



Green Futures – STEM Learning

End of Project report,

July 2024



Students from a participating school tour a solar car at Durham University, June 2024

Green Futures – STEM Learning

Project Summary

Funder: STEM Learning

Partner: Durham University Energy Institute

Aim: To enable Year 5 children within 5 County Durham Primary schools in disadvantaged areas to appreciate how STEM, research and innovation into energy solutions is enabling humans to tackle climate change. Each school will investigate a different and locally relevant energy technology.

To enable STEM Ambassadors to visit schools and assist OASES with Green Futures delivery.

To facilitate the recruitment of STEM Ambassadors.

Outcomes:

- Learn about the challenges we are facing as a planet regarding climate change.
- Investigate new and improving solutions.
- Share this information with the wider school and community by producing informative films.



Project Description

The project has impacted children within the 5 County Durham schools located within areas of high deprivation. The Year 5 children in each school were the direct recipients (approximately 120 children), but their resultant films will enable the project's influence to extend into their whole school communities. The schools were selected on the basis that they had 45% or higher free school meals provision for pupils.

To ensure our work remained relevant to the context of the schools, the project lead worked with staff from Durham Universities Energy Institute. Before the commencement of the project discussions between Lynn Gibson (Institute Manager), Stuart Jones (Co-director), Kate Webb (Admin Apprentice) and Patrick Randall (Student Ambassador) took place to select 5 locally relevant technologies. From their expertise staff identified:

- Solar Energy
- Wind Energy
- Geothermal (Minewater specifically)
- Hydrogen
- Carbon Capture and Storage

Schools were recruited through attendance at a virtual Primary Science Conference, as well as through OASES social media. We had 10 schools apply to take part. The 5 schools selected best fit the criteria laid out above.

OASES worked with staff and students from the Durham Energy Institute to design relevant and interesting sessions for each school, with a specific focus on session 2, where the school begins to focus upon their energy technology. The assistance from the Institute was invaluable in making the sessions active and experimental in a classroom environment, especially in terms of understanding how each technology works.

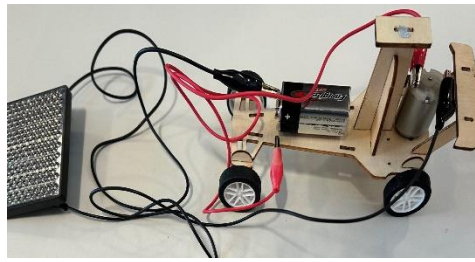
Each school received a **set up meeting** with the class teacher, head teacher and OASES officer to explain the project requirements and to decide upon which technology they thought would interest their students the most.

Session 1 – Understanding Climate Change

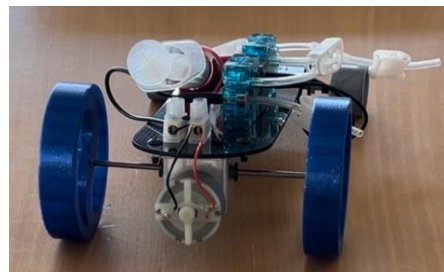
The first sessions took place in March 2024, focussing on what climate change is, what the causes of climate change are, common misconceptions and what solutions we are starting to use. During this session the children and teachers were surveyed to discover their baseline knowledge.

Session 2 – Renewable Technologies

The second sessions consisted of a sustainable energy workshop targeted at each school's identified energy technology. 5 new workshops were created with help from the DEI, one for each renewable technology:



- Solar Energy – Explored what a solar panel uses to generate electricity for homes and the national grid, pointing out key misconceptions. Furthermore, it looked at what we could be using solar power for in the future. The active investigation involved constructing a solar car - problem solving the limits of solar power and looking at how we could improve this with the use of batteries.
- Wind Energy – This workshop looked specifically at how wind turbines are designed and the complexity of a seemingly simple design. Pupils constructed their own turbines using K'nex and attached motors and blades to their towers. Groups had to problem solve unstable towers, blade shape, balance and angle to achieve a functioning turbine that generated the maximum amount of energy using the given components.
- Geothermal (Minewater specifically) – Beginning with the concept of heat exchange, students investigated how heat energy moves towards equilibrium. Students did this by using the endothermic reaction created when mixing ice and rock salt to freeze oat milk and sugar to create ice cream. The students then investigated the structure of the earth and were asked to consider how we could use the heat generated by the core. Historical maps were used to identify local collieries and students applied the same heat exchange and heat of the core knowledge to the heat of the shafts and heat of water to generate steam and turn a turbine.



