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Initial Science Teacher Development

4.0 Assessing learning in science: summative and formative approaches

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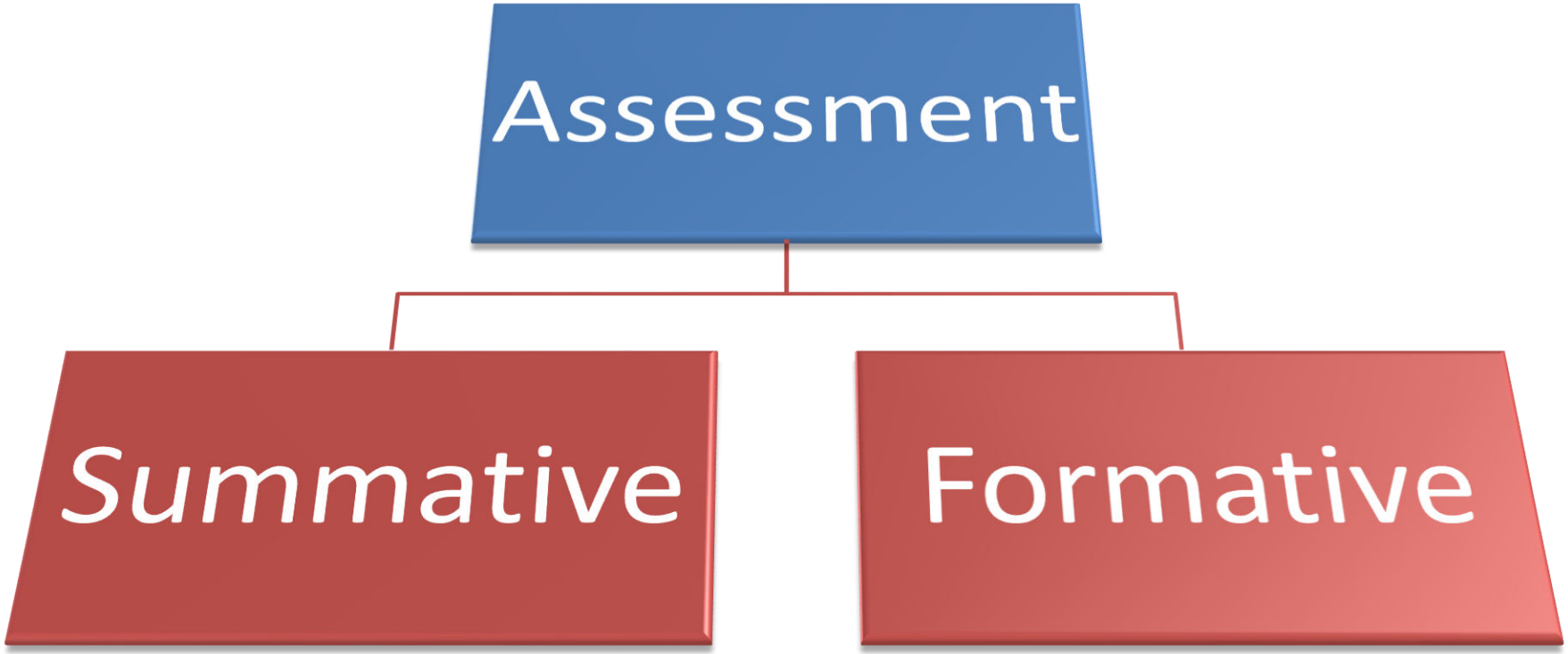
Do you understand?

YES!

