

Meeting pupils' needs.

Our main aim for the project was to introduce more girls into STEM subjects but also to offer the clubs to those girls lower down the school, hoping for them to gain interest earlier in their school life and for them to maintain their interest. One of our biggest obstacles was staffing as well as finances. The Rolls-Royce prize has allowed us to bring staff and STEM ambassadors together as well as gain the funding necessary to purchase extra resources as well as some new pieces of equipment and a wider variety of materials.

Successes, Awards and Achievements.

Participation in the clubs and competitions have help develop student's report writing and project planning and provides them with an opportunity to practice describing in writing as well as orally, it gives them confidence in presenting, not only to their teachers, but also to visitors and judges at the competitions.

On the point of student confidence, they also gain sureness with some of the workshop machinery and equipment, at the beginning of the year seeing some students in trepidation at the thought of using a pillar drill, then as time goes by seeing how they competently and safely can use the equipment and show others also. The introduction of the laser cutter and the 3D printer to some of the groups will be extended over time, ensuring that all the students involved in the clubs can operate and monitor these machines more independently.

The students in the year 8, 9 and 10 groups have taken ownership over their projects and have been coming up with solutions to current, existing problems. Many of the activities and content of the practical side of the extracurricular clubs are similar to those in the curriculum but more importantly are allowing them to be more innovative and consider a broader audience, they must ensure that they consider the client and need in more detail, setting them in context. We have tried where ever possible to encourage the students to consider the activities and presentation methods and to constantly evaluate them to ensure that they are able to discuss their projects confidently with a range of adults – i.e. judges, visitors and staff.

Miss Parkin	4 x year 12 girls - GOLD Crest Awards
Mr Bye	2 x year 13 girls - GOLD Crest Awards
Mrs McSorley	Year 8-10 Young Engineers Club
(With Mr Bye & Mr Sipple)	18 x Year 8 girls - Bronze CREST Awards 3 x year 9 girls - Bronze CREST Awards 4 x year 10 girls - Silver CREST Awards
Mr Bartlett	23 x year 7 – Involved in Robotics club 4 x year 11-13 girls involved in Robotics club
Mrs Vaughan Teacher (Chemistry)	16 x year 7 girls –Involved in Year 7 Science club
Mrs Cobb HoD Science	EES students: 5 x Year 12, 3 x girls and 2 x boys - All gained the Gold CREST Award.

One of our Year 13 girls, Charlotte Crisp, won a Jack Petchey Award for her services to the school including her involvement in the Music/ Drama departments as well as acting as a mentor to younger Maths students and being a good role model and prefect. She has also been involved in STEM clubs over the years and asked for her £250 prize money to go to the physics department because she is part of the robotics club and wants other extra-curricular activities like it to continue to be possible.

The Rolls-Royce competition has enabled us to bring together the STEM subjects to work in collaboration to encourage more girls into our clubs. This year so far has seen the reintroduction of year 7's into STEM/Engineering clubs in the form of the Robotics and programming club. Their enthusiasm has been

really promising and they are keen to continue working on projects within STEM clubs next year. The year 8 & 9 groups have been just as popular as previous years, although numbers have shifted up and down throughout the year, the same core pupils have continued and numbers have stayed fairly high.

This past year has allowed us, as a team, to expand the clubs on offer by having more staff and volunteers available to deliver them, in order to encourage more girls into STEM subjects. We will hopefully see the results of this over the coming years as we continue to work with our STEM ambassadors and teachers during our club sessions and try to introduce competitions within our own school as well as between other local schools. As Science and Mathematics are compulsory subjects, the results will hopefully be reflected in the uptake of students in D&T and Engineering and those going on to higher education and careers in the STEM subjects.

Miss S Parkin HoD D&T and Engineering/ Team Leader

As a STEM Ambassador that has supported students and staff at Westcliff High School for Girls over several years, I have seen changes in staff and working practices of technology related lunchtime clubs. This year has been no exception; receiving the fantastic award from Rolls-Royce has provided opportunities to develop and extend the existing club I am involved with as well enabling co-operation and collaboration across other technology clubs involved with robotics and computing.

