Overview

Working on *Futures* provides an opportunity for teachers from different disciplines to share good practice by planning joint project work.

The curriculum calls for collaboration between school departments to enable enhanced cross-curricular experiences. Nuffield STEM has activities extending across the STEM disciplines.

This CPD module explores the subject knowledge needed for teachers to be able to deliver the content of the *Futures* programme. An overview of the subject knowledge required is prepared, with links for non-specialist teachers to explore topics.

Learning outcomes

- Know the subject knowledge needed to work effectively in Futures
- Know sources of relevant information to develop knowledge
- Be able to plan how to gain necessary knowledge

Resources

- Copy of *Futures* resources
- Background information from the general teachers' guide
- STEM audit template
- Personal action plan

Activity 1 Using the STEM audit template (20 mins)

Use the STEM audit template. Complete the audit of subject knowledge for your own subject area needed by teachers to deliver *Futures*. Ensure you understand where you will need subject knowledge.

Show the areas where non-specialists need to develop knowledge of your subject.

Insert links or sources which would give non-subject specialists relevant knowledge to deliver the pod.

Activity 2 Audit follow-up (30 mins)

You will need to meet with other members of your team for this activity, that is, the specialists from other disciplines.

Discuss your audit results with your team. Ensure that, between you, you have a complete picture of subject knowledge needed to deliver the topic or pod. Identify and note cross-curricular themes.

Complete the 'Development' column, thinking about any action you need to take to ensure acquisition of relevant knowledge.

Activity 3 Drawing up a personal development plan (10 mins)

Draw up a personal development plan, showing the steps you will take to develop subject knowledge prior to delivery of the topic or pod.

See template provided.

Reflective questions

Think about the following.

Q What subject knowledge is needed for the pod I am going to deliver?

Q What sources can I use to develop the knowledge I need?

Q Have I completed a plan to develop my personal subject knowledge?

STEM audit: supporting documents

STEM audit for pod ……..			
Subject area	Specific content	Opportunities to develop elsewhere in the curriculum	Comments
Science			
Technology			
Engineering			
Mathematics			
Other			

Personal Action Plan to help you develop your subject knowledge for STEM delivery

Date	What I need to do to develop subject knowledge	Source	I will do this by…	Comments on progress

Overview

The curriculum incorporates and emphasises the need for a skills-based approach to learning. To work effectively on the STEM *Futures* topic, pupils need to develop specific learning and enquiry skills. These skills are developed, in context, within the project but may also be developed in other areas of the curriculum. In addition, individual pupils will be at different stages of development in different skill areas.

This CPD module introduces a means of auditing the skills needed to be successful in a *Futures* pod. Once identified, teachers can determine how and where they can be developed. The audit can then be used for individual pupils to determine the skills needing to be developed.

Learning outcomes

- Know the specific skills needed to work effectively in *Futures*
- Know where the skills can be developed
- Understand how a pupil might use the skills audit

Resources

- Copy of *Futures* resources
- Skills audit template – 'Waste'
- Skills audit template – blank
- Skills audit template – pupil

Activity 1 Using the skills audit template (20 mins)

Study the skills audit provided for 'Waste' alongside the materials for 'Waste'. Ensure that you understand where the skills arise in delivery.

Think about where else in the curriculum your pupils might develop these skills and complete the audit.

Complete the 'Comments' column, thinking about any action you need to take to ensure development of the skill. Examples include providing worksheets, liaising with subject teachers, demonstration, and assigning responsibility for developing a skill to a teacher.

Activity 2 Comparing skills for different pods (30 mins)

Choose another pod from *Futures*. Write down all the skills necessary for successful completion of that pod. Complete the blank skills audit template as before.

Activity 3 Skills audit for pupils (10 mins)

The skills audit can be adapted for pupils so that they undertake self-assessment and develop as independent learners. See the Skills audit template for pupils.

Consider how and when this might be used with pupils. Think about how you would wish to adapt it for your own pupils.

Feed back three key points from your thoughts or discussion.

Reflective questions

Think about the following:

Q What skills are needed for the pod I am going to deliver?

Q Who is going to help pupils develop those skills?

Q What further resources are needed to develop the skills?

Q How can I ensure that individual pupils develop their skills?

Skills audit: supporting documents Name of pod ……

Skill area: learning skills	Specific skill	Opportunities to develop elsewhere in the curriculum	Comments
Information retrieval (I)			
Communication (C)			
Team work(T)			
Modelling (M)			
Planning (P)			
Personal learning and thinking skills: Independent enquirer Creative thinker Team worker Reflective learner Effective participator Self-manager			

Skills audit: Waste

Skill area: learning skills	Specific skill	Opportunities to develop elsewhere in the curriculum	Comments
Information retrieval (I)	Conducting an internet search Listening to extract information Extracting information from a chart Extracting information from a fact file		
Communication (C)	Representing information as synoptic notes Constructing an exploded diagram Making a presentation		
Team work (T)	Working as a member of a team to create a product Making a team presentation		
Modelling (M)	Using a spreadsheet to engage with a mathematical model		
Planning (P)	Work as a member of a team to plan a production Plan and evaluate a presentation		
Personal learning and thinking skills: Independent enquirer Creative thinker Team worker Reflective learner Effective participator Self-manager			

