Bright Green Hydrogen
STEAM Progression Pathway

Helping your school demonstrate a framework for STEAM learning across all primary years.

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STEAM Progression Pathway
Framework Overview

This plan presents a template for primary schools to implement STEAM workshops at every year group delivered by Bright Green Hydrogen. This allows a natural succession of learning as a pupil progresses from Primary 1 all the way up the school until P7, and also avoids repetition of content in successive years. These workshops focus on renewable energy, which has many applications within STEAM. We are an operational renewable energy demonstration centre based in Methil, specialising in renewables and energy storage, and have continue to deliver our education programmes for the last 9 years.

P1	P2	P3	P4	P5	P6	P7
What makes things work?	**Clean vs Dirty Energy**	**Exploring Hydropower**	**Exploring Solar Power**	**WoW – Recyclable Racers**	**Exploring Wind Power**	**Exploring Energy Storage**
45 mins	45 mins	1.5 hours	1.5 hours	1.5 hours	1.5 hours	1.5 hours

These workshops can be delivered at any time of year to suit your school's learning and complement class topics. The 1.5 hour workshops are designed to fit in with the 3 sections of the school timetable. By following this structure, we are providing a ready-made progression pathway that can bring structure to STEAM learning in your school. We appreciate that some schools will have composite classes. The above template is a sample model and can be adapted as such to create a bespoke delivery plan to suit your school's composition.

The above model could be implemented into a primary school for as little as £750 (excl VAT) per year.

Our workshops:

- Practical activity based
- Hands-on learning
- Renewable energy focused
- STEAM linked
- Interactive kits & K'nex kits
- Curriculum for Excellence linked
- DYW/WoW linked
- Skills based – team work, problem solving

Workshop Descriptors

Our education team with turn up on the day with everything we need to run the workshops, so you don't need to collect any resources before our visit. Sometimes we encourage class participation in gathering recycled materials for some of our deliveries, but we'll all discuss this with you first.

Primary 1 – What makes things work?

Pupils will learn more about how things work and where the energy comes from to allow everyday objects to function. Through discussion and interactives, the pupils will gain an understanding of power, heating and transport and the role these play.

Primary 2 – Clean vs Dirty Energy

Using a PowerPoint with quiz features, the pupils will be asked to look at different types on energy and decide whether these are clean or dirty. This can be identified through asking questions, from listening and from looking. Following on from primary 1, this will allow the pupils to consider different sources of power, heat and transport and whether these are good or bad for the planet.

Primary 3 – Exploring Hydropower

Building on their knowledge of clean and dirty energy, the pupils will have the chance to investigate hydropower as their first clean energy study. After a brief explanation of how a hydroelectric dam works, the class will work in groups to complete a matching challenge using an annotated diagram of a hydropower system. Once familiar with the workings, the pupils begin a practical activity that involves making water wheels out of recycled and upcycled materials. The variety of materials on offer will encourage the groups to problem solve and make decisions on what will work best for their model. Water wheels can be tested in classroom sinks to look at the design success and speed. Demonstration models capable of generating electricity can also be incorporated for learning.

Primary 4 – Exploring Solar

Pupils can now move on to explore a second clean energy in the form of solar power. The class will be challenged to think of applications of solar panels and are helped to identify the key characteristics. The benefits and disadvantages of solar power will also be highlighted along with news stories from around the world. Using simple circuit kits, groups will be able to connect up solar panels to different output types to help understand the concept of electricity generation and flow. With the K'nex kits, the class will then be able to investigate different solar models, trace the path of energy transfer and optimise their designs.

Primary 5 – World of Work with Recycled Racers

Moving the conversation onto the World of Work, Primary 5's will be able to find out more about Bright Green Hydrogen, where we're based and what we do. Through discussion and questions, the pupils will find out about the different roles in our business and our career paths. Linking Bright Green Hydrogen's involvement with sustainable transport into a classroom setting, groups will be challenged to create a self-propelling recycled racer using materials commonly found around the home or classroom. This develops the pupils' problem solving, communication and team work skills, as well as raising their awareness to good environmental practise.