(but they probably don’t)

Assessment in science



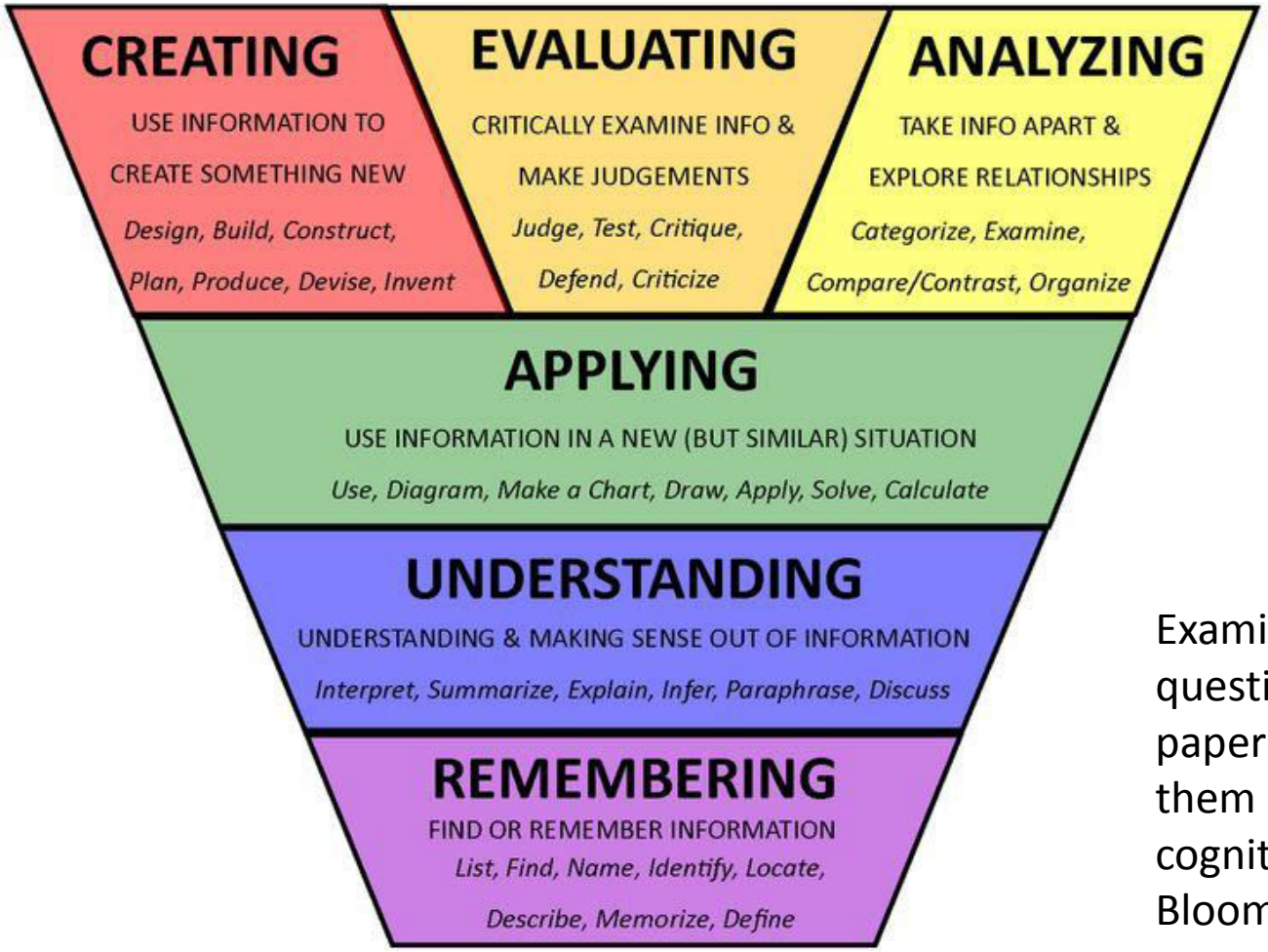
Summative assessment

Using Bloom’s taxonomy to assign cognitive levels

Using performance descriptors

What does a summative grade tell you?

What does the grade tell us in an exam paper?



Examine the questions in the paper and assign them a level of cognition using Bloom's taxonomy.

