# CYBER SCHOOLS HUB
# NEWSLETTER

## July/August/September 2019

Since being appointed a Cyber Schools Hub, Cleeve School has developed a number of extra-curricular concepts to help students engage with real-world computer science, and to help them understand many of the challenges of programming and engineering hardware solutions. This article details just a few of the initiatives we have trialled, as an insight into what is possible.

Our position as a Cyber Schools Hub allowed us to develop a Mars Rover Programme, where the Science, Computer Science and Design & Technology departments work together to design a vehicle that could potentially work in the low temperatures and harsh conditions of Mars. Whilst the Design team worked on a suspension system, the software designers developed an environmental monitoring system and the Science group came up with a range of low-temperature experiments. To test the low-temperature performance of the system, the experiments and electronics were loaded onto a high-altitude balloon platform which was launched into the atmosphere. The balloon flew from Bishop's Cleeve to Kenilworth, fortunately landing in the one green space in a heavily built up area, chased by some very excited learners in a school minibus. The experiments all survived and were returned to school for further study and analysis. The airborne images were spectacular, as was the video. A second launch is planned before the end of the year.

Another regular club is our Ethical Hacking club. Available to Year 9s and above, the club teaches Ethical Hacking in a responsible and collaborative way. Membership of the Cyber Schools Hub has brought access to platforms such as Immersive Labs' Digital Cyber Academy, which enables experimentation in a safe, sandboxed environment and brings understanding of the risks faced by individuals and enterprises in 2019. We also have an unpatched server which can be attacked over the air; again, this allows learners to develop skills and to understand the dangers of neglecting updates. The club has a keen focus on the ethics of the subject, and a strict policy on what can and cannot be probed. We are planning to push out the club to other schools using our Attend from Anywhere system before Christmas.

Industry engagement is a massive bonus for schools in general, but for cyber schools in particular. Massive enterprises such as Northrop Grumman and Raytheon are involved with the programme, developing special work placement opportunities and realising that there are a whole group of non-degree educated youngsters they might miss out on. Meanwhile, local SMEs such as Cyber Security Associates, Cygenta and Deep 3 also dedicate time and effort to deliver

worthwhile experiences whilst seeking to attract talent to their organisations. This two-way process benefits the companies, the school and of course our learners.

Given the opportunities that students receive through the Cyber Schools Hub, there is some payback asked of some learners. We often ask students to speak at events, and in the past, they have spoken at the Cybersecurity Conference, the Cyber Schools Hub Industry Awards and most recently at the Cheltenham Cyber Hub8 launch. At Hub8, four students formed a panel where they all spoke eloquently about the opportunities they now receive at school, and the ways they have leveraged them in order to progress with their learning. Two also did pieces to camera as if it were second nature! This confidence in presenting themselves and their expertise is part and parcel of the development enabled through the Cyber Schools Hub, which simply would not otherwise exist. Many attendees commented that the Cleeve speakers were by far the best of the evening, bringing a freshness to the event.

Cyber Schools Hubs provide a huge number of opportunities for schools, and those mentioned in this piece are just a small number amongst a wealth of trips, speakers and industry engagement. There are no doubt learners at Cleeve School has really benefitted from being part of the project, and the impact will continue to improve many learners' chances in the future.

## Wyedean Students Inspired by Cyber Club & Work Experience Opportunities

**Wyedean Cyber Club** - Wyedean School and Sixth Form Centre has established an extra-curricular cyber club that aims to develop cyber skills and knowledge. The club has been running weekly for two hours for 18 months. It attracts on average over forty students aged 11-15 and 72% of students are female. In additional to this club time, the cyber club students are on average spending three to four hours at lunch applying their newly developed skills and further learning about cyber security and defences.





The school believes the success of the club is down to the fact that it is student driven; students communicate their cyber passions and the school focuses the club session on different strands of the subject. They aim to deliver one hour of skills-based learning and a further hour on applying these skills to real world challenges. They use industry expertise as much as possible and this support has linked learning with real applications and has raised the students career aspirations-bringing learning to life!

**Work Experience -** Deep3 opened its doors to Wyedean School GCSE and A-level students, offering work experience in software engineering. This experience was so inspiring for students, showing them future career possibilities and totally raising career aspirations

Kara said the most enjoyable part for her was using the different technologies. "It was very intriguing to try to solve problems," she said. "It expanded my knowledge of software development and the process involved, as well as broadening my skillset with programmes that I hadn't used before." Jake said he discovered the field of work he would love to pursue as a future career. "I realised that a career in computing is both achievable and fulfilling when I attended work experience at Deep3 as I understood the tasks set and found joy in solving the problems by myself. At Deep3 I worked on the ingestion system for a server which converted data from a range of formats into an object which would then be stored in a database so that the data could be used to train a recommendation engine. The experience of creating my own AI using TensorFlow allowed me to gain a deeper understanding of the importance of finding a robust way of converting the object into an input layer."

