Bloom, Katy ORCID logoORCID:
https://orcid.org/0000-0002-4907-425X and Dainty, Frances (2014)
Moving a Science department to 'Good'. In: Association of Science
Education Annual International Conference, 7-10/1/15, Reading
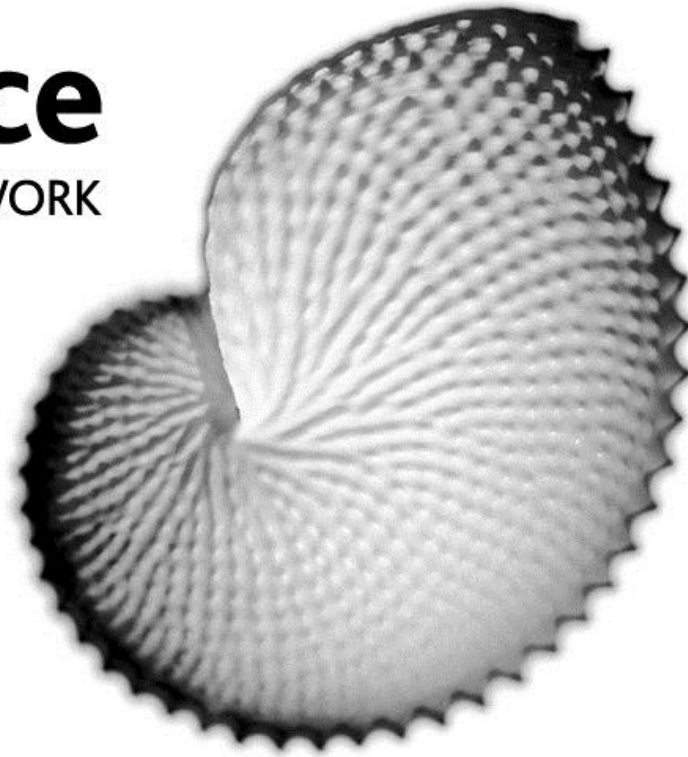University. (Unpublished)

RaY

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Getting to 'Good'

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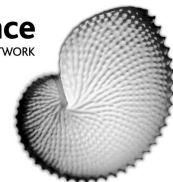
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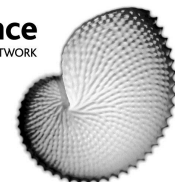
Intended Learning Outcomes

By the end of the session you will:
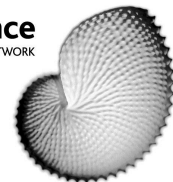
- consider the different aspects comprising key features of the standards good and outstanding

- reflect on current practice of individual and team to help agree a model for future action in their own institution

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Defining 'Requires Improvement'

Q: What do you think are the defining characteristics of the category 'Requiring Improvement'?

A: "…because the xxxxxxxxxx is not Good"

Statutory Documentation

1. The new Ofsted Framework (January 2015)

2. The Teachers' Standards (2011)

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Leeds Trinity has clustered the Teacher's Standards into 10 clustered headings to provide a framework for training and assessment during the course.
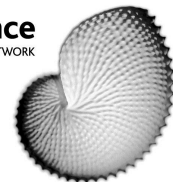
PROFESSIONAL STUDIES (PS)		Constituent Standards Include…									
PS1	Professional Frameworks	T1	T2							T8	PPC
PS2	Relationships with Pupils	T1	T2			T5				T8	PPC
PS3	Managing Behaviour	T1	T2					T7			
PS4	Achievement and Diversity	T1	T2			T5			T8		
SUBJECT APPLICATION (SA)											
SA1	Subject and Curriculum Knowledge			T3		T5					
SA2	Planning for Progression	T1	T2		T4	T5					
SA3	Planning Teaching and Learning		T2		T4	T5					
SA4	Assessment		T2				T6				
SA5	Managing the Learning Environment	T1	T2		T4	T5		T7			
SA6	Teaching for Learning	T1	T2	T3		T5	T6				

The framework supports structured, personalised training by providing a clear structure for target setting within and across different aspects of professional practice.

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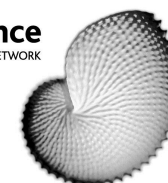
Let's kite your 'departments'…

Using the adapted Trinity framework to ask questions of your department/team, give each question a score of 1-5, where 5 is 'Good', and mark onto the relevant kite diagram.

We'll look at those areas that the group define as lowest-scoring.

Subject & curriculum knowledge

The Science Learning Network offer a variety of high-quality scheduled and bespoke professional development courses throughout the academic year.

Many of these are focused on specialist and non-specialist subject knowledge, and dedicated areas such as 'Outstanding Schemes of Work', 'Leading Assessment for Learning', and 'Behaviour Management in Science'.

For more information, visit
https://www.sciencelearningcentres.org.uk/cpd/

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Planning for Progression

- To clarify the idea of progression in learning in science

- To identify some features of well-mapped progression within lesson and unit plans, and schemes of work

- To clarify the idea of progression in learning in science and how this is exhibited in lesson and unit plans

- To demonstrate how key scientific ideas can be used to aid planning for progression and to derive appropriate lesson objectives

- To exemplify the strong foundation of scientific knowledge and understanding that pupils bring to early Key Stage 3

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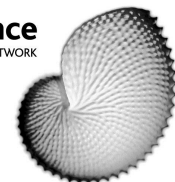
Task A

Progression is…

In pairs or threes, discuss your own ideas about progression in learning in science.

