



Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

Yr Athrofa
Centre for Education
Addysg i Gymru | Education for Wales

Trawsnewid Addysg, Trawsnewid Bywydau

Transforming Education, Transforming Lives

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Transforming Education, Transforming Lives

www.uwtsd.ac.uk

ECAD5012

Science and Technology 1

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Bwriadau Dysgu

Learning Intentions

- Ymglyfarwyddo gyda chynnwys y Cwricwlwm i Gymru 2022 o fewn y Maes Dysgu a Phrofiad Gwyddoniaeth a Thechnoleg
- Sut i gynllunio'n effeithiol er mwyn sicrhau cynnydd mewn Gwyddoniaeth a Thechnoleg
- Ystyried technegau cwestiynu effeithiol (AagD)
- Familiarise yourself with the content of the 2022 Curriculum for Wales for the Science and Technology Area of Learning and Experience
- How to plan effectively to make progress in Science and Technology
- Consider effective questioning techniques (AfL)

Cam cynnydd 2 & 3

Progression step 2 & 3

1.

Beth wyf yn dysgu?
What am I teaching?



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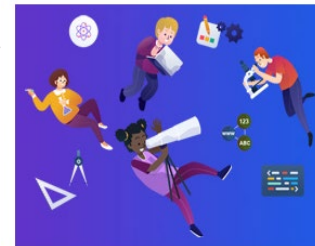
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Curriculum for Wales

- [AoLE Science and Technology](#) - What Matters

- Being curious and searching for answers is essential to understanding and predicting phenomena.
- Design thinking and engineering offer technical and creative ways to meet society's needs and wants.
- The world around us is full of living things which depend on each other for survival.
- Matter and the way it behaves defines our universe and shapes our lives.
- Forces and energy provide a foundation for understanding our universe.
- Computation is the foundation for our digital world.

[Descriptions of learning - Hwb \(gov.wales\)](#)



Science and Technology

Task :

Take 10 minutes to familiarise yourself with the Area of Learning and Experience

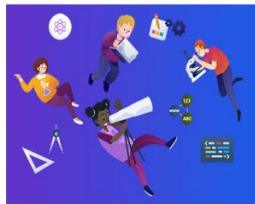
What are the key concepts?
From where do they derive?

Curriculum for Wales: Progression

Progression in learning is a process of developing and improving skills and knowledge over time'.

Principles of progression

These are the overarching principles of each Area of Learning and Experience and the curriculum in general. They are about progress across the whole curriculum.



Science and Technology

[Science and Technology: Principles of progression - Hwb \(gov.wales\)](https://gov.wales/science-and-technology/principles-of-progression)



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How do investigations support the Curriculum? (Progression step 2 & 3)

- Being curious and searching for answers is essential to understanding and predicting phenomena.

Progression step 2	Progression step 3
I can ask questions and use my experience to suggest simple methods of inquiry.	I can identify questions that can be investigated scientifically and suggest suitable methods of inquiry.
I can recognise patterns from my observations and investigations and can communicate my findings.	I can suggest conclusions as a result of carrying out my inquiries.
I can use my knowledge and understanding to predict effects as part of my scientific exploration.	I can evaluate methods to suggest improvements.
I can recognise that what I do, and the things I use, can have an impact on my environment and on living things.	I can engage with scientific and technological evidence to inform my own opinions.
I can explore relationships between living things, their habitats and their life cycles .	I can understand how my actions and the actions of others impact on the environment and living things.
I can observe and describe ways in which materials change when they are mixed together.	I can describe the impacts of science and technology, past and present, in my everyday life.
I can investigate different forms of energy and how it can be transferred.	
I can explore and communicate the basic properties of light, sound, electricity and magnetism.	
I can identify things in the environment which may be harmful and can act to reduce the risks to myself and others.	

- Design thinking and engineering offer technical and creative ways to meet society's needs and wants.

Progression step 2	Progression step 3
I can make design decisions, using my knowledge of materials and existing products, and suggest design improvements.	I can creatively respond to the needs and wants of the user, based on the context and on the information collected.
I can explore how different component parts work together.	I can identify and consider factors when developing design proposals.
I can safely use a range of tools, materials and equipment to construct for a variety of reasons.	I can use design thinking to test and refine my design decisions without fear of failure.
I have experienced using basic prototyping techniques to improve outcomes.	I can apply my knowledge and skills when making design decisions in order to produce specific outcomes.
I can identify things in the environment which may be harmful and can act to reduce the risks to myself and others.	I can consider how my design proposals will solve problems and how this may affect the environment.
I can explore and describe the properties of materials and justify their uses.	I can use design communication methods to develop and present ideas, and respond to feedback.
	I can combine component parts, materials and processes to achieve functionality and improve the effectiveness of my outcomes.
	I can select and safely use appropriate tools, materials and equipment to construct purposeful outcomes.
	I can use prototyping as a link between my designing and making.
	I can take into account the impact my making may have on the environment.