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Skills audit: Waste – pupil version

Skill area: learning skills	Specific skill	Opportunities to develop elsewhere in the curriculum	Comments
Information retrieval (I)	Conducting an internet search Listening to extract information Extracting information from a chart Extracting information from a fact file		
Communication (C)	Representing information as synoptic notes Constructing an exploded diagram Making a presentation		
Team work (T)	Working as a member of a team to create a product Making a team presentation		
Modelling (M)	Using a spreadsheet to engage with a mathematical model		
Planning (P)	Work as a member of a team to plan a production Plan and evaluate a presentation		
Personal learning and thinking skills: Independent enquirer Creative thinker Team worker Reflective learner Effective participator Self-manager			

Overview

Reflection is important in helping pupils to identify their strengths and areas for development in their learning. It helps them develop a clear understanding of what they are trying to achieve and what is expected of them. Pupils need to be fully involved in next steps for their learning and know sources of help when needed.

Each lesson in *Futures* is followed by reflective questions provided on the PowerPoint. However, it is often difficult for pupils to distinguish between what they have done and what they have actually learnt. It is even more difficult for pupils to identify the next steps they need to take to extend their learning. A learning nutshell and plenary questions are used as tools to aid reflection when delivering *Futures*.

This CPD module explores strategies for you to use to train pupils in reflective practice.

Learning outcomes

- Know strategies to develop reflective practice in pupils
- Be able to apply strategies for reflection to other curriculum areas

Resources

- Learning nutshell example
- Ideas for reflection
- Feedback cards

Activity 1 Reflection as an aid to learning (10 mins)

Think of three benefits of reflective practice.
Share these with your colleagues.

Activity 2 Using feedback and the nutshell (30 mins)

A nutshell can be used in conjunction with each 'pod' to act as a reference point for pupils to identify the key problems they meet, the questions that occur to them, and closed loop solutions.

Think about a CPD session you have already completed. List all the problems you met in that session and the questions that occurred to you. Complete the learning nutshell for the same session, and reflect on how you approached the problems and questions that occurred to you.

Think about *how* you could use the nutshell to encourage pupils to think more deeply about how they have learned in their pod activities.

Discuss how the learning nutshell helps reflective practice.

Activity 3 Reflecting on learning (20 mins)

Here is an example of reflecting on learning from *Futures* Waste lesson 1.

WASTE Lesson 1 Natural systems

What did you learn about listening, extracting key information, and making graphic notes?

How will these skills be useful in your learning?

Think of three different ways of reflecting on learning for this session. Demonstrate one to a colleague.

Reflective questions

Think about the following.

Q How does reflective practice contribute to learning?

Q How might I use a learning nutshell with my pupils?

Q What strategies for reflection can I use in other areas of the curriculum?

Supporting documents

Skills I'm working on	How have I demonstrated the skill?	Level	What can I do to improve?	How will the skill help me with my final project?

Overview

Pod 5 of the *Futures* topic consists of a summative project where pupils use the skills, knowledge and understanding about 'closing the loop' to identify a problem or question relating to sustainable *Futures*. As a group, they carry out research, then design and present a solution to the issue.

In this CPD module you will think about the implications of running the project in terms of managing time, groups and resources. For the purposes of the CPD module, a delivery model of two separate days has been assumed with time in between. If you are using a different model, you will need to amend your plan.

Learning outcomes

- Know what resources will be needed to run the pupil project
- Understand what makes a successful project
- Be able to plan delivery of *Futures* pod 5 'Final project'

Resources

- Copy of *Futures*
- Choosing a *Futures* question page from *Futures* Pod 5 (copies)
- Project Day Plan template
- Flip chart paper

Activity 1 Choosing a subject for the final project (15 mins)

The most difficult part of running a project is finding an appropriate research topic. If the topic is only decided on day 1 of the project, a lot of time may be wasted as pupils discuss choice of topics. Pressure of time may result in a less suitable topic being chosen.

If you are well-prepared you will run a session on choosing the topic before day 1, possibly at the end of another pod. You need to have thought about topics to run so that you are able to guide pupils to a suitable topic.

Consider alternative ways of presenting the research results, and make sure a decision is taken on this at the same session. Having the start and end points of the project decided will make planning the Project days' activities more straightforward.

In Activity 1 you consider some suitable topics. Think of a few possible topics and then test them using the pupil activity 'Choosing a *Futures* question'.

Think about two or three possible ways of presenting the results of the project.

Activity 2 Making a flow chart for running a project (20 mins)

Draw up a flow chart of all the stages that a group of pupils will go through to complete a successful project over two separate days.

Develop your flow chart into a mind map with all the different interventions and resources that pupils will need from teachers, and show at what stage. Make sure your interventions include milestone checking points,such as checking that research is completed.

Activity 3 Managing the project (25 mins)

Compare your chart with that completed by another teacher if possible, and discuss any similarities or differences.

