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Sustainability Design Challenge

How engineering can improve the quality of people's lives

A series of free courses has been developed in association with the British Council as part of the Connecting Classrooms through Global Learning programme in partnership with Engineers Without Borders. The courses are for a range of ages and present problem-solving challenges which can be used with students to highlight how engineering can improve the quality of people's lives. With an emphasis on using appropriate materials and technologies to provide solutions to problems, the Level 2 and Level 3 courses are suitable for D&T teachers irrespective of their specialist areas of knowledge. The following show a sample of outcomes from five different schools who have taken the challenge.

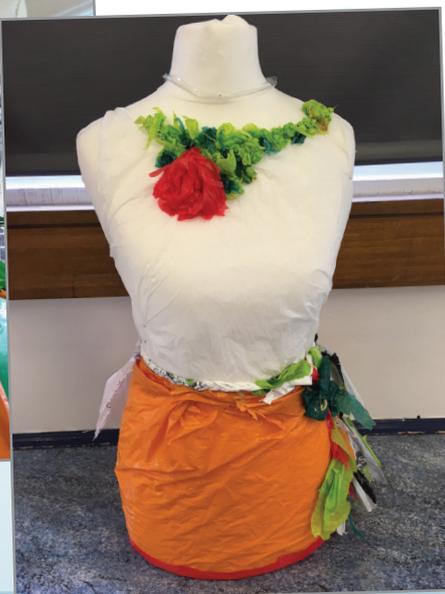
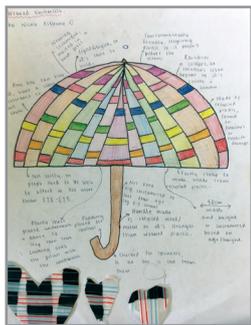


Inspiration is from real life case studies, provided by Engineers Without Borders UK, as a video of people in Kibera in Kenya and the challenges they face. Teachers set a design challenge for students based on either Goal 6, Clean Water and Sanitation or Goal 7, Affordable and Clean Energy. They are introduced to key issues facing the inhabitants of Kibera and design a challenge based on either the sourcing, collection and storage of clean water, or the use of an alternative fuel source.

On course...

The Level 2 course for teachers offers:

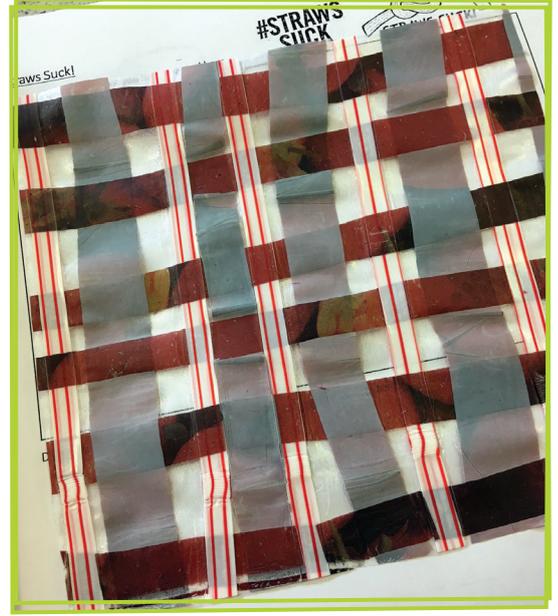
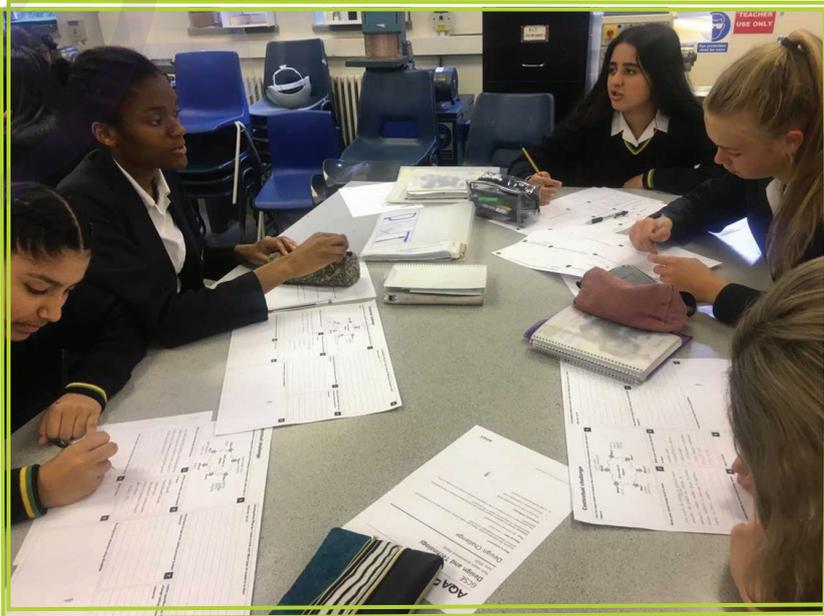
- an understanding of the importance of global learning and how it impacts on us all
- a better understanding of the UN Sustainable Development Goals and how to refer to them in your teaching
- content to support the delivery of core knowledge associated with sustainable design, energy, mechanisms and structure
- problem-solving challenges to show your students how engineering can improve the quality of people's lives.



