RED SQUIRREL FEEDER BOX

AN INTERDISCIPLINARY STEM UNIT OF WORK FOR S3 BGE

RATIONALE

This unit of work will enable the learners' to work as real life designers, manufacturing authentic and meaningful artefacts for real clients whilst taking inspiration from natural form. Learners will also gain confidence in developing their tool skills. All practical projects should incorporate these factors when they are designed. as they form the basis of how teachers assess and report on learners' performances. (Scottish Government, 2011). Scaffolding will be provided through the use of field trips, a detailed design brief, the Nuffield approach whereby The Small Tasks provide the learners' with the skills to undertake The Big Task and where necessary, direct teacher inputs (Barlex, 1998).

Interdisciplinary Learning

The main learning intentions of this unit is to develop learners' understanding of sustainability and meeting the design and manufacture challenge of a red squirrel feeder box for The Forestry Commission and RSST. This will be achieved through the interaction of different subject disciplines in order to achieve a common goal. According to Harvie the 'Curriculum for Excellence calls for learning to become more active and for interdisciplinary work to become more frequent in schools' (Harvie, 2012, p2). Therefore this unit of work is designed from the outset to be interdisciplinary with Design and Technology leading supported by the Biology and Geography.

According to the Scottish Government, Interdisciplinary Learning (IDL) has been proven to help increase learners' enthusiasm for content and instil the confidence to undertake challenges. Building the Curriculum 3 promotes IDL and the framework for planning a curriculum in which 'young people can explore areas of interest in depth' and 'can provide opportunities to extend and deepen understanding' (Scottish Government 2008, p36; SEEAG, 2012). Drake also identifies this type of learning as an effective way for learners' to experience real life working scenarios. Learners therefore can work collaboratively with other disciplines, share skills and solve complicated tasks whilst understanding is 'increased by connecting to the real world' (Drake, 1998, pp17-18).

Outdoor Learning

Outdoor learning can bring many benefits to learners' including increasing learners' awareness of the relationship between all the different curriculum areas (Scottish Government, 2010). Teachers, according to the Scottish Government should 'adopt approaches to learning which are active, creative, co-operative and collaborative' with outdoor learning deemed central to achieving this. The view is that these methods of learning are necessary if 'rich and transformative learning experiences relating to sustainability' are to be created (The Scottish Government, 2015, p15).

Outdoor learning according to Higgins and Nicol is grounded in constructivist pedagogy whereby learners are able to consolidate learning and build understanding more effectively outdoors (Higgins and Nicol, 2002). Two field trips are proposed which will help facilitate and inspire collaborative learning, an approach which is recommended by eminent educational theorists such as Bruner and Vygotsky (Bruner, 1977; Vygotsky, 1962).

The first trip will set the scene and introduce the learners to the clients their design brief and their explicit expectations. The learners will be informed about the Red Squirrel, its plight, habitat and discover its way of life in a changing world. Learners will discover how coniferous forests are managed so as to provide a sustainable supply of timber whilst simultaneously providing a habitat on which the red squirrels survival may depend. The second field trip will be carried out at the end of the unit of work and will consolidate all the learning of the unit. The learners will watch as their manufactured feeder boxes are attached to the coniferous trees which will give the red squirrels a source of food and instil the learners with a sense of pride, joy and achievement. Learners will also help to plant more trees for the forestry commission, thus doing their part for the circular economy and providing sustainable materials for the future.

Authentic Learning

This unit of work will employ authentic activities and tasks for the learners in accordance with the Wood Commission's quality assurance recommendations which state that 'Education Scotland must work more closely with business organisations and their members to ensure that their work is underpinned by an understanding of industry's needs and expectations' (Scottish Government, 2014, p11).

Building the Curriculum 4 also highlights skills for learning life and work and identifies 'the five core skills of communication, numeracy, problem solving, IT and working with others' (Scottish Government, 2009, p5). This unit of work is designed to fulfil all of these skills in order to prepare learners for future employment.