Primary 6 – Exploring Wind Power

Looking at a key component of Bright Green Hydrogen's project, the Primary 6's will explore wind power and find out more about our wind turbine Poppy. The pupils will be asked to consider various aspects of wind turbines and feedback as a class. Working in small teams, the pupils will then be challenged to construct a wind turbine design of their choosing and to build a model that will spin in the correct direction and fast enough to light an LED motor. These miniature models give a clear demonstration of how wind can be used to generate electricity and put the pupils' thinking to the test. K'nex models can also be incorporated for learning.

Primary 7 – Exploring Energy Storage through Hydrogen

To complete the pupils' learning, the last session of the framework will look at the one downside of renewables; intermittency. By being introduced to the concept of energy storage, the pupils will learn how this can be used as a solution. As the main technology used by Bright Green Hydrogen, the class will focus on hydrogen energy storage and incorporate this learning into a practical activity. The task will be to generate enough hydrogen to propel a fan using the provided fuel cell kits. This kit will form an engine which will be used in the fuel cell boat challenge. Investigating buoyancy, balance and depth, groups will design and build their own fuel cell boats that need to avoid sinking and move using the stored hydrogen.

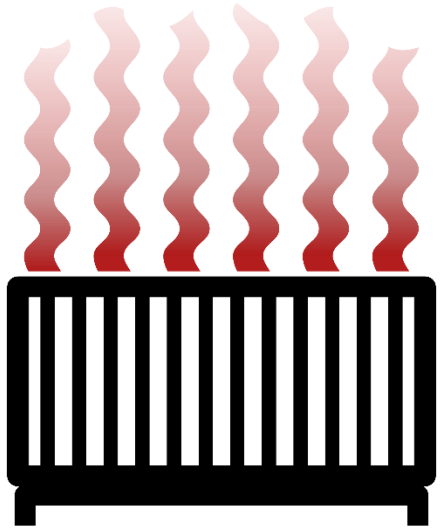
P1 What makes things work?

Key Curriculum Outcomes

1. I have experienced, used and described a wide range of common appliances. I can say “what makes it go” and say what they do when they work. **SCN 0-04a**
2. I am aware of different types of energy around me and can show their importance to everyday life and my survival. **SCN 1-04a**
3. I enjoy playing with and exploring technologies to discover what they can do and how they can help us **TCH 0-01a**

Also Covers

- Within and beyond my place of learning, I can reduce, reuse and recycle resources I use, to help care for the environment **TCH 0-02a**
- By exploring and using technologies in the wider world, I can consider the ways in which they help **TCH 1-01a**
- Throughout all my learning, I take appropriate action to ensure conservation of materials and resources, considering the impact of my actions on the environment. **TCH 1-02a**
- I can consider ways of looking after my school or community and can encourage others to care for their environment **SOC 1-08a**



P2 Clean vs Dirty Energy

Key Curriculum Outcomes

1. I have experienced, used and described a wide range of common appliances. I can say “what makes it go” and say what they do when they work. **SCN 0-04a**
2. I am aware of different types of energy around me and can show their importance to everyday life and my survival. **SCN 1-04a**
3. I enjoy playing with and exploring technologies to discover what they can do and how they can help us **TCH 0-01a**
4. Within and beyond my place of learning, I can reduce, reuse and recycle resources I use, to help care for the environment **TCH 0-02a**
5. I can consider ways of looking after my school or community and can encourage others to care for their environment **SOC 1-08a**

Also Covers

- By exploring and using technologies in the wider world, I can consider the ways in which they help **TCH 1-01a**
- Throughout all my learning, I take appropriate action to ensure conservation of materials and resources, considering the impact of my actions on the environment. **TCH 1-02a**
- By exploring climate zones around the world, I can compare and describe how climate affects living things. **SOC 1-12b**