Complete the day plan template for the project.

Consider who will manage each aspect of the project. List the resources and equipment required at each stage.

Reflective questions

Q What suitable topics are likely for the project?

Q How might these projects be presented?

Q How will the project be managed throughout the two days?

Running the pupil project: supporting documents

Project day plan for one day – the plan may be spread over a number of lessons if required

Topic: ……

Groups: ……

Time	Pupil activity	Teacher activity	Resources	Differentiation for groups (different activities or support)	Comments

Overview

The *Futures* topic lends itself to different modes of delivery. You will need to decide what model of delivery best suits the needs of your pupils and your school environment. You will also have to plan which activities should be included, who will deliver them, and what resources are to be organised.

This CPD module introduces three different models for delivering the 'Climate change' pod. You will have the opportunity to study the different models and think about which model best suits your school. You will be able to plan delivery of a pod with colleagues.

Learning outcomes

- Understand the different models for delivering *Futures*
- Be able to plan delivery of a pod in *Futures*

Resources

- Copy of *Futures*
- Examples of delivery models for a pod
- SWOT worksheet (optional)
- Pros and Cons worksheet (optional)

Activity 1 Different delivery models (10 mins)

Study the examples of models for delivery of 'Climate change', a *Futures* pod.

Draw up a list of pros and cons of each model, thinking about delivering the pod in your own school environment. If you wish, you can use a SWOT worksheet or a Pros and Cons worksheet to help you evaluate the delivery models. Different pods may lend themselves to different delivery models.

Here are some factors you may need to consider:

- which pupils/year/groups
- which teachers
- rooms available and when
- pre-delivery tasks
- essential skills for pupils undertaking *Futures*
- timing of introduction
- how you will evaluate the programme

Come to a conclusion about which model is most appropriate for you and state why.

Activity 2 Applying the model (30 mins)

Using the model you determined was most appropriate for your school, apply it to another pod, preferably one that you are soon to deliver.

Draw up a delivery plan based on the model, amending if necessary.

Decide which activities to include according to the ability and skills of the learner and time available. Consider who will deliver which aspects. List resources and equipment needed at each stage.

Activity 3 Constructing an overview (20 mins)

Think about the programme as a whole. How will you deliver the other pods? Is the same model to be followed for all pods? When will the pods be delivered? How will you deliver the project pod? Build up your plan showing an overview of the whole programme.

Reflective questions

Q Have I understood the different models for delivering *Futures*?

Q Am I able to plan delivery of a pod using one of the delivery models?

Q Am I and my team able to plan delivery of the whole programme?

Q What staffing, resources and equipment are needed to deliver the programme?

Action planning: supporting documents

Decision-making and problem-solving: pros and cons

Poor decision-making will hold up progress on your project, and use up precious time. Not everyone finds decision-making easy, but you can develop skills and techniques to help you take decisions more effectively.

1 Consider these two techniques below. Select one technique to apply to a decision, and fill in the relevant grid.

The decision might be one of the following.

- Should I holiday in the UK or abroad?
- Should I apply for promotion?
- Should I buy private health care?
- Should I vote Conservative?
- Should I move?
- Or another decision of your choice.

Pros and cons weighting

1 List all the pros and cons regarding the outcome of a decision.

2 Apply your own scoring method to each of these 'pros' or 'cons'. For example, you can score with 1-5 points, or an A, B, C scoring method or even award 10, 20 or 100 stars. It's entirely up to you.

3 Count up your scores. How does this affect the decision you make?

Decision to be made:			
Pros (all those arguments for this decision; the advantages)	Weighting score	**Cons** (all those arguments against this decision; the disadvantages)	Weighting score
Total ... pros		Total …. cons	

Decision-making and problem-solving: SWOT analysis

This technique forces you to consider a decision from a variety of points of view and consider its implications.

S = Strengths **W** = Weaknesses
O = Opportunities **T** = Threats

Consider the possible outcome of a decision by viewing it from these points of view.

- What are the strengths or advantages of this outcome?
- What are the weaknesses or downsides to this outcome?
- What opportunities does it offer me?
- What might I consider as threats or risks to this out come?

Decision or option to be analysed

Strengths	**Weaknesses**
What are the advantages of this proposition? What are our strengths (such as people, assets, resources, IT, communications)?	What are the disadvantages? What are the gaps in our knowledge, capability, and so on? What would make us vulnerable?
Opportunities	**Threats**
What's going on in the world that would actually make this a positive outcome? What are the trends that we can capitalise on?	What are the external factors that would have a negative impact on us? What are the external factors that would create obstacles?

'Climate change': Lesson delivery (assumed double lessons)

Lesson 1 Carbon cycle

Introductory film

Activity 1.1 Building an action (kinaesthetic) model of the carbon cycle

Activity 1.2 Predicting changes in the carbon cycle

Plenary

Lesson 2 Exploring global warming

Introductory film

Activity 2.1 Is carbon dioxide a greenhouse gas?

Activity 2.2 What is the evidence for global warming?

Plenary

Lesson 3 Carbon footprints

Introductory film

Activity 3.1 What's your carbon footprint?

