with opportunities as amazing as my own to progress and succeed.

DENBIGH HIGH SCHOOL HAS BEEN SUCCESSFUL AGAIN THIS YEAR WITH **TEAM QUANTUM** GAINING A PLACE AT THE INTERNATIONAL FINAL IN ABU DHABI IN NOVEMBER. **AMY MARTIN,** CENTRE, HAS BEEN GIVING THE TEAM THE BENEFIT OF HER EXPERIENCE

AMY BACK IN DRIVING SEAT FOR QUANTUM

AMY MARTIN

Team Tachyon was an F1 in School's team from Denbigh High which competed in the 2015 and 2016 F1 in Schools World Finals in Singapore and Texas, and what a busy few years they have had since!

Tachyon came away from the two world finals with four awards and seven further nominations. Furthermore, their team manager, Amy Martin, secured a place at the Unilever Williams Engineering Academy. So, what's next for Team Tachyon?

I have been busy with Williams F1 completing work experience with the model shop as well as completing my third year in the academy.

I recently went to a Pirelli tyre testing day at Silverstone with Williams which was an unforgettable experience. After completing four A-levels in maths, physics, English literature and politics, I received an offer from Imperial College London to study mechanical engineering.

I have also been offered an engineering degree apprenticeship with Airbus after working closely with Airbus throughout the F1 in Schools competition. Recently, I spoke on BBC Radio Wales with Denbigh High School's next F1 in Schools team, Quantum.

Quantum is participating in the 2019 F1 in Schools World Finals in Abu Dhabi and it has been working closely with the girls from Team Tachyon to improve its chances of winning the title of world champion.

Holly Roberts was Tachyon's design engineer. After a thrilling time in the F1 in Schools competition, Holly decided to pursue a STEM career. Holly has taken A-levels in maths, physics, further maths and chemistry and has received an offer to study maths at University College London. She hopes to pursue a career in finance.

Holly has also been active in supporting Team Quantum and has mentored the new team in aspects such as the verbal presentation and the engineering portfolio.

Katie Rowlands was Tachyon's resources manager and was vital to securing the funds which enabled Tachyon to go to the world finals.

After the competition Katie studied history, politics and English literature A-levels along with the Welsh Baccalaureate. She has been offered a place at Cambridge University to read English literature.

Katie has passed on valuable skills to Team Quantum, giving advice on conducting radio and TV interviews. Katie wishes to further her studies and complete a PhD and then hopefully enter the marketing sector.

Manufacturing engineer, Jessica Briody-Hughes, was a pivotal part of Team Tachyon's success.

Jessica worked with many companies to secure solid professional partnerships, which have also since helped Quantum.

Jessica has mentored Quantum in approaching companies and forming connections with large corporations such as Airbus. Jessica has completed A-levels in history, biology, chemistry along with the Welsh Baccalaureate.

She has received an offer to study natural sciences with biology and anthropology at Durham University.

Jess wishes to complete her PhD and then go into research or science communication.

EESW'S HEADSTART CYMRU PROGRAMME AT **BANGOR UNIVERSITY**

Smart students experience university life in Bangor

ALICE MURRAY
North Wales activity deliverer

I met so many new people and have made some great friends through this Headstart course. I have now decided that Bangor is the university for me.

Year 12 students from across Wales took part in EESW's Headstart Cymru programme at Bangor University, which aims to give pupils an experience of university life.

14 pupils attended the three-day course hosted by the product design department at Bangor University, where they were given expert training on using Autodesk Fusion 360 CAD software.

The course, delivered by certified Fusion 360 trainer Steve Cox, included a full day learning to use Fusion 360, with the students creating example designs to practice the skills they had learned.

They then used the following two days to complete the design challenge set by Steve; design a 'smart' product with multiple functions that will improve lives.

Pupils worked in groups to generate concepts, pitch their ideas and refine their product ideas. They then used Fusion 360 and the CAD skills they had learned to design their product to bring it to life in the software.

The pupils concluded the course by delivering a presentation about their final product to the other groups. As well as the academic experiences they gained, the Headstart programme also provided the students with a chance to sample residential university life.

In the evenings, the students took part in activities including sport and a quiz, before staying overnight in Bangor University halls of residence.

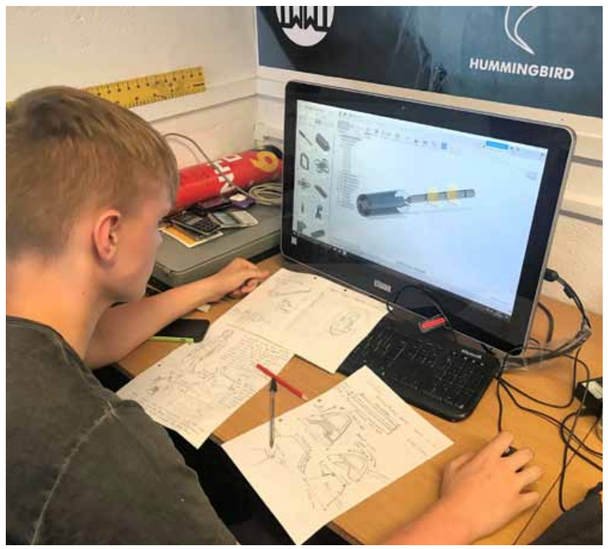
They were also joined by student ambassadors who are currently studying product design at the university, who answered any questions they had, and gave the pupils further insights into higher education.

The pupils have spoken in particular about how much they have gained from the programme, with one participant commenting that it was "an outstanding view into life at university", while another student remarked: "I met so many new people and have made some great friends through this Headstart course. I have now decided that Bangor is the university for me. It has been a wonderful experience."

Equally as impressed was Steve Cox, the course trainer. After delivering the course, he shared his thoughts with EESW: "I'd like to say how much I enjoyed being involved with the three-day Headstart course. The quality of the ideas and modelling that were presented was exceptional.

"This format is fantastic and, coupled with the outstanding outcomes that I saw this year, easily makes this the best education training event that I get to be involved in."

EESW would like to thank Bangor University product design department for hosting the course and Steve Cox for delivering the training.



PUPILS USED **FUSION 360** AND THE **CAD SKILLS** THEY HAD LEARNED TO DESIGN THEIR PRODUCT TO BRING IT TO LIFE

EESW working with Swansea University

TAMSYN PROTHEROE
Digital marketing and communications officer, College of Engineering, Swansea University

Almost a century after it was founded to serve the needs of local industry, Swansea University remains as dedicated as ever to creating outstanding opportunities for students while forging enduring industrial partnerships.

The College of Engineering now boasts a purpose-built base at the university's new £450m beachfront bay campus alongside its partners, with seven buildings supporting outstanding teaching and applied research.

Our relationship with companies – ranging from SMEs to multinational businesses – ensures that our students are consistently developing the skills and expertise they need to drive businesses – and our society – forward.

We continually strive to improve our graduates' prospects; a board of industry experts advises on our curriculum annually, and we offer opportunities for students to network with businesses through employer talks, mentoring schemes and site visits.

Engineering employers provide work placements, which allow students to apply what they have learned to real world situations in industry.

Each of our degree courses offer a year in industry scheme, which gives students a chance to earn a salary while experiencing the world of work.

We currently have students on placements at multinationals such as Rolls Royce, Airbus, TATA, GE, and ARUP, as well as at local SMEs in Wales where they are helping to add value to the local economy.

Andy Dodd, who is currently a functional safety engineer at HORIBA MIRA after graduating with a degree in electronic and electrical engineering with a year in industry here at Swansea University, spent his placement year with Mercedes AMG High Performance Powertrains.

He said:"I chose to integrate a year in industry into my course so that I could develop skills and experience in industry.

I worked with the electronics team, designing and developing trackside equipment and testing circuit boards in the energy recovery and energy storage systems in the Mercedes F1 Power Units.

The year in industry gave me the chance to develop transferable skills such as organisation, communication and report writing, as well as practical electronics.