- Hydrogen – Students investigated one of the biggest and most apparent causes of climate change – the release of CO₂ using Diesel and Petrol transport – and looked at possible clean alternatives. Hydrogen was identified as being abundant and non-polluting. Pupils used Hydrogen fuel cells, wiring, 3D printed cars and Hydrogen gas to power alternative vehicle models.
- Carbon Capture and Storage – This topic was slightly different to the others as it looked at how we can help with the CO₂ already released into our atmosphere. Pupils first appreciated the carbon cycle, acting as carbon atoms they travelled through the cycle using passports, the students then repeated the activity adjusted for the influence of humans. Pupils created their own Carbon Capture systems using vinegar, Bicarb and balloons. They then had to figure out how to transport their captured carbon using pipelines and finally where we could store this Carbon in underground rock.

Session 3 – Knowledge Sharing

The third sessions enabled the pupils to complete targeted research of their energy technology. During this session they also started to write their scripts. Pupils worked in groups of 4-6 to investigate: where locally the technology is being used/developed, what jobs are being created as a result, what qualification might be needed to do those jobs and any other interesting facts. The results of the research were then turned into scripts for their films, written by the pupils.

Session 4 - Filming

Session four was when the students filmed their completed scripts and completed the baseline survey, once again, to assess progress. Below are some images of the fabulous films they created using green screen technology:

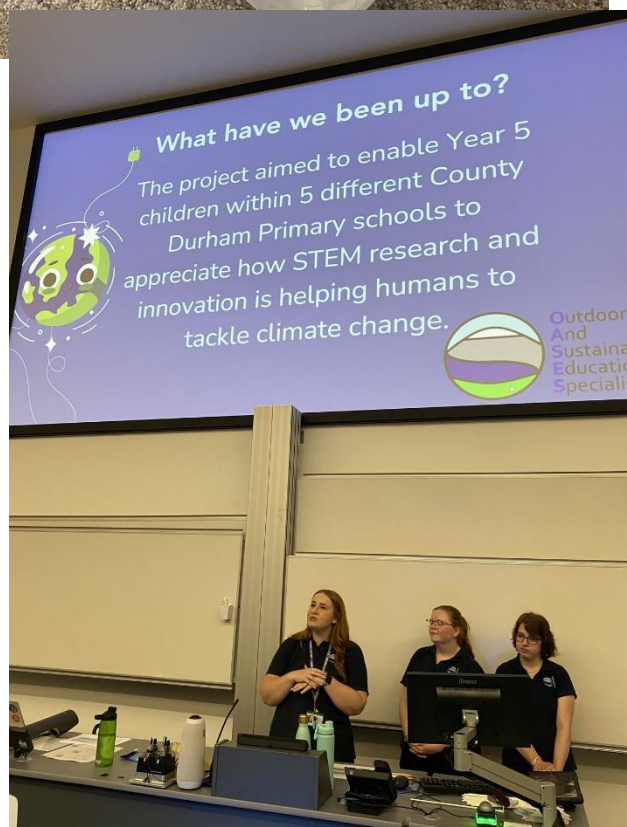


Celebration Event at Durham University

As part of the project, all 5 of the participating schools were invited to attend an experience and celebration day at Durham University. This was organised by the Project Lead and Durham University Staff and took place in June 2024. The day was split into two halves. Schools spent a half-day session touring some of the labs at Durham University, including the Solar Car, SmartGrids, The Clean Room, Rocks Room and the Wind tunnel. These tours and the workshop content were delivered by Durham university professors and students, all of whom were/ were made aware of STEM Learning and the Ambassador programme.