The work experience opportunities provided to Wyedean students from many industries has extended learning and presented students with the opportunities to apply their skills and knowledge to real world challenges in cyber security.

**STEAM -** In the summer term, Wyedean School and Sixth form centre welcomed 200 year 5 students to the school to learn about Cyber STEAM education from industries. The school was overwhelmed with the support from the NCSC Cyber Schools Hub supporting industries. The industries agreed to run workshops to the students to develop their understanding of Cyber, showing the full diversity of the subject and how it links to the curriculum. Industries included; Deloitte, Deep3, Raytheon, BAE Systems, CGI, Infrastar, Cygenta, Cyber Security Associates, Sopra Steria, Digital Exploitation Centre and USW. The feedback from the event was just brilliant. Students were engaged, inspired, learning new things and most importantly having fun.
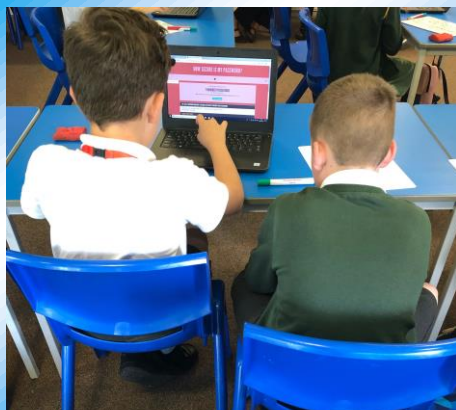
## Ribston School - Lots of Cyber Opportunities for Students

**Visit to the National Cyber Security Academy -** On 16th June, 72 Year 7 girls visited the National Cyber Security Academy (NCSA) in the University of South Wales City Campus. One of the students' favourite activities was digital forensics where they had to don forensic suits and then identify which items they would confiscate from a crime scene. In other activities they learnt how to use the command line in Linux to locate hidden Pokémon, and took part in problem solving as part of an escape room task. The aim of the visit was to increase their awareness of cyber and also to give them a glimpse of university life.

**Immersive Cyber Day -** In June, 40 students in year 8 took part in an Immersive Cyber Day as part of their enrichment week activities. In the morning they took part in sessions led by local industries. Staff from Atkins talked to the girls about careers in cyber and lead a blue team vs red team activity. Staff from Cygenta came in to talk about how hackers crack passwords and how to create secure, memorable passwords of their own. They also lead the girls to https://haveibeenpwned.com/ where some of the girls were horrified to find that their details had been compromised in previous online hacks. Staff from Cyber Security Associates showed the girls how to use Kali Linux on Raspberry Pis to investigate wireless network security and demonstrated Man in the Middle attacks. This really helped the girls to understand some of the precautions they should take when using public WiFi hotspots. In the afternoon there was a cyber scavenger hunt and students worked in teams to decrypt coded messages and solve puzzles, find clues hidden in image files and also use social engineering to extract information in order to reach their goal.

**Computer Club -** Throughout the year, students came into computer club at lunchtimes to work on projects. Year 7 and 8 students started the year working with 3-D printers creating their designs in TinkerCAD, and then moved onto coding with OhBots before starting to use Lego Mindstorms to make a robot follow a line. Year 9 students designed and made a weed killer robot. Currently, entire fields are sprayed with glyphosate to control weeds and the girls wanted to create a robot that could identify the weeds and then just deliver weed killer where it is needed. To model

the situation, they made a test area with different coloured dots with red signifying weeds, and made a robot that would dab the red 'weeds' with a board marker 'weedkiller'. The students had to solve several problems, from designing a robot that could extend and retract the pen, to creating a program that used feedback from a gyro sensor to move the robot in a search pattern locating the weeds. On Ada Lovelace day, we had a number of activities for students including a session on extracting data from a vulnerable website using SQL injection techniques. This year, computer club takes place after school and is supported by staff from BAE Systems. We are hoping that holding it after school will allow local primary school children to join us.



**Sixth Form Hardware Challenge -** The sixth form were challenged with



specifying their ultimate gaming computer. The winning entry came from Penelope and included water cooling and dual graphics cards. The Cyber Schools hub purchased the parts and with some help of FC from Cygenta and John from BAE systems, the students built the monster rig. This project helped them gain a better understanding of hardware, and how to specify components for computing systems.

## *Lockheed Martin Offer Work Experience at Cyber Works Centre for the First Time*

In July, three year 10 students from Homleigh Park High School (was previously Beaufort Co-operative Academy) joined the Lockheed Martin STEM Crew after undertaking a week of work experience.

