



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**

*Trawsnewid Addysg, Trawsnewid Bywydau
Transforming Education, Transforming Lives*

www.uwtsd.ac.uk

ECAD6051

**Gwyddoniaeth
a
Technoleg**

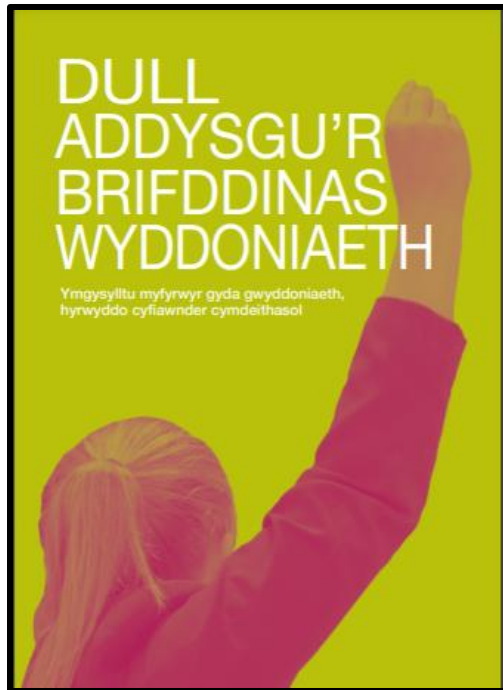
Darlith 3

Menna Davies

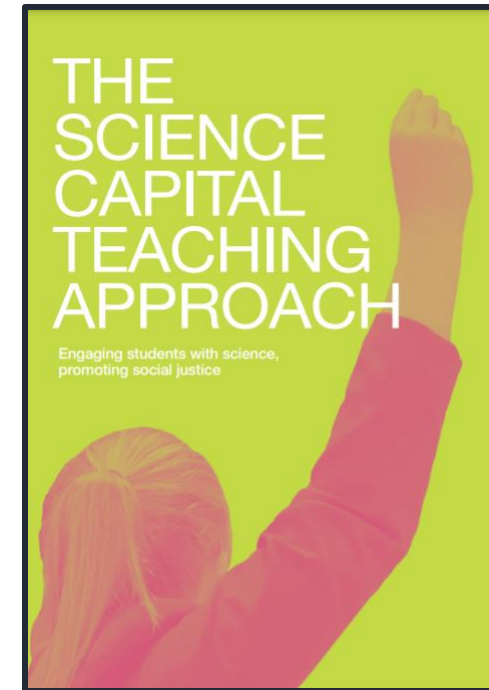
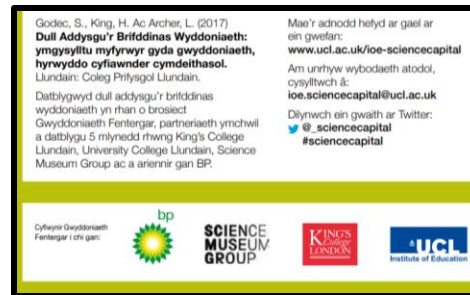
menna.davies@uwtsd.ac.uk

Cyfalaf Gwyddonol : Science Capital

“The Science Capital Teaching Approach is designed to support teachers in helping students find more meaning and relevance in science and, as a result, engage more with the subject.”



[the-science-capital-teaching-approach-pack-for-teachers-welsh.pdf \(ucl.ac.uk\)](https://discovery.ucl.ac.uk/id/eprint/10080166/1/the-science-capital-teaching-approach-pack-for-teachers-welsh.pdf)



<https://discovery.ucl.ac.uk/id/eprint/10080166/1/the-science-capital-teaching-approach-pack-for-teachers.pdf>



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Cyfalaf Gwyddonol- Beth ydyw?

Mae rhai dysgwyr yn cael trafferth gweld gwyddoniaeth fel rhywbeth sy'n berthnasol i'w bywydau ac fel rhywbeth sy'n addas iddyn nhw. Gall hyn wneud eu hymgysylltiad gyda gwyddoniaeth yn anodd.

Golyga cynnydd gwyddonol y bydd angen cynyddol i bobl ddeall pynciau STEM er mwyn bod yn ddinasyddion gweithredol sydd â dweud mewn cymdeithas.