How do investigations support the Curriculum? (Progression step 2 & 3)

The world around us is full of living things which depend on each other for survival.

Progression step 2	Progression step 3
I can recognise patterns from my observations and investigations and can communicate my findings.	I can describe how living things compete for specific resources and depend on each other for survival.
I can use my knowledge and understanding to predict effects as part of my scientific exploration.	I can describe the features of organisms and recognise how they allow them to live, grow and reproduce for survival in their environment.
I can recognise that what I do, and the things I use, can have an impact on my environment and on living things.	I can explain the role of different organs and systems that enable plants and animals to live and grow.
I can explore relationships between living things, their habitats and their life cycles .	I can describe some changes in growth and development caused by hormones.
	I can identify the threats to the development and health of organisms and recognise some natural defences, preventions and treatments.

Matter and the way it behaves defines our universe and shapes our lives.

Progression step 2	Progression step 3
I can recognise patterns from my observations and investigations and can communicate my findings.	I can recognise that changes in materials affect their properties and uses under different conditions.
I can use my <u>knowledge</u> and understanding to predict effects as part of my scientific exploration.	
I can make design decisions, using my <u>knowledge</u> of materials and existing products, and suggest design improvements.	I can recognise that our planet provides natural materials and can explain why they may have been processed to make them useful.
I can explore and describe the properties of materials and justify their uses.	
I can observe and describe ways in which materials change when they are mixed together.	



How do investigations support the Curriculum? (Progression step 2 & 3)

Forces and energy provide a foundation for understanding our universe.

I can recognise patterns from my observations and investigations and can communicate my findings.

I can use my [knowledge](#) and understanding to predict effects as part of my scientific exploration.

I can investigate different forms of energy and how it can be transferred.

I can communicate the effect [forces](#) have on myself and on objects.

I can explore and communicate the basic properties of light, sound, electricity and magnetism.

I can explore how the motion of objects can be affected by applying specific [forces](#).

I can use a variety of simple [models](#) to describe the forces acting on an object.

I can explain that energy can be transferred from one place to another and how this can be used to provide the energy we need in our modern lives.

I can describe the factors that affect electrical circuits and this will enable me to change variables and predict what will happen.

I can explain how the properties of sound and light will affect how they are experienced.

By manipulating the properties of sound and light, I can produce a desired effect.

I can describe how magnetic fields behave and explore a range of practical uses for them.

Computation is the foundation for our digital world.

Progression step 2

I can safely use a range of tools, materials and equipment to construct for a variety of reasons.

I can use computational thinking techniques, through unplugged or offline activities.

I can create simple [algorithms](#) and am beginning to explain errors.

Computation is the foundation for our digital world.

I am beginning to explain the importance of accurate and reliable data to ensure a desired outcome.

I can follow instructions to build and control a [physical device](#).

Progression step 3

I can use conditional statements to add control and decision-making to [algorithms](#).

I can identify repeating patterns and use loops to make my [algorithms](#) more concise.

I can explain and debug [algorithms](#).

I can use sensors and actuators in systems that gather and process data about the systems' environment.

I can identify positive and negative design elements that affect user interactions.

I can explain how digital devices can be interconnected locally and globally.

I can explain the importance of securing the technology I use and protecting the integrity of my data.

I can explain how my data is used by services, which can help me make more informed decisions when using technology.