I also used a range of professional software that I wouldn't have had the chance to use otherwise."

We are proud to say 93% of our engineering students are currently in graduate-level roles or further study within six months of graduating (16/17 Graduate DLHE).

HEADSTART CYMRU PROGRAMME AT **SWANSEA UNIVERSITY**

EESW participated in another very successful Headstart Cymru course in collaboration with Swansea University's Engineering Summer School in July.

The programme has become so popular that even though two four-day courses were held in consecutive weeks; both were so oversubscribed that Swansea University is now considering running three courses next year.

The Headstart programme, facilitated by EESW, is a residential course that allows Year 12 students to experience university life – attending engineering lectures, staying overnight in campus accommodation as well as meeting and socialising with students who have similar interests.

VINCENT KEATING
EESW activity deliverer

Courses help them to make decisions as to whether they wish to attend university and what they want to study.

Swansea University has the very same goal, and so both EESW and Swansea University came together to bring students to the summer school.

This year's course has been a fantastic success, allowing 80 students from across the UK to sample lectures and taster sessions in civil, chemical, aeronautical, materials, medical, electrical and chemical engineering.

Students spent a jam packed four days on the campus, starting their first day with a campus tour and group ice breaker activities to help them get to know one another.

They took on a campus-wide geocaching challenge after dinner before settling down for the evening and preparing for their busy second day.

Students began the next day competing to build bamboo structures that were to support a sandbag weighing several tonnes which was lowered using the ceiling crane of Swansea University's structures lab.

This was followed by an exciting chemical engineering activity where students experimented to create an exothermic reaction to optimise conditions in an incubation chamber.

In the metallurgy lab, using the university microscopes which included an impressive electron microscope, the students had the chance to examine the structures of different materials.

They then witnessed the university's destructive testing equipment which is used to measure the tensile strength of different steels to test the compressive strength of materials under different conditions, such as when flash-frozen with liquid nitrogen.

The STEM ambassadors with the Bloodhound project helped the students wrap up the day building rocket-powered cars to race along the beach in the evening.

On the penultimate day, students were given a talk on medical engineering which was followed by a VR experience.

This session involved building model skeletons as well as a discussion on the exciting applications VR has for training and telepresence in the medical field.

Electrical engineering presented a challenge to the students, building circuits of increasing complexity until they had created a functioning musical instrument.

Mechanical engineering was a particularly hands-on session where the students found themselves examining the density of different materials and competing to create a vessel using a limited supply of these materials to carry the most weight without sinking in a pool of water.

The day concluded with a fun game of rounders and socialising outdoors in the evening.

The course ended with a round-up of the summer school activities and a photo competition where students and ambassadors reflected on the highlights of their experience.

Spirits were high as the students exchanged contact details and prepared to head home, looking forward to the many exciting years ahead as they embark on their journey into the next phase of their education.

STEM AMBASSADORS WITH THE **BLOODHOUND PROJECT** HELPED THE STUDENTS WRAP UP THE DAY BUILDING ROCKET-POWERED CARS TO RACE ALONG THE BEACH IN THE EVENING

The latest Guardian University Guide 2020 saw all our degree subjects ranked in the Top 10 for their graduate prospects.

The director of employability in the College of Engineering, Dr Gavin Bunting, explained: "Our vision for employability is to equip our engineering graduates with the ability to address engineering challenges of the future, leading to fulfilling and distinguished careers.

Professional and capable, they will demonstrate the value of having a Swansea University engineering degree as the backbone to a rewarding career."

F1 IN SCHOOLS WINNERS – WALES

Entry class	School and team
NORTH WALES	
Fastest car	Sbardun Y Mor (Ysgol Glan Y Mor)
Future stars	Idris Burnout (Ysgol Bro Idris)
Best engineered car	Rapidez (Ysgol David Hughes)
Star quality: Portfolio	YMG (Ysgol Maes Garmon)
Star quality: Presentation	Sbardun Y Mor (Ysgol Glan Y Mor)
Star quality: Team identity	Rapidez (Ysgol David Hughes)
Entry class: Regional champions	Sbardun Y Mor (Ysgol Glan Y Mor)
Development and professional classes	
Fastest car development	PHS F1 (Prestatyn High School)
Fastest car professional	Fastest car – XLR8 (Connah's Quay)
Star quality: Pit display	Team Whiplash (Ruthin School
Star quality: Research and development	Ka Chow (Ruthin School)
Star quality: Sponsorship and marketing	Bweldau Boded (Ysgol Gyfun Bodedern)
Judges choice	Ka Chow (Ruthin School)
Development class: Best engineered car	PHS F1 (Prestatyn High School)
Professional class: Best engineered car	XLR8 (Connah's Quay)
Development class: 3rd place	PHS F1 (Prestatyn High School)
Development class: 2nd place	Bwledau Boded (Ysgol Gyfun Bodedern)
Development class: Champions	Team Whiplash (Ruthin School)
Professional class: 3rd place	Red Racing (Connah's Quay)
Professional class: 2nd place	XLR8 – (Connah's Quay)
Professional class: Champions	Quantum (Denbigh High School)
Professional class regional champions	Denbigh High School – Quantum
SOUTH WALES	
Entry class: Best engineered car	Blackout (St John's College)
Entry class: Fastest car	Drifft Y Dreigiau (Ysgol Gyfun Gwent Is Coed)
Entry class: Future stars	Sonic Speed (Ysgol Bro Myrddin)
Star quality: Research and development	No Limits (Whitchurch High School)
Judges choice	Rapid Raptors (Treorchy Comprehensive School)
Star quality: Presentation	Gator Racing (Ysgol Bro Myrddin)
Entry class: Regional champions	Blackout (St John's College)
Development and professional classes	
Development class: Fastest car	Apex Alpha (Ysgol Bro Edern)
Professional class: Fastest car	Atlana Racing (Afon Taf High School)
Star quality: Portfolio award	Nemesis Inferno (Pencoed Comprehensive)
Star quality: Pit display award	Infinity Racing (St John's College)
Star quality: Team identity award	Team Vulcan (Ysgol Bro Myrddin)
Star quality: Sponsorship and marketing	Mach One (Merthyr College)
Development class: Best engineered car	Infinity Racing (St John's College)
Professional class: Best engineered car	Nemesis Inferno (Pencoed Comprehensive)
Development class: 3rd place	Team Vulcan (Ysgol Bro Myrddin)
Development class: 2nd place	Apex Alpha (Ysgol Bro Edern)
Development class: Champions	Infinity Racing (St John's College)
Professional class: 3rd place	The Exception (St John's College)
Professional class: 2nd place	Firefly's (Brynteg School)
Professional class: Champions	Mach One (Merthyr College)

F1 IN SCHOOLS WINNERS

Award	Team name	School	Town
PROFESSIONAL CLASS			
National champions	Britannia Red	Robert May's School	Odiham
2nd place	Evolve	Queen Elizabeth's Grammar School	Faversham
3rd place	Centurion Racing	Rishworth School	Halifax
Scotland champions	Overdrive	Aberdeen Grammar School	Aberdeen
Wales champions	Quantum	Denbigh High School	Denbigh
Best engineered car	Britannia Red	Robert May's School	Odiham
Fastest car	XLR8	Connah's Quay High School	Connah's Quay
Research and development	Protoanic	Calday Grange Grammar School	West Kirby
Sponsorship and marketing	Novo	Royal Grammar School	Newcastle Upon Tyne
Verbal presentation	Sheff1 Racing	Bradfield Secondary School	Bradfield
Pit display	Morson-Blackout	Sprowston Community Academy	Norwich
Portfolio	Imperium	Whitley Bay High School	Whitley Bay
DEVELOPMENT CLASS			
National champions	Infinity Racing	St John's College	Cardiff
2nd place	Avidity Racing	Scarborough UTC	Scarborough
3rd place	Illusion	St Joseph's College	Reading
Best engineered car	Avidity Racing	Scarborough UTC	Scarborough
Fastest car	Speed of Light	Harlow College	Harlow
Research and development	Infinity Racing	St John's College	Cardiff
Sponsorship and marketing	Igneous Racing	Royal Grammar School	Newcastle Upon Tyne
Verbal presentation	Ouragan Platine	The Nelson Thomlinson School	Wigton
Pit display	Tîm Apex Alpha Bro Edern	Ysgol Gyfun Gymraeg Bro Edern	Cardiff
Portfolio	Illusion	St Joseph's College	Reading
Social media	Blue Rockets Racing	The Castle School	Thornbury
FIA Women in Motorsport	Illusion	St Joseph's College	Reading
Team identity	Aspire6	Leasowes High School	Halesowen

...we've seen the UK record beaten by nine teams!

