Why 'Children Challenging Industry' is so important

Kate Sutton shares her school's recent experiences of participating virtually in Children Challenging Industry (CCI)

Figures 1 & 2 Pupils collaborated to filter muddy water as efficiently as possible

I became aware of CIEC and Children Challenging Industry (CCI) whilst undertaking the Primary Science Quality Mark (PSQM) in 2017 as a new Science Co-ordinator at my school in East Yorkshire, and was really impressed by the organisation. In the years that followed, I came to understand the pivotal role in primary education that careers learning has and the vital element of children learning about local industry and being 'hands-on' to make their experiences relevant to enhance learning. I also feel passionately about the need to work towards overcoming the STEM skills gap (RAEng, 2017), i.e. the low take-up of Science, Technology, Engineering and Maths careers due to a decline in interest in these subjects during education, particularly in girls. Making learning local, relevant, achievable and accessible are seemingly the strategies to building knowledge and understanding for our pupils (OECD, 2020).

At my school, Burlington Juniors, we have been working hard over recent years to develop STEM teaching and learning and have become involved in various incentives in this regard. We are in a low socio-economic area; therefore, it is of great importance that we support all our pupils to have access to as many opportunities as possible to enhance their social mobility. Science capital is low (Archer *et al*, 2016) – the children have not had enough science experiences out of school to develop an affinity or interest in the subject. It is vital that these children learn how to engage with the world and value that we, the world and everything in it, have a science base. Many of our students rely totally on school in this endeavour.

I completed a Master's in Education last year. During that time, I used brilliant resources from the CIEC website, including the Careers Cards and accompanying PowerPoint presentation. Our school also participated in the Primary Careers Mark (after developing careers education in our school over quite some years), which was most successful, funded by Skills Support for the Workforce project (SSW), European Social Fund (ESF) and Local Enterprise Partnership (LEP) and in conjunction with Complete Careers. An important goal for our school going forward was to become a CCI school; however, lockdown hampered our ability to be able to participate in such activities, which had to be postponed.

Virtual CCI

We were so pleased when we heard that CIEC were developing a virtual CCI package and that our school was to participate in the funded activities in Yorkshire and the Humber, in collaboration with PX Group's Saltend Chemicals Park (SCP), Hedon. Our Year 5 (age 9-10) pupils were really excited to welcome CIEC and SCP into our school,

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particularly as CIEC celebrate 25 years of Children Challenging Industry this year.

Extensive resources arrived and were left to quarantine to comply with COVID-19 requirements. My Year 5 colleague, Sarah Caulfield and I had pre-visit meetings online with Mackayla Millar from CIEC, and she talked through the lessons, slides and everything we needed to know before we participated. We were supported throughout the whole process. We were provided with parent information and consent forms, the COVID risk assessment, lesson risk assessments and a kit list (which included a minimal number of items that school needed to provide, such as plastic cups). We were also given a link to initial online questionnaires for the pupils and teacher to complete.

It is so important to enthuse children and teachers alike. Teachers have felt less confident about teaching science and STEM (Wellcome Trust, 2018). One colleague stated in a questionnaire, with regard to STEM: '*Giving children full and varied experience in STEM/science subjects is essential to ensuring that they feel happy, engaged and confident, so that "I can..." and "I love..." become their opinions. Lifelong loves start in childhood*' (Anonymous respondent, staff questionnaire, 2019).

Water for Industry – our experience at Burlington Juniors

The children participated in three lessons based on CIEC's resource *Water for Industry* (freely available for anyone to download). The first was all about Leaky Pipes. Pupils developed their collaborative skills and enhanced working scientifically skills whilst undertaking a problem-solving investigation. The 360-degree virtual industry visit to Saltend Chemicals Park was a great way to put the learning environment into context for our pupils. The activities really encouraged the mindset we hold at school that all of us are scientists: the children being treated in a mature way and as young individuals. The way that the tasks were presented – as requests from the company for help – gave them a feeling of what it would be like to address these problems from a business/employee point of view. Through active involvement and fair testing, they were able to deduce, through trial and error, which sealant was the most effective for sealing 'water pipes' (empty food tins) together and what was the best way to join them. They worked to timeframes in conjunction with the lesson, presented live and remotely by CIEC, and facilitated by their teacher. It was really encouraging to see their mature attitude and collaborative skills. They used their experience and the first set of results to ensure that a second attempt was more successful. They were also very engaged with the STEM professionals from SCP and enjoyed the online discussion and engagement with them. Having contact and interaction with real STEM employees helped them to link their experiences to the wider world. They were fascinated by the industrial site and many were enthused about STEM subjects going forward. We were so proud to receive comments from the experts involved regarding the thoughtful and probing questions that our children asked. I firmly believe that it is so important to expose children to a wide range of careers and industry, to broaden their understanding of the wider world. The children were extremely positive in their feedback regarding their first interactive lesson:

'*What I thought was interesting was when we put the tape on and saw how much it leaked. I liked watching how much we improved*' (Leah).

The autonomous nature of the activities meant that children had much more say as a group about the direction of their investigation:

'*I liked when Callum* [from SCP] *was telling us where the water went after it rushed out of the pipes. I liked it because when one of us was holding the tape the other was holding the tins and we were all working as a team*' (Mia).

'*I liked when we watched the videos and I liked that we got to pick our own tape*' (Bradley).

'*I enjoyed the experiment because I liked timing it and seeing how much water leaked out of it*' (George).