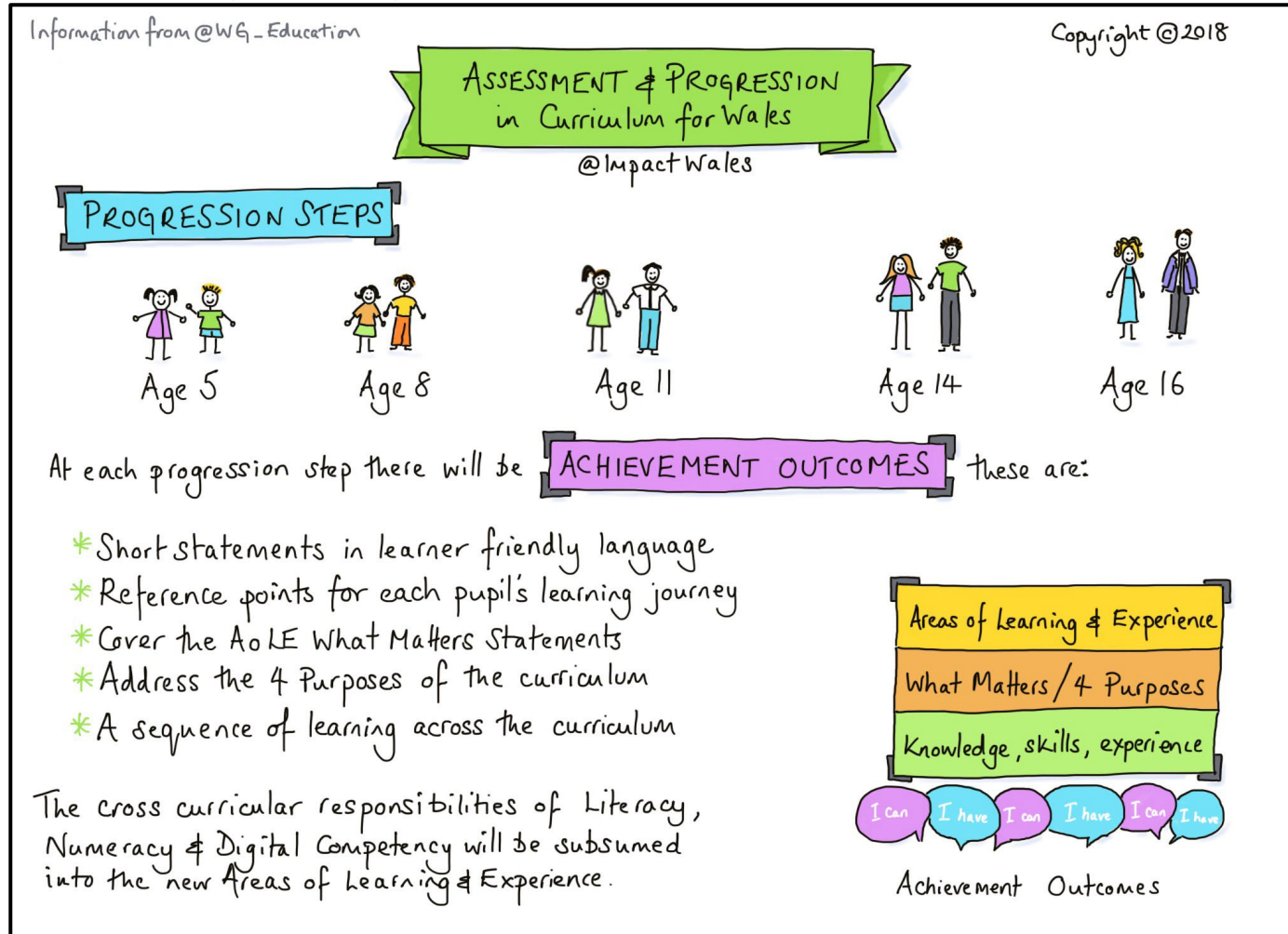
I can explain how data is stored and processed.

I can effectively store and manipulate data to produce and give a visual form to useful information.



Aseu & Cynnydd

Assessment & Progression



<https://www.impact.wales/>

Developing Science and Technology

- ▶ Curiosity
- ▶ Explore
- ▶ Observe
- ▶ Communicate
- ▶ Materials
- ▶ Connect properties to their use
- ▶ Sequences
- ▶ Patterns
- ▶ Grow
- ▶ Instructions
- ▶ Explore computing technology

Use Youtube / Pinterest/ twitter to research some the following ideas:

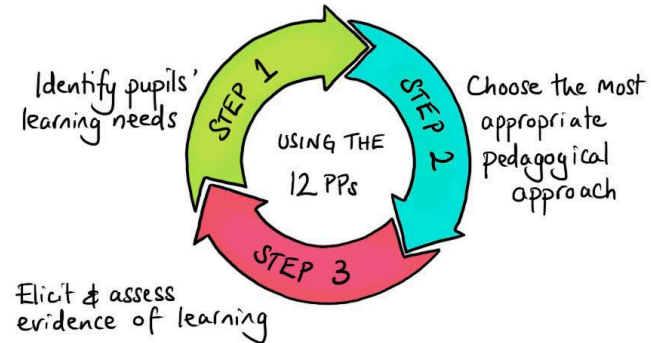
Sink or float
Will it dissolve
Magnet maze
Discovering magnification
Homemade marble runs
Weather station
How do plants grow
Pooter (bug trap)
Water cycle
Light (shadows)
Life cycles of plants
Life cycle of creatures
Filtering
Magic dancing milk

**These are great ideas and allow pupils to have fun yet also ask lots of questions.
Encourage talking. Increase descriptive vocabulary.
Encourage sorting and pattern making.**

[CLEAPSS Home page](#)
Username - trainee
Password - cleapss27

"The recommendations of this Review do not imply an emphasis on any particular teaching approaches: decisions about teaching and learning are best taken by teachers themselves."