ON YOUR MARKS: **REACTION RACING** AT THE 2019 F1 IN SCHOOLS UK NATIONAL FINAL

Champions at fastest and largest UK finals

Britannia Red, a team of students from Robert May's School, Odiham, Hampshire, has won a place at the F1 in Schools World Finals 2019 after taking victory at the UK finals held at Airbus' West Factory in Broughton, Flintshire.

Evolve, a team of three boys from Queen Elizabeth's Grammar School, Faversham, Kent, took the runners-up spot and also won a place at the world finals, representing England. Centurion Racing from Rishworth School, Halifax were third and are invited to collaborate with an international team at the world finals.

During the competition a local team of six 13 and 14-year-old Welsh students from Connah's Quay High School, Flintshire, had the fastest car on track, smashing the UK record with a time of 1.041 seconds, four-hundredths of a second quicker than the previous record held by a Coventry team.

Britannia Red won Best Engineered Car award as well as taking the National Champions title.

Abi said: "We really didn't expect to win, we didn't think we'd get anywhere, so it was totally unexpected, especially as it was our first year. There's lots of judging sessions and so there's lots of pressure, but we were surprisingly calm.

"It's a mix of fun and hard work. You have to dedicate a lot of time to it, but it's great fun. It opens our eyes to the scope of engineering too, especially coming to a place like Airbus!"

NICOLA DENFORD
Corporate affairs director, Denford

F1 in Schools is a hugely popular competition, engaging and inspiring students about engineering by practical application of STEM skills to create their own Formula 1 team and a scale-model car, from scratch.

The students assess their performance against other schools at a series of regional finals around the country. The best teams at each regional final compete at the UK national finals.

The UK Champions win a trip to the headquarters of an F1 team, a trip to the Formula 1 British Grand Prix at Silverstone with grandstand tickets courtesy of Silverstone Circuit and F1 paddock access from Formula 1 and two £5,000 bursary scholarships – one from UCL Engineering and one from Denford Ltd.

In addition, Britannia Red's School wins F1 in Schools equipment to the value of £5,000 from Denford Ltd, as well as the impressive F1 in Schools UK Champions trophy.

Andrew Denford, founder and chairman, F1 in Schools, said: "I'm blown away – we've seen the UK record beaten by nine teams! It's been a tight race on and off the track. Talented UK Champions have been crowned today at our biggest UK event – more than 250 students – held at one of the largest manufacturing facilities in the world, which builds wings for the largest commercial aircraft in the world.

"Airbus has been a very appropriate venue to house the UK finals of the largest global STEM challenge and we've had outstanding hospitality and support, with a team of Airbus graduates and apprentices capably hosting our students and inspiring them with their experience of working in the engineering industry.

"Today we've seen an unbelievably high level of work from the F1 in Schools students. They develop skills that go far beyond the classroom which have enormous value, not only within their school education but in a broader context with increased confidence and life skills that will be invaluable to them in the future. "

The highest placed Scottish and Welsh teams, Overdrive from Aberdeen Grammar School and Quantum from Denbigh High School have also progressed through to the world finals later this year.

The F1 in Schools UK Finals also featured development class teams, with Infinity Racing, a team of 12-13-year-old boys and girls from St John's College, Cardiff claiming the winners trophy and a place at the world finals 2019.

Avidity Racing from Scarborough UTC was the runner up. Team Illusion from St Joseph's College, Reading, was awarded third place.

BRITANNIA RED, WITH TEAM MEMBERS ABI BESSANT, 14; TILLY WAKE, 13; HARRIET QUARMBY, 13; CAOIMHE THOMAS, 14; CALLUM GREEN, 14 AND TED HODGSON, 15, WON THE **BEST ENGINEERED CAR** AWARD AS WELL AS TAKING THE **NATIONAL CHAMPIONS** TITLE

WHAT IS THE F1 IN SCHOOLS STEM CHALLENGE ALL ABOUT?

Andrew Denford, an entrepreneurial engineer working within the education sector, founded the F1 in Schools STEM Challenge in the UK in 1999.

He implemented a STEM programme that uses the high profile, glamorous and hi-tech world of fast cars and Formula 1 to engage and inspire students, introducing them to engineering in a compelling and unique educational competition.

Today, this world-leading global educational initiative operates in 45 countries worldwide.

Researching, designing, making and racing an F1 car of the future is at its core. Teams then race each other head-to-head on the F1 in Schools 20-metre racetrack. The challenge can be used as an education tool or hook to engage students in STEM subjects.

This gives students the opportunity to develop key skills such as communication, presenting and teamwork, while forming the foundation for any career path they choose to follow.

The students assess their performance against other schools at a series of regional finals around the country.

The best teams at each regional final compete at the UK national finals. The students win a trip to the headquarters of an F1 team, a trip to the Formula 1 British Grand Prix at Silverstone with grandstand tickets courtesy of Silverstone Circuit and F1 paddock access from Formula 1, as well as the impressive F1 in Schools UK Champions trophy.

This Formula 1 supported global STEM programme is also a proven route to motorsport and automotive careers with former participants working in Formula 1 teams, engine manufacturers, sports agencies and many more allied companies.

Yet another excellent year for F1 in Schools

HANNAH WILSON
EESW F1 activity deliverer

F1 in Schools competition has been a fantastic success for 2018- 2019 in Wales. From new teams beginning their journey to competitors who have enjoyed the experience for many years, F1 in Schools brought a smile to many faces.

Within a team, members are assigned roles they will excel in and master a variety of skills including CAD (computer- aided design), aerodynamics, management and many more.

For new teams, the work starts at the beginning of the academic year where planning, training, designing and testing takes places to ensure they are ready for the project.

EESW supported many schools including Cwmtawe Community School and Afon Taf High School with CAD training on Autodesk Inventor and Fusion 360, where pupils designed their F1 cars to be aerodynamic as possible.

Schools were offered testing sessions with the floor track and wind tunnel to get a feel of whether they were happy with their manufactured cars or if changes needed to be made.

St John's College, Cardiff and Ysgol Gyfun Ystalyfela, Neath Port Talbot ran in-school competitions, both extremely enjoyable and successful. The winners of the in-school competitions had a place in the South Wales regional finals.

At the thrilling regional finals in South and North Wales, teams competed in an array of challenges which varied from racing their cars for the chance to win fastest car, to presenting their project to a panel of judges.

The high standard of preparation and hard work was prominent at both finals. All teams wanted to win an award and a chance to take part in the national finals held in Airbus in Broughton.

Bright minded individuals flooded Venue Cymru, Llandudno, to prepare their pitstops and their day ahead. The infamous racing track grabbed the attention of many as crowds gathered. The day was a constant head to head battle with judges in awe with the remarkable effort from all teams.

Cardiff City Stadium was an impeccable location for the South Wales regional finals. An incredible 31 teams competed. As with North Wales, the teams were full of enthusiasm and inspired one another by having unique approaches to meet the strict rules and regulations.

EESW was pleased to announce three professional class teams and a development class team were invited to compete in the national finals from both regional finals. One of the lucky entry class teams had a VIP invite to visit Air Bus to experience teams competing from across the UK.

Every individual who took part in F1 in Schools at North and South Wales deserves congratulations for increasing the standard of the regionals and continually pushing their limits.

