

Materials and processes for sustainable living

Carbon footprint board activity: guidance notes

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Section 1

Introduction

These activities have been designed to encourage learners to think in depth about sustainable construction and their own environment. This is a complex area for debate and there are no absolutes. The purpose is to develop learners' understanding through questioning, encouraging them to ask better questions and engaging them in developing reasoned arguments.

In the board activity, learners explore and extend this knowledge through collaboration and debate. They also consider their personal contribution to sustainability. The debate and peer assessment will promote deeper learning. You will act as an 'arbiter' in the board activity. This will give you the opportunity to give specific and detailed feedback (assessment for learning) to resolve any misconceptions, and to give additional information and explanations where appropriate.

Objectives for learners

Learners should be able to:

- discuss with peers the relative merits of different materials and processes
- identify sustainable processes and materials to use in construction
- consider how each of us contributes to carbon emissions by the way we live and work
- complete related calculations
- build a glossary of technical vocabulary
- describe appropriate approaches to customer care in given situations.

Language, literacy and numeracy (LLN) objectives

- SLC/L2.4 Present information and ideas in a logical sequence and provide further detail and development to clarify.
- SLr/L2.2 Listen to, and follow lengthy instructions.
- N1/L1.7 Work out simple ratio and direct proportion.
- N1/L2.2 Carry out calculations with numbers of any size using efficient methods.
- N1/L2.3 Calculate ratio and direct proportion.
- N1/L2.4 Evaluate expressions and make substitutions in given formulae in words and symbols to produce results.
- MSS1/L2.6 Calculate with units of measure within the same system.

Learning outcomes for learners

After completing this activity learners should:

- understand the impact of construction activities on the environment
- be aware of the significance of a carbon footprint
- be able to identify strategies for reducing a carbon footprint.

Learning outcomes for teachers

After completing these activities teachers* should be able to:

- understand the importance of embedding LLN into vocational learning
- facilitate active learning activities
- understand the importance of giving specific and timely feedback
- reflect on and evaluate the teaching and learning experiences in the activities
- encourage learners to talk about their learning experience and learning skills.

* We use the word 'teacher' as a generic term to include teachers, tutors, trainers, lecturers and instructors in the further education (FE) system.

Resources required

- Carbon footprint board.
- Dice.
- Carbon footprint score cards.

- Question cards:
 1. customer care cards
 2. challenge cards
 3. sustainability cards
 4. calculation cards.
- Mini white boards and dry wipe markers.

Starting points

Learners may need to be prepared for the calculation questions at Levels 1 and 2 which are a part of the board activity. Liaise with your LLN or Mathematics specialist. Learners should be encouraged to use mini white boards in undertaking their calculations so that they can work together effectively and other learners can see their approach.

Suggested approach (indicative timing 60 minutes)

The board activity requires learners to interrogate their own and others' knowledge. Learners should work in pairs and, through a series of questions, answers and challenges, debate and explain their ideas. It's important to note that there should be discussion around some of the answers as the cards are designed to promote debate. This will model the reality of the continuing uncertainty about solutions to some of these issues.

Before starting, ask the learners to decide on some protocols for contributing to the discussion. Learners should be encouraged to respect other members of the group when they are asking or answering questions.

The debate can be further extended by the use of challenge cards. Challenge cards allow the players to defer to you for a full explanation or alternative answer. You take the role of arbiter. Feeding back clear reasons for decisions will contribute to assessment for learning. You may, however, choose to model the wider debate by facilitating an arbitration that includes quick internet research, peer review and a group decision.

Give your learners the current:

- average carbon footprint for a person living in Britain: 9,400 kg per year
- sustainable carbon footprint based on the world population: 1,000 kg per year.

They should write these on their carbon footprint scorecards in the appropriate box.

Alternative approach

Ask your learners to find information about the average carbon footprint for a person living in Britain. You could ask them to compare this with other countries. Ask them also to find out how much this level needs to be reduced.

Objective of the activity

The objective of the activity is for pairs of learners to reduce the average carbon footprint number on their score card, by answering questions correctly. Each correct answer will give a score of 500 kg which the learners can deduct from the average carbon footprint. A further reduction of 250 kg can be made for every bonus question that is answered correctly. The pair with the lowest carbon footprint after a given time wins.

Rules

1. Place all cards in piles around the outside of the board.
2. Each pair takes:
 - a. a blank carbon footprint score card on which they record the average carbon figures.
 - b. one challenge card.
3. Roll the dice to decide who goes first.
4. Each pair then takes it in turn to roll the dice and move around the board.
5. The squares on the board represent different categories. As pairs land on a square the corresponding question or statement is then read out by the next pair. Each player in the pair should take turns in reading out the questions.
6. If the answer is correct, the player subtracts the score given from the average carbon footprint score which is on their score card.