Summarising this year - once again it has been good to see so many young students show an interest in technological subjects, not just within the lunchtime club I am involved with but across the other clubs as well. It is encouraging that the school is able to offer these extra opportunities outside the curriculum via the dedication of staff and volunteers giving their time and also for the financial support of Rolls-Royce to ensure materials and other resources are provided. The school is certainly flying the flag and promoting technology and engineering and I'm sure will be a springboard for a number of future engineers. This in itself is encouraging, even more so when one considers that this is an all-girls school.

Mr E Bye, MIET/ STEM Ambassador

It has been a good year for STEM Club activities this year because of the involvement of Rolls-Royce, the variety of staff involved from the different disciplines and the student's own motivation to gain their CREST Awards and participate in regional Engineering and Science competitions. We have four teams competing this year for prizes at the Big Bang and the Chelmsford Science and Engineering Fair. It is a great opportunity for these students to see what other schools are producing for these completion as well as meet and speak to other student's about their work. They are also expected to explain to the judges what their project topic is and talk through the technical aspects. As some of the students in our teams are only in year eight this can be quite a daunting experience. However, in terms of preparing students for adult life it is a valuable lesson in learning how to work as a team and help to build their own self confidence.

Lyn McSorley, D&T Teacher

The students have learned a wide array of skills, including electronics, programming, soldering, and 'hacking' devices to change how they operate. These are all challenging tasks for such young students and I have been really impressed with the perseverance and enthusiasm of all those attending. Feedback has been very positive, with students already planning on projects for the Year 8 club next year. From student comments they have been particularly interested to see the connections between different areas of STEM, with pleasing interest in learning more about electronics and microcontrollers.

A small group of Year 12 students are now working on constructing a prototype of the new robot kit and debugging the software. By showing a prototype I hope to increase the level of interest and re-launch the club next year. Again we have produced a very cheap but powerful platform with a working vision system for students to explore robotics and I am confident an integrated STEM robotics club will be successful. The design will again be released as open-source plan.

Despite the various challenges I think this has been a successful first year for the robotics club. The groundwork is now in place to let the club grow in the following years and students are far more aware of the links between engineering disciplines.

Jon Bartlett, HoD – Physics

Year 7 Club: It's very clear that the students have dived into their projects with passion. They're very keen to show off their progress so far, and when questioned on their current activities, they are able to give clear and accurate answers on what they're doing, the technology involved, and what is required to complete the project. The 'Sumo' challenge seems to be of particular interest, with some creative designs being discussed for wrestling arms.

Year 8+ Club: It's been a pleasure to be a part of the team helping to deliver the various projects that the students are working on. It's been particularly rewarding to see them move from discussing their ideas, to researching the current market for their projects, diving into product design, and now working on prototypes. The focus now is on the completion of prototypes and project documentation ahead of the upcoming competitions, and the teams are prepared to go the extra mile to work on material at home and on non-club lunchtimes. Projects such as the Pet Tracker and the robotic cleaner show a great deal of ingenuity and problem-solving, and written material supplied has been of a very high quality. Teamwork and division-of-labour has been excellent, and when put on the spot in front of the Rolls Royce camera, the girls have been both articulate and passionate about their projects.

Pete Sipple, STEM Ambassador

Sustainability – what happens next?

We have had a number of D&T workshops, Science laboratories and ICT suites available to us over the past year, although at times, it has been difficult to monitor the students and split up the team as different facilities have been needed at the same time. This will only improve in time, once our new Design & Technology block has been completed, by September 2018, allowing us to have two fully fitted workshops and an ICT CAD/CAM suite all next to each other with the ability to open the rooms up into one large workspace. This will be situated next to the Science block, so all the rooms will be accessible and nearby.

The plan for the future is to build on the hard work and effort that the team has achieved so far. Many of the activities are long running and we are continuing to build to profile around the school. We have already put in place the following for the next academic year:

- Year 7 Robotics & Programming club
- Year 7 Science club
- Year 8 & 9 Young Engineers
- Year 10 Young Engineers
- Years 10-13 Robotics & Programming
- Year 12-13 Engineering Education Scheme (EES)
- We will continue to offer all students the opportunity to enter their projects in for Bronze, Silver & Gold CREST Awards.
- Entry into the Big Bang and Chelmsford Science & Engineering Society (CSES) competitions.
- We will continue to run the Arkwright Scholarship program, offering year 11 students the opportunity to gain funding and support from industry.
- Members of the team are also involved in 'Activity Day' events which have involved a whole or half a year group. These have included; CSI day, Genetics workshop, Enterprise Days and Robotics. Again, all go towards raising the profile and students interest in our subjects.