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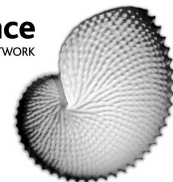
Instructions for task B

- The 20 cards contain some statements of what pupils should/could learn about Earth and beyond (at mainly Key Stage 3).

- Arrange the cards in a sequence which shows the main progression in ideas.

- There is not one correct linear sequence

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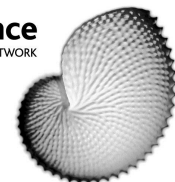
Instructions for task B

- Lay your cards on the large sheet of paper. Write or draw on the paper if that helps show the sequence.

- You have 10 minutes for this task before you share your sequence with others.

- Identify those statements which are content 'covered' at **Key Stage 2.**

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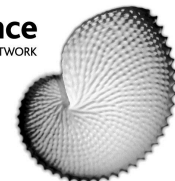
Key Stage 2 content

Pupils should be taught to:

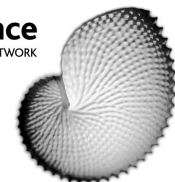- describe the movement of the Earth, and other planets, relative to the Sun in the solar system
- describe the movement of the Moon relative to the Earth
- describe the Sun, Earth and Moon as approximately spherical bodies
- use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.

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Key Stage 2 content

Notes and guidance (non-statutory)

Pupils should be introduced to a model of the Sun and Earth that enables them to explain day and night. Pupils should learn that the Sun is a star at the centre of our solar system and that it has eight planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune (Pluto was reclassified as a 'dwarf planet' in 2006). They should understand that a moon is a celestial body that orbits a planet (Earth has one moon; Jupiter has four large moons and numerous smaller ones).

Note: Pupils should be warned that it is not safe to look directly at the Sun, even when wearing dark glasses.

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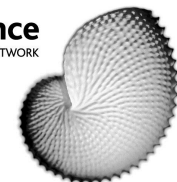
Key Stage 2 content

Notes and guidance (non-statutory)

- Pupils should find out about the way that ideas about the solar system have developed, understanding how the geocentric model of the solar system gave way to the heliocentric model by considering the work of scientists such as Ptolemy, Alhazen and Copernicus.

- Pupils might work scientifically by: comparing the time of day at different places on the Earth through internet links and direct communication; creating simple models of the solar system; constructing simple shadow clocks and sundials, calibrated to show midday and the start and end of the school day; finding out why some people think that structures such as Stonehenge might have been used as astronomical clocks.

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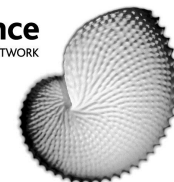
Task C. Progression in a SOW

Task C is the first part of a scheme of work for the Year 7 unit 'The solar system and beyond'. It comes from a department using a published scheme that is aligned to the [disapplied] QCA scheme of work from 2002.

The department's annotations are printed in 'handwriting'.

In pairs, skim the handout to identify at least five ways in which this scheme of work will enable teachers to ensure that pupils make good progress in their learning.

Be prepared to feedback to the group!   (10 mins)

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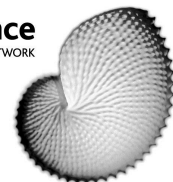
What features did you notice?

• expectations differentiated at three levels;

• anticipated prior learning identified;

• links with other units 'How we see things' and 'Light' are identified;

• clear learning objectives and learning outcomes;

• starting-point activity to elicit existing understanding;

• map of the unit;

• likely misconceptions identified;

• development of enquiry skills built in.

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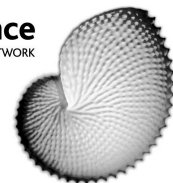
Planning for Teaching and Learning

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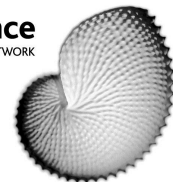
Successful lesson design

In successful lessons students are:

• clear about what is to be learned, how it fits in with what they know already and the structure of the lesson;

• actively engaged in their learning so they make their own meaning;

• able to work independently when required to do so;

• able to understand expectations;

• able to use assessment to help them to improve;

• confident that they can succeed because the right conditions for learning prevail.

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Why might lessons not be successful?

- Sometimes students do not appear to make enough progress in lessons

- The teacher may be unhappy about the way students respond to activities.

- Lessons do not go according to plan.

- Lessons have not been adequately planned.

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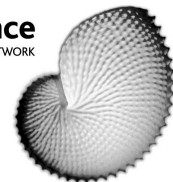
Resolving the issues

Good lesson design is a key factor in resolving these issues.

Designing a lesson follows the same process as other design projects. It starts with a clear understanding of the purpose and the tools and materials that are available.

You need to have:

• clarity about objectives and outcomes;

• awareness of the range of pedagogic approaches and strategies available;

• knowledge of how to select the right approaches and strategies to meet the objectives;

• knowledge of how then to structure a lesson or series of lessons to ensure that learning takes place.