Reviewing an exam paper

Write your name here

Surname	Other names

Centre Number | Candidate Number

Edexcel GCSE

Chemistry/Science

Unit C1: Chemistry in our World

Higher Tier

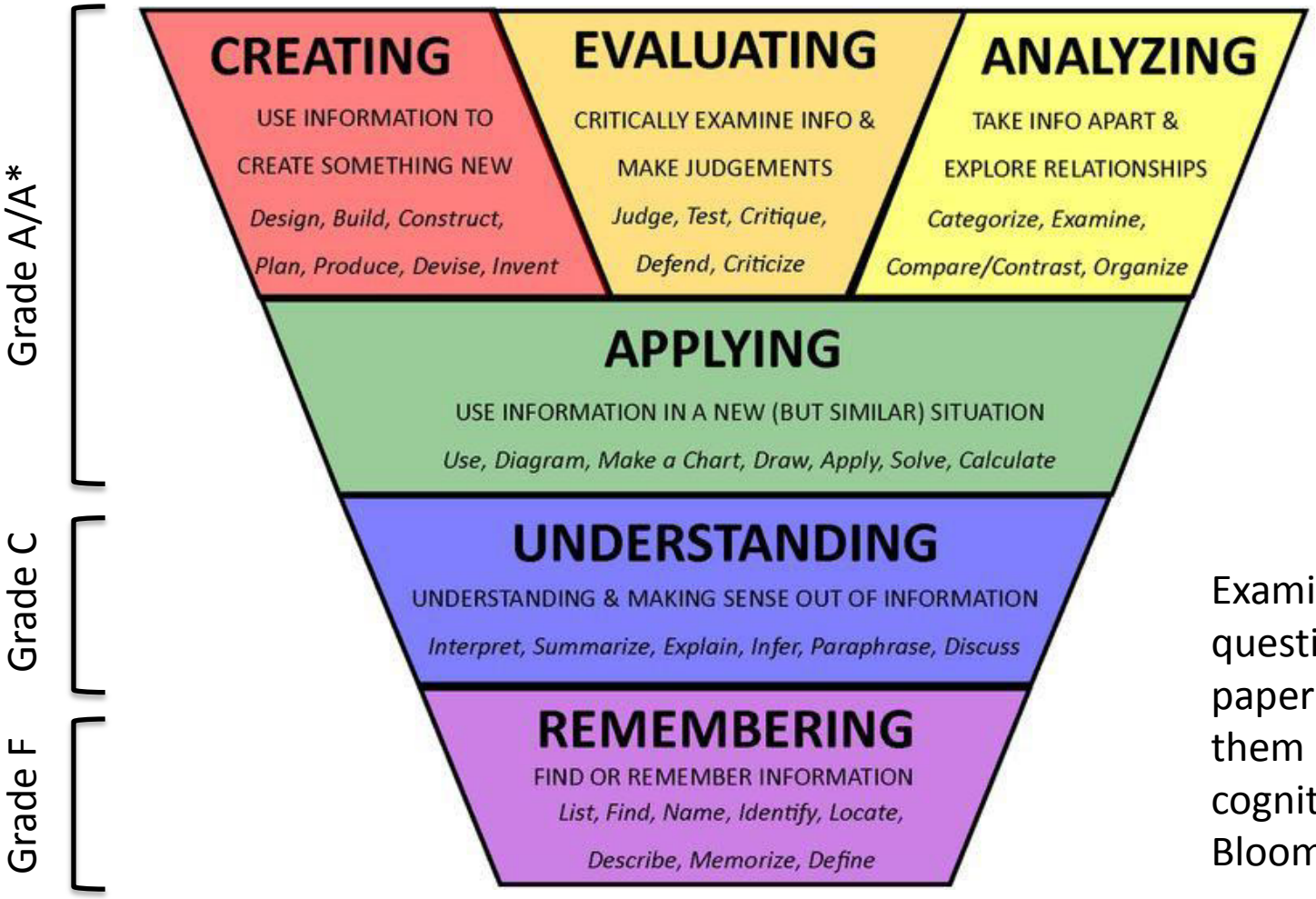
Wednesday 7 November 2012 – Morning
Time: 1 hour

Paper Reference
5CH1H/01

You must have:
Calculator, ruler

Total Marks

What does the mark tell us?