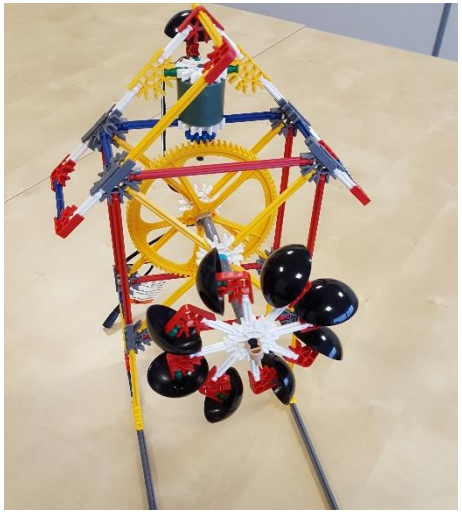
P3 Exploring Hydropower

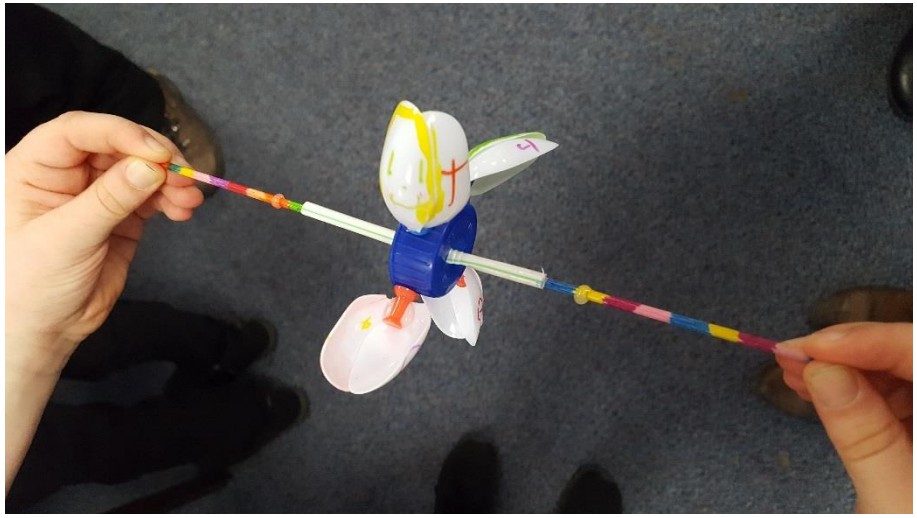
Key Curriculum Outcomes

1. I enjoy playing with and exploring technologies to discover what they can do and how they can help us **TCH 0-01a**
2. Through discovery, natural curiosity and imagination, I explore ways to construct models or solve problems **TCH 0-14a**
3. I can work with others to generate, discuss and develop imaginative ideas to create a product of the future **TCH 1-01b**
4. Having evaluated my work, I can adapt and improve, where appropriate, through trial and error or by using feedback **TCH 1-14b**
5. When exploring technologies in the world around me, I can use what I learn to help design or improve my ideas or products **TCH 2-01a**

Also Covers

- By investigating forces on toys and other objects, I can predict the effect on the shape or motion of objects. **SCN 1-07a**
- Through exploring properties and sources of materials, I can choose appropriate materials to solve practical challenges. **SCN 1-15a**
- Throughout all my learning, I take appropriate action to ensure conservation of materials and resources, considering the impact of my actions on the environment **TCH 1-02a**
- During practical activities and design challenges. I can estimate and measure using appropriate instruments and units **TCH 1-13a**
- Through discovery and imagination, I can develop and use problem-solving strategies to construct models **TCH 1-14a**
- Having analysed how lifestyle can impact on the environment and Earth's resources, I can make suggestions about how to live in a more sustainable way **TCH 2-02a**





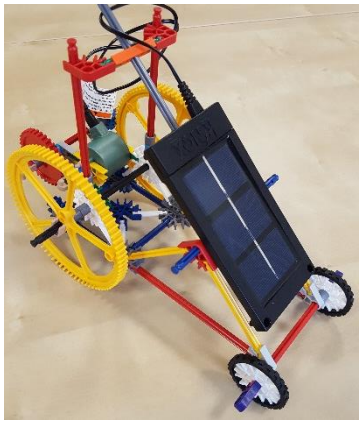
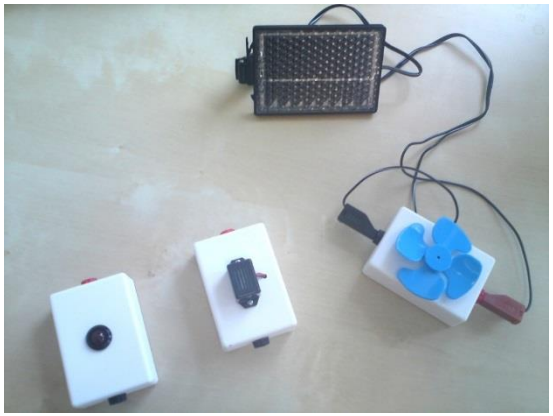
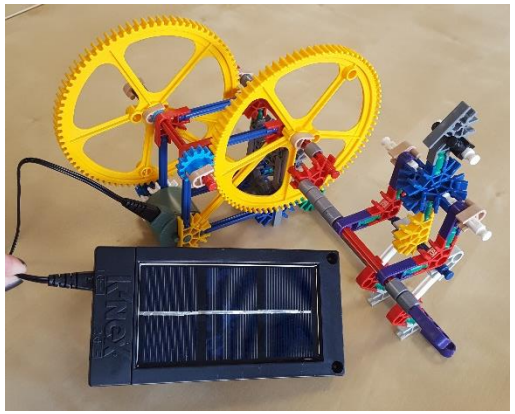
P4 Exploring Solar Power