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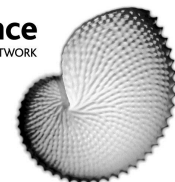
Factors affecting lesson design and the design process
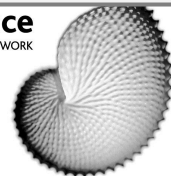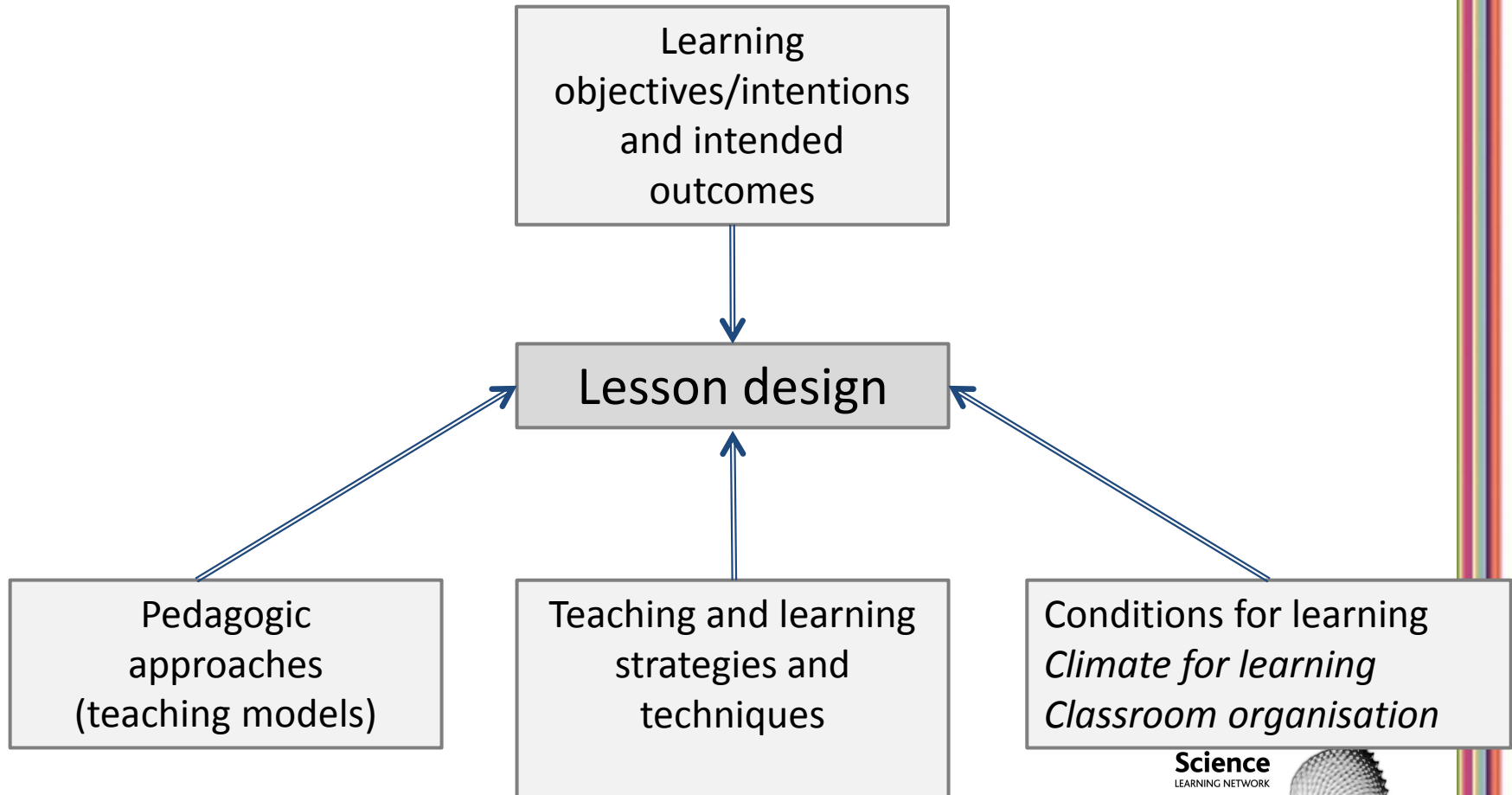
Learning Intentions & Outcomes

- The learning objective(s) or **intentions** for a lesson will come from the scheme of work.

- Having clearly defined the learning objective, now consider the **intended outcome**. What will students **produce** at the end of the lesson or sequence of lessons that will demonstrate the learning that has taken place – for example, a piece of writing, an artefact, a presentation or the solution to a problem?

- You will need to be clear from the outset what a good-quality product will look like. This will help you to clarify your expectations with students.

- Learning objectives fall into **five** categories.

- The nature of the learning intention – for example, skill acquisition or developing understanding – will determine the approaches and strategies you use.

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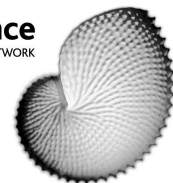
Terminology

Lesson objective: What do you want all the students in the class to learn? = **WALT**

We **A**re **L**earning **T**o…

For example, **W**e **A**re **L**earning **T**o explain how night and day happen.

Expected student outcomes: What are your expectations of students with differing abilities? There are likely to be a range of outcomes for any one lesson objective for the whole class = **WILF**

What **I**'m **L**ooking **F**or is…

For example, **W**hat **I**'m **L**ooking **F**or is for you to:

•   show me your model;

•   explain how rotation causes day and night;

•   use your model to explain a month and year.