Examine the questions in the paper and assign them a level of cognition using Bloom's taxonomy.

Grade descriptors

Grade descriptions

Chemistry

A	Learners recall, select and communicate precise knowledge and detailed understanding of chemistry. They demonstrate a comprehensive understanding of the nature of chemistry, its laws, principles and applications and the relationship between chemistry and society. They understand the relationships between scientific advances, their ethical implications and the benefits and risks associated with them. They use scientific and technical knowledge, terminology and conventions appropriately and consistently showing a detailed understanding of scale in terms of time, size and space. They apply appropriate skills, including communication, mathematical, technical and observational skills, knowledge and understanding effectively in a wide range of practical and other contexts. They show a comprehensive understanding of the relationships between hypotheses, evidence, theories and explanations and make effective use of models, including mathematical models, to explain abstract ideas, phenomena, events and processes. They use a wide range of appropriate methods, sources of information and data consistently, applying relevant skills to address scientific questions, solve problems and test hypotheses. Learners analyse, interpret and critically evaluate a broad range of quantitative and qualitative data and information. They evaluate information systematically to develop arguments and explanations, taking account of the limitations of the available evidence. They make reasoned judgements consistently and draw detailed, evidence-based conclusions.
C	Learners recall, select and communicate secure knowledge and understanding of chemistry. They demonstrate understanding of the nature of chemistry, its laws, principles and its applications and the relationship between chemistry and society. They understand that scientific advances may have ethical implications, benefits and risks. They use scientific and technical knowledge, terminology and conventions appropriately, showing understanding of scale in terms of time, size and space. They apply appropriate skills, including communication, mathematical, technical and observational skills, knowledge and understanding in a range of practical and other contexts. They show understanding of the relationships between hypotheses, evidence, theories and explanations and use models, including mathematical models, to describe abstract ideas, phenomena, events and processes. They use a range of appropriate methods, sources of information and data, applying their skills to address scientific questions, solve problems and test hypotheses. Learners analyse, interpret and evaluate a range of quantitative and qualitative data and information. They understand the limitations of evidence and use evidence and information to develop arguments with supporting explanations. They draw conclusions based on the available evidence.

F	They apply skills, including limited mathematical, technical and observational skills, knowledge and understanding in practical and some other contexts. They recognise and use hypotheses, evidence and explanations and can explain straightforward models of phenomena, events and processes. They use a limited range of methods, sources of information and data to address straightforward scientific questions, problems and hypotheses. Learners interpret and evaluate limited quantitative and qualitative data and information from a narrow range of sources. They can draw elementary conclusions having collected limited evidence.

Creating assessments using Bloom's and grade descriptors

Create a 15 mark question that assesses students' understanding of photosynthesis as described by the specification below. The question does **not** need to assess **all** of the points.

Students will be assessed on their ability to:

Flowering plants

2.17 describe the process of photosynthesis and understand its importance in the conversion of light energy to chemical energy

2.18 write the word equation and the balanced chemical symbol equation for photosynthesis

2.19 understand how varying carbon dioxide concentration, light intensity and temperature affect the rate of photosynthesis

2.20 describe the structure of the leaf and explain how it is adapted for photosynthesis

2.21 understand that plants require mineral ions for growth and that magnesium ions are needed for chlorophyll and nitrate ions are needed for amino acids

2.22 describe experiments to investigate photosynthesis, showing the evolution of oxygen from a water plant, the production of starch and the requirements of light, carbon dioxide and chlorophyll

The question should be able to distinguish between F, C and A grade candidates using Bloom's taxonomy and grade descriptors.

You will also need to produce a mark scheme.