We are extremely proud to announce we have two Welsh teams competing in the world finals in Abu Dhabi – Quantum from Denbigh High School and Infinity from St John's College.

Our F1 in Schools delivery is developing new and exciting activities where pupils gain an insight of F1 in Schools before preparing for the project.

EESW AWARD WINNERS 2018-19 – SOUTH WALES

AIRBUS	**Most innovative or adapted design** Y cynllun arloesol neu addasedig gorau	41 St Joseph's School and Sixth-form Centre 2 44 Rougemont School 61 Ysgol Maes y Gwendraeth	44 **Rougemont School working with Safran Seats**
GENERAL DYNAMICS United Kingdom Limited	**Best overall team performance** Y perfformiad tîm cyffredinol gorau	28 Queen Elizabeth High School 49 Cardinal Newman School 57 Gower College Swansea, Gorseinon 1 60 Gowerton School	57 **Gower College Swansea, Gorseinon 1 working with TATA Steel**
IChemE ADVANCING CHEMICAL ENGINEERING WORLDWIDE	**Best chemical/process engineering design** Y cynllun peirianneg gemegol/broses gorau	21 St Teilo's Church in Wales School 28 Queen Elizabeth High School	21 **St Teilo's Church in Wales School working with Eastman Chemical Company**
IET The Institution of Engineering and Technology	**Best application of engineering and technology** Y defnydd gorau o beirianneg a thechnoleg	2 Brynteg School 4 Cynffig Comprehensive School 41 St Joseph's School and Sixth-form Centre 2 57 Gower College Swansea, Gorseinon 1	4 **Cynffig Comprehensive School working with Zimmer Biomet**
Institution of MECHANICAL ENGINEERS	**Best appreciation of safety issues** Y gwerthfawrogiad gorau o faterion diogelwch	50 Pontypridd High School 65 Croesyceiliog School 3	50 **Pontypridd High School working with Rhondda Cynon Taf County Borough Council**
INDUSTRY WALES Growing Welsh Technology and Manufacturing Business Globally	**Most effective presentation of the chosen solution** Y cyflwyniad mwyaf effeithiol o'r ateb	2 Brynteg School 37 King Henry VIII Church in Wales High School 55 Bishop Gore School 57 Gower College Swansea, Gorseinon 1	2 **Brynteg School working with SAS International**
NEWPORT WAFER FAB	**Best engineering design/exhibit** Y cynllun peirianneg gorau	8 Lewis Girls' School 30 Ysgol Dyffryn Taf 61 Ysgol Maes y Gwendraeth 65 Croesyceiliog School 3	61 **Ysgol Maes y Gwendraeth working with National Botanic Garden of Wales**
Power & Water	**The Professor Philip Morgan Award** **Best application of science** Y defnydd gorau o wyddoniaeth	7 Heolddu Comprehensive School 21 St Teilo's Church in Wales School 41 St Joseph's School and Sixth-form Centre 2	41 **St Joseph's School and Sixth-form Centre 2 working with Weartech**
SAFRAN	**Most innovative application of an existing technology** Y defnydd mwyaf arloesol o dechnoleg gyfredol	2 Brynteg School 28 Queen Elizabeth High School 34 Caldicot High School 1 57 Gower College Swansea, Gorseinon 1	34 **Caldicot High School 1, Waferfabulous working with Newport Wafer Fab**
Swansea University Prifysgol Abertawe	**Best energy appreciation** Y gwerthfawrogiad gorau o ynni	12 Fitzalan High School 1 49 Cardinal Newman School 57 Gower College Swansea, Gorseinon 1 62 Ysgol Gyfun Gwyr	49 **Cardinal Newman School working with Capita**
	Best working model or prototype Y model gweithio neu'r prototeip gorau	4 Cynffig Comprehensive School 21 St Teilo's Church in Wales School 55 Bishop Gore School 60 Gowerton School	55 **Bishop Gore School working with University of Wales Trinity Saint David, School of Engineering**
TATA STEEL	**Best use of mechanical engineering principles** Y defnydd gorau o egwyddorion peirianneg fecanyddol	7 Heolddu Comprehensive School 40 St Joseph's School and Sixth-form Centre 1 45 St Joseph's Roman Catholic High School	40 **St Joseph's School and Sixth-form Centre 1 working with TATA Steel**
Llywodraeth Cymru Welsh Government	**Most innovative solution to the project set** Yr ateb mwyaf arloesol i'r prosiect	11 Cardiff and Vale College 2 25 Whitchurch High School 4 26 Ysgol Gyfun Gymraeg Plasmawr 1 64 Croesyceiliog School 2	11 **Cardiff and Vale College 2 working with Arup**
wjec cbac	**Best overall written report** Yr adroddiad ysgrifenedig gorau	4 Cynffig Comprehensive School 16 Llanishen High School 1 37 King Henry VIII Church in Wales High School 41 St Joseph's School and Sixth-form Centre 2 57 Gower College Swansea, Gorseinon 1	16 **Llanishen High School 1 working with GE Aviation**
The Big Bang Fair South Wales/De Cymru	**Big Bang South Wales Regional winners 2018-19** Enillwyr Rhanbarthol Big Bang De Cymru 2018-19	2 Brynteg School 4 Cynffig Comprehensive School 21 St Teilo's Church in Wales School 41 St Joseph's School and Sixth-form Centre 2 57 Gower College Swansea, Gorseinon 1	

Team working key for Coleg Cambria

NICHOLAS HARDING
Coleg Cambria Bersham Road

Coleg Cambria Bersham Road is a trade-specific college in Wrexham, North Wales. At the beginning of the year we were approached by the college to be a part of the EESW team.

The team consisted of five members: Nick Harding, Adele Hughes, Ffion Parry, Tyler Armstrong and Matthew Edwards.

We chose this team as we all work well with each other and all brought different skills to the team.

After team selection we attended the Toyota Engine Plant in Deeside on October 9, 2018 where we met our link engineer, Laurence Baron from Raytheon UK and were also provided with our brief.

The brief was to design and produce a tablet holder that is to be mounted on the visor or visor surround rail. It must be: stowable, light and follow aerospace guidelines such as FOD (foreign object debris) and anti-glare, to keep the pilots and passengers safe.

CAD was used to create images of our product, which was then taken to the workshop and produced. We made six prototypes until we had our final product which was revealed at the Big Bang fair in Venue Cymru.

After six months of work we had our final product and finished report. We submitted these to Laurence and were given the go ahead to finish the project

Overall, we found the project was very helpful in giving us experience in working as a team and working to deadlines.

We all agree that this is a brilliant experience and wish all of the future teams good luck in their competition.