Abbey Horn, Loreto Grammar School, Manchester

A group of 26 students completed challenges on how to be sustainable as part of their Year 9 Sustainable Design project in D&T. We looked at three areas:

- Weaving Waste – how local artisans make and sell using what they have available. The students weaved using waste materials (plastic straws and plastic bags) and heat pressed them as the basis for making and designing marketable products. They then went on to draw a product that could be made from this technique.
- Trashion – students researched the textiles industry's effects and worked as a team to create something wearable from what is available considering that many in Kibera cannot afford clothing.
- Sanitation – how difficult it is to have good sanitation and water, the right to have clean water and the importance of hygiene. Students built quick models of ways to encourage hand washing and clean water.



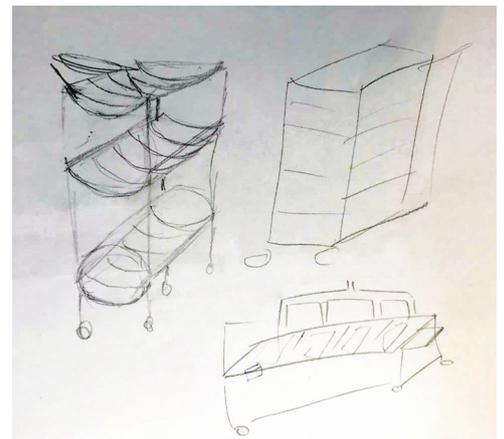
Skills were varied but the students enjoyed iterations in context rather than just one design and make activity. This encouraged them to get involved in the project and interact with a real-life situation and fits well with the school value of Internationality and the new specification. My intention is to embed some of these activities and give the SoW a more real context. I aim to develop this, and next year the activities will include making their own paper and notebook, looking at water transport and developing some CAD solutions rather than card models. The activities were good to get students into the swing of working within a context and developing problem solving skills.

In future I aim to embed a more realistic context to the design challenges, getting students to focus more on how it is achievable, and give them the element of choice regarding how to explore the problem. I believe that a context is important to inspire them to think big; as is to move away from purely design and make projects. Teachers shouldn't be afraid to let go of control and allow the students freedom within activities – by limiting the resources not the creativity.



Katie Lovelady, Altrincham Grammar School for Girls, Manchester

I taught this with my Year 10 GCSE D&T class. The 14 students are all female and of generally high ability and my aim was to encourage them to work collaboratively on an open-ended problem-solving project. I used the resources to help prepare them using the context of 'clean water in Kibera' and as we also focus on independent research skills in my school, this is a great opportunity for them to practice this. Students were introduced to the project using the UN sustainability goals.



In each lesson I set a focus for the project, an activity based on this, and time to work in their groups. The students were asked to complete a collaborative prototype of the solution and an A2 display board of research, designing and development work.

The linked string activity helped them think about the sustainability goals in more depth and provoked class discussion. This was a good opportunity to establish prior knowledge and links with other subjects: those studying citizenship had a good background knowledge of the goals. We explored water, where it comes from, its uses, how it is treated and collected. Using images helped establish initial thoughts about Kibera and misconceptions were challenged through the 'Kibera: we have a life' video.

"I enjoyed spending time with my daughter and learning about water purification and how it affects the people of Kibera."



The second lesson focused on the user, using photographs to consider the different needs of families, children and women. Each group was given the 'Engineering for people design challenge' booklet to help with their research. The lesson was in a computer room so groups could start to carry out research and come up with some 'hazy ideas' to solve the problem.