Formative assessment

Badger tasks and self assessment

Teacher written feedback

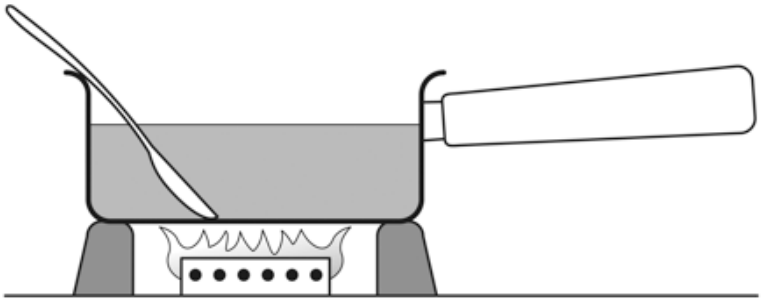
Badger tasks

Task Sheet (E-C)

Heat in the kitchen

During a Food Technology lesson, some students were wondering why the metal spoon gets hot, but the wooden handle of the saucepan does not.
Use your knowledge and understanding to explain how the energy is transferred from the cooker to the end of the wooden spoon.

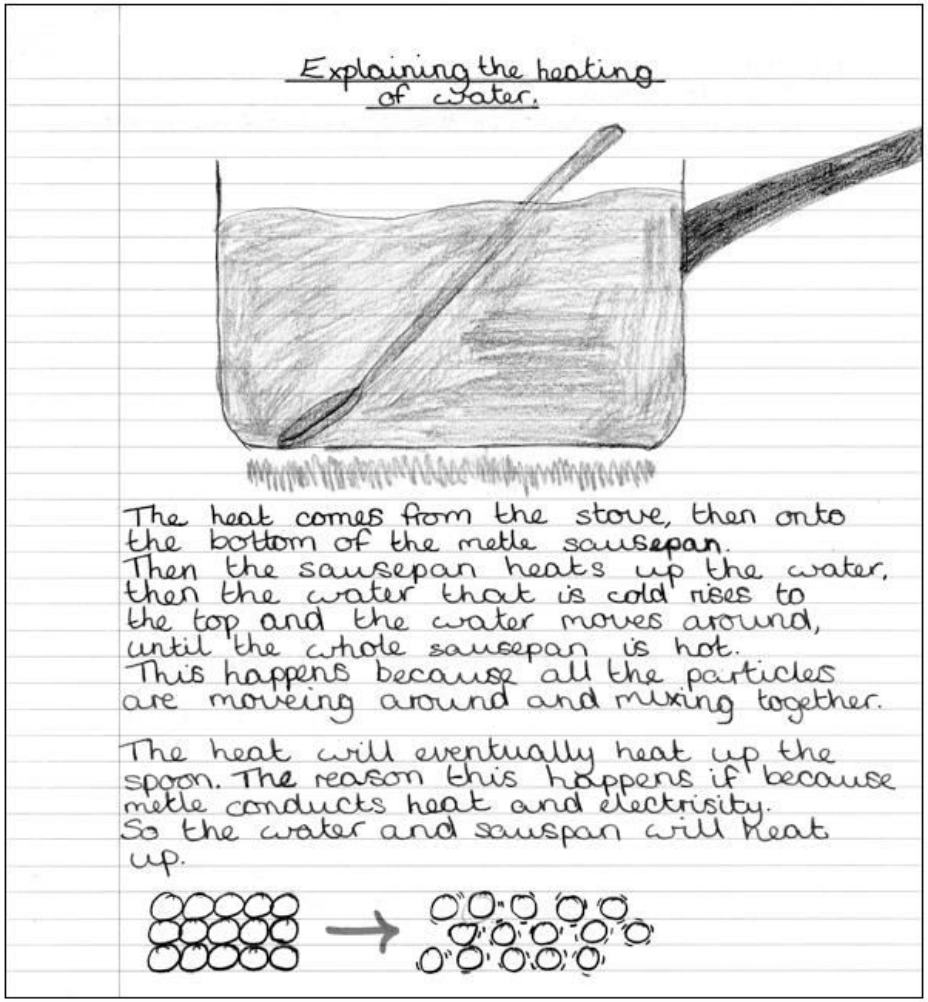
Task:
Show how the energy from the gas ring is transferred to the end of the spoon but not the pan handle and how the water gets hot.
Describe how the energy is transferred.
Use particle diagrams to show what is happening.