Activity 3.2 One Earth

Plenary

Lesson 4 The Wind Farm

Introductory film

Activity 4.1 Installing a wind farm

Lesson 5 The Wind Farm *continued*

Introductory film

Activity 4.1 Installing a wind farm *continued*

Plenary

'Climate change' plan for 2 half days Day 1

Time	Activity	Teacher activity	Resources	Preparation
0900	Registration and introduction			
0915	Lesson 1 Carbon cycle Introductory film Activity 1.1 Building an action (kinaesthetic) model of the carbon cycle Activity 1.2 Predicting change in the carbon cycle Plenary			
1030	Break			
1045	Lesson 2 Exploring global warming Introductory film Activity 2.1 Is carbon dioxide a greenhouse gas? Activity 2.2 What is the evidence for global warming? Plenary			
1215	Lesson 3 Carbon footprints Introductory film Activity 3.1 What's your carbon footprint? Activity 3.2 One Earth Plenary	Either cut an activity or finish for homework		
1300	LUNCH			

Climate: plan for 2 half days Day 2

Time	Activity	Teacher activity	Resources	Preparation
0900	Registration and introduction			
0915	Lesson 4 The wind farm Introductory film Activity 4.1 Installing a wind farm			
1045	Break			
1100	Lesson 5 The wind farm *continued* Activity 4.1 Installing a wind farm *continued*			
1230	LUNCH			

'Climate change': plan for one full day

Time	Activity	Teacher activity	Resources	Preparation
0900	Registration and introduction			
0915	Lesson 1 Carbon cycle Introductory film Activity 1.1 Building a kinaesthetic model of the carbon cycle Activity 1.2 Predicting change in the carbon cycle Plenary			
1015	Break			
1030	Lesson 2 Exploring global warming Introductory film Activity 2.1 Is carbon dioxide a greenhouse gas? Activity 2.2 What is the evidence for global warming?			
11.00	Lesson 3 Carbon footprints Introductory film Activity 3.1 What's your carbon footprint? Activity 3.2 One Earth			
1200-1300	LUNCH			
1300	**Lesson 4 The wind farm** Introductory film Activity 4.1 Installing a wind farm			
1430	Break			
1445	**Lesson 5 The wind farm *continued*** Activity 4.1 Installing a wind farm *continued*			
1515	Plenary			

'Climate change': plan for one full day: notes

Timings need to be adjusted to fit the school day.

Need to add teacher activities – who is doing what.

Preparation beforehand essential.

What skills will pupils need to develop before the day?

Decide which lessons/activities to include.

Overview

This CPD module introduces materials which can be used with pupils to help them develop skills. You may also find them useful for your own planning.

The curriculum incorporates and explicitly emphasises the need for a skills-based approach to learning. To work effectively on the STEM *Futures* topic, pupils need to develop specific learning and enquiry skills. In the skills audit CPD session (module 2) you are encouraged to think about where such skills might be developed throughout the curriculum. However, there will be occasions where you wish to support pupils in the development of a skill before they embark on a *Futures* lesson, or as a supplementary activity to aid progress in a skill area.

Learning outcomes

- Know what support materials are useful to support pupils
- Understand how a range of support materials can be used in skill development
- Be able to explain the use of some materials to colleagues

Resources

- Copy of *Futures*
- Ideas shower worksheet
- Building up a mind map example
- Decision making – SWOT
- Decision making – pros and cons
- Planning – time management matrix
- Presentation skills

Activity 1 Ideas showers and mind map (15 mins)

These are two techniques for idea generation.

They are useful for pupils for ideas for project topics, and for planning a topic.

They are useful for you to generate topics for teaching sessions, to help pupils come up with ideas for projects, and to plan lessons or whole topics.

Try out the two ideas, thinking about a suitable project for a group to undertake for the *Futures* pupil project pod.

Write some bullet points on the advantages of each technique, and how you might use it with pupils.

Activity 2 Decision-making (15 mins)

Decision-making – SWOT analysis and Pros and cons

These techniques are commonly used when choices have to be made.

Useful for pupils:

- can be used in any sphere in or out of school
- should help them determine a course of action with justification

Useful for you:

- should help you decide on suitable projects
- should help you decide on a suitable structure to deliver *Futures*

Try out both techniques, thinking about whether to deliver parts of *Futures* as:

- a pod delivered in a whole day
- in normal timetabled lessons

Write some bullet points on the advantages of each technique, and how you might use it with pupils.

Activity 3 Time management (15 mins)

Creating a Time Management Matrix is useful for planning.

Useful for pupils:

- can be used for any project or event
- develops independent planning skills
- aids time management

Useful for you:

- develops project management skills
- aids time management

Try out the technique, thinking about what tasks and actions you need to do before you are ready to deliver *Futures* to pupils in your school.

Write some bullet points on the advantage of the technique, and how you might use it with pupils.

Activity 4 Thinking about presentation skills (15 mins)

These documents introduce ideas to improve presentation skills.