Prof G. Donaldson, *Successful Futures* (2015)



Good teaching & learning...

Focuses on the 4 Purposes

Supports sustained effort to reach high but achievable expectations

Employs a range of pedagogical approaches including direct teaching

Promotes wider skills including problem solving creative & critical thinking

Builds on previous knowledge and experiences

Creates authentic contexts for learning

Uses assessment for learning

Makes connections within & between AoLES

Reinforces cross curricular skills of LNF, DCF etc.

Supports learners to take responsibility for their own learning

Supports social and emotional development & positive relationships

Encourages collaboration

Odd one out?

<https://pstt.org.uk/?s=odd+one+out>



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Living Things & Classification

How do you know the person next to you is alive?



Living Things & Classification

HOT Question

Is a tree alive?



Living Things & Classification

HOT Question

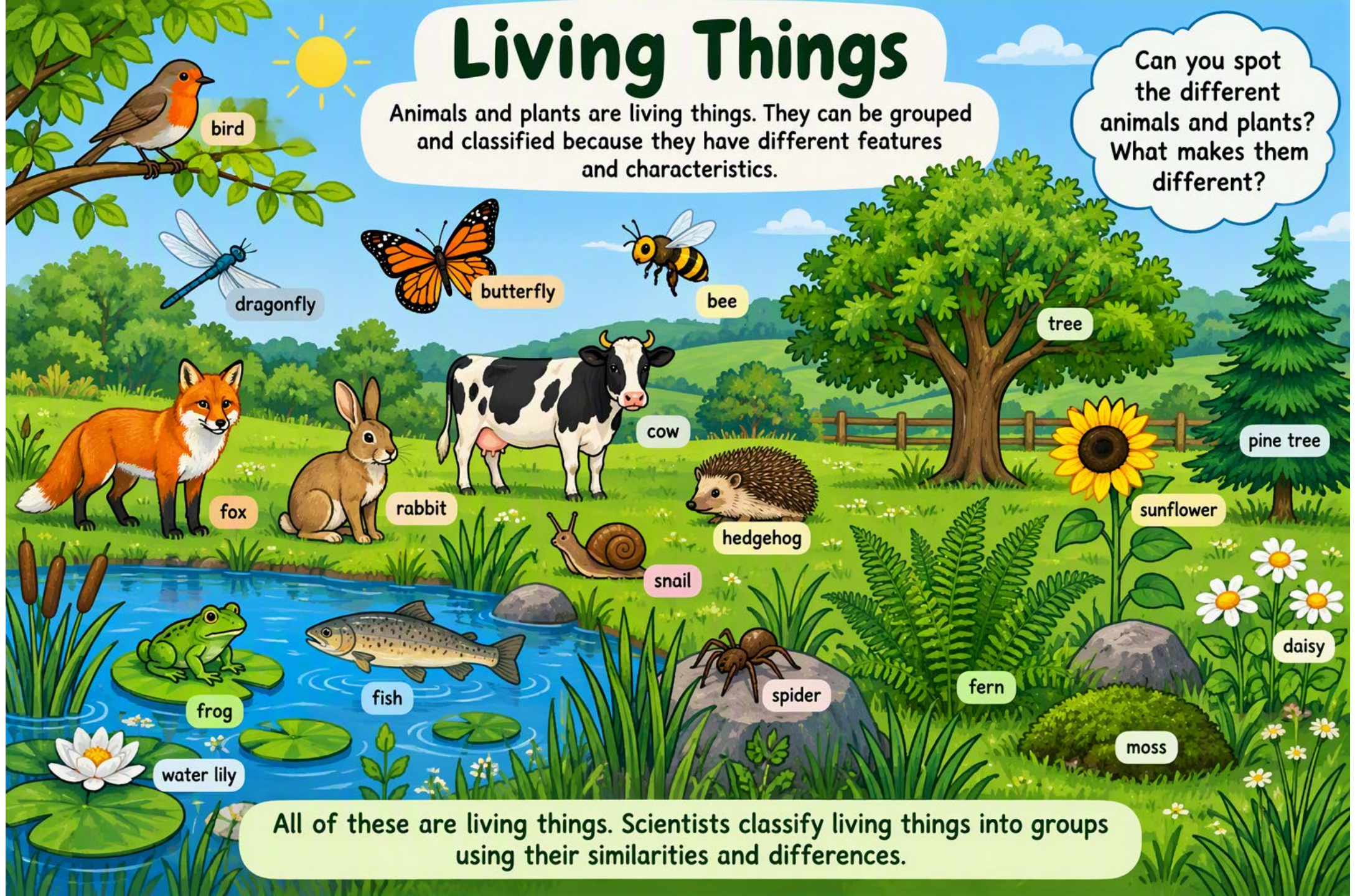
Is a flame alive?