I tend to use '**ILOs**' – Intended Learning Outcomes

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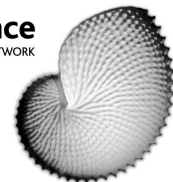
Yearly teaching objectives

encompass many lessons and lesson objectives

| lesson objective | lesson objective |

Each lesson focuses on about two

| lesson objective | lesson objective |

translates into

expected student outcome

expected student outcome

expected student outcome

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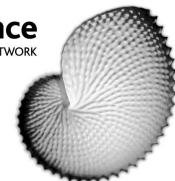
5 types of objectives/intentions

1. Acquiring and applying knowledge

2. Acquiring concepts

3. Acquiring new behaviours, learning new skills

4. Exploring attitudes and values, perspectives on a problem and solutions to complex issues

5. Personal growth, developing creativity

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1 Acquiring and applying knowledge

(learning factual information such as names of people, equipment, places, symbols processes and formulae)
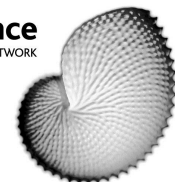
Many lesson objectives may fall into this category. Teaching methods that lead to meeting these objectives are highly organised by the teacher. Students are led through a well-planned set of activities.

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2 Acquiring concepts

(understanding concepts including abstract ideas, reasons, generalisations, laws, principles, how processes occur)

A large proportion of objectives in secondary education fall into this category. Once again teaching methods will be highly organised, but will often involve more than one approach being used, so that students increasingly develop a better grasp of the idea. This may happen over a period of lessons.

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3 Acquiring new behaviours, learning new skills

(learning processes and procedures, handling equipment, writing specific text types, applying techniques, analysing information)

All subjects have a significant number of lesson objectives associated with skill acquisition and practice. Subject-specific skills are easily identified; however, underlying skills are often hidden and students' lack of skill, for example in writing or discussion techniques, may be the cause of slow progress.

Teaching methods are highly structured and involve direct interaction between teacher and student.

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4 Exploring attitudes and values, perspectives on a problem and solutions to complex issues

(developing understanding through empathy, caring,

sensitivity towards social issues, moral issues)

While all subjects will have objectives in this category, some will have a significant number, such as PHSE, RE, history and geography. The application and use of Science however, also has ethical and moral implications.

Teaching methods, while being structured, often involve high levels of student–student discussion.
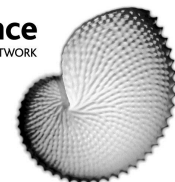
5 Personal growth, developing creativity

(exploring motives, creating, designing, hypothesising, exploring alternatives)

It is easy to point to subjects such as PHSE, English, art,

drama, music, dance, design technology for this category; it is important to position Science as an incredibly creative subject and offer learning in this area too.

Teaching methods here seek to promote productive independence, helping students become increasingly aware of their abilities.

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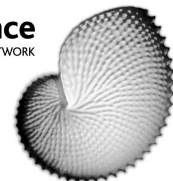
Pedagogic approaches

- Researchers have identified a number of different **approaches** to teaching that can promote different types of learning.

- Each of these has a defined sequence of episodes or steps that give a particular structure to the lesson. Some subjects have a strong leaning towards particular approaches because of the nature of the content and demands of the syllabus.

- The choice of pedagogic approach or teaching model will depend on the nature of the learning objective.

- **Direct interactive teaching**, **inductive enquiry** and **deductive enquiry** are examples of different approaches.

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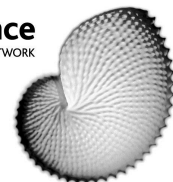
Teaching strategies and techniques for learning

- Within each pedagogic approach teachers may draw on a range of strategies to maximise learning from their input.

- For example, within the direct interactive teaching approach, demonstrating could be used to help students learn a new skill or procedure.

- Other strategies include questioning and explaining. Each has a set of procedures or methods that makes them effective.

- To embed learning and/or assess learning, teachers can select from a wide range of techniques such as card sorts, model mapping or group work (see area 6).

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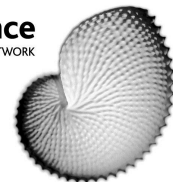
Structuring a lesson in episodes

- An effective lesson will be organised into a sequence of distinct learning episodes with a beginning (teacher input), a middle (activity for students) and then a quick check for understanding before moving to the next episode – until the end of the lesson, at which there might be a longer review time.

- students remember more from the beginning of a learning activity than they do from the middle. They also learn more from the end of the experience than they do from the middle.

- It follows that with slower learners or challenging classes it is beneficial to create lots of beginnings in a lesson.

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Planning episodes

- Each episode should have a distinct purpose and distinct outcome.

- Planning for smooth transition from one episode to the next is important. This can often be achieved by establishing classroom routines or using signals that students recognise, such as the phrases 'eyes on me' or 'now move to your home groups'.

- It takes time to establish these routines. They need to be introduced, then used confidently and consistently.

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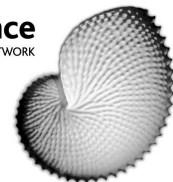
Selecting a teaching model

…as an example:

Direct interactive

Key features: Talk or demonstration is followed by active tasks that help students remember and fit the new knowledge into their existing ideas.

Good for:
- Learning new knowledge or practical skill
- Learning new processes
- Learning new communication or mathematical skill

Not so good for:
- Exploring feelings
- Generating new perspectives about complex issue
- Forming a concept
- Generating creative thinking

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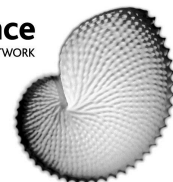
Why do starters?

- Planned effective starters, as part of a series of episodes of learning, provide opportunities to **engage** students immediately with the **learning objectives**.

- Starters exploit the prime learning time at the beginning of lessons when students are often at their most **receptive** and **concentration** levels are high.

- Effective starters are about purposeful, whole-class, interactive teaching involving all students.

- Teachers find starter activities particularly effective when they become part of the agreed routine of each lesson. students arrive at the lesson **expecting** to begin work immediately, and the stress created by discipline issues (such as late arrivals and homework not being handed in) is reduced.