The students spent their first four days making DARCCs (Damn Vulnerable RC Cars) and learning various techniques to exploit and then protect them. This also gave them an opportunity to get hands on with tools they haven't had a chance to use in school; including software defined radios, oscilloscopes and Wireshark. Over the course of the week the students undertook workshops using each of these tools with real world contexts, such as performing teardowns of routers and sniffing on their other's Wi-Fi traffic. Armed with the knowledge of how to use the tools they became each other's Red team then switched back to Blue to protect their own cars.

Throughout the week the students spent time with CyberFirst students on Summer Placements with Lockheed Martin, fulltime employees and managers to learn about all the different ways into industry and what the company does.

Their STEM activity was rounded off by preparing and then providing a short presentation to stakeholders about what they had learned.  This left Friday free to join one of Lockheed Martin's community outreach events – volunteering at the Orchard Trust where they learned another new skill for building fences on the small holding.  As well as Lockheed Martin personnel and the work experience students, the team included CyberFirst Summer Placement students, a teacher from Homleigh Park High School, a new employee due to join Lockheed Martin in September and a friend.  Following the hard work completed by the team, we then had a BBQ social with the manager of The Orchard Trust to complete the day.

This group of students was the first time Lockheed Martin's Cyber Works Centre has provided a work experience activity.  We met with the students prior to understand their interests and created an activity that would interest them, but could also be used in modules by a the Cyber Schools Hub.  As well as the students, we learned a great deal and are looking to complete the artefacts that will be needed in order to create a stand along activity that can be provided to other schools.

## CGI - Developing a Digital Greenhouse with Wyedean Students

CGI is a company that cares. As stated in our commitments—and as demonstrated through our actions—we take our obligation to best serve our stakeholders and to improve the social, economic and environmental well-being of the communities in which our members live and work seriously. We have local champions whose role is to ensure these commitments are met through our many outreach programmes and initiatives. One such programme is our close relationship with the NCSC where we align our commitment with that of the NCSC. The NCSC introduced us to Wyedean School as a centre of excellence for cyber and the three organisations have been actively working together to encourage school children into the cyber world. In the previous quarter CGI has been involved in two exciting initiatives.

Following on from the STEM event that CGI supported on 2nd July at Wyedean school on 2nd July where we hosted a variety of workshops linked to Computing, Cyber Security or STEM , we collectively decided to take on an ambitious project to teach children at Wyedean about technology and sustainability. This took the form of an Internet of Things greenhouse that featured subject matter from different subject areas that would connect cyber across the curriculum at Wyedean with the Computer Science, Design Technology and Science departments all committed to playing a role.

- Computer Science - Programming of Raspberry PI's, sensors, web development for data analytics and cyber security aspects
- Design Technology - CAD design, building and maintaining.  The coffee shop will also use all products grown in the greenhouse to give this project a real application.
- Science - Input into data collection before using the data within lessons.  Supporting learning with the sensors and helping to develop concept ideas.

CGI is focused on turning the greenhouse concept into a physical product by generating ideas and committing funding, providing technology tutorials and staff members to deliver the content. The first of these lessons took place where 5 CGI members taught a range of pupils from year 7 to year 10. It was great to see that, after an open invitation, 71% of the students were female. The content itself involved the basics of electronics, introduction to a Raspberry PI, and a CGI developed game that closely resembles that of the sorting hat from Harry Potter in order to pay homage to Wyedean's connection to JK Rowling. CGI members were able to tailor different difficulties of the game to the ability of the students which was key to the success of the workshop. Over the next few weeks we will be delivering specific lessons related to the sensors that will subsequently be placed in the real greenhouse. Topics will include how to code individual sensors, how sensors can interact with one another and engaging with graphical user interface to view and control sensor output.

Corporate Social Responsibility is part of the essence of our business—it is built into the CGI dream on which the company was founded, and sustained through our values and local operating model. We look forward to completing a successful project in the Spring and Summer months.

## Deep3  - Nurturing the Grass Roots of the Cyber Industry

The people and diversity challenges we face in the tech sector are complex and varied. Therefore, the industry needs to nurture talent from as diverse a range of people as possible, including gender, ethnicity and neurodiversity. We have supported the NCSC's Cyber Schools initiative since it started to help address this, the projects are aimed at inspiring more kids, particularly girls, to take up computer science.

With a highly documented talent shortage in the technology industry and a lack of women and young people entering into the tech space, we are constantly looking for ways to tackle this critical business risk.