Living Things

Animals and plants are living things. They can be grouped and classified because they have different features and characteristics.

Can you spot the different animals and plants?
What makes them different?



bird

dragonfly

butterfly

bee

tree

pine tree

fox

rabbit

cow

hedgehog

snail

sunflower

daisy

fern

moss

frog

fish

spider

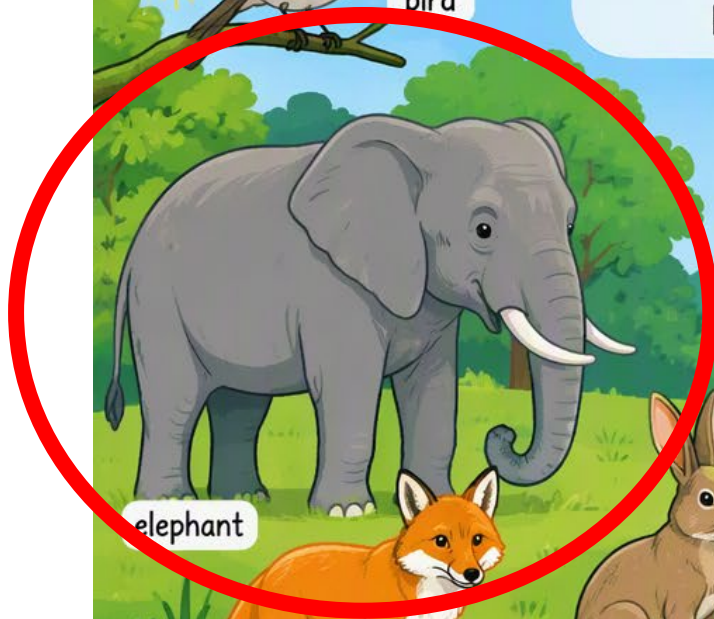
water lily

All of these are living things. Scientists classify living things into groups using their similarities and differences.

Living Things

Animals and plants are living things. They can be grouped and classified because they have different features and characteristics.

Can you spot the different animals and plants? What makes them different?



butterfly



bee



cow



tree



pine tree



sunflower

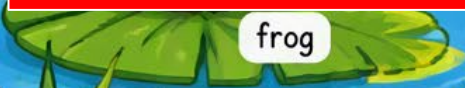


bush

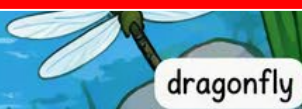


snail

A reminder to be careful with AI!



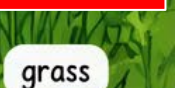
frog



dragonfly



moss



grass

All of these are living things. Scientists classify living things into groups using their similarities and differences.

Cam cynnydd 2 & 3
Progression step 2 & 3

Sut a paham wyf yn dysgu?
How and why am I teaching?



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Ymholiad Gwyddonol

Dysgu drwy ymholiad gwyddonol

Dyma ffordd o ddisgrifio dysgu ble mae'r sgiliau ymholi yn cael eu defnyddio i **gasglu tystiolaeth i brofi a all rhai syniadau esbonio ffenomenau a digwyddiadau yn y byd o'n cwmpas.**

Gweler: Harlen, W. (2009) "Enquiry and good science teaching", *Primary Science*, 106, January, p5-8.

Scientific Enquiry

Learning through scientific enquiry

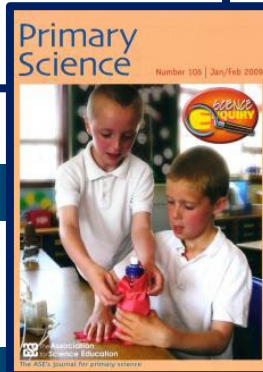
This is a way of describing learning in which the science enquiry skills are used to gather evidence to test whether certain ideas can explain phenomena and events in the world around us.

Directed reading: Harlen, W. (2009) "Enquiry and good science teaching", *Primary Science*, 106, January, p5-8.