- A well-balanced starter allows students to work **without intervention** from the teacher for some of the time, but also includes direct and specific teacher input.
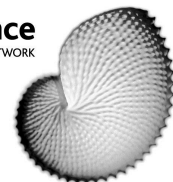
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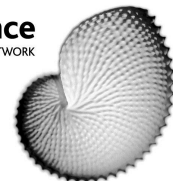
Successful starters:

• are planned as a discrete element of a lesson but will often contribute to the achievement of the lesson's objectives;

• have a clear purpose.

Starter activities tend to be most effective when they:

• engage all students;

• establish pace;

• provide challenge.

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Engagement

The challenge with starter activities is to get *all* students on-task quickly. students' motivation and involvement in learning are influenced by several different factors.

Engagement is more likely to happen if:

• the task does not outlast the concentration span of students;

• the task is immediately accessible to all or most students: starters that involve complex instructions or extended reading or writing activities are less likely to engage all students quickly;

• the task 'hooks' students' interest; this can be done by incorporating an element of mystery, curiosity, novelty or particular relevance;

• expectations are made clear, for example 'Each group should come up with at least five suggestions in the next 3 minutes';

• the teacher intervenes, where necessary, to help maintain engagement.

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Pace

Pace does not mean simply moving quickly through the lesson. It is about moving the lesson forward purposefully with the minimum number of distractions and amount of off-task time.

Many of the points made in relation to engagement also help to maintain pace. Of particular relevance are:

• making tasks quickly accessible to all or most learners as soon as they arrive in the classroom;

• setting and adhering to clear expectations within given time frames;

• intervening, where necessary, to move the lesson forward.

The pace at which a starter activity proceeds can sometimes be improved if the teacher quickly demonstrates or models what is required.

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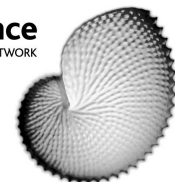
Challenge

Starter activities that demand active engagement and high-level thinking provide students with a mental 'warm-up' for the lesson. Broadly, there are two 'levels' of:

• activities and questions that involve remembering, checking on understanding and applying knowledge – Bloom calls these knowledge, comprehension and application;

• activities and questions that involve higher-order critical and creative thinking – Bloom refers to these as analysis, synthesis and evaluation.
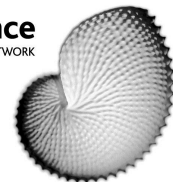
More challenging starter activities will require students to apply, analyse, synthesise or evaluate information or ideas.

The relationship between challenge and engagement is an important one. If the learning activity is too easy, students become bored; if it is too hard, frustration reduces motivation.
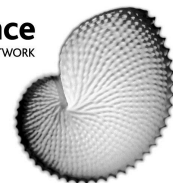
Approaches to differentiation

- by Task

- by Support

- by Outcome

- by Assessment and route design

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Differentiated Learning Strategies

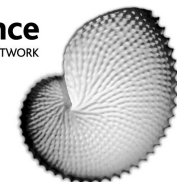| By task: allowing appropriate access	By design: allowing different routes
• Adjust the level of scientific skills required • Adjust the level of literacy skills required • Adjust the level of maths skills required • Provide suitable resources	• Use a range of learning styles • Take pupils' ideas into account • Vary the pace or sequence of learning • Vary groupings and roles within groups
By intervention: the teacher's role during the lesson	By outcome: how pupils communicate their learning
• Vary the nature of teacher intervention and distribution of teacher time • Use suitable questions • Vary the degree of independence expected	• Vary the response expected and the method of presenting/recording • Use activities that allow pupils to interact at their own level

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Adapted from Amos, S and Booham, R (ed.) (2002) *Aspects of Teaching Secondary Science,* London, Routledge/Falmer

Considerations when differentiating…

Carol Ann Tomlinson suggests that before differentiating lessons teachers should consider students:
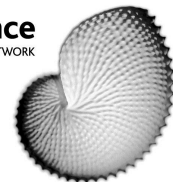
- Readiness (what skills do the students already have)
- Interest (what interests the student?)
- Learning Profile (in what way does the students like to work)

Good knowledge of students readiness, interest, learning profile is key to appropriate differentiation

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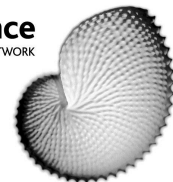
Assessment

Why do we assess?

Which of these is feedback?

"Nice job on the project, Sheshona!"

"Next time, Sam, you'll want to make your thesis clearer to the reader"

"The lesson would be more effective, Shana, if your visuals were more polished and supportive of the teaching."

"You taught about ants, Stefan? I LOVE ants!"

None of these is feedback.

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Feedback?

"Nice job on the project, Sheshona! *You answered the essential question in great depth, with lots of illustrative examples, and your oral presentation was polished and informative.*"

"*I found it very difficult to grasp your main point. At the start, it seemed that you were arguing against mining coal, but in paragraph three you focused on the need to provide healthcare to all workers.* Next time, Sam, you'll want to make your thesis clearer to the reader"

"*Your spoken delivery was clear and your account of the topic was a helpful and interesting summary: most students were engaged. Alas, the supporting materials you supplied looked unfinished and rough; 5-6 students were confused by them.* The lesson would be more effective, Shana, if your visuals were more polished and supportive of the teaching."

