A Bat-Tastic Journey

Bats are the theme of this unit of work and which is aimed towards pupils in Secondary school education as part of their CfE 3rd / 4th level broad general education and developed in partnership with various external enterprises. The contextual theme for the unit is based around an authentic scenario of bats; the protection of them and their habitats; environmental impacts; bat roost construction; and outdoor learning.

Presenting the unit within an authentic context is derived from Situated Learning theory, where authenticity brings a coherent, personally meaningful and purpose to the unit of work whilst set within a social framework. This will promote pupils motivation, interest, engagement and cognitive learning.

Along with fulfilling the CfE needs of learners, this unit of work is intended to be presented and possibly adopted for use by the project partners, these include: Forest Research, Forestry Commission Scotland, Forest Engineering Group and the Ellen MacArthur Foundation. These partners will contribute to the creation of the authentic context setting that will engage and motivate the learners involved.

Together the Technologies, Sciences and Social Studies will combine to form an interdisciplinary unit of work that will break down boundaries across curriculum areas and allow pupils to draw links between them. This cohesive method of learning will develop pupils with holistic knowledge & understanding and enrich the learning that it brings to them. The main learning intentions of this unit are set to focus on aspects that will develop pupils understanding of environmental sustainability, including the Circular Economy and upcycling; Global Citizenship; recognition of unit specific knowledge of a bat's environment, biological requirements, habitats and civilisation influence. These learnings will develop further into the unit and shall influence the Big Task/Creative Practical Task activity, where pupils will be set a challenge of helping protect bats. This will be carried out through fulfilling the need of the Forestry Commission for bat boxes to made that are suitable for roosting. The Forestry Commission will act as the client, where a Design Specifications must be met. Points include, the box should be wind and water tight and have a suitable entry size for the intended bat species. There is also to be a deadline for box completion, so as so bring the responsibility of real world scenario to the challenge. On completion of the challenge, a field trip is to be carried out to a local forest and the pupil's bat boxes are to be mounted for bat habitation. This final example, where pupils see their boxes installed will instil them with a sense of pride, joy and achievement.

Structuring the unit of work in this way create a truly memorable experience for all pupils and meet the requirements set out within CfE documentation and contributing towards pupils becoming Confident Individuals, Effective Contributors, Successful Learners and Responsible Citizens.

Technologies Experiences & Outcomes

TCH 4-02a
I can examine a range of materials, processes or designs in my local community to consider and discuss their environmental, social and economic impact, discussing the possible lifetime cost to the environment in Scotland or beyond.

TCH 4-03b
I can use ICT effectively in different learning contexts across the curriculum to access, select and present relevant information in a range of tasks.

TCH 4-10a
I can confidently apply preparation techniques and processes to make items using specialist skills, materials, equipment or software in my place of learning, at home or in the world of work.

TCH 4-13a
I can confidently apply preparation techniques and processes to manufacture items using specialist skills, materials, tools and software in my place of learning, at home or in the world of work.

TCH 3-13b
I can practise and apply a range of preparation techniques and processes to manufacture a variety of items in wood, metal, plastic or other material, showing imagination and creativity, and recognising the need to conserve resources.

TCH 4-15d
I can understand and use computer aided design/computer aided manufacture, exploring its applications.

Other Experiences & Outcomes

SCN 4-01a
I understand how animal and plant species depend on each other and how living things are adapted for survival. I can predict the impact of population growth and natural hazards on biodiversity.

SOC 3-10a
I can investigate the climate, physical features and living things of a natural environment different from my own and explain their interrelationship.

SOC 4-10a
I can develop my understanding of the interaction between humans and the environment by describing and assessing the impact of human activity on an area.

SOC 4-8a
I can discuss the sustainability of key natural resources and analyse the possible implications for human activity.

EXA 4-06a
By working through a design process in response to a design brief, I can develop and communicate imaginative and original design solutions.

LIT 3-09a
When listening and talking with others for different purposes, I can:
- communicate information, ideas or opinions
- explain processes, concepts or ideas
- identify issues raised, summarise findings or draw conclusions.

LIT 3-02a
When I engage with others, I can make a relevant contribution, encourage others to contribute and acknowledge that they have the right to hold a different opinion.
I can respond in ways appropriate to my role and use contributions to reflect on, clarify or adapt thinking.

MNU 3-07a
I can solve problems by carrying out calculations with a wide range of fractions, decimal fractions and percentages, using my answers to make comparisons and informed choices for real-life situations.

MNU 3-11a
I can solve practical problems by applying my knowledge of measure, choosing the appropriate units and degree of accuracy for the task and using a formula to calculate area or volume when required.

HWB 3-12a
Representing my class, school and/or wider community encourages my self-worth and confidence and allows me to contribute to and participate in society.

HWB 3-13a
Through contributing my views, time and talents, I play a part in bringing about positive change in my school and wider community.

HWB 3-19a
I am developing the skills and attributes which I will need for learning, life and work. I am gaining understanding of the relevance of my current learning to future opportunities. This is helping me to make informed choices about my life and learning.