Key words: conduction, conductor, convection, energy transfer, evaporation, heating, insulator, radiation, particle, density

http://www.badgerscience.com/

Practice marking some work



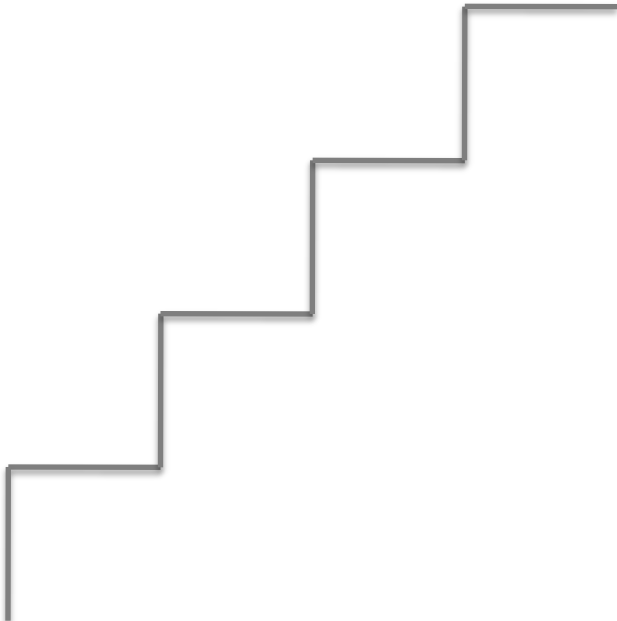
Explaining the heating of water.

The heat comes from the stove, then onto the bottom of the metle sausepan. Then the sausepan heats up the water, then the water that is cold rises to the top and the water moves around, until the whole sausepan is hot. This happens because all the particles are moveing around and mixing together.

The heat will eventually heat up the spoon. The reason this happens if because metle conducts heat and electrisity. So the water and sauspan will heat up.

Teacher written feedback: DiES

- Should be diagnostic
- Should reward effort
- Should provide clear steps on how to improve



Effective written feedback in science

Quality of feedback

You said H_2O only changes to a gas at 100 °C. So why do clothes dry outside on the line at 22 °C?

Difficult to respond to but good feedback

You identify strengths of the model, but what are the limitations?

Draw particles the same size for pure substances. Please draw (i) NaCl(s) and (ii) NaCl (aq).

Easy to respond to and good feedback

An element's 2nd letter is always small e.g. Na NOT NA

Research about sublimation.

Difficult to respond to and little feedback

Improve the quality.

Don't leave gaps.

Write the date and title.

Easy to respond to but little feedback

Underline titles.

Ease for pupils to respond

Where does your marking want to sit on this grid?

Setting the correct piece of written work

- Think carefully about the work you set. Start with the end goal THEN select the task.

- If you find yourself only ticking and crossing work STOP!, it should be done by a machine.

- The task set must allow **students to show you what they know AND what they don't** so that you can provide them with **personalised diagnostic feedback** to move them on.

- Open tasks often allow opportunities for richer feedback.

(My) top tips for written feedback

- You don’t need to mark everything
- Tick and flick is probably a waste of time
- Mark where the ‘error’ occurs – long feedback at the end of the homework has less impact
- Only mark questions that allow for diagnostic marking
- Common errors should be noted down as you mark and highlighted to the class next lesson
- Students must be able to understand and read your comments
- Mark literacy too
- Give time for re-drafting in class
- Set next piece of written work that builds on the skills/understanding made in the previous task

Let's review

1. Explain the difference between summative and formative assessment

2. Use Bloom's taxonomy and grade descriptors to assign grades to students' work and produce assessment materials

3. Describe effective features of formative assessment through written feedback