Useful for pupils:

- will help pupils prepare for presentations as part of *Futures* or other topics
- develops pupil confidence

Useful for you:

- will help you prepare to promote *Futures* to stakeholders
- will generally aid presentation skills

Try out the activity, thinking about preparing for a presentation to promote the implementation of the *Futures* topic in your school.

Write some bullet points on the advantages of the worksheet, and how you might use it with pupils.

Reflective questions

Q What support materials are useful to help develop skills?

Q What further resources would you like to have available?

Helping pupils to develop their skills: Supporting documents

Ideas shower

An 'Ideas shower' is used to think up new ideas.

You can do it by yourself, but doing it with a group is fun and allows more creativity as people bounce ideas off each other. One person comes up with an idea, and this encourages others to join in or develop the first idea. At the end, the ideas are evaluated and decisions made about which to take forward.

Guidelines

Set a clear objective for the session, for example, choosing a topic for a project.

Keep to a strict time of 10-20 minutes.

Do not criticise each others' ideas; keep them all to evaluate at the end of the session.

Appoint a member of the group to record the ideas and keep everyone to time.

Decide how you will evaluate the ideas.

Making a mindmap

Think of a topic and write that down in the middle of a piece of paper.

Let your thoughts wander around that topic. Write down anything that occurs to you which seems to link to the first idea. Draw arrows and new circles showing the links between the different ideas.

When you have finished, discuss your ideas with a partner and decide which ones are worth pursuing.

Time management matrix

You need to have an effective plan to manage your time and achieve your objectives. You need to decide which activities are important and which ones take priority over the others.

Have a look at the matrix below. Planning in this way helps you decide what to do now (your priorities) and what can be done later. You may be able to dispense with some activities, having decided that you don't need to do them at all.

	URGENT	**NOT URGENT**
IMPORTANT	**1 DO NOW!** For example: activities that move your project to the next stage meetings with others in the group meetings with the teacher *Action:* Prioritise the order of the tasks and allocate a time to complete them.	**2 PLAN TO DO** For example: further research decisions about presenting the project *Action:* These activities still need to be done but are not urgent. Decide when they need to be done and allocate a time for them.
NOT IMPORTANT	**3 REJECT AND JUSTIFY** For example: people interrupting you unhelpful suggestions for actions completing tasks for people who are absent or lazy *Action:* Think carefully about distractions and interruptions, and reject those that are not moving the project forward. Remember that some may be useful.	**4 STOP!** For example: taking constant breaks socialising online surfing the net *Action:* Stop. These activities distract you from completing your project.

Time management matrix

	URGENT	**NOT URGENT**
IMPORTANT	1 DO NOW! Action	PLAN TO DO Action
NOT IMPORTANT	3 REJECT AND JUSTIFY Action	4 RESIST AND STOP! Action

Decision-making and problem-solving: pros and cons

Poor decision-making will hold up progress on your project, and use up precious time. Not everyone finds decision-making easy, but you can develop skills and techniques to help you take decisions more effectively.

1 Consider these two techniques below. Select one technique to apply to a decision, and fill in the relevant grid.

The decision might be one of the following.

- Should I holiday in the UK or abroad?
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- Should I buy private health care?
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- Or another decision of your choice.

Pros and cons weighting

1 List all the pros and cons regarding the outcome of a decision.

2 Apply your own scoring method to each of these 'pros' or 'cons'. For example, you can score with 1-5 points, or an A, B, C scoring method or even award 10, 20 or 100 stars. It's entirely up to you.

3 Count up your scores. How does this affect the decision you make?

Decision to be made:			
Pros (all those arguments for this decision; the advantages)	Weighting score	Cons (all those arguments against this decision; the disadvantages)	Weighting score
Total ... pros		**Total .... cons**	

Decision-making: SWOT analysis

This technique helps you to consider the strengths and weaknesses of a particular decision. Opportunities and threats arising from the decision are also considered.

S = Strengths **W** = Weaknesses
O = Opportunities **T** = Threats

Think about your decision:

- What are the strengths of doing this?
- What are the weaknesses of doing this?
- What opportunities does it offer me later on?
- What are the later threats or risks of doing this?

Decision or option to be analysed

Strengths	**Weaknesses**
(Examples are team members, skills, resources, communications)	*(Examples are lack of skills, few resources, poor location)*
Opportunities	**Threats**
(Examples are building on the outcomes of the project for a further project, a successful project, getting good grades,or winning awards)	*(Examples are failing to complete the project, another team carrying out the same work, being over-ambitious)*

Presentation skills

1 You will have listened to plenty of presentations. Think about a presentation you really liked. Make notes on:

- what you liked
- what visuals or props were used
- how the presenter engaged with the audience
- what was the presenter's body language?
- what slides and handouts were used, if any

2 Now think about a presentation you didn't like and found boring. Make notes on

- what you didn't like
- what visuals or props were used
- how the presenter engaged with the audience
- what was the presenter's body language?
- what slides and handouts were used, if any?

3 Now think about your own presentations. Which of your notes above applies to you? Use the chart below to give yourself a score.