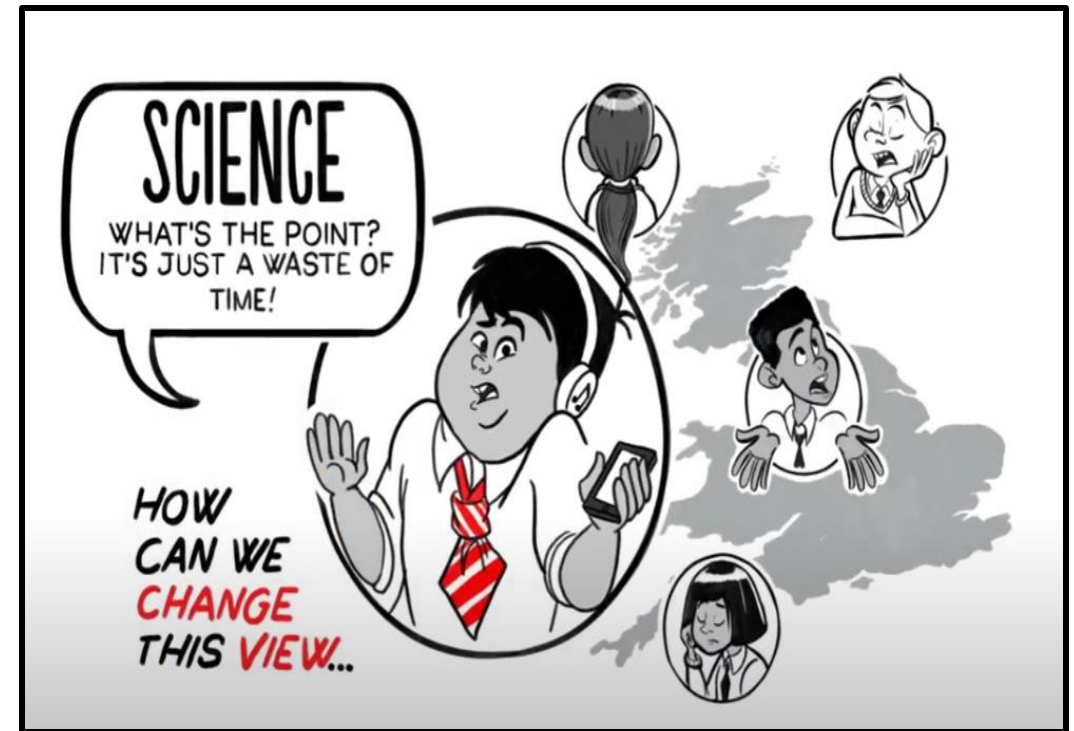
I helpu mwy o bobl—a mwy o amrywiaeth o bobl—i ymgysylltu gyda gwyddoniaeth, mae dull addysgu cyfalaf gwyddoniaeth yn adeiladu ar arferion addysgu da.

Y gwahaniaeth allweddol yw ffocws penodol ar gydnabod a gwerthfawrogi cyfalaf gwyddonol cyfredol myfyrwyr, tra hefyd yn eu helpu i adeiladu ar gyfalaf gwyddonol newydd

Cyfalfaf Gwyddonol : Science Capital



<https://www.youtube.com/watch?v=A0t70bwPD6Y>



<https://www.youtube.com/watch?v=hWWPUK3xZ0>



Datganiadau o'r hyn sy'n bwysig

Statements of what matters



- Mae bod yn chwilfrydig a chwilio am atebion yn hanfodol i ddeall a rhagfynegi ffenomenau.
- Mae meddylfryd dylunio a pheirianeg yn cynnig ffyrdd technegol a chreadigol i ddiwallu anghenion a dymuniadau cymdeithas.
- Mae'r byd o'n cwmpas yn llawn pethau byw sy'n dibynnu ar ei gilydd i oroesi.
- Mae mater, a'r ffordd y mae'n ymddwyn, yn diffinio ein bydysawd ac yn ffurfio ein bywydau.
- Mae grymoedd ac egni yn gosod sail i ddeall ein bydysawd.
- Mae cyfrifiaduraeth yn gosod sail i'n byd digidol.

<https://hwb.gov.wales/cwricwlwm-i-gymru/gwyddoniaeth-a-thechnoleg/disgrifiadau-dysgu/>

- 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.

<https://hwb.gov.wales/curriculum-for-wales/science-and-technology/descriptions-of-learning/>

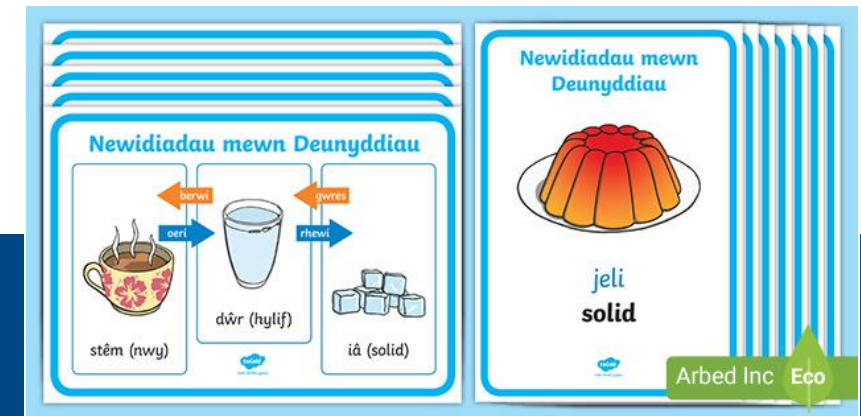
Egwyddorion Cynnydd :Cynllunio ar gyfer cynnydd:

“Caiff cynnydd ym Maes Dysgu a Phrofiad Gwyddoniaeth a Thechnoleg ei ddangos wrth i ddysgwyr archwilio a phrofi