7. A bonus question is available on some cards which, if answered correctly, allows the pairs to deduct an additional amount from their carbon footprint score.
8. If the answer given is incorrect, the correct answer should be read out and discussed, and the card placed at the bottom of the pile.
9. Challenge cards are gained by landing on a challenge square. They are retained by the pair who can then take another go. The challenge cards can be used as follows.
 - a. If a player feels that an answer they give to a future question is correct but it has been deemed incorrect, the player may challenge the decision by offering up a challenge card. The player must give clear reasons for their challenge.
 - b. If the arbiter decides that the answer of the challenger was correct then the player retains the challenge card and can deduct the relevant carbon emission score from the total on their card. Clear reasons must be given for the judgement.
 - c. If the player challenging the decision is adjudicated as still being incorrect, that player should have the question card and challenge card placed at the bottom of the relevant piles. Clear reasons must be given for the judgement.
10. The pair with the lowest carbon footprint after a given time is the overall winner. Pairs should be encouraged to work out their own scores by first totalling up their carbon reductions in each category and then deducting this from the average footprint.

Extension activity

Learners could be asked to use the internet to find local, regional or national examples of construction projects which are focusing on carbon neutral buildings. Pairs or small groups could feed back their findings to the rest of the group.

Learners could be asked to design a carbon neutral building and compare the costs to a conventional building. They could then explain their ideas to the rest of the group.

Learners could compare the cost savings gained when introducing specific energy saving measures in their homes.

Consolidating, checking and reflecting on learning

Give a summary of what the activity has covered.

- A range of materials and approaches has been discussed.
- Some are more sustainable than others.
- People involved in the construction industry need to choose more sustainable materials and approaches.
- We all need to think about our carbon footprint.

At the end of the activity ask learners:

- Have you discovered any new information?
- What new technical terms have you used?
- Have you updated your glossary
- Have any of the answers surprised you?
- Why is a low carbon footprint desirable?
- Why are some of the answers debatable?
- Why is it important to express yourself clearly and logically?

Ask learners to reflect on their learning using the Learner reflection sheet.

Reflect on your own learning for CPD using the Teacher reflection sheet.

Alternative approaches

At the end of the activity, two pairs may have identical scores. You could use a tie breaker question to decide the winner. This should be in the form of a time limited research answer that you think is most relevant to your learners. This may be an extension of an existing question or one that you have devised. The remainder of the group could be involved in a number of ways, for example by judging the responses of the two pairs or being allocated to help the researchers. You can ask individuals or pairs of learners to create questions on the same or different topic areas related to sustainability. These can be used with the board as it has been designed to allow for the use of new topic cards

The cards could be used without the board for 10 minutes at the end of lessons over a period of time. Learners could still fill in the score card and update their glossaries.

Differentiation to meet individual needs

Learners should work in pairs to answer questions. Peer work will encourage deeper learning and exploration of each question. It will also help less knowledgeable learners or those with specific learning or language difficulties to participate actively.

Make sure that dyslexic learners can both see the question and have it read to them. Where there are answers on the card, these should be covered by the questioner's thumb. You may wish to enlarge the cards for those with visual impairment or print them on coloured paper for those with dyslexia.

Challenges – what learners might do next

Learners could undertake further research on how to reduce a carbon footprint and other environmental issues associated with construction.

Ask learners how they could reduce the carbon footprint of their home by:

- improving insulation
- using alternative materials
- improving heating efficiency
- reducing waste.

Section 2

Learner reflection sheet

How are my language, literacy and numeracy skills?

	Skills, knowledge and understanding Can I:	I do this well	I'm okay at this	I need to work on this
SLr/L1	... respond to questions on a range of topics?			
SLc/L2	... present information and ideas in a logical sequence and provide further detail ?			
SLr/L2	... listen to, and follow lengthy instructions?			
Rw/L2.1	... read and understand technical vocabulary?			
Rw/L1.1	... use reference material to find the meaning of unfamiliar words?			
What action can I take to improve my literacy and language skills?				

	Skills, knowledge and understanding Can I:	I do this well	I'm okay at this	I need to work on this
N1/L1.7	... work out simple ratio and direct proportion?			
N1/L2.2	... carry out calculations with numbers of any size using efficient methods?			
N1/L2.3	... calculate ratio and direct proportion?			
N1/L2.4	... evaluate expressions and make substitutions in given formulae in words and symbols to produce results?			
MSS1/L2.6	... calculate with units of measure within the same system?			
What action can I take to improve my numeracy skills?				

How are my learning skills?

Learning approaches	I do this well	I'm okay at this	I need to work on this
I make a positive contribution to the group work.			
I listen to other people.			
I make helpful suggestions to other learners.			
I give clear verbal explanations.			
I question other learners to help them think clearly.			
I use the internet to select information.			
I find things out for myself.			
I work individually.			

I learn best by:

I find it difficult to learn when:

I could improve my learning by:

Next time I will:

Teacher reflection sheet

Reflect on your own professional practice. This can contribute to your CPD targets for the year.