Petrina in addition to Higgins and Nichol highlight the importance of constructing units of work that are authentic and relatable for the learner in order to impart a sense of ownership, significance and purpose (Petrina, 2009; Higgins and Nichol, 2002). In order to achieve this learners will be working to a real design brief set by real life clients working to real deadlines and will have to present their final work to the Merchants of Edinburgh at a set date.

Learners will have to communicate with their peers in order to engage with the tasks, improve their own working and achieve success (Fox-Turnbull, 2012). Scaffolding will be provided through small tasks as the learners' seek to widen their design understanding and practical ability (Murphy and Hennessy, 1999). The unit will culminate in the big tasks which is the fulfilment of the design brief and the expectations of the clients in the Forestry Commission and the RSST

Learning for Sustainability

The United Nations 2005 report 'Decade of Education for Sustainable Society' advocates the incorporation of sustainable development into the education system. This helped to facilitate the inclusion of sustainable development as well as outdoor learning and global citizenship into the Curriculum for Excellence (Mula and Tilbury, 2009). This unit of work seeks to deepen learners' awareness and understanding of sustainability through highlighting the Curriculum for Excellences experience and outcomes connected to sustainability and addressing current issues of sustainability including environmental, social and economic concerns.

According to Singleton, the Head (cognitive), Heart (affective) and Hand (Psychomotor) is a 'holistic approach to developing eco-literacy' and should be considered when planning a unit of work as it enables learners' to reflect on issues, relate to them and actively participate (Singleton, 2015, p1). It is therefore thought that students should be made aware of species in danger of extinction and be taught why conservation is important.

There is a strong possibility that the next generation of learners will bear witness to the extinction in the wild of several species during their lifetimes. According to the One Planet School Working Groups recommendations 'all learners should have an entitlement to learning for sustainability and as part of this entitlement, outdoor learning should be a regular, progressive curriculum led experience for all learners'. (Scottish Government, 2012, p13) This will be achieved by raising learners' awareness of conservation issues, the development of learners' skills for life and work, learning for sustainability an appreciation of how all the different subject areas work together.

Pavlova identifies the crucial role teachers will play in emphasising the necessity of global citizenship and sustainability ideals (Pavlova, 2015). This will be accomplished through imparting upon the learners a sense of responsibility to help ensure the survival of the native red squirrel and simultaneously raising awareness of global issues affecting other species and the environment (The Ellen MacArthur Foundation, 2012).

UNIT OVERVIEW

This unit of work is designed to be taught at S3 broad general education (BGE) level over twelve sessions. It will look at red squirrel conservation in the forest whilst simultaneously highlighting the use of timber as a sustainable material which can be used to manufacture feeder boxes for these animals. The unit will explore the issues pertaining to the red squirrels current plight as an endangered native species and look into the methods conservationists are utilising in order to protect the species from extinction. Red squirrel conservation and sustainable forestry have been selected as the foundations of this unit of work in order to inform the learners' of the cyclical nature of the forestry which may hold the key to saving the native red squirrel population from extinction and which simultaneously provides timber which, when managed correctly, provides a sustainable material.

This Interdisciplinary learning (IDL) unit will incorporate learning for sustainability, authentic learning and outdoor learning in an attempt to 'maintain challenge and enjoyment' whilst advocating 'the highest possible expectations of what young people can achieve' (Scottish Government, 2008, p36). Learners will develop 'higher order, critical and holistic thinking skills' and therefore the ability to comprehend 'how ideas and information from relevant disciplines relate to each other and the problem' (Harvie, 2012, p6). IDL opportunities will help to augment the learning and teaching, with particular emphasis on Biology and Geography thus enabling deeper understanding whilst demonstrating to the learners' how these distinct disciplines overlap. The utilisation of real life clients and design challenges will create a unique opportunity to sample authentic learning and it is envisaged this will help foster engagement with the content. The benefits of a circular economy as a way of tackling climate change and introducing learners' to potential future careers in this sector will also be highlighted.