4 Think about what actions you can take to improve your presentation in the areas where your score is low.

A …

B …

C …

D …

	Score out of 10
I am very confident when speaking in front of an audience	
I prepare my notes and prompt cards so I don't have to read directly from notes	
I am prepared to answer challenging questions	
I know how to prepare a slide presentation	
I make sure there are interesting visuals to engage the audience	
I prepare an introduction and a conclusion as well as the main part of my presentation	
I think about my body language	
I make eye contact with the audience	
I avoid using jargon and explain technical terms	

Overview

The Nuffield STEM programme exemplifies a skills-based cross-curricular framework which enables teachers and pupils to work on authentic and purposeful activities across Science, Technology, Engineering and Mathematics subjects.

Where the programme has been identified as beneficial by subject teams, they may need to explain the programme and its benefits to senior management.

This CPD module prepares teachers for presenting the case for introducing the *Futures* programme in their school. It aims to raise awareness of the features of the programme and the likely benefits to pupils and to the school.

Learning outcomes

- Know the features of *Futures*
- Understand the benefits of using *Futures*
- Be able to provide solutions to problems raised around implementation
- Be able to make a presentation about *Futures*

Resources

- Copy of *Futures*
- PowerPoint presentation

Activity 1 Turning features into benefits (20 mins)

In order to promote the *Futures* programme you must be aware of the content – so that you can describe it. However, it is more important that you can explain the benefits of implementing the programme, that is, what the pupil and the school will gain by using *Futures*.

One of the basics of sales training is understanding how to turn features into benefits which fit the needs of a particular customer.

In this activity, you will consider the features of the *Futures* programme and determine the benefits.

Feature	Benefits
Skills-based approach to curriculum	
Teachers work across the STEM curriculum	
Pupils work across the STEM curriculum	
Modular structure	
All pupil activities provided	
All teacher guidelines provided	
Focuses on sustainability	
Poses problems for pupils to solve	
Set in context of 'real' issues	
Provides model for other topics	
Includes guidelines for doing a project	
Opportunities for Enterprise	
Includes self-evaluation	
Includes aspects of SEAL	
Conforms to aspects of ECM	

Activity 2 Overcoming objections
(20 mins)

Another stage of selling is described as 'overcoming objections'. A super salesperson will have anticipated objections in their sales presentation so there might not be any. However, if there are objections, you need to provide solutions.

In this activity, you need to think of any potential objections to the implementation of the STEM programme which may be raised by your own senior management.

List any possible objections, for example 'no space in the curriculum'.

Now think of solutions to the objections raised. This will ensure you are well-prepared.

Activity 3 Customising the presentation
(20 mins)

You have been provided with a PowerPoint presentation to help you promote *Futures* to senior management.

Study the presentation and customise it to the needs of your own school and management. Think about how you will make the case for implementing *Futures* and practise your presentation.

You need to

- be concise
- engage your audience
- present solutions not problems

Reflective questions

Q Do I know what the features of *Futures* are?

Q Have I understood the benefits of using *Futures*?

Q What objections might be raised?

Q What solutions might I propose?

Q Am I prepared to promote *Futures*?

Overview

Education for Sustainable Development provides the context for Nuffield STEM *Futures.*

Futures provides opportunities for pupils to think creatively about how they can become citizens in a healthy and sustainable global community. Why is sustainable development so important in education?

In this CPD module you will explore the background to initiatives in education in sustainable development, so that you understand the context of Science, Technology, Engineering and Mathematics (STEM) programmes and in particular that of *Futures*.

The background to education in sustainable development is changing, following the change of government in May 2010.

Learning outcomes

- Know what is meant by sustainable development
- Understand how a STEM programme supports objectives across the revised curriculum

Resources

- Copy of *Futures* programme
- Extract from 'Every Child's Future Matters'
- Sustainable development in the 11-14 curriculum
- A Big Picture of the Secondary Curriculum

Further resources useful for this module

New government policies mean that some of these are changing

- Sustainable development in action: a curriculum planning guide for schools - from http://www.defra.gov.uk/environment
- www.teachernet.gov.uk/sustainableschools/
- www.forumforthefuture.org
- www.un.org/esa/sustdev/index.html

Activity 1 Defining sustainable development (10 mins)

Spend a couple of minutes thinking of a definition for 'sustainable development'. Compare your definition with that of a colleague or a text book definition.

Activity 2 The curriculum (25 mins including feedback)

Study the documents provided.

- Extract from Every Child's Future Matters (Sustainable Development Commission: Nov2009)
- A Big Picture of the Secondary Curriculum
- Sustainable development in the KS3 curriculum

If possible share these documents with colleagues and discuss the following.

Q How does sustainable development fit into the 11-14 curriculum?

Q How does sustainable development support the Every Child Matters agenda?

Q What do we understand by STEM?

Q How does STEM *Futures* support cross-curricular dimensions?

Write at least two key points for each discussion question.

Activity 3 The circular alternative or closed loop (25 mins including feedback)

The Nuffield Foundation has been collaborating with the Ellen MacArthur Foundation on the production of *Futures*.

Visit: http://www.ellenmacarthurfoundation.org/about/the-circular-alternative. Choose one of the sections on the circular alternative and read it. Then explain the section to a colleague.