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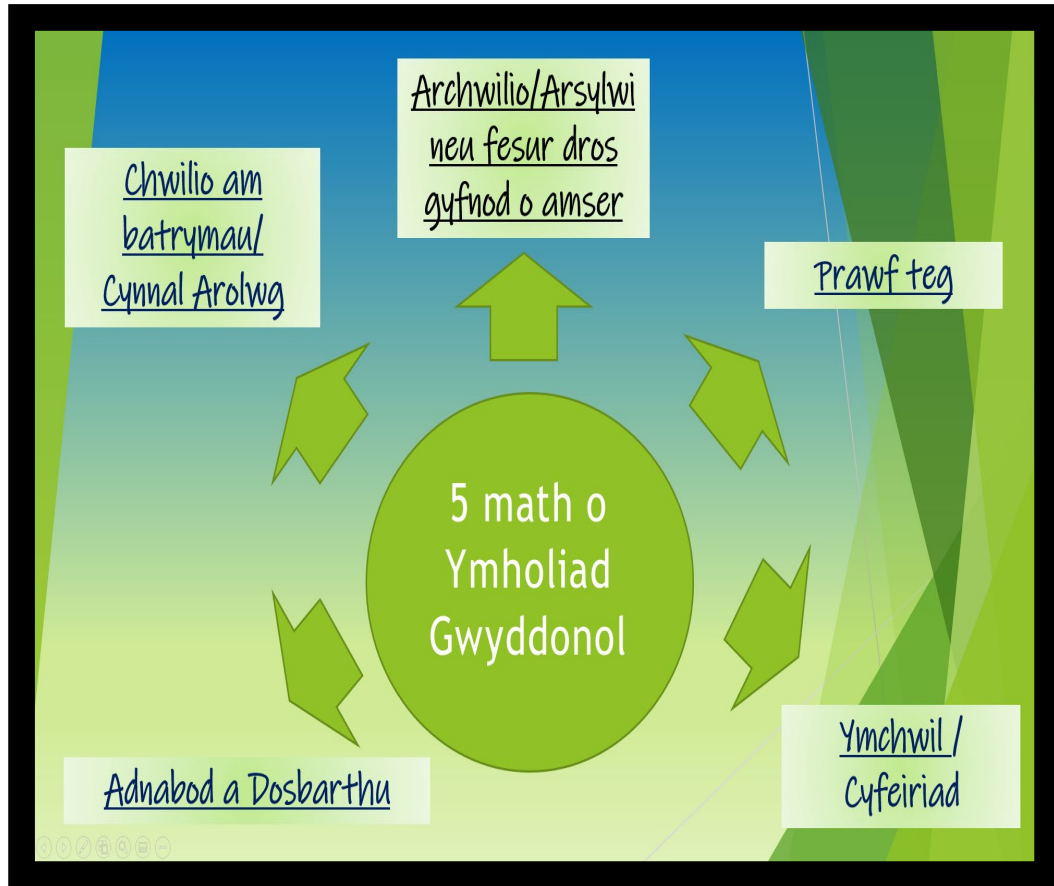
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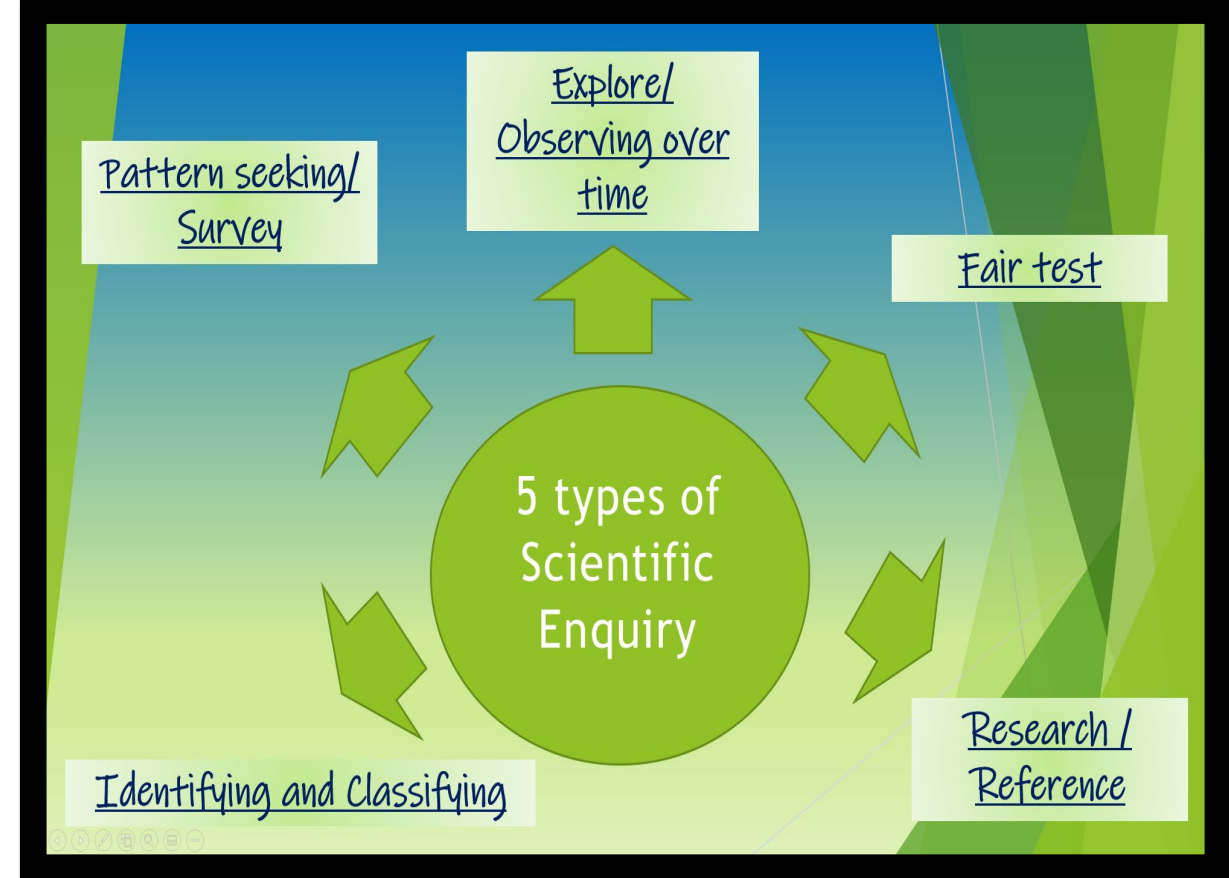
File: Lecture 2 Resources