Key Curriculum Outcomes

1. I can work with others to generate, discuss and develop imaginative ideas to create a product of the future **TCH 1-01b**
2. When exploring technologies in the world around me, I can use what I learn to help design or improve my ideas or products **TCH 2-01a**
3. Having analysed how lifestyle can impact on the environment and Earth's resources, I can make suggestions about how to live in a more sustainable way **TCH 2-02a**
4. I can describe an electrical circuit as a continuous loop of conducting materials. I can combine simple components in a series circuit to make a game or model. **SCN 1-09a**
5. By investigating renewable energy sources and taking part in practical activities to harness them, I can discuss their benefits and potential problems. **SCN 3-04b**

Also Covers

- By exploring and using technologies in the wider world, I can consider the ways in which they help **TCH 1-01a**
- I explore materials, tools and software to discover what they can do and how I can use them to solve problems and construct 3D objects which may have moving parts **TCH 1-12a**
- Through discovery and imagination, I can develop and use problem-solving strategies to construct models **TCH 1-14a**
- I can investigate the use and development of renewable and sustainable energy to gain an awareness on their growing importance in Scotland or beyond **TCH 2-02b**
- I can discuss the environmental impact of human activity and suggest ways in which we can live in a more environmentally-responsible way **SOC 2-08a**

P5 WoW – Recyclable Racers

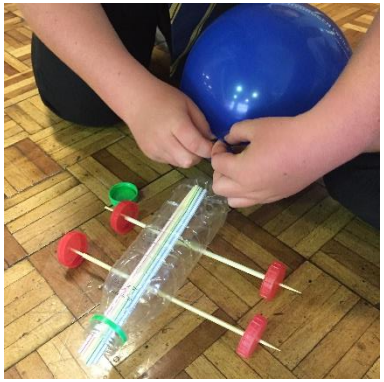
Key Curriculum Outcomes

1. I have experienced the different jobs involved in running a business enterprise and understand the role each one plays in its success. **SOC 1-22a**
2. Having explored the ways journeys can be made, I can consider the advantages and disadvantages of different forms of transport, discussing their impact on the environment. **SOC 2-09a**
3. Having analysed how lifestyle can impact on the environment and Earth's resources, I can make suggestions about how to live in a more sustainable way **TCH 2-02a**
4. By applying my knowledge and skills of science and mathematics, I can engineer 3D objects which demonstrate strengthening, energy transfer and movement **TCH 2-12a**
5. By investigating how friction, including air resistance, affects motion, I can suggest ways to improve efficiency in moving objects. **SCN 2-07a**

Also Covers

- By considering examples where energy is conserved, I can identify the energy source, how it is transferred and ways of reducing wasted energy. **SCN 2-04a**
- I explore materials, tools and software to discover what they can do and how I can use them to solve problems and construct 3D objects which may have moving parts **TCH 1-12a**
- Throughout all my learning, I take appropriate action to ensure conservation of materials and resources, considering the impact of my actions on the environment. **TCH 1-02a**
- Through discovery and imagination, I can develop and use problem-solving strategies to construct models **TCH 1-14a, TCH 2-14a**
- By using problem-solving strategies and showing creativity in a design challenge, I can plan, develop, organise and evaluate the production of items which meet needs at home or in the world of work **TCH 3-14a**