Reflective questions

Think about the following:

Q What do I understand by sustainable development?

Q How does sustainable development fit into the curriculum?

Q How does the STEM *Futures* programme support the curriculum?

Education for sustainable development: Supporting documents

Extract from *Every Child's Future Matters*

Sustainable Development Commission, Nov 2009

www.sd-commission.org.uk/publications/.../ECFM_report.pdf

The DCSF's Children's Plan (2007) aimed to make England "the best place in the world for children and young people to grow up" and states that "sustainable development is a non-negotiable for children's wellbeing". The DCSF's own Sustainable Development Action Plan 2008-10 Brighter Futures – Greener Lives stated that "children cannot grow up into a stable and secure world unless we, as a country and as an international partner, find ways to improve our wellbeing while conserving our most precious resource, the planet." *(DCSF is now the Department for Education)*

The five Every Child Matters (ECM) outcomes remain central to a range of initiatives that have been developed to cover the needs of all children and young people – from birth to nineteen – focusing on their wellbeing, personal development and future prosperity. Every Child Matters aims to improve the daily experiences of all children and young people in England. It recognises that growing up is a process of understanding yourself and your place in the world, and that this is best done in a healthy, safe and supportive context. That having the chance to enjoy life and feel a sense of achievement is good for children's self-esteem. That being involved from a young age in activities which make a positive contribution to society develops important skills for life and work. And that all of these factors can help to secure children's economic wellbeing.

What is sustainable development? Sustainable development enables "all people throughout the world to satisfy their basic needs and enjoy a better quality of life, without compromising the quality of life of future generations".

Five 'guiding principles' have been adopted by government to define the essential elements of sustainable development. In some areas, the links between children's wellbeing and sustainable development are abundantly clear, for example in children's health, participation in decision-making, and economic aspirations.

Guiding principles of sustainable development

1 Using sound science responsibly
Ensuring policy is developed and implemented on the basis of strong scientific evidence, whilst taking into account scientific uncertainty (through the precautionary principle) as well as public attitudes and values.

2 Promoting good governance
Actively promoting effective, participative systems of governance in all levels of society – engaging people's creativity, energy and diversity.

3 Achieving a sustainable economy
Building a strong, stable and sustainable economy which provides prosperity and opportunities for all, and in which environmental and social costs fall on those who impose them (polluter pays), and efficient resource use is incentivised.

4 Ensuring a strong, healthy and just society
Meeting the diverse needs of all people in existing and future communities, promoting personal wellbeing, social cohesion and inclusion, and creating equal opportunity.

5 Living within environmental limits
Respecting the limits of our planet's environment, resources and biodiversity – to improve our environment and ensure that the natural resources needed for life are unimpaired and remain so for future generations.

Sustainable Development in the 11-14 curriculum

Social aspects such as human rights, justice and social diversity are important, as well as the environmental aspects of sustainable development.

Sustainable development is a specific feature of Geography, Science, Citizenship, and Design & technology

Overview

The *Futures* topic challenges pupils to consider key environmental issues which may impact on their lives. Processes in natural and human-made systems are compared.

In nature there is no waste since all materials are cycled in 'closed loops'.

Many manufactured products are simply dumped as waste when their useful life is over. By copying the closed loop systems of nature, products and systems can be designed so that useful materials are reclaimed.

To deliver the *Futures* topic effectively, you need to understand the principles of closed loop thinking. In this CPD module you can learn about closed loop thinking whilst doing one of the activities your pupils will carry out in the introductory sessions of *Futures*.

Learning outcomes

- Explain why natural systems are sustainable
- Explain why many human systems are not sustainable
- Explain closed loop thinking
- Be prepared to deliver the introductory sessions

Resources

- Copy of *Futures* resources
- Video clip from Lesson 3 'Cycles' (film clip 2)
- Background information on closed-loop thinking from the general teachers' guide
- Cards for Pod 1 Activity 3.1 'Woodland flows'

Activity 1 Starting out (30 mins)

Familiarise yourself with the introductory pod in *Futures*. Make sure you know how to navigate the materials.

Find Activity 3.1 on woodland flows. Carry out the activity yourself. You will need to prepare a set of cards.

Now think about how you will deliver this activity with your pupils.

Think about:

- how you will introduce the topic
- whether pupils will work individually or in groups
- how groups will be arranged
- how results of the activity will be presented
- how you will check understanding of closed loop thinking
- how you will summarise the activity

Activity 2 Using the DVD (15 mins)

Watch the DVD – from Lesson 3 'Cycles' (film clip 2)

Think about how you will incorporate the DVD into the lesson. What questions will you prepare following the DVD?

Activity 3 Planning (15 mins)

Refer to the introductory pod of *Futures*. Review the other activities. Think about what STEM knowledge is needed to deliver the activities.

Now think about how you and the team will deliver these activities with your pupils.

Think about:

- who will deliver the lessons
- what resources will be needed
- how you will introduce the activity
- whether pupils will work individually or in groups
- whether you will keep the same groups throughout the lesson(s)
- how findings will be presented
- how you will check understanding of closed loop thinking
- how you will summarise activities

Reflective questions

Think about the following:

Q How has my understanding of closed loop thinking progressed?