FIVE-STRONG TEAM FROM **COLEG CAMBRIA** BERSHAM ROAD

EESW AWARD WINNERS 2018-19 – NORTH WALES

AIRBUS	**Best application of engineering and technology** Y defnydd gorau o beirianneg a thechnoleg	11 Alun School 1 13 Coleg Cambria, Bersham Road	11 **Alun School 1 working with JCB**
PŴER NIWCLEAR HORIZON NUCLEAR POWER	**Best energy appreciation** Y gwerthfawrogiad gorau o ynni	17 Ysgol David Hughes 1	17 **Ysgol David Hughes 1 working with Dŵr Cymru Welsh Water**
IET The Institution of Engineering and Technology	**Most innovative solution to the project set** Yr ateb mwyaf arloesol i'r prosiect	10 Ysgol Glan Clwyd 12 Alun School 2	10 **Ysgol Glan Clwyd working with Innogy Renewables UK**
Institution of MECHANICAL ENGINEERS	**The Ian Binning Award for the best use of mechanical engineering principles** Y defnydd gorau o egwyddorion peirianneg fecanyddol	1 Ysgol Bryn Elian 1 10 Ysgol Glan Clwyd 11 Alun School 1 12 Alun School 2 13 Coleg Cambria, Bersham Road 20 Ysgol Uwchradd Bodedern	20 **Ysgol Uwchradd Bodedern working with Holyhead Marine**
RTBTech	**Best application of IT** Y defnydd gorau o TG	1 Ysgol Bryn Elian 1 6 Ysgol Eirias	6 **Ysgol Eirias working with Bangor University**
TATA STEEL	**Best engineering design** Y cynllun peirianneg gorau	4 Ysgol Dyffryn Conwy 1 12 Alun School 2	12 **Alun School 2 working with UPM, Shotton**
Llywodraeth Cymru Welsh Government	**Best application of science** Y defnydd gorau o wyddoniaeth	9 Prestatyn High School 21 Ysgol Uwchradd Caergybi	9 **Prestatyn High School working with WSP**
Llywodraeth Cymru Welsh Government	**Project with the most commercial potential** Y prosiect â'r potensial masnachol mwyaf	6 Ysgol Eirias 9 Prestatyn High School 17 Ysgol David Hughes 1 21 Ysgol Uwchradd Caergybi	21 **Ysgol Uwchradd Caergybi working with Babcock and BAE Systems**
wjec cbac	**Best overall written report** Yr adroddiad ysgrifenedig cyffredinol gorau	1 Ysgol Bryn Elian 1 2 Ysgol Bryn Elian 2 9 Prestatyn High School 11 Alun School 1 19 Ysgol Gyfun Llangefni 20 Ysgol Uwchradd Bodedern 22 Ysgol Morgan Llwyd	1 **Ysgol Bryn Elian 1 working with KnitMesh Technologies**
The Big Bang Fair North Wales/Gogledd Cymru	**Big Bang North Wales Regional winners 2018-19** Enillwyr Rhanbarthol Big Bang Gogledd Cymru 2018-19	9 Prestatyn High School 21 Ysgol Uwchradd Caergybi	

Jaguar Primary School Challenge

HANNAH WILSON and ALICE MURRAY
EESW activity deliverers

At EESW, we want to engage young minds in STEM activities in a fun and exciting way. Jaguar Primary School Challenge is a project to inspire pupils aged six to 11 years old to look at STEM subjects in an enjoyable way.

The project involves teams of pupils who have assigned roles and responsibilities, to design and manufacture their own fast cars. These young minds delve into a world of engineering processes just like engineers at Jaguar Land Rover.

Many schools, including Ysgol Mynydd Bychan, have embedded the challenge into their curriculum. Pupils plan, design and create a Jaguar F1 car using 160m2 card while getting creative using CAD software to design an aerodynamic body for their car.

Teams see their work come to life when using plotter cutters, which shape the car bodies. The fun doesn't stop there. During the competition, competitors will race their cars on a 20m track using CO2 gas canisters for propulsion.

Throughout the academic year, the pupils will continually develop their portfolio of work and refine their verbal presentations.

This project captivates teachers across Wales because of the opportunities to develop a range of skills which encourages learning in an exciting context.

SOUTH WALES REGIONAL FINALS

Standards were raised once again this year with teams pushing themselves. Both new and old teams tried new and inspiring ways to impress the judges in all categories.

The South Wales regional finals were held at National Waterfront Museum where all teams were dressed like professional racing teams and displayed their pit stops skilfully.

With a fast race time of 1.435 seconds, Drifting Dragons from Llangewydd Junior School beat the other teams. Two new teams from Blackwood Primary School were future stars in the competition. Fflamell stood out to the verbal presentation judges and Y Ddraig impressed the engineering judges.

Best pit display was very close, but Plastic Tide, Garnteg Primary took the lead.

Stealing the award for best portfolio was Red Fury, Crickhowell Primary.

Another team from Crickhowell Primary, The Chasers was presented with the additional challenge award after getting closest to the target.

CARS WAITING FOR SCRUTINEERING

The competition provided an engaging insight into the world of engineering.

Three teams were extremely lucky to be invited to the national finals held in the British Motor Museum; in third place – Cadoxton Big Cat, Cadoxton Primary School. Second place – Seren Wib, Ysgol Mynydd Bychan. Meteor, from Llanbedr Church in Wales Primary School, was the winning team.

NORTH WALES REGIONAL FINALS

The North Wales regional final of the Jaguar Primary School Challenge took place in May at Venue Cymru, Llandudno.

Twenty-eight teams from 13 primary schools attended the exciting day which saw them race the cars that they designed and manufactured down the 25m F1 in Schools track.

As part of the competition, teams of up to six pupils used 2D CAD software to design and manufacture a unique and aerodynamic car, using a chassis template as a base.

PUPILS AT THE **START GATE**

They also produced a verbal presentation, a 10-page engineering portfolio and an eye-catching pit display.

The main focus of the competition, the car, is raced using a compressed gas canister which is pierced by the race triggers.

Pupils' reaction times as well as their cars' speed are counted for the adrenaline-fueled races. The cars can reach up to 60mph.

As well as the thrill of racing their cars, the young engineers had the opportunity to speak to the judges about their design process, including how they tested the best shape for the car, and experimented with different types of wheels.

They were also able to demonstrate their business acumen by including their marketing and sponsorship activities, with some teams having raised hundreds of pounds for their materials via social media, persuasive letters to local businesses and even presentation evenings at school.

The competition provided an engaging insight into the world of engineering for the pupils, as well as developing lots of useful STEM skills.

Teams won awards for fastest car, best engineered car, pit and portfolio, and for being future stars.

Three teams from Ysgol Betws-Y-Coed, Ysgol Esgob Morgan and Fantastic Flames from Ysgol Bro Gwydir, who were crowned regional champions, progressed through to the national final in the British Motor Museum, Gaydon.

FANTASTIC FLAMES TEAM STAND

Rhian Richardson, teacher and team coach for 13 Lwcus of Ysgol Betws-Y-Coed, said: "The pupils had a wonderful experience taking part in the competition.

"This is our first time taking part; we never thought we'd get through to the national final! The team has been really excited."

Flying into orbit with FIRST LEGO League

ELLA MORGAN
EESW activity deliverer

Another season of the FIRST LEGO League (FLL) has come to a close and this year was the most successful yet!

FLL is a global science, technology, engineering and mathematics competition with a new exciting theme each year. This year more than 40,000 teams from 98 countries competed world-wide with EESW supporting Welsh teams as well as hosting regional competitions in North and South Wales.

The competition is divided into four different areas:

- **Project** – teams prepare a presentation on their chosen problem and solution.
- **Robot design** – teams are assessed on the design of their robot, but also their knowledge of the programming of the robot.
- **Core values** – a teamwork challenge set on the day, based on the FLL core values of discovery, innovation, impact, inclusion, teamwork and most importantly, fun!
- **Robot game** – where teams put their STEM skills in to action. Pupils design, build and programme their EV3 robot to complete missions and earn as many points as possible.

This year's theme, Into Orbit, challenged teams to identify problems faced by humans during long duration space exploration and come up with innovative solutions. Ideas ranged from growing food using hydroponic technology to creating new ways to transport astronauts in to space – one team even communicated with real astronauts from NASA!

A record 23 teams competed across two days at the South Wales regional with Ysgol Bro Edern and Ysgol Maes Y Gwendraeth's Tesla claiming top spots and earning a place at the 2019 UK national finals in Bristol.

Ysgol Morgan Llwyd came out on top, competing against 13 other teams in North Wales, alongside wildcards Team Egni from Ysgol Glan Clwyd which also earned the chance to compete at the national finals.

After being crowned Wales Champions in Bristol, Team Egni also earned a spot at the FLL World Finals in Detroit where it picked up yet another award for its efforts – the judges award for thinking big.

PRIMARY SCHOOL PUPILS AT THE **FFGL JUNIOR EXPO**

LLANYRAFON PRIMARY SCHOOL 1

Team coach Sion Jones said: "I am thrilled the team has been awarded such a prestigious accolade and I am sure it will have inspired others across Wales.

"Our journey would not have been possible without those companies and individuals who donated their time and funding to the trip. A special thank you to EESW, the IET and Technocamps."

Next year's challenge – City Shaper – promises to be the biggest yet! Registration is open – contact us on info@stemcymru.org.uk to register your interest.