"You taught about ants, Stefan? I LOVE ants! *However, the task was not to please me; the task was to make students ignorant or afraid of an animal to become interested in them. Yet, you began as if the students already shared your interest in ants instead of helping them overcome their distaste and become more interested in them.*"

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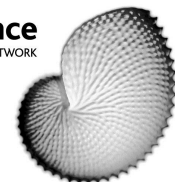
When feedback is only half there.

Fifth graders were busy writing acrostic poems on small posters. One girl wrote a school spirit poem, with the first letter of each line spelling out the school name: S for "super," N for "nice," and so on. She even drew a picture of a bobcat (pictures were not required) that was a spot-on replication of the school mascot.

A boy wrote an acrostic poem with the first letter of each line spelling out his name: A for "agressive" (unfortunately spelled incorrectly); N for "nutty"; and so on. No picture.
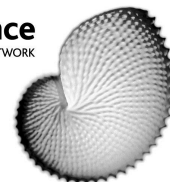
So what kind of feedback did the teacher give?

Her comments gave students the impression that the girl's poem was perfect and that the boy's poem was not so good, mostly because of that one misspelled word and the fact that his lines sloped downward on the poster.

The girl's work was a skilful replication of things she'd seen before. All the words were simple, the school spirit theme was a common one, and the point of her drawing was to duplicate the school mascot.

This assignment was a giant missed opportunity for both students.
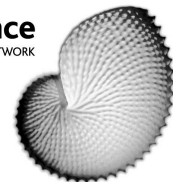
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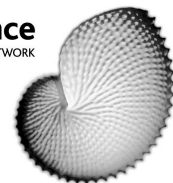
Why wasn't it quite enough?

The girl needed to know that her work was proficient—but she also needed to be challenged to work with more originality when writing poems. She only received half that feedback.

The boy's work was more original. Although the poem was only five lines long, it gave readers a real sense of who he was—or, at least, how he saw himself. He needed to know that he had used a prescribed format creatively—but he also needed to be challenged to check his spelling and use a ruler to make straight lines of text on posters. He, too, only received half that feedback.

Some teachers talk about 'feed-forward'

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Position within AfL paradigm

1. Clarifying and sharing learning intentions and criteria for success.

2. Engineering effective classroom discussions, questions, and learning tasks.

3. Providing feedback that moves learners forward.

4. Activating students as the owners of their own learning.

5. Activating students as instructional resources for one another.

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Unpacking formative assessment

	Where the learner is going	Where the learner is	How to get there
Teacher	Clarifying, sharing and understanding learning intentions	Engineering effective discussions, tasks, and activities that elicit evidence of learning	Providing feedback that moves learners forward
Peer		Activating students as learning resources for one another	
Learner		Activating students as owners of their own learning	

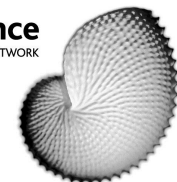Science
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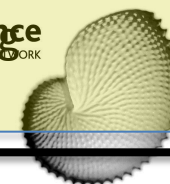
Feedback Can Occur Between:

- Teacher to pupil

- Pupil to teacher

- Pupil to pupil

- Teacher to teacher

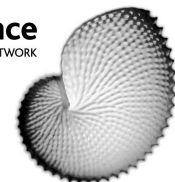*The feedback students give teachers can be more powerful than the feedback teachers give students - Hattie*
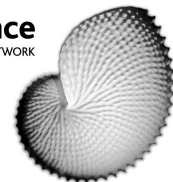
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Pupil to Teacher Feedback

- Listen to pupils questions

- Ask pupils questions to probe their understanding "Tell me more about…"

- Traffic lights

- Pupils written response to your comments

- Pupil observers

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Pupil to teacher feedback

Teacher to Pupil Feedback
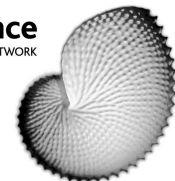
Two stars and a wish

✷ What you did well

✷ Another thing you did well

What your next step is (this could be a question)

Evaluate the strengths and weaknesses of this technique.

What other ideas are there for giving immediate feedback during the lesson?
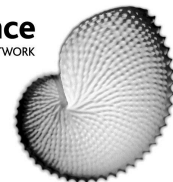
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Pupil to Pupil Feedback

How to help pupils understand success criteria:

1. Prove it/doing it wrong

2. A finished product

3. Comparison of two products

4. Sloppy success criteria

5. Teacher demonstration

6. Revisiting Existing

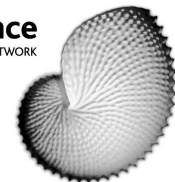- *Clarke, S. (2008) Active Learning Through Formative Assessment*

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What teachers see as feedback

- Comments
- Clarification
- Confirmation
- Criticism (pros & cons)
- Content development
- Correction