The second session was teacher-led, supported by CIEC through discussion prior to the lesson. This was related to filtering, which fits in perfectly with the Year 5 National Curriculum for England unit 'Properties and Changes of Materials'. Once again, the pupils were really engaged and increasingly confidently used equipment, expressing opinions and developing teamwork skills, and these all built on prior knowledge learned earlier in the academic year. They were surprised that filter paper didn't actually completely clean the water. This really made them think about less developed countries and the unclean water that some communities, including the young and vulnerable inhabitants, have to consume. I thought that this showed a very mature and outward-thinking, thoughtful and empathetic attitude from our pupils. This made me really proud, as I reflected on how this activity had helped children to gain these valuable attributes.

Session 3 was all about cooling systems and we, me included, were all fascinated to learn more about how cooling towers actually work. I have lived very close to the SCP industrial site for many years and still found this really informative. Children participated in groups to test, measure, analyse and evaluate results of their findings related to their water-cooling task. Once again,

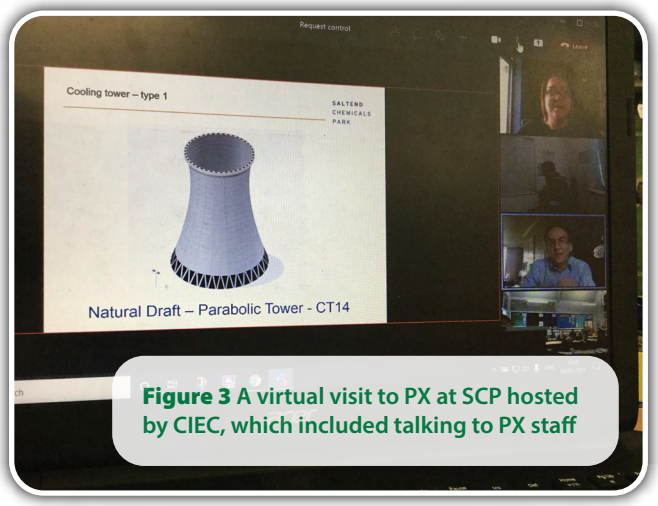

Figure 3 A virtual visit to PX at SCP hosted by CIEC, which included talking to PX staff

it was wonderful to see the children interacting with visitors, albeit in this virtual way. It was a brilliant idea to get around COVID-19 issues and bring CCI to pupils who otherwise would certainly not have participated. This session evoked much thought from our pupils relating to the heat exchange between the hot and cold water and really deepened their understanding.

On reflection

Reflecting on the sessions with the children was very informative, pleasing and exciting as a teacher. They had really taken the experience on board and felt privileged to be part of the incentive. They expressed real enjoyment and engagement and many pupils displayed true interest in science going forward, enjoying the collaborative nature of the sessions and the challenge and sense of competition between groups within the session. It was also great to see pupils who do not normally participate being so engaged and enthused:

'*I enjoyed the videos and when Callum and Jason talked to us about what their work was. I liked that when we did the experiments, we were experiencing what it might be like in the real world*' (Blanka).

'*I liked the experiment part because it was satisfying when you retrieved your score, especially when it was better than last time*' (Molly).

'*I liked hearing about their jobs and all the things like that*' (Braidan).

Mrs Caulfield, teacher of the Year 5 class involved, commented:

'*It was an amazing opportunity with excellent resources. The whole event was professional and gave our pupils a window into [a nearby industry], SCP, making learning local, relevant, developing STEM interest and challenging gender stereotypically-held views. Instructions for teachers and learners were clear, safe, personal and had links to extension activities. There was real expertise displayed, and time to talk directly to guests allowed queries to be answered; this was excellent. Developing enthusiasm and science capital, allowing the pupils to realise that this can be something they could achieve and in their own locality, was such a wonderful thing. It also helped children to see how resilient they must be and the need for accuracy and attention to detail as they travel along their learning journey*'.

Having a programme that combines tailored training for both industry partners and primary school staff, and the fully resourced problem-solving classroom activities, provide such a wonderful way of developing engagement with industry for our pupils. A fantastic resource for schools and pupils alike, these lessons are professionally produced by experts to ensure outstanding experiences. As part of the incentive, a staff meeting regarding 'A whole school approach to Science Capital' is provided, which really supports teachers to understand and enhance their own science capital as well as that of their pupils. We will be supported to carry out and complete further work, developing staff science capital further, over the coming year. This really enhances the attitude and science ethos in school. Perceptions about our local chemical industry were certainly challenged and demystified, the blended learning really bridging the gap between industry and education, which is a vital requirement. Many colleagues and acquaintances have been asking us how this came about for our school and if they can take part: we feel very lucky.

Making information relevant and receiving it from trusted individuals, in an active way, enables a greater understanding and subsequent internalisation regarding the reality and actual suitability of a profession. Dealing with unrealistic career aspirations, and supporting pupils to understand that these may be challenging to attain, are vital steps towards them considering a wider range of careers opportunities.

Andreas Schleicher, Director for Education and Skills at the OECD, states that:

'*Giving children a better sense of the world of work is not just a matter of social justice. It is also a matter of bringing the potential of the next generation fully to bear. At a time when our economies count on everyone's contribution, we cannot afford that disadvantaged youths rule themselves out of careers*' (Chambers *et al*, 2018, p.7).

Good careers information starts early and connects relevant learning with future economic life. Children need trustworthy information sources and stereotyping must be addressed; this broadens understanding, whatever the socio-economic background (OECD, 2020).

'*It is about ensuring young people emerge from the education system with the skills and knowledge that enable them to participate in post-compulsory education, in working life, and to become the workers, leaders, entrepreneurs and citizens of the future*' (Andrews & Hooley, 2018, p.3). I certainly hope that we will continue to develop links with CIEC and industry in the future to ensure personal progression of our pupils, including careers learning and vital transferable skills going forward.

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