More than 40,000 teams from 98 countries competed world-wide.

July saw EESW host this year's FLL Junior Expo at its centre in Bridgend.

Mission Moon challenged pupils aged six to 10 to investigate living on the moon and create imaginative posters and LEGO models to show off their research.

Each model had to include a moving part using a LEGO WeDo robot – the models were all excellent displays of programming – proving it's never too soon to learn coding!

Every team that attended produced fantastic displays that impressed our reviewers from Welsh Water and CapGemini who had kindly donated their time to support the event. We look forward to next year's "Boomtown Build" event.

LLANYRAFON PRIMARY SCHOOL 1

HOW OUR FUTURE SHAPES UP WITH AI

GASH BHULLAR
Managing director, Control 2K Ltd

There are many applications and areas where artificial intelligence (AI) is established and, from an engineering perspective, the applications of AI on the shop floor are just now emerging. What is AI? Well the easiest way to define it is to think of it as a tool that is used for humans to take away the pain of spending hours, number crunching and looking for patterns and trends in various systems.

As an emerging technology, AI will drive our economy and create future wealth as we become creators and users of the technology. It will expand the minds of the people who can create and control the deployment of AI systems.

Conversely, those who use AI systems, will become more reliant on the results produced by these systems and therefore won't use their minds as much as they did before. This might sound controversial, but it's the same argument when calculators came out in the 1970s and many were happy that they didn't need to do long and complicated calculations. Many will assume calculators always lived in mobile phones and others will think, "what's a calculator? You just ask Google for the answers!" which sort of makes my point.

The biggest challenge for any engineer is to make things simple. It is extremely hard to make complex things simple, but the art is to take away all the complicated things and put them all in a "box". This way people simply see the results of what the box is doing for them, rather than worrying about what is hidden away from them. When you see a robot moving, it's carrying out a series of steps that it's been programmed to do repeatedly. It doesn't change its path unless a sensor tells it to. The robot has no power to make human decisions and simply carries on going even when things go wrong. If the robot could spot a problem, it should be able to make similar or better decisions than a human doing the same job. This is the ultimate goal of AI.

From the outside, things with or without AI look the same. Imagine if somehow your brain was reconstructed to do 20 or 30 more tasks than it can now at once, people would still see the same person, but notice a change in your behaviour. It's a simple concept, but the true solutions are still far from reality, even if people tell you otherwise.

As an innovation company, Control 2K will be looking to push the boundaries of AI in control systems and will be organising an AI on the shopfloor event on October 17, 2019 and more information can be found on www.smecluster.com under events. The event is aimed at engineers in the automation domain and will show them how the future will shape up with AI.

APPLICATIONS OF **AI** ON THE SHOP FLOOR ARE NOW EMERGING

THE JOURNAL OF THE ENGINEERING EDUCATION SCHEME WALES

Mentoring 240 physics GCSE pupils

ROSIE MELLORS
Physics mentoring project, Cardiff University

Students from five Welsh universities are mentoring hundreds of pupils studying GCSE physics across Wales. The aim of the project is to increase physics take up at A-level, particularly among girls.

The work is led by Cardiff University alongside Aberystwyth University, Bangor University, Swansea University and the University of South Wales.

Students are being trained to support almost 240 Year 10 and 11 pupils. Funded by the Higher Education Funding Council for Wales (HEFCW) and backed by Welsh Government, the mentoring is taking place during spring and autumn 2019 and features up to 12 schools.

The mentoring of girls will be a priority because they account for just 21.5% of physics A-level entries in Wales, and less than two out of 10 full-time physics students in Welsh universities. The mentors are studying a broad range of subjects such as physics, astrophysics, computer games development and mechanical, aeronautical and electronic engineering.

The project will build upon the success of a Welsh Government-funded scheme in which pupils from across Wales are mentored in modern foreign languages using students from Welsh universities.

Project lead Dr Chris North, from Cardiff University's School of Physics and Astronomy, said: "Our aim is to increase the number of young people, particularly girls, choosing STEM subjects and physics post-16. We hope to boost their confidence and show that a physics qualification opens many doors.

"It's so important for our country to encourage young people in this field as they will become the scientists who can help solve some of the great challenges facing our society in areas such as health, engineering and the environment.

"This is a great example of how the work of Welsh universities can directly benefit their communities as part of their civic mission."

Importance and impact of mentoring

Mentor Isabelle Boreham, who is studying mechanical engineering at Cardiff University, said: "Studying a STEM subject such as physics at A-level lays the foundation for a young person to play an important and key role in future society, whether it be through studying engineering, pure physics or any other STEM-related degree or apprenticeship."

Teacher Lowri Evans, of Ysgol Bro Hyddgen in Machynlleth, Powys, said: "The school is very proud to be able to take part in this exciting project, because the pupils will gain essential skills that will be important for them in the future."

Minister for Education, Kirsty Williams, said: "Deepening and strengthening the links between Wales's universities, their students and our schools is essential to the national mission to raise standards.

Expanding undergraduate mentoring schemes in science, as well as languages and technology, is a key commitment in my progressive agreement with the First Minister.

"Such schemes are essential to enhancing universities' civic engagement.

"That's why we as a Government, through HEFCW, have invested in this exciting opportunity for students to share their knowledge, skills, and love of science and technology.

"Our universities have a special responsibility as stewards of their community. Getting more involved with schools, and making subjects such as physics as stimulating and engaging as possible, will help inspire and ignite passions that lead to new futures, new opportunities and new horizons for all our young people.

"I look forward to continue working with the physics mentoring programme to break down any preconceived barriers and assumptions about STEM subjects, so that all our pupils can appreciate the opportunities and rewards that STEM study and careers can offer."

Dr Alyson Thomas, director of policy and funding at HEFCW, said: "We can't underestimate the positive impact of universities on future generations of scientists through schemes such as this one, and the experience that undergraduates will get from it.

"We hope that pupils of all ages will be enthused by taking part in the bilingual scheme, and we are particularly excited about the influence the student role models will have on girls interested in STEM subjects.

"This programme was a great fit for our civic mission fund, which encourages community engagement with schools."

Amanda Wilkinson, director of universities Wales, said: "As a sector, we welcome the delivery of the physics mentoring project.

"This innovative project builds upon the successful mentoring work universities have done in modern language and demonstrates the important and valuable contribution that universities make to schools and communities in Wales as part of their civic mission."

Science and technology in the new curriculum

KIRSTY WILLIAMS
Minister for Education

PRIMARY SCHOOL PUPILS WORKING WITH COMPUTER CONTROL

The curriculum has been made in Wales, but shaped by the best ideas from around the world.

Developments in science and technology have always been drivers of social change, underpinning innovation and impacting on everyone's lives – materially, economically and culturally.

Public attitude surveys show more than 80% of people in the UK consider science important for addressing key challenges affecting society, 90% consider science to be important for improving human health and over 90% consider young people's interest in science essential for future prosperity.

In other words, the importance of scientific and technological literacy in our modern world cannot be understated.

Our national mission for education in Wales is to raise standards, reduce the attainment gap and ensure we have an education system that is a source of national pride and public confidence.

The biggest change we're currently undertaking is our new curriculum for schools in Wales from September 2022. The curriculum has been made in Wales, but shaped by the best ideas from around the world.

The existing national curriculum was first introduced in 1988 – before online shopping, Google and the Cloud.

Now, work is different, technology is different, society is changing. The new curriculum must prepare young people to thrive in a future where digital skills, adaptability and creativity, alongside knowledge, are crucial.

The new curriculum will be broad, balanced, inclusive and challenging with four 'purposes' which provide the starting point for all decisions made in the curriculum. We want to see all our young people develop as ambitious, capable learners; enterprising, creative contributors; healthy, confident individuals; and ethical, informed citizens.

The curriculum will be organised as a continuum of learning from ages three to 16, allowing all young people to make progress throughout their journey. The curriculum will not be overly prescriptive. It has been developed to allow schools to provide a balance of knowledge, skills and experiences, with subjects and disciplines which sit side-by-side, with meaningful links between them.