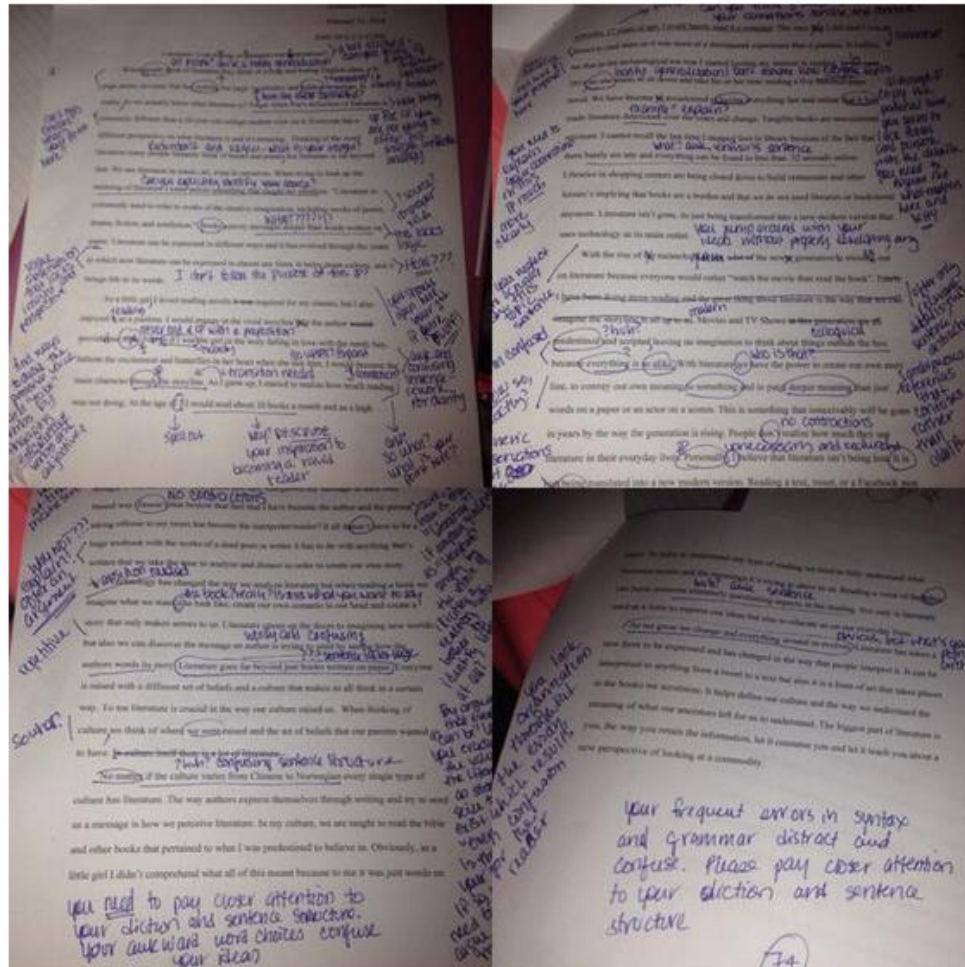*[All of these tend to relate to how the student is doing now]*

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People wonder why I hate my English teacher. Well this is why... Did she rewrite my essay or grade it

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your frequent errors in syntax and grammar distract and confuse. Please pay closer attention to your diction and sentence structure

you need to pay closer attention to your diction and sentence structure. Your awkward word choices confuse your ideas

What students see as feedback

- Give advice on what to do next

- How to improve

- What to do better next time but also what you are doing well

- "you do something and the teacher tells you whether you are going in the right direction"

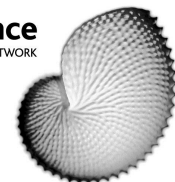- How to make adjustments to make it better

- To have time to make it better

[all of these are to do with 'where next']
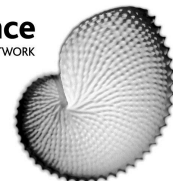
Student perceptions of feedback…

Feedback is:

- too late

- too vague

- too cryptic

- inconsistent

- didn't relate to learning criteria

- demotivational

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Three Fundamental Principles of Effective Classroom Feedback

1. Be more work for the recipient than the donor

Feedback should cause thinking. Students should be expected to have time to do something with it.
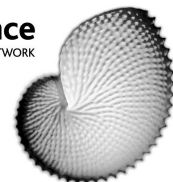
2. Be focused

'less' can be more: feedback should be accurate *and* helpful

3. Relate to shared learning goals

Have clear learning intentions and success criteria that are referenced through a lesson & in feedback given at the appropriate time

[From Dylan Wiliam Embedded Formative Assessment (2011)]

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Managing the Learning Environment

- describe the **self-discipline approach**, **instructional approach**, and **desist approach** to classroom management;

- specify causes of classroom misbehaviour;

- describe organizational techniques that lead to effective classroom management;

- summarize teacher-tested techniques for proactively preventing classroom management problems; and discuss the use of appropriate consequences.

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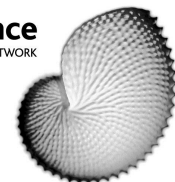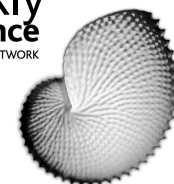
The Self-Discipline Approach

The self-discipline approach is built on the premise that students can be trusted to reflect upon and regulate their behaviours to benefit themselves and others.

The Instructional Approach

This approach to classroom management prevents most management problems by actively engaging students in high-interest lessons geared to meet their interests, needs, and abilities. Thus, students are motivated to attend class, positively participate in activities, and manage their own behaviour.

The Desist Approach

This approach to classroom management gives the teacher full responsibility for regulating the classroom. The teacher establishes and enforces a set of specific rules to control student behaviour in the classroom. Since the desist model of classroom management give teachers power to deal forcefully and quickly with misbehaviour, it can be viewed as a power system.

Questions to ask yourself…

1. **Discipline Approaches.** Can you identify some basic concepts that all three approaches have in common? Which approach, if any, do you prefer? Combine elements of the different approaches to develop an eclectic model that would work for you. Be ready to share.

2. **Causes of Misbehaviour.** Reflect upon disciplinary incidents you have witnessed in classrooms. Identify the misbehaviours and possible causes. Were any of the misbehaviours caused by the teachers' words, actions, or inaction? How might knowledge of the causes of these incidents influence a teacher's actions?