Q What else should I do to ensure I have sufficient knowledge of the principles behind *Futures*?

Q How prepared am I to deliver the introductory sessions of *Futures*?

Overview

Working on *Futures* allows teachers to share good practice, working with colleagues across disciplines. It also provides an opportunity for teachers to develop new approaches to teaching and learning, since a wide variety of strategies is included in the programme. The aim is to engage pupils and to access a range of possibilities for active learning.

This CPD module encourages you to reflect on the teaching approaches you commonly use, and to consider those that you might try out to improve learning.

Learning outcomes

- Be able to evaluate your approaches to teaching and learning
- Understand a greater range of teaching and learning strategies
- Plan a lesson using a teaching and learning approach that is new to you

Resources

- Copy of *Futures* resources
- Teaching and learning strategies – checklist
- Lesson plan – blank (not provided)

Activity 1 Introducing learning strategies (30 mins)

Complete the teaching and learning strategies checklist.

Be clear about what strategies you use and how effective they are.

Check out any strategies you are not familiar with in the glossary.

Choose two or three strategies that are new to you and you would like to try with your learners.

Activity 2 Analysing approaches (30 mins)

Study a lesson from *Futures*, such as 'The Four Ages of Civilisation' in pod 1 Introduction.

Think about what approaches are used in this lesson.
How effective do you think they are?
How comfortable are you using these approaches?
Think about the teaching and learning approaches you thought you would like to try. Adapt the lesson using one of your chosen approaches. Try to use an approach which increases the challenge for pupils.

Present your plan to a colleague and ask for constructive feedback on your approach.

Reflective questions

Think about the following.

Q What teaching and learning approaches do I most commonly use?

Q What new teaching and learning approaches have I considered?

Q What will I do next to try out different approaches?

Teaching and learning strategies: checklist for self-assessment

All the teaching strategies in the *Futures* project are included in the checklist.

This assessment will help you determine how wide-ranging your current approaches to teaching and learning approaches are.
It will help you to consider strategies it might be useful to try – in *Futures* or elsewhere.

Strategy	**Use/ Do not use**	**Advantages of this approach for my learners**	**Ideas for trying/ improving**
Action learning sets			
Blogs			
Case study			
Demonstration			
Discussion			
Distance learning			
Quiz			
Ice breaker			
Brainstorming			
Buzz group			
Triads			
Task group			
Laboratory work			
Pairs			
Role play			
Rote learning			

Simulation			
Peer assessment			
Self assessment			
E-learning			
Question and answer			
Mind map			
Observation			
Video clip			
Photo story			
Review and reflection			
Pyramid groups			
Pair checking			
Summative assessment			
Snowball groups			
Debate			
Essay			

Teaching and learning strategies: Glossary

This assessment will help you determine how wide-ranging your current approaches to teaching and learning approaches are. It will help you to consider strategies it might be useful to try – in *Futures* or elsewhere.

Strategy	
Action learning sets	A group of between 4 and 7 people, who meet regularly to support one another in their learning in order to take purposeful action on issues.
Blogs	Short for weblog – a personal online journal
Case study	An in-depth investigation of a real life situation or simulated situation
Demonstration	A practical showing how things work
Discussion	Consideration of a subject by a group
Distance learning	Learning carried out remotely from the teacher, such as e-learning
Quiz	Series of questions to test knowledge
Ice breaker	Starter activity that introduces people to each other
Brainstorming	Activity used to generate multiple ideas
Buzz group	Small group discussion to address an issue and suggest a solution
Triads	Groups of three
Task group	A group brought together to complete a specific task
Laboratory work	Performing experiments in the laboratory
Pairs	Working in twos
Role play	Playing different characters to develop an understanding of another perspective
Rote learning	Fixing information in the memory through repetition
Simulation	Opportunity to be immersed in a situation that represents a real world situation

Peer assessment	Undertaken by pupils to check each other's work using criteria
Self-assessment	Undertaken by the pupil to evaluate their own performance
E-learning	Learning facilitated through the use of ICT
Question and answer	Using questioning to develop learning
Mind map	A visual summary of information showing links between ideas
Observation	Observation of pupil behaviour or other teachers methods
Video clip	Using video followed by discussion or Q & A
Photo story	A description or explanation of an issue illustrated by a series of photos
Review and reflection	Development of knowledge and competence by continued reflection
Pyramid groups/ snowball	Pupils work in a small group and then join another group to share their findings. Groups continue to combine until there is one group with a consensus.
Pair checking	Teacher sets a question; pupils work on it and compare their answers with a partner, giving one good point and one for improvement. Teacher then checks the work.
Summative assessment	A test or assessment at the end of a unit or programme of study
Crossover groups	Sub-groups are assigned specific tasks. Then the groups are reformed with new groups containing at least one person from each original group, so that task results can be shared with all.
Debate	Presentation of opposing arguments for a specific proposal in a competitive forum
Essay	A short composition on a subject