STEM subjects were intentionally selected for IDL as the Government seeks to actively promote and encourage STEM in education. There is a severe shortage of UK based STEM graduates and this needs to be addressed. According to Hickey and Robson, learners' will then be able to use knowledge from across the STEM subjects helping to stimulate innovation and equipping them to make an important contribution to today's economy (Hickey and Robson, 2013). It is intended that this unit will be delivered in an enterprising manner, with learners creating meaningful hand crafted artefacts for the Forestry Commission and the Red Squirrel Survival Trust (RSST). Ambassadors from the S3 BGE will be given the opportunity to represent their peers and present this unit of work to the Merchants of Edinburgh competition.

OUTLINE PLAN

SESSION 1 INTRODUCTION	SESSION 2 OUTDOOR LEARNING 1	SESSION 3 CLASS DEBRIEF	SESSION 4-5 GROUP DESIGN	SESSION 6-10 MANUFACTURE	SESSION 11 OUTDOOR LEARNING 2	SESSION 12 MERCHANTS PREPARATION
EXPERIENCES AND OUTCOMES TCH 4-02a , HWB 4-20a , SCN 4-01a , SOC 4-08a	EXPERIENCES AND OUTCOMES TCH 4-14c, HWB 4-20a, HWB 4-18a, SCN 4-01a, SCN 4-04a, SCN 4-05b, SOC 4-08a	EXPERIENCES AND OUTCOMES TCH 4-14a, MNU 4-10a , LIT 4-02a , HWB 4-10a, HWB 4-14a	EXPERIENCES AND OUTCOMES TCH 4-14a , TCH 4-14d , TCH 4-02a, TCH 4-13a, TCH 4-14c , MNU 4-10a , LIT 4-02a, HWB 4-10a, HWB 4-14a	EXPERIENCES AND OUTCOMES TCH 4-13a, HWB 4-16, MNU 4-11a, MNU 4-10a	EXPERIENCES AND OUTCOMES TCH 4-14c , HWB 4-20a , HWB 4-18a, SCN 4-01a , SCN 4-04a, SCN 4-05b, SOC 4-08a	EXPERIENCES AND OUTCOMES LIT 4-10a , HWB 4-12a
LEARNING INTENTIONS - To develop an understanding of sustainability through exploring the 6R's and wildlife conservation	LEARNING INTENTIONS - To develop an understanding of sustainability through exploring sustainable forestry and red squirrel conservation efforts	LEARNING INTENTIONS - To develop knowledge of interpreting the requirements of a design brief into a specification. To develop knowledge of the key factors for design	LEARNING INTENTIONS - To develop knowledge of designing to a strict design brief and specification. To fully understand the relationship between all the design factors. For learners to work cooperatively on a design whilst meeting a strict deadline	LEARNING INTENTIONS - To develop an understanding of manufacturing skills and processes. To develop the learners practical skills for use in life and work	LEARNING INTENTIONS - To consolidate understanding of sustainability through sustainable forestry and red squirrel conservation.	LEARNING INTENTIONS - By the end of the session the learners should be able to present in a clear expressive manner Draw on all of the work from this unit as well as the outdoor learning experience and individual research.
TEACHER INPUT - Introduce the 6R's highlighting the need for sustainable design. PowerPoint on the squirrel project so that learners will have some knowledge of the issue before the outdoor learning session next week. **formative assessment**	TEACHER INPUT - Continuing on from the introduction to the unit the learners will be introduced to their real clients; representatives of the Forestry Commission and the Res Squirrel Survival Trust. Learners will be handed their real design brief and the itinerary for this session.	TEACHER INPUT - Teacher will take the learners through the clients design brief step by step so that they understand explicitly what is expected of them. **formative assessment**	TEACHER INPUT - Teacher will use the squirrel feeder box example to show that there must be the use of wood in the design but that there is also the option to upcycle jars etc.	TEACHER INPUT - For all hand tool and machine process that the learners need to undertake , the teacher will give a whole class demonstration in order to ascertain any potential issues **formative assessment**	TEACHER INPUT - Teacher will introduce the design groups to the Forestry Commission and the RSST. **formative assessment**	TEACHER INPUT - The teacher will explain the merchants of Edinburgh competition to the learners' Teacher and learners' to give constructive feedback on the presentations. **formative assessment**
LEARNER ACTIVITIES - Shopping bag comparison and specification., 6R'sactivity., party bag activity resources available at www.Practicalaction.org Learners will be given an endangered animal to research and then present this issue to the class during session 12	LEARNER ACTIVITIES - Learners will participate in two workshops with their clients. sustainable forestry to provide a source timer and highlighting the plight of the red squirrel and the need for feeder boxes to help prevent the spread of the pox virus.	LEARNER ACTIVITIES - Interactive lesson with whole class discussion All learners must write a specification to inform their designs.	LEARNER ACTIVITIES - Each learner will design feeder boxes. The members of the group will come to a consensus about the design to carry forward and must have it approved by the teacher **formative assessment through peer evaluation**	LEARNER ACTIVITIES - Learners will be marking out, cutting, shaping, drilling, gluing, sanding and finishing **formative assessment through peer evaluation**	LEARNER ACTIVITIES - Learners will participate in two workshops with their clients. The activities will enable the learners to plant trees and witness their feeder boxes mounted in the forest thus helping to conserve the native red squirrel population	LEARNER ACTIVITIES - Learners will present to the whole class the conservation issue they chose during session 1. Learners are to give constructive feedback on their peers. Presentations **formative assessment**

