ST RONAN'S COLLEGE

Annita Jain

GEO-TOPICS

Background

After attending the Geo Topics last year, I went away feeling fully inspired and determined to implement a new decision making / fieldwork exercise into our KS3 scheme.

At the same time, we were planning a KS4 trip to Iceland and I was excited about all the sites we had planned to visit.

Year 10 - Tectonics

One of the first topics we teach in Year 10 is tectonics. We begin by looking at rocks. Unfortunate question……

This planted the idea of fieldwork within this topic, but I needed ideas. So, I rang Paul.

We had just come back from Iceland and of course buzzing about all the geothermal power and volcanic activity.

Paul made a link with Robert Raine at the British Geological Survey in Belfast and a zoom was set up.

Robert told me about the Geo Discovery Centre and so I went looking….

Rocking Geothermal Roadshow

- The GeoEnergy Discovery Centre, based at Stormont, is a key part of the GeoEnergy NI project being delivered by the Department of the Economy, with scientific support from the Geological Survey of Northern Ireland (GSNI).

- Its aim is to let pupils explore the geothermal potential of Northern and how it can be used to contribute to net zero by 2050 and security of supply.

- Pupils get the opportunity to handle rocks from below the Earth's surface, be transported 250 metres underground using VR headsets and discover their depth of knowledge solving puzzles from the activity book.

Pupils loved the roadshow and how interactive it was.
Rocks took on a different meaning.


The GeoEnergy NI study at the Stormont Estate will focus on shallow geothermal. This will involve the drilling and testing of five boreholes; four boreholes to 250 metres and one borehole to 500 metres depth.
At the CAFRE Greenmount Campus near Antrim, the project will explore deep geothermal energy, identifying potential target depths for future drilling and suitable heat recovery systems which can be used in the local area.
Let's imagine how deep these boreholes are!
BOREHOLE DEPTHS
250m
500m
2km
GEOENERGY NI DISCOVERY CENTRE
DID YOU KNOW?



WHAT IS GEOTHERMAL ENERGY?
HOW LOW WILL WE GO?
GEOENERGY NI DISCOVERY CENTRE
Department for the Economy
www.economy-ni.gov.uk
GEO ENERGY NI

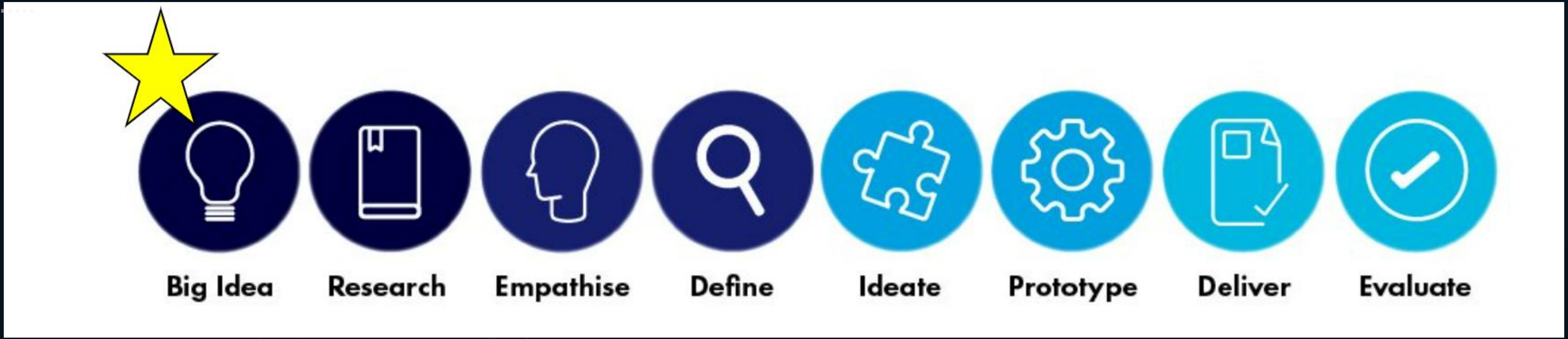
Taking it further

The Geothermal bus was fantastic, and the pupils enjoyed the interactive, hands-on approach.

I wanted to take this further and make it real. This is where PBL and Dr Kirstin Lemon (GSNI) came together.

What is GSNI (Geological Survey Northern Ireland)?

- **The GSNI is part of the [Department for the Economy Northern Ireland (DfE)](). It is staffed by scientists of the [British Geological Survey]() (BGS)**
- **The Geological Survey of Northern Ireland (GSNI) provides geoscience information and services to inform decision making.**
- **GSNI maps, models and monitors the ground we live on. Our geological research underpins decision making, promotes economic development and generates baseline data for environmental management.**



What is Project Based Learning? (PBL)

- PBL is entirely different to a traditional classroom experience
- Pupils work on a project over a period of time that engages them in solving a complex problem or question.