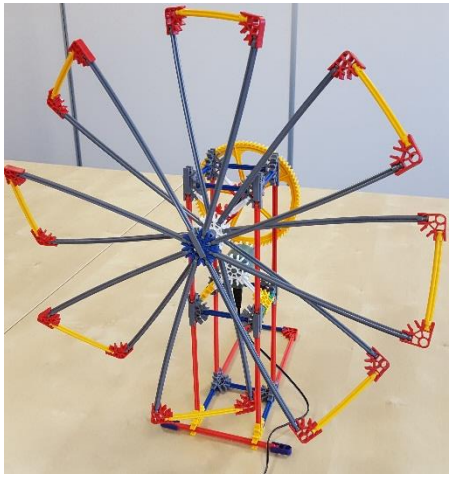
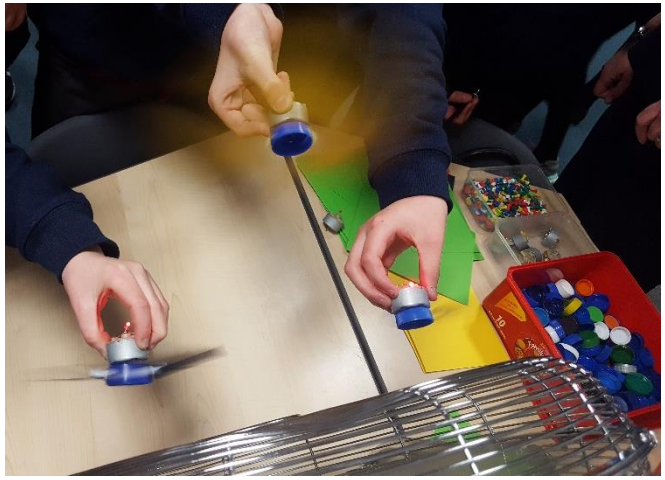
P6 Exploring Wind Power

Key Curriculum Outcomes

1. By investigating renewable energy sources and taking part in practical activities to harness them, I can discuss their benefits and potential problems. **SCN 3-04b**
2. When exploring technologies in the world around me, I can use what I learn to help design or improve my ideas or products **TCH 2-01a**
3. I can investigate how an everyday product has changed over time to gain an awareness of the link between scientific and technological developments **TCH 2-01b**
4. I can investigate the use and development of renewable and sustainable energy to gain an awareness on their growing importance in Scotland or beyond **TCH 2-02b**
5. By applying my knowledge and skills of science and mathematics, I can engineer 3D objects which demonstrate strengthening, energy transfer and movement **TCH 2-12a, TCH 3-12a**

Also Covers

- Through exploring properties and sources of materials, I can choose appropriate materials to solve practical challenges. **SCN 1-15a**
- During practical activities and design challenges. I can estimate and measure using appropriate instruments and units **TCH 1-13a, TCH 2-13a**
- Through discovery and imagination, I can develop and use problem-solving strategies to construct models **TCH 1-14a, TCH 2-14a**
- Having evaluated my work, I can adapt and improve, where appropriate, through trial and error or by using feedback **TCH 1-14b, TCH 2-14b**
- Having analysed how lifestyle can impact on the environment and Earth's resources, I can make suggestions about how to live in a more sustainable way **TCH 2-02a**


P7 Exploring Energy Storage

Key Curriculum Outcomes

1. By considering examples where energy is conserved, I can identify the energy source, how it is transferred and ways of reducing wasted energy. **SCN 2-04a**
2. By investigating floating and sinking of objects in water, I can apply my understanding of buoyancy to solve a practical challenge. **SCN 2-08b**
3. By investigating renewable energy sources and taking part in practical activities to harness them, I can discuss their benefits and potential problems. **SCN 3-04b**
4. During practical activities and design challenges. I can estimate and measure using appropriate instruments and units **TCH 1-13a, TCH 2-13a**
5. I can investigate the use and development of renewable and sustainable energy to gain an awareness on their growing importance in Scotland or beyond **TCH 2-02b**

Also Covers

- I can work with others to generate, discuss and develop imaginative ideas to create a product of the future **TCH 1-01b**
- When exploring technologies in the world around me, I can use what I learn to help design or improve my ideas or products **TCH 2-01a**
- By applying my knowledge and skills of science and mathematics, I can engineer 3D objects which demonstrate strengthening, energy transfer and movement **TCH 2-12a, TCH 3-12a**
- By using problem-solving strategies and showing creativity in a design challenge, I can plan, develop, organise and evaluate the production of items which meet needs at home or in the world of work **TCH 3-14a**
- I can identify the possible consequences of an environmental issue and make informed suggestions about ways to manage the impact **SOC 3-08a**