TASKS

BIG TASK

learners will develop their practical psychomotor skills, discover how to read drawings and diagrams, measure and mark out, cut, shape and finish material. Learners will work effectively alongside peers in a shared workshop environment whilst acquiring skills valuable for learning, for life and for the world of work. Learners will also consolidate all of the work undertaken in this unit by presenting to the merchants of Edinburgh in an enterprise challenge.

SMALL TASK 1

Learners will participate in an interactive lesson on the 6R's which highlights the need for sustainable design—various excellent resources will be utilised from- www.Practicalaction.org

SMALL TASK 2

Learners will be given an endangered animal to research and present their findings to the class during session 12 this is to ensure that all learners will actively participate in the process throughout

SMALL TASK 3

Learners will be designing to a strict brief and specification. To ensure that they understand how all the design factors relate to one another the learners will participate in a feeder box group work activity and map activity designed to help to consolidate understanding thus far

SMALL TASK 4

The learners will be tasked with designing a feeder boxes. They will be asked to consider the design factors. The brief is very detailed to ensure a meaningful artefact for the clients but there is a lot of scope for personalisation and choice including upcycling.

SMALL TASK 5

Learners will present their findings from lesson 1 to the whole class. Learners are to give constructive feedback on their peers. Presentations should consolidate all learning thus far. Learners will be asked to volunteer and represent their peers at the presentation for the Merchants of Edinburgh.

INTERDISCIPLINARY LEARNING

BIOLOGY

Learners will explore the life cycle of trees in the forest and investigate the role the red squirrel plays within the ecosystem. Learners will explore what the consequences would be if the red squirrel was lost to extinction. Learners will look at food chains and life cycles within the forest to understand reasons for red squirrel conservation.

SCN 4-01a

GEOGRAPHY

Learners will explore the story of the life cycle of forest over the centuries. Time will be taken to look back hundreds of years to highlight how the landscape is constantly evolving. Learners will discuss the sustainability of key natural resources and specifically forestry. Learners will learn about the circular economy and squirrel conservation.

SOC 4-08a

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