Why PBL?

Skills in demand

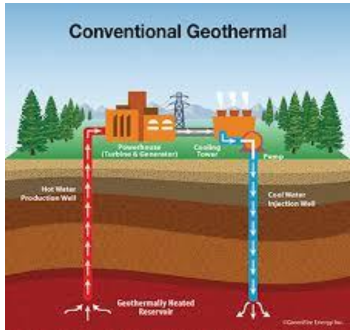
*"In a world where many of the career options available to the children we currently teach may not even exist yet, it is these important skills acquired through **Project Based Learning** that set them up to be successful in life beyond school."*

NI Skills barometer

The project.

- Currently GSNI are conducting research at deep Geothermal to prove that in Northern Ireland, particularly Co Antrim, there is enough heat deep under the ground for us to use at district level to heat. This will ultimately help in decarbonising Northern Ireland.
- The project GSNI put together was scenario based.

3 ingredients



The Project (PBL)

The project outline.

- Dr Lemon introduced herself and her role within The Geological Survey of Northern Ireland (GSNI):

    When it was established, the GSNI facilities, what work the GSNI does and the natural resources they look after.

    Decarbonsation targets, one of these being, Net-zero greenhouse gas emissions by 2050.

Geothermal energy – non volcanic areas.

Pupils examined how lower temperatures beneath the earth can still be harnessed to provide to heat our homes, workplaces, leisure facilities and to replace fossil fuels in heat intensive industrial and agricultural processes.

The pupils were given briefing on Geothermal systems (this was also in the resource pack)

Geothermal systems

Shallow geothermal systems (2 – 500m)

- Horizonal or vertical closed loop
- Shallow aquifer open loop
- Mine water energy

(10 – 20 degrees Celsius)

Deep geothermal systems (> 500m)

- Hot sedimentary aquifers
- Hot dry rocks

(30 to 100 degrees Celsius)

Task 1

Using the information on the shallow and deep geothermal systems, as well as additional resources, carry out the following

- Identify which geothermal system and location should be used for each of the three geothermal projects

Social housing development located in Co. Armagh.

Large-scale heated greenhouse system for sustainable agriculture.

Electricity power plant to support one of NI's cities.

- There will be more than one answer and location identified. Pupils must justify their location and geothermal system using the additional resources.

Additional resources:

- Aquifer information sheet
- Rock properties
- Simplified bedrock geology
- Thermal conductivity map
- Aquifers for open loop systems
- Mining districts of Nothern Ireland
- Temperatures at depth
- Borehole logs from Antrim, Belfast, Lurgan, Derry, Enniskillen and Newry
- Information on geothermal systems
- Map of Northern Ireland

Group work

In small groups the pupils worked through each scenario using the information from the PowerPoint and the maps included in the resource pack.

We were also very fortunate that 3 undergrads studying Geography at the UU came down to help. Each group had an advisor.

For each scenario the group would decide on a geothermal system and put it on the task sheet, they would also highlight any negatives that the geothermal system may have for that project. For example, if they chose Newry as the city for power plant as it had a lot of granite rock, they would also identify that it was in an area of outstanding natural beauty, and this may prevent it from being accepted.

Each group completed a simple table justifying their reasons for the geothermal system and location.

Task 1.

Location	Geothermal System	Location	Justification
Social housing development located in Co. Armagh			
Large-scale heated greenhouse system for sustainable agriculture			
Electricity power plant to support one on NI's cities			

Task 2

Only one project will be funded. Pupils in each group must decide which one should go forward and explain why.

Pupils had to look at the 3 scenarios and make a team decision as to which project had the least negatives and the best chance of being funded.

Task 2.

Only **one project** will be funded so decide **which one should go forward and explain why.**

From the 3 projects that you have looked at, decide as a group which project has the best chance of being funded. Which project has less negatives or issues.

Justify your reasons for choosing this project.

Project going forward	Reasons

How did it go?

The pupils enjoyed learning about rocks in a different context and relating it to something real.

They worked well with all the resources to suggest a suitable geothermal system for each scenario, and all consider the pros and cons of each

They were then able to decide as a group which project had the best chance of being funded. With all the groups deciding on scenario 3 but in a few different areas.

Evaluating the project.

- I would consider completing the project as a half day exercise or if your classes were within a few days of each other.
- I found that there was quite a lot of information and having 1 week between the classes the pupils took a while to get back into it.
- It could be simplified especially for this age group by creating a table or flow chart when they were working through each geothermal system for each scenario.
- Putting the 4 maps on one A3 page would be easier than having multiple maps.
- The thermal conductivity map could be different colours to avoid confusion.

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Dr Kirstin Lemon (BGS)

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