Linking to NEA, I have been encouraging students to approach the project in an iterative way. They began to consolidate knowledge and write a brief, discussed their 'hazy ideas' and evaluated their effectiveness through discussion.

This project has provided students with the following skills:

- Independent research using a range of different sources. I really feel that it has encouraged them to read more instead of purely relying on the internet.
- Challenged misconceptions – all Year 10 students are thinking about people who live in a very different environment to themselves but can see the similarities.
- Team working – working collaboratively they can problem solve much more effectively and evaluate their ideas through discussion.



In future I intend to adapt this scheme of work, making it more suitable for Year 7 students working in a 13-week block. From September, all our Year 7 students will complete this project; this gives a more realistic idea of what GCSE D&T involves.

Tips

- Encourage students to work independently as much as possible but provide a bank of resources to help guide them.
- Make sure students are given roles within the teams so that they take responsibility.
- Do not give examples of other outcomes (until they really need it).

Andrew Young, Colston's Girls' School, Bristol

I began by introducing the UN Sustainable Development Goals to the Year 10 group through the string activity developed by Practical Action and introduced in the face-to-face course. I introduced the water challenge, initially asking students to think about where water comes from and what people use it for, before using the Kibera video to establish a context. I then defined the challenge by establishing three sub-problems that helped students focus their initial thinking:

- collection
- storage
- hygiene

Students produced a 'user-story' for homework which helped them develop a deeper understanding of some of the issues involved in the challenge. They then sketched ideas for a water filter before modelling and trialling these using plastic bottles, activated charcoal and coffee filter papers. Further modelling and research explored how water would be filtered and stored in the home using a 'kit of parts' which reflected materials which would be available in Kibera. Progress on the project has been recorded through a blog.





How sustainable is your classroom?

Challenge your students and yourself to see how you use materials and energy when designing and making. You may be surprised to see how considering the Sustainable Development Goals might affect your teaching and students' attitudes.

I feel that Kibera is a persuasive context for design work and is a great way to teach global sustainable development. It helps students understand what is meant by user-centred design and was a major reason they responded well to the challenge and empathised with the clients they were designing for. There were many touch points with the OCR specification and students responded really well, finding the real context excellent preparation for their coursework and the videos helped them engage with the realities of life in Kibera.

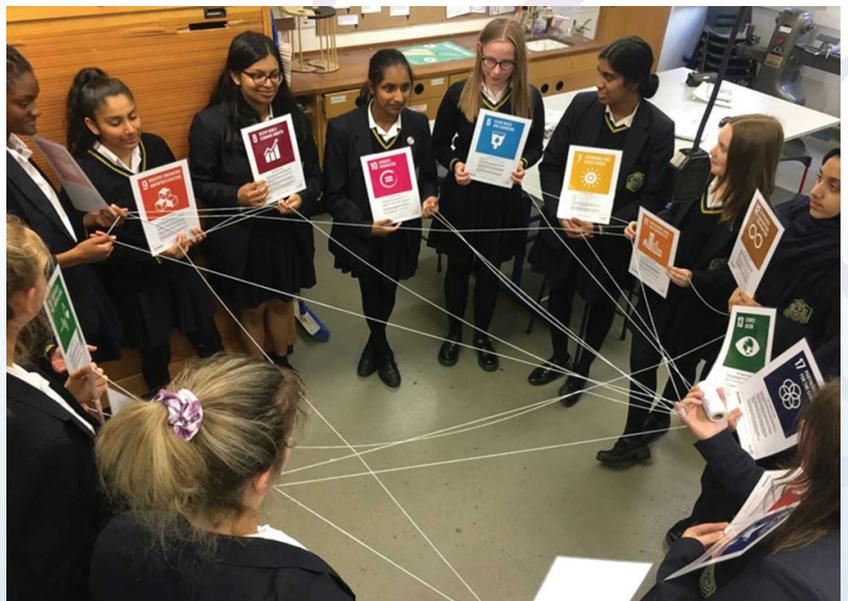
See Andrew's blog at <https://bristolsciencecapital.tumblr.com/>