HWB 3-25a
I am experiencing enjoyment and achievement on a daily basis by taking part in different kinds of energetic physical activities of my choosing, including sport and opportunities for outdoor learning, available at my place of learning and in the wider community.

Small Task Activities

Teaching Strategy

Stage 1 - Sciences (2-3 Lessons)

Aim - Why learn about bats, their environment and habitats

- Pupils will be learning about why bats are a protected species by law and why it is important to protect them.
- Pupils will discover more about a bat's natural environment, the types of habitats suited to them and how this is being affected by civilisation.
- Investigate the types of species local to their area (ST).
- A final learning experience pupils will encounter is that of how a bat hunts, using echolocation, and practical experimentation into this (ST).

Stage 2 - Social Studies (1 Lesson)

Aim - Developing an appreciation of wildlife protection & interests of partners.

- Pupils will learn about the protection of wildlife and specific attention to bats; legislation protecting them and what can be done to help them thrive.
- Learning about:
  - The Ellen MacArthur Foundation and its vision of a Circular Economy;
  - Forestry Engineering Group and how it uses wood as a building material, example showing the Far Moor stress laminated arch bridge;
  - Forest Research supporting the development and interests of UK forestry, one such investigation is a means of mitigating climate change;
  - Forestry Commission – protection and expansion of forests areas and increasing their value to our society and the environment.
- Use of discussion groups to debate why bats or any animal needs to be protected and if pupils can make a quantifiable difference (ST).

Stage 3 - Technologies (1-2 Lessons)

Aims - Developing appreciation for sustainability, materials and their application.

- Global Citizenship and its influence on sustainability.
- Sustainability, Circular Economy.
- Upcycling by reusing old wooden pallets as material for bat box construction.
- Research different materials and innovative methods for upcycling (ST).



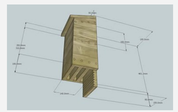
Big Task

Stage 4 - Technologies (3-4 Lessons)

Aim - Develop investigation, design and presentation skills

- Working from a Design Brief.
- Researching types of bat box and specific bat requirements.
- Design a bat box and associated wood cutting list.
- Design a bespoke image for laser etching.


Exemplars of bat box design and cutting list.



Presentation example using CAD

Stage 5 - Technologies (6-8 Lessons)

Aim - Developing practical craft skills and bat box construction

- Development of skills using both hand and automatic tools.
- Working from a design drawing.
- Working to a meet client completion date.
- Carry out self evaluation and appraisal of completed box.



Sample stages of bat box construction

Stage 6 - Technologies, Sciences & Social Studies (Field Trip)

Aim - Consolidate unit learning through an outdoor learning experience.

- Field trip, carried out in conjunction with the Forestry Commission.
- Learning outdoors to develop enquiry, critical thinking and reflecting skills.
- Pupils to have the opportunity to mount their box in the forest.
- Pupils given the opportunity to handle a bat.
- Specialist presentation given from Forestry Commission representative, with a Q&A session.


Field Trip

Small Task Activities - Stages 1-3

These proficiency tasks are intended to build the underpinning knowledge required to make informed decisions when pupils move on to the design of their bat box in the Big Task activity. The tasks are noted as (ST) within the stages.

Big Task Activity - Stages 4-5

Pupils are to conduct a research task that will allow them to design, build and evaluate their own bat box.

Design Decisions to be made by the pupils:
- Presentation of bat box design;
- The type of box to be made;
- The size and style of their box;
- Creation of an image for laser etching;
- Wood joining methods.

Future Development

Engineering Science class to design a camera / motion detection system that can be installed inside a bat box.

Sciences can further this conducting an observation analysis of bats

Project Partners

The Ellen MacArthur Foundation

Forestry Engineering Group

Forest Research

Forestry Commission

Technologies Evaluation Criteria

Pupils are to produce:

1. A bat box that is wind and water tight (joints should be within +/- 3mm tolerance).
2. Bat box to completion by set date.
3. A rendered sketch, orthographic drawing or CAD graphical representation of bat box design (finish should be correctly proportioned and dimensioned).
4. An accurate cutting list for their bat box.
5. Ability to create and implement a design for laser etching onto their box.

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IDL CfE BtC 1,3&4 OUTDOOR LEARNING BGE 3rd/4th LEVEL GLOBAL CITIZENSHIP

Supporting Resources:

Forestry Commission

Woodland Management for Bats

www.forestry.gov.uk

Bat Conservation Trust

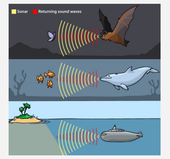
Amazing Bats / Bats Across Scotland / Encouraging Bats

www.bats.org.uk

Ask a Biologist

What is echolocation?

www.askabiologist.asu.edu/echolocation



Colchester Countryside Volunteer Rangers

Bird & Bug Box Page

http://www.highwoodsvolunteers.org.uk/bird,bug,box.html

Ellen MacArthur Foundation

Hierarchy of Waste

http://www.ellenmacarthurfoundation.org/schools/secondary-schools-resources

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PGDE 2014
Design & Technology