The new curriculum will change the way science and technology are taught in our schools. Science and technology will be one of six Areas of Learning and Experience (AoLE) within the new curriculum.

Bringing science and technology together as a single area is intended to facilitate a collaborative approach resulting in better engaged learners and enhanced learning experiences. As such, the AoLE will be consistently relevant in the opportunities young people encounter and the life choices they make.

Schools across Wales have been at the centre of designing and implementing the new curriculum. I've been really impressed by the innovative work already taking place in schools across Wales to prepare for and help develop the new curriculum, which will give teachers greater autonomy of what they teach and how they teach it, meeting the needs of their classes and inspiring their own unique student cohorts.

We've been consulting on the curriculum this year and will publish the final version early in the new year.

It is essential we engage all learners in science and technology from an early age and help change perceptions of who are most likely to succeed in this area.

I'm committed to improving gender balance in these subjects and our STEM in Education and Training Delivery Plan has a strong focus on gender, setting out a number of specific gender-related actions.

Our children and young people learn about science through design, discovery and innovation, which in turn generate curiosity and creativity that can enable deep learning.

And what could be more exciting than learning about ourselves and the world, and indeed the universe, in which we live?

EESW IS ONE STEP AHEAD

STEPHEN LANE
EESW senior activity manager

With all eyes firmly fixed on the new curriculum in Wales and how it will be rolled out, EESW has committed itself to ensuring that it stays one step ahead. EESW will focus on the structure and content of the new curriculum and adapt as an organisation to continue offering STEM support and enrichment sessions to Key Stages 2, 3 and 4 across Wales.

Introduction to Engineering (i2E) sessions offered this year have included energy quest, micro:bit coding and wind turbines and have been a huge success across both North and South Wales.

Next year, EESW will focus on how these sessions can be delivered to support the three cross-curricular responsibilities of literacy, numeracy and digital competence. Both the energy quest and wind turbines sessions will continue to look at renewable energy, while micro:bit coding will take a fresh approach of discovering coding with the opportunity to consider a choice of current topics, including plastics in our seas or space junk.

There will also be the opportunity for schools to use the activities to further develop their own extended cross-curricular projects.

As the F1 in Schools delivery partner for Wales, EESW will continue to promote and support both new and existing schools entering the competition. This project gives schools the possibility of exploring areas of learning of the new curriculum while engaging pupils in a fun and practical activity; one teacher described the project as the "ultimate cross-curricular opportunity".

EESW will offer two new STEM sessions covering flight and earthquakes. Pupils will develop their skills in three areas of learning including mathematics and numeracy, science and technology and literacy and communication.

As part of our commitment to working alongside the new curriculum, these activities will also give teachers the opportunity to continue these topics as part of their own cross-curricular projects with support from EESW.

Flight sessions will involve a simple paper-plane-making exercise to enthuse pupils before introducing numeracy, science and technology aspects, which are built upon to support basic theory of flight principles. Pupils will work in teams to assemble motor-powered planes to perform basic tasks and fly their planes indoors around a pole as part of an in-class competition. Teams will produce a simple booklet to demonstrate what they have learned, which they will present during a feedback exercise.

Earthquake workshops will engage pupils in understanding how buildings are designed to deal with earthquakes, before pupils design and build scale models which will be tested on a shaker rig.

Both sessions will be offered initially as single days, with the opportunity to be flexible.

Last year, EESW engaged more than 2,500 pupils in i2E activities.

KIRSTY CAMPBELL'S DESIGN WAS UNVEILED BY TOYOTA GAZOO RACING WRC STAR **JARI-MATTI LATVALA**, A DOUBLE-WINNER OF WALES RALLY GB

Kirsty's car design revealed

JONATHAN GILL
National press officer, Wales Rally GB

This autumn's high octane Wales Rally GB (October 3-6) will again be the focal point for a number of far-reaching initiatives aimed at inspiring future generations of ambitious young talent in the region.

The presence of the high-tech and exciting FIA World Rally Championship will once again be exploited via the presence of a Big Bang Industry Awareness STEM exhibition.

After several years in Deeside, close to Chester, the event's dynamic Service Park where all the competing teams are based, is moving to Llandudno. As a result, this year's Big Bang will be hosted in the seaside town's Venue Cymru arena.

More than 1,500 students studying key STEM subjects at local educational establishments will visit the Big Bang fair which will be home to a raft of engaging, interactive activities provided by a number of proactive exhibitors.

What's more, the showcase will be open to all those visiting the Service Park – one of a number of free-to-view opportunities available to the public.

The Big Bang showcase will also host the prize-giving for the latest running of the Design a Rally Car Livery competition – an exciting programme open to all young students in Wales and beyond, with the winning entry being applied to a Toyota GT86 rally car.

Once liveried, the GT86 will be displayed within the Big Bang showcase and at other popular venues throughout the four-day rally.

Jointly coordinated by the rally organiser's and the EESW on behalf of the Welsh Government, the inspirational contest was open to all primary schools, secondary schools and colleges throughout the UK with individual entry categories for Key Stages 2, 3, 4 and 5.

Winners of all four categories are being invited to the Service Park where they will be presented with their awards and enjoy a special behind-the-scenes insight into one of the world's most dramatic and technologically advanced sports.

KIRSTY CAMPBELL WITH LORD ELIS-THOMAS

Now in its third year, the competition was first organised in 2017 when it was won by 12-year-old Rheinallt Jones from the Ysgol Gyfun Llangefni comprehensive school in Anglesey.

Last year's winner was 15-year-old Kirsty Campbell, a GCSE student at Dorin Park School, a specialist SEN school in Chester.

Both had their victorious designs unveiled by Toyota GAZOO Racing WRC star Jari-Matti Latvala, a double-winner of Wales Rally GB.

Lord Elis-Thomas, the Welsh Government Minister for Culture, Tourism and Sport, was also in attendance to present Kirsty with a scale-model replica of the Toyota GT86 featuring her livery.

"The Big Bang is a fantastic interactive experience which will help to inspire the engineers and scientists of the future," he said. "Wales is home to around 150 component and systems manufacturing companies, which employ some 18,500 people within automotive manufacturing with an annual turnover of £3bn.

"This is an excellent opportunity to get young people interested in the subjects they need to become a part of this dynamic sector in the future."

"The livery competition has been a huge success, producing many excellent entries and two very worthy winners – that's why we are so delighted to be continuing the scheme with Toyota's support in 2019," added Hugh Chambers, chief executive of Motorsport UK, organiser of Wales Rally GB.

"It is one of the many ways in which we maximise the presence of a major world championship event in North Wales to the considerable economic, social and educational benefit of all those in the region."

KIRSTY WILLIAMS MINISTER FOR EDUCATION TALKS TO GIRLS FROM **LEWIS GIRLS' SCHOOL**

SCIENCE AND THE ASSEMBLY

STEVE POLE
Teacher, Lewis Girls' School

Designed to foster close relations with the National Assembly and the Welsh Government, Science and the Assembly is organised by the Royal Society of Chemistry, on behalf of, and in cooperation with, the Welsh science and engineering community. Science and the Assembly, now in its 16th year, comprises speaker presentations in the Pierhead, an exhibition and early evening buffet reception in the Senedd.

Science and the Assembly once again brought together scientists, politicians and science and technology educators from schools' colleges and HEIs, to share experiences, good practice and recommendations for teaching and curriculum development.

EESW was invited again this year to be at the event. A team of sixth-form girls from Lewis Girls' school represented us there. They had worked on an engineering problem with the University of South Wales which was to find a solution to house and display their BA Jetstream 41 aircraft.

The girls attracted a lot of attention to describe their experience and what they had gained through engaging with the project. They were excellent ambassadors for their school and EESW.