What would help me to embed LLN into my teaching? I can:	I do this well	I'm okay at this	I need to work on this
Show the learners that I value work on LLN.			
Liaise with LLN or Mathematics specialists.			
Work with a Subject Learning Coach.			
Work with other people who are teaching my subject to plan how to embed LLN.			
Know what the LLN core curriculum is.			
Know my organisation's policy on embedding LLN.			
Have embedding LLN as a regular agenda item in meetings.			
Participate in LLN projects both inside and outside the organisation.			
Look at the NRDC research which shows how other teachers have done it.			
I will take these actions to improve the embedding of LLN into my teaching:			

If you have adapted these resources and used different approaches, please edit this sheet accordingly. You may find it helpful to read Section 3 before doing this self assessment.

Teaching and learning approaches or activities Do I:	I do this well	I'm okay at this	I need to work on this
...use vocationally relevant examples?			
...encouraging peer explanation?			
...build in opportunities for peer review and feedback?			
...provide specific and constructive feedback?			
...integrate mathematics?			
...integrating cross curricular themes?			
...encourage learners to reflect on the development of their personal, learning and thinking skills?			

How can I help my learners to become 'expert learners'?	I do this well	I'm okay at this	I need to work on this
I allow my learners to seek for information rather than giving it to them			
I encourage my learners to explore and discuss information			
I construct activities so that learners are confident to work independently.			
I work with a Subject Learning Coach to explore methods and approaches which will make learners more independent			
I use a wide range of active learning methods			
I get regular feedback from my learners about how they learn most effectively?			
I explain to learners the methods I am using and why they are effective?			
I show my learners how to plan effectively?			
I give timely and specific feedback to learners about their work.			
My learners have personalised learning plans which help them to know what they should be doing inside and outside the classroom.			
I will take these steps to enable my learners to become more 'expert':			

Section 3

Guidance on teaching and learning approaches

Embedding language, literacy and numeracy

Recent research has found that programmes that fully embedded LLN led to a 16% improvement in retention and achievement of vocational qualifications. Achievement of national LLN qualifications was also higher, with 43% more learners achieving literacy qualifications than on non-embedded courses and 23% more learners achieving numeracy qualifications (Helen Casey et al, 2006).

There is a particular emphasis in these activities on presenting verbal information clearly and completing calculations using a range of techniques. It's important that you highlight the LLN skill(s) to be developed in the activity and that you give specific guidance on how to improve. It would be useful to collaborate with an LLN or mathematic specialist. Research has shown that learners benefit from being taught by teams of staff, each with different areas of expertise, working closely together. Collaborative planning is also very effective. (Helen Casey et al, 2006).

Learners will have the opportunity to develop speaking and listening skills, extend their vocabulary, develop their understanding of ratios and proportions and do some calculations.

Before starting, ask the learners to decide on some protocols for contributing to the discussion. Learners should be encouraged to respect other members of the group when they are asking or answering questions.

Glossary

The glossary is a feature of all the materials developed for Construction and the built environment (CBE) in this phase. We have included a glossary that you can adapt.

A range of technical terminology is used in this activity. You can work with learners to develop personalised glossaries. Value the glossary by reviewing it on a regular basis. You may also want to refer learners to one of the following websites to help them in developing their glossaries:

<http://www.esd.rgs.org/glossarypopup.html>

<http://www.greenconstruction.co.uk/glossary/default.asp>

Assessment for learning

Assessment for learning is also sometimes referred to as formative assessment. It's about checking learning and giving timely and constructive feedback. This has been shown (Black and Wiliam, 1999) to have a profound influence on learners' motivation and self esteem. John Hattie's 2002 study showed that giving learners feedback on their learning errors and omissions and getting them to make corrections or work towards improvement is one of the most significant methods of improving performance.

The process does not always have to be teacher-led. This activity uses both self-assessment and peer assessment, which are powerful forms of assessment for learning.

Planning learning in multiple environments

It would be beneficial for learners to use their experience of local or regional sustainable building programmes in this activity. This could include visits to construction sites, general knowledge and research from the internet.

A visit from a planning officer, architect, designer or product specialist would add value to this activity.

Reflect on the teaching and learning approaches used in this activity

You could use the Teacher reflection sheet in Section 2 when planning or after using the activity in these resources. This enables you clearly to identify areas in which you may need development and, using the instruments outlined below, plan and record the development of these skills.

This can contribute to the development of your skills within the framework of the new overarching professional standards for teachers in the lifelong learning sector.

The new professional standards can be downloaded from the LLUK website: http://www.lifelonglearninguk.org/standards/new_prof_standards.html.

The Institute for Learning website, www.ifl.ac.uk, can provide:

- a description of the CPD process

- a place for teachers to keep a record of their activities and achievements.

The joint Training and Development Agency for Schools/Lifelong Learning UK website supporting the workforce delivering diplomas, www.teach14-19.org can provide an online interactive training needs analysis for teachers of Diplomas.

If you have adapted these resources and used different approaches you can edit the Teacher reflection sheet accordingly. You should undertake this reflection on the use of the approaches and the development of your skills with your subject learning coach or another colleague. Encourage your learners to give you feedback.

Bibliography

Helen Casey et al, 2006, *“You wouldn’t expect a maths teacher to teach plastering...” Embedding literacy, language and numeracy in post-16 vocational programmes – the impact on learning and achievement*, NRDC, London.

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