Future Aspirations:

- To introduce a combined schools robotics & programming club, with the aim of a 'friendly' competition at the end of the year, our own pupils acting as mentors and encouraging other girls into the competition. We have set aside some of the prize money to enable us to purchase more kit for this to be introduced next term.
- To encourage more year 10 & 11 students into the STEM clubs, either developing their own projects or acting as mentors to the younger students.

The project has led us to now have:

- Improved resources and facilities, including a 3D Printer.

- Wider variety of STEM clubs on offer due to increased staff/ambassador numbers
- Increased knowledge of what the students want to 'do' at STEM clubs
- A wider variety of materials on offer for the students to have access to for their projects.

As a result this will allow us to further develop the clubs, ensuring the students are fully engaged and interested, which in turn will increase numbers even if just by 'word of mouth'.

To date we have spent £5304 of the prize money. This has included a variety of materials, electronic equipment and resources to use to show the students different materials/processes that are available to them with the largest purchase being the 3D printer. These items are not only for use within the clubs, but will also benefit students in lessons throughout the school, in different year groups, enabling them to be better informed and to improve the quality of their GCSE and A Level coursework.

The remaining money, approx. £700, will go towards further materials, electronics, kits etc allowing the club teams to have a wider choice resources for their current and future projects, and to help fund proposed enhancements to club activities.

Monitoring, Evaluation and IMPACT.

As a team the staff have met on a regular basis to allow everyone to discuss activities and ensure that everyone has had the support and resources that they needed. With a number of clubs taking place, this was important, even if just to ensure that rooming was sufficient as well as having machines and equipment available when needed.

Evaluations in the form of questionnaires were done to get valuable feedback directly from the students. As well as regular informal discussions with the students to get their general feedback on the clubs and their projects.

We monitored the students' grades throughout the year to see if this has had an impact on their grades in STEM subjects. The students' involvement in STEM clubs has made a positive impact on their learning, although because of the nature of our school, being a Grammar, their grades are generally fairly high throughout the school and year groups. All of them are making good progress towards their end of year and key stage grades. Continual monitoring over the coming years will see if this has had a definitive impact. The impact it HAS had on these students is to reassure and convince them further of their future aspirations to work in a career in the field of STEM subjects.

- 65% of the year 8 club members are in the top 6% of their year group with regards their grades

The initial aim of the project was to not only raise the profile of STEM clubs across the school, but also the hope was that by extending the staff involvement and student participation in the clubs, we can improve/maintain attainment levels and progression, motivating them to continue their studies and future careers in different fields of STEM subjects.

Our involvement in the regional and national STEM competitions and the various awards gained by the teams and individuals are all celebrated in year group and whole school assemblies as well as on the school website and newsletters, ensuring that all students, staff and parents here about the students' successes.

The majority of the students involved have shown a genuine interest in STEM related careers and have said that the clubs have either changed their minds to follow this path or made them more excited about Engineering and Science.

Year 8 student's thoughts on what Engineering means to them:

'Engineering means inventing things and innovation'

'It means making a change that will benefit society'

'It is vital for everyday life'

'It is problem solving and bringing ideas to life using technology'

'A combination of skills which help resolve common problems'

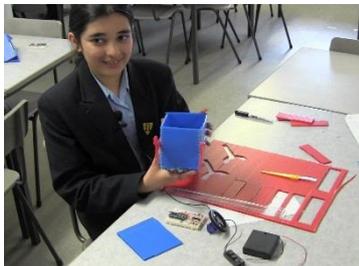
The questionnaire results showed us that the majority of the students involved joined the clubs to help improve their knowledge, understanding, confidence and grades within the STEM subjects. They also had a

genuine interest in the subjects beforehand, with many of them saying that they wanted to try something new, for example 'Electronics' and 'Programming'. Many of them also had given some consideration to STEM careers before hand and said that was a reason for them being involved, with others showing growing interest once they had been involved and wanting to continue their involvement in years to come.

The 'Rolls-Royce Science Prize Awards - Finals' will be held in London in November 2017.

The journey continues...

Photographs of the students 'in action'



Miss S Parkin HoD D&T and Engineering/ Team Leader