We recognise that to make change happen in the sector, those working in tech need to inspire confidence and provide role models for people early on in their careers to allow them to grow. So, we take our mission to inspire seriously. We have supported the Cyber Schools since its inception and engaged with a number of schools, such as Beaufort, Denmark Road, Newent and Wyedean Schools to name a few. We support and encourage the teachers and young

people in their development of technical skills related to cyber security. Each school that takes part can then also increase their teaching of cyber security and promotes gender diversity in computer science, through the collaborations.

Our aim is to inspire young people into the power of cyber and break down the barriers young people face to entering the tech industry. Whether that's a lack of skills, awareness and education, or simply confidence. A lot of our work focuses on getting students to discover that technology is everywhere and what they can do with it. We know that a grassroots approach is the best way to tackle the issues affecting the next generation of cyber technologists.

Our work with Cyber Schools also inspired us to take on work experience students in the summer. This taught us all that, as software developers, learning from real-life work experience is inherently part of our job description to continuously improve or learn new skills. Hopefully they saw that some of the skills you need to succeed in tech as a software engineer are the same as the skills required to do well in work experience, school and in most walks of life. Passion, enthusiasm, curiosity, problem-solving and tenacity. If at the end of the experience, we've given them the confidence to take on a career in tech, then we've done our best work.

Reflecting internally at Deep3, working with these inspired young people taught us to make sure we practice what we preach to them. This includes visible leadership – being transparent with employees (just as we are with the kids) as to the opportunities and barriers to progression, as well as ensuring a strong presence that encourages people to challenge perceptions, have a voice and innovate in their roles so they can find their niche.

The cyber threat continues, so it's never been more important to encourage new and diverse thinking to build the future of our industry. We're always striving to achieve a better gender balance at Deep3, as well as encourage inclusion at every level. The more we champion inclusivity and provide role models in the industry, the more prospective students and employees will see their own backgrounds reflected, encouraging them to take up the career as a viable option.

By 2030, we expect to have levelled the playing field for all tech employees, with many more young people seeing cyber technology as an exciting and relevant field, one at the heart of the UK workforce.

## CSA - Raspberry Pi's and Cyber Ideas with lots of Work Experience!

Cyber Security Associates (CSA) has been working with the NCSC on the Cyber School Hub programme since early 2018. Helping numerous schools within the local community to grow and educate their students by opening up their eyes to the possibilities that "Cyber Security" has been a core objective for the CSA team. Activities from attending open evenings and career fairs to running hands-on cyber sessions at the schools has enabled CSA to contribute to the Hub programme.  Moreover, CSA offers an active work experience programme for students between the ages of 15-18 which provides an immersive experience within a working cyber operational environment.

The Cyber Pi Projects programme was one of the first joint CSA/NCSC initiatives designed to provide students with all the resources and learning material needed to complete over 50 cyber related projects covering the areas of security, STEM and IoT.

More recently a unique and safe cyber environment which allows students to practice different techniques from within the world of Cyber Security has been introduced - the Cyberdea™ Zone – which is available to all Cyber School Hub Schools. Cyberdea™ provides the capability to demonstrate and teach students of all ages how to attack and defend networks as well as teaching students about the Computer Misuse Act (CMA).  In addition, the facilitated sessions also provide Open Source Intelligence (OSINT)

training so that students can learn how much information is online about themselves or their families.

**What's New**: Coming soon will be the Cyberdea™ Zone Capture the Flag (CTF) experience will ensure that students are continually being given every opportunity to learn within a positive and fun environment. The CTF allows students of all ages to play against each other using real time hacking mixed with answering questions on cyber security to gain points. Progress and scores will be tracked on the Cyberdea™ big screens, allowing students to compete as individuals or teams. Looking ahead to the next 12 months, there will be more Cyber Pi Projects added focusing on Artificial Intelligence (AI) as well as a Security Operations Centre (SOC) set of projects which will include Security Analyst, Threat Intelligence Analyst and Malware and Forensics Analyst projects.

## *Deloitte - Having a Ball!*

Over the last few months Deloitte have been working with CyberFirst to support on a series of events with the Cyber Schools Hub in Gloucestershire. We have been involved in all manner of events from inspirational female talks to hack labs and it's safe to say we've had a ball! These challenges ranged in difficulty, from finding out the name of the first programmer (Ada Lovelace) to breaking into a web application using hacking techniques.

It is of utmost importance for us as a firm that we engage with the next generation of cyber talent and encourage diversity in our talent pipeline and in the cyber industry! This initiative has given us a chance to show the young people that Deloitte is so much more than an accountancy firm and that the people who work here are different genders, background, ethnicity and personalities and there is no "one size fits all". The positive feedback we have received from the schools has been amazing and we have felt a real sense of getting involved, rolling up our sleeves and engaging with the next generation of cyber.

Going forward we have a number of exciting events lined up with the Cyber Schools Hub and we feel like this is going to be the best school year yet!