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5 math o Ymholiad Gwyddonol



5 Types of Scientific Enquiry



Scientific enquiry in the UK Tud/Pages 2-4 , 8-10

<https://www.ase.org.uk/system/files/Scientific%20Enquiry%20in%20the%20UK%20V2.pdf>



The Association for Science Education
Promoting Excellence in Science Teaching and Learning

Scientific enquiry

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Ymholiad Gwyddonol

Yn ystod blwyddyn academiaidd, bydd disgyblion yn cynnal sawl ymchwiliad sy'n cynnwys gwahanol fathau o ddulliau ymholi gwyddonol:

Pa ddefnyddiau sy'n fagnetig? - Adnabod a Dosbarthu

Pa fath o ymholiad?

- Sut mae hyd llinyn gitar yn effeithio ar draw?
- Ydy bwydydd sy'n cynnwys llawer o egni bob tro yn cynnwys llawer o siwgr?
- Beth ydy microplastigau a sut maen nhw'n niweidio'r blaned?
- Sut mae fy nghysgod yn newid yn ystod y dydd?

Scientific Enquiry

Over the course of an academic year, pupils will carry out several investigations which involve different types of scientific enquiry approaches:

Which materials are magnetic? Identifying and Classifying

What type of enquiry?

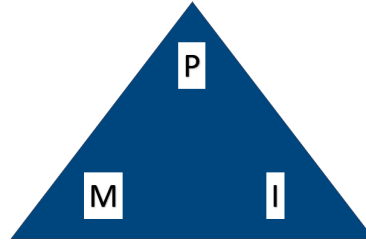
- How does a guitar strings length affect pitch?
- Do high energy foods always contain a lot of sugar?
- What are microplastics and how do they damage the planet?
- How does my shadow change during the day?

Ymholiad Gwyddonol

Scientific Enquiry

Tasg 2

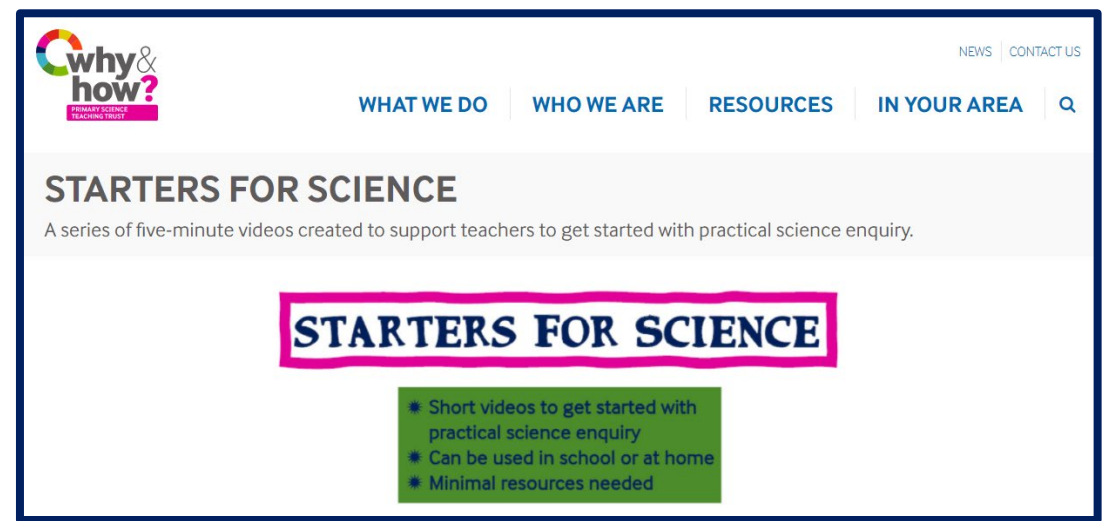
Task 2



- Cymerwch 20 munud i edrych ar ac i gasglu rhai syniadau ac adnoddau:

<https://pstt.org.uk/resources/curriculum-materials/Starters-for-Science>

- Clipiau fideo ac adnoddau yn y Gymraeg.