The second part of the celebration day consisted of an OASES Floating Wind Turbine Workshop, where children created and tested turbines.



Finally, at the end of the day, the schools watched their edited videos for the first time and Durham University and OASES staff voted for the best videos.

- 1st Prize Willington Primary School
- 2nd Prize Prince Bishop Primary School
- 3rd Prize Laurel Avenue Primary School

Schools are now sharing the completed films via social media and at their end of year assemblies.

Schools involved:

- Willington Primary School
- Prince Bishop Primary School
- Laurel Avenue Primary School

Project Finances

STEM Learning provided £15,000 of funding for the project.

This was spent on:

- Project delivery (staff costs)
- Session equipment costs
- Bus Cost for University Day
- Packed Lunch for University Day
- Prizes for film production

Project Evaluation

The project was popular from the start with 10 schools wanting to take part! The resulting 5 schools engaged 119 pupils and created 20 films to distribute to the wider community.

We had good verbal feedback from the children; all of them enjoying the workshops and learning something new about energy technology. They also all enjoyed the process of filming their videos. Verbal feedback from children after the university visit also suggested that more pupils, who identified as female, were now interested in careers like engineering and scientific research.

Pupil Quotes:

'I enjoyed filming the Carbon Capture Report'

'It was really fun I got to learn what I didn't know about CO₂'

'[I learned] That we need to respect our world.'

Teacher Quotes:

'I was initially concerned that the context and understanding of the technology would prove difficult for the cohort, however, due to the excellent delivery and [OASES Project Officer] ability to include all children (especially neurodivergent/SEND) this was not an issue. The children have been motivated, inspired and exited by the project. I was so impressed with their videos. Thank you!' – Laurel Avenue

'sessions were enjoyable, informative and very well prepared' – Prince Bishops Primary

'Children are more aware of sustainable energy and how important it is. As a school we will continue to embed this learning and share knowledge' St Wilfrid's Primary

'[the most useful part was] the discussion on different topics and the work looking at different types of STEM careers..... We will carry on building children's knowledge on climate change and explore future energy sources.' St Francis Primary

Impact Statistics

Number of pupils: 119

Teaching/school staff: 14 (class teachers and teaching assistants)

Number of Durham University staff directly involved: 8 (including those who volunteered their time to escort schools during the university visit).

Number of University Students engaged: 7 (4 helping create sessions, 1 attending some sessions, 2 volunteers during university visit).

The project was advertised through STEM Learning but sadly no STEM Learning Ambassadors took up the opportunity to be involved.

Survey Analysis

The below analysis is a result of the baseline survey completed the 1st and 4th sessions. The survey was developed by STEM Learning and focused on the children's knowledge of STEM, attitudes towards the STEM industry and attitudes towards STEM Jobs. Analysis is still ongoing, but the more children answering questions with 'yes' on the baseline survey the more receptive to STEM careers a child is, for example:

When I grow up, I could get a job doing science, design and technology, engineering, maths or computing.

- ☐ Yes
- ☐ No
- ☐ I don't know

Comparing the results of the surveys the total number of 'yes' answers has increased from 555 to 696 showing the positive impact of the project. The table below shows the project has had a positive impact across all five schools (each line is a new school). Furthermore, with this survey being completed before the University visit, this number is now likely to have increased.

Pre intervention	Yes	% of Total Answers	Post Intervention	Yes	% of Total Answers
	135	68%		167	84%
	142	76%		145	77%
	123	59%		95	70%
	146	65%		180	80%
	93	74%		109	81%

Schools will be surveyed a year on to understand the longer-term impact of the programme.

THANK YOU

For more information about OASES please:

visit: www.oasesnortheast.org.uk

Email: info@oases.org.uk

Phone: 03000 260535