3. **Rules and Consequences.** Prepare a list of rules and rationales for a classroom at the age level you expect to teach. How will you maintain control?

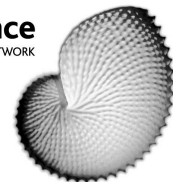**Science**
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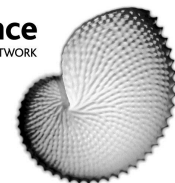
Conditions for Learning

This has two components: the **climate for learning** and the **classroom organisation**.

Students learn most effectively when they feel motivated, confident and successful. The main factors contributing to a climate of success are:
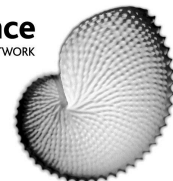
- getting the pitch of the lesson right so students can recognise and demonstrate their learning;

- establishing relationships which allow students to feel safe and able to respond;

- providing variety so that different learning styles can be accommodated over time.

- Classroom organisation and the use and appearance of the physical environment can have an enormous impact on the attitudes and behaviours of students.

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Teaching for Learning

Effective science T&L includes:

- Delivering the content
- Key classroom techniques (such as…?)
- (Good) Assessment for Learning
- Thinking Skills

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Teaching for Learning

What's in the Toolkit?

Ability to communicate

Sharing objectives, signposting learning
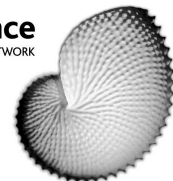
Effective questioning

Monitoring & feedback

Differentiation, appropriate challenge

Ability to guide pupils to reflect on their progress, and discuss their learning

Implicit & explicit, embedded, contextualised thinking skills

Imaginative & creative teaching strategies & interventions

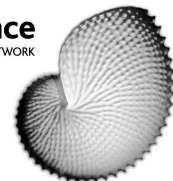*strategies task*

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Selecting strategies and techniques

Teachers need a repertoire of **teaching strategies** to promote learning and develop understanding.

The nature of the learning objective will determine when it would be appropriate to use each strategy within an episode.

They also require a wide variety of **techniques** to actively engage students, and to plan for variety.

Key strategies

Questioning

Most effective when it is planned and sequenced. Use questioning to promote higher-order thinking and active listening when developing

knowledge and understanding.

Modelling

Modelling is more than demonstrating; it helps students understand underlying structures through the teacher's 'thinking aloud'. Use modelling to introduce new skills, procedures, processes and conventions (such as text types).

Explaining

crucial to helping students understand abstract concepts and events that are outside their own experience. Verbal explanations are supported with the use of models and analogy. Use explaining to develop knowledge, understanding and reasoning.
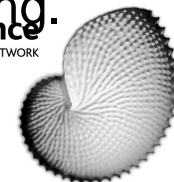
The best techniques require students to think and make decisions…

Verbalise

Reduce information

Transform information

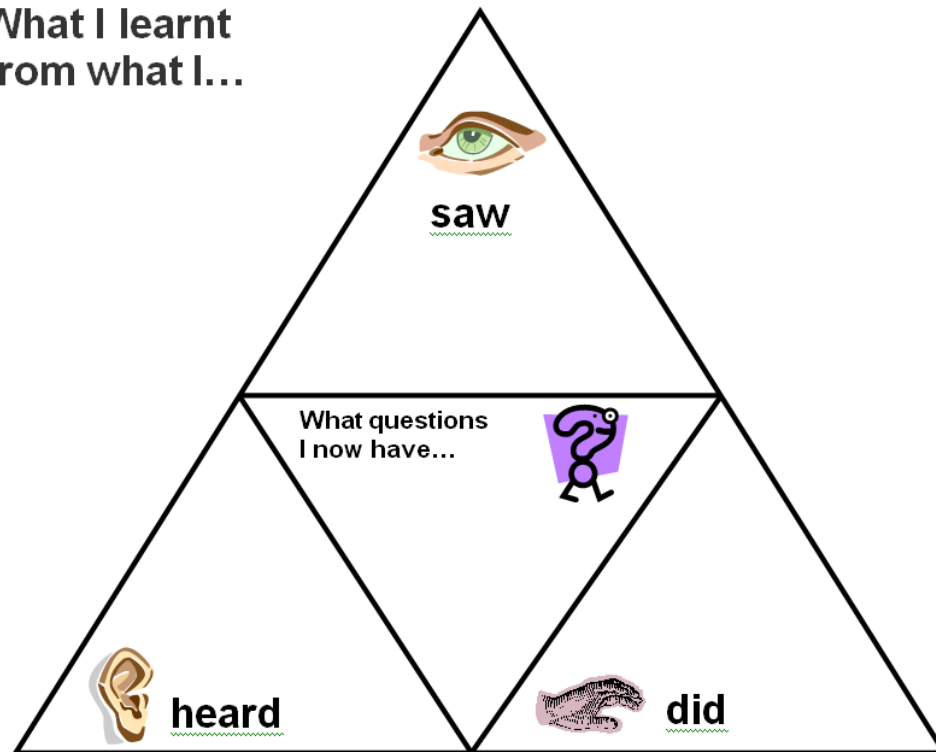Sequence text

Use analogy

Predict

Classify

Rank order maps

Create cognitive maps

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Plenary Triangle

Let's revisit your kites from earlier, and use this prompts from the plenary triangle to see if you have some future targets for your team