- Take 20 minutes to look at and collect some ideas and resources:

<https://pstt.org.uk/resources/curriculum-materials/Starters-for-Science>

- Video clips and resources .

Felly sut?

- ☐ gofyn cwestiynau
- ☐ gwneud rhagfynegiadau
- ☐ sefydlu profion
- ☐ arsylwi a mesur
- ☐ cofnodi data
- ☐ dehongli a chyfleu canlyniadau
- ☐ Gwerthuso



So how?

- ☐ asking questions
- ☐ making predictions
- ☐ setting up tests
- ☐ observing and measuring
- ☐ recording data
- ☐ interpreting and communicating results
- ☐ Evaluating



AFL in Science and Technology



What works well?

- misconceptions and classroom climate: puppets, concept cartoons, learning journal
- talk and discussion: extensive talk, highlighting language, explore pupils' views
- questioning: 'big' or 'rich' question, focused questions, returning to the question, provide 'wait time', 'no hands up' strategy
- feedback: constructive, marking against learning objectives, comment-only marking, pupils responses
- self-assessment: use of the plenary for self-evaluation, self-assessment 'journal, self-marking of work against specific criteria, concept maps, traffic light'
- peer-assessment: paired-assessment against specific criteria

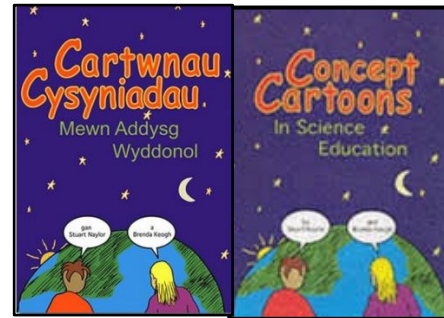
AagD mewn Gwyddoniaeth a Thechnoleg

AFL in Science and Technology

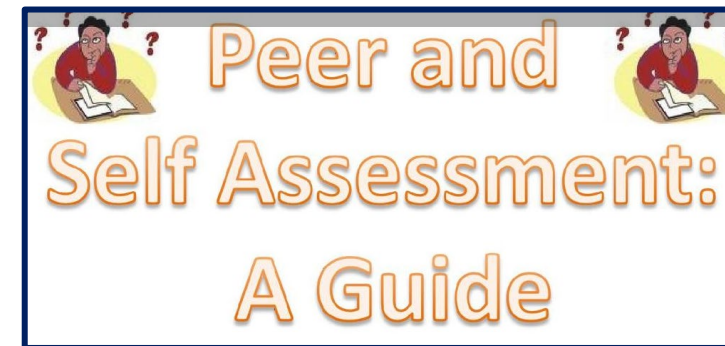
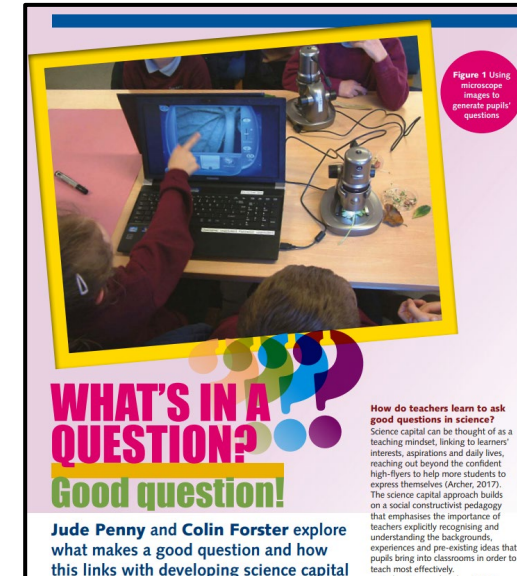
PDF Moodle



Puppets and engagement in science:
a case study- PDF Moodle



ISBN: 9780952750628



<https://www.stem.org.uk/resources/elibrary/resource/359749/peer-and-self-assessment-guide#&gid=undefined&pid=1>

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Useful links:

- <https://www.stem.org.uk/resources/collection/3485/teaching-primary-science>
- <https://www.ase.org.uk/resources/primary-science>
- <https://wowscience.co.uk/>
- <https://www.tes.com/teaching-resources>
- <https://www.farmvention.com/>
- <https://explorify.wellcome.ac.uk/>
- <https://pstt.org.uk/>



<https://pstt.org.uk/what-we-do/why-how-magazine>