Coleg Meirion Dwyfor students mentor F1 in Schools competitors

DEWI WYN EVANS
Coleg Meirion Dwyfor

Recently, Ms Kirsty Williams, Minister for Education, witnessed at first hand the work and dedication the students at Coleg Meirion Dwyfor had given to deliver and mentor schoolchildren in designing and producing cars for the F1 in Schools competition.

The engineering students taught design, CAD, aerodynamics to Year 10 pupils before 3D printing the cars.

Student Tomos Williams said that Ms Williams was impressed with the work that we had done and that we had taught schoolchildren.

Mr Graham Nutt, EESW manager, North Wales said: "EESW is keen to work with Coleg Meirion Dwyfor in order to enhance the support provided to students from local schools which are participating in the F1 challenge.

"EESW is therefore placing a benefit from it.

Previous experience had shown how students benefited from completing the EESW sixth-form industry project.

Partnering with a company to solve a real life problem gave access to industry experts, opportunity to experience first-hand how companies work and put them in a favourable position when looking for work or an apprenticeship.

This was used to complete the individual project challenge and the connection with industry, which has resulted in job interviews.

This activity also satisfies the requirements to achieve the Enterprise and Employability Challenge in the Welsh Baccalaureate.

Engineering students from Coleg Meirion Dwyfor at Dolgellau have, over the past two years, been using their learning in engineering to help them complete the WJEC Advanced Welsh Baccalaureate (WBQ).

This has enabled them to understand and appreciate how skills are transferable and can be utilised to achieve success in other sectors.

They also gain a good understanding of digital manufacturing.

To encourage engagement with the WBQ, the engineering department staff strategically mapped out how the qualification would be delivered and how the students could gain the most

Denford CNC/CAM machine at the Dolgellau site.

"This will enable mentored students to see their cars being machined before they are made ready for competition.

"The Dolgellau machining centre will be the third in North Wales supporting this exciting STEM activity.

"EESW is looking forward to our developing partnership with Coleg Meirion Dwyfor."

BASSALEG SCHOOL TEAM NANO SEPT AT THE BIG BANG 2019

Three key factors to make industrial change a success

JOANNE DANIELS
Learning and development business partner, Newport Wafer Fab Ltd

In any industrial change, there are key factors at play to make it a success.

People and communication: To be given the knowledge of the change required, skills and capability of individuals to assist in change, commitment to share information with others: Evangelist for change.

Strategy: Clear goals to develop products, technologies and infrastructure to drive the change.

Time: For the concept to gain momentum, integrate into society and reach a tipping point, were everyone is working together to achieve.

An example of this model is Silicon Valley, USA. Most people have the impression it started in the 70s, when really it started much earlier in 1938.

It took 33 years to reach the tipping point and drive the Third Industrial Revolution with electronics, IT and automated production.

CSconnected is the world's first compound semiconductor cluster, based in the south-east Wales region. CSconnected is taking a supercharged approach and is aiming to achieve the cluster tipping point in just five years!

This is a challenge by any measure, yet to fully appreciate what it means let's look at one target – skilled workforce/jobs. The forecasted requirement of the semiconductor industry/ CS Cluster in South Wales of 3,000-5,000 engineering jobs within the next three to four years.

For every job created in the sector, three/four jobs are created in the wider economy, creating a ripple effect equivalent to 15,000 to 20,000 jobs.

The CS Cluster will transform the way Wales is seen internationally and how Wales sees itself

We are rapidly moving towards the Fourth Industrial Revolution with the advancement of emerging technologies, creating breakthroughs in science and technology from robotics, artificial intelligence (AI), autonomous vehicles to biotechnology. Changing the concept of jobs in engineering and advanced manufacturing is essential to success.

To support this change and ensure we maximise the opportunities it will create, we must drive the key enabling factors of people and communication.

This year Newport Wafer Fab engaged with EESW as part of our programme of outreach to local external stakeholders. Working with five groups of Year 12 students the brief for the EESW project was to demystify the world of semiconductors/compound semiconductors and how we use them every day by creating an educational exhibit for all ages to be displayed at Techniquest in Cardiff.

The exhibits the teams produced also included an overview of the production processes used to manufacture these devices as well as descriptions of the different types semiconductors and how we use them.

The teams were also able to provide a view of the different types of engineering roles and clear routes to new career opportunities for students in college and those in the current workforce who wish to upskill/retrain for a new career in the semiconductor industry.

Students from Bassaleg School, Caldicot School and St John's College spent time at NWF to understand the semiconductor industry/process and think about how they could share this knowledge with different age groups.

Supported by the Techniquest team they designed exhibits that are cost effective and robust enough to withstand the visitor usage at this attraction.

The exhibits produced as part of this project are being adapted by Techniquest for use in a new compound semiconductor display starting in October 2019.

If you want to find out more about CSconnected, semiconductor or advanced engineering please use the links below or visit Techniquest exhibit in the autumn.

CSconnected www.csfusion.org/ www.csconnected.com and www.newportwaferfab.com

ST JOHN'S COLLEGE GOWNED FOR THE CLEANROOM

A win-win situation for Lewis Girls' School pupils

STEVE POLE
Teacher, Lewis Girls' School

We started our EESW journey at a launch event in October 2018. We were partnered with the University of South Wales and given a brief to design an aircraft hangar to display the university's British Aerospace Jetstream 41. After several weeks of initial design ideas and research, we selected our final design.

By December's workshop days we had our final design on paper and we knew what we wanted the hangar to look like. Our time at the workshops was spent working with Bethan and Emma-Jane, the engineering mentors from the university, building a scale model and producing a digital model.

Between January and March, we concentrated on producing our technical report and completing our financial analysis. We also continued to work on our scale model and presentation, ready for the final judging at the Big Bang fair, which this year was held at MOD St Athan.

Our experience at the EESW final was great. The three judges were extremely kind and set us at ease from the outset. Our presentation went without a hitch and seemed to fly by. It was with great surprise to find that we'd been nominated for one of the awards, we didn't win, but as the saying goes "it's the taking part that counts."

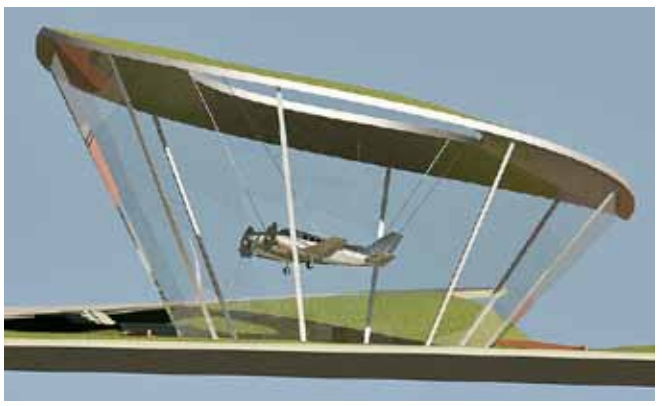
A few weeks after the EESW final, we were lucky enough to be asked to attend an event at the Senedd highlighting the importance of STEM education in Wales. During this event we were asked to present our design for the hangar once again, but this time to Assembly Members including Education Minister, Kirsty Williams.

As a teacher and mentor to EESW teams over the years, I am continually impressed with the quality of the problem-solving ideas and the reports that the young people are challenged to produce.

With the support of the staff at STEM Cymru, and the engineers with the different companies, the participants develop some useful and sought-after skills. Even though members of the teams that I have supported have not particularly shown any signs of wanting to pursue careers in engineering, preferring to follow paths leading to medicine, architecture, veterinary science and business, the skills that they have developed during the EESW program have been instrumental in obtaining places at their chosen universities.

Problem solving, teamwork, communication and report writing are skills that are looked for by universities and employers alike. Their experience of participating in the EESW has given each team member a focus for their interview, where they can talk confidently and with a deep knowledge of the project that they undertook.

With the experience also counting towards their Welsh Baccalaureate, participating in the EESW is a win-win situation. I hope my students will remain involved for years to come.



LEWIS GIRLS' SCHOOL DIGITAL MODEL

I am continually impressed with the quality of the problem-solving ideas and the reports that the young people are challenged to produce.