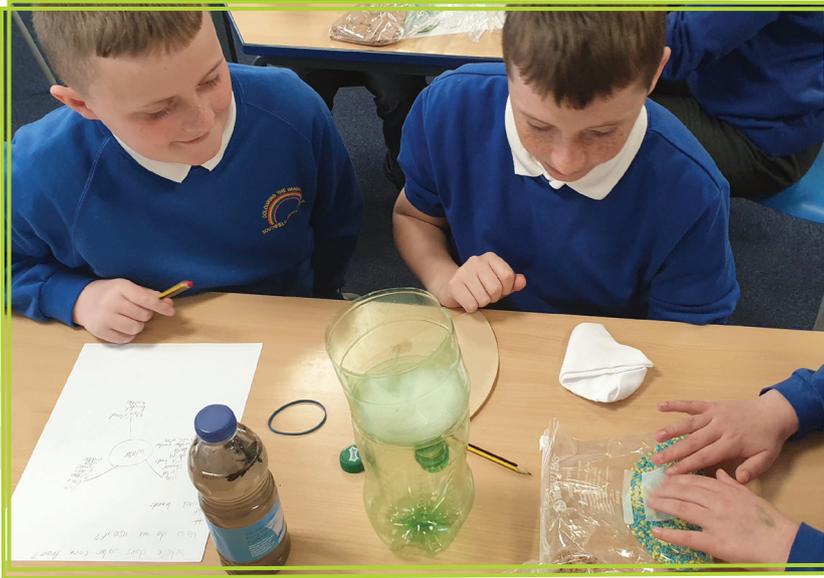
Nick Hart, Bristol

This project was incorporated into a series of planned KS4 lessons in which sustainable development was used to help frame the lesson topic which increased engagement. We were constrained by when I could introduce the activity. The main focus was therefore on theory and designing with responsibility, top and tailing the theory with all 17 sustainable goals in two mixed ability and gender Y9 groups of 23 and 19.

I felt the real-world context increased their engagement and understanding of the world we live in and helped students' engagement in an otherwise 'dry' topic by bringing together chemistry and geography in a real context. There was really good feedback from the students; sharing the development goals helped to frame their learning resulting in more thoughtful designing and less wasteful making.

I feel this course supports the new vision for Ofsted, understanding user needs and the wider world and designing ethically. I was not aware of the Sustainable Development Goals until we started researching this project but would like to see some influence from them on the exam boards and make them part of the curriculum. I am planning to develop a scheme of work for Year 7 and to build in tutor time for the whole school and to incorporate the goals in a similar manner in future KS4 lessons where applicable and where time allows.





Sasha Perkins, Armthorpe Southfields Primary School, Doncaster

The activities were completed with a whole class of 25 over two sessions over two hours, playing the video as an introduction to Kiberia. We looked at how we get clean water, making our own natural water filtration models and then making a water transportation and collection model in the second session. The children understood about clean water through other work with water companies. They were given a bucket of resources per group, they selected materials and tested their ideas more than once to test filtration effectiveness.

“Mrs Perkins’ lesson about how we could use recycled materials to purify, collect and transport water was excellent and very informative as well as being fun.”



I was very impressed with the outcomes and the discussion from the second part of the activity. The most amazing element was how many of the students incorporated the water filtration part into their designs, showing a link from past learning and then being able to adapt it. The cart with wheels was described as a fold away carriage that could be hung on the wall to save space proving students had really thought about the environment of the users. One team decided to make their water tank from metal to use heat and condensation for cleaning the water as well as helping create more using condensation. My favourite solutions were the ones that could hang from the roofs of the dwellings and be used when needed. The difference in model making was also diverse, with one having an actual working tap. It was really a fantastic, engaging and interesting morning.

Sustainable resources

Sustainability has become embedded in designing and all young people wishing to follow a career in design need to be aware of the materials, construction and processes that have an impact on the world’s resources. In association with our funders, the Design and Technology Association has developed a number of resources that can help schools and students deliver this aspect of D&T in effective ways. Ranging from interactive files, videos and courses, we have a range of items that can help drive these important points home.

Resources include:

- Designing with sustainability in mind
- Fibre to fabric: Textiles processes in practice
- Make the World...more sustainable
- 21st Century Technical Textiles



The children really enjoyed this but time was limited due to SATS. We ran the second part as an activity with parents after SATs and are working towards Crest awards for the children through this. In the future I would add a maths element to the activity by getting pupils to “buy” resources, especially when making models. From this experience, we are planning to run the water activity with Year 4 next year and the solar challenge with Year 5; Year 6 will take part in both after SATS, using the local secondary school for resources if needed.

Further Sustainability Design Challenge courses are running from September.

See the website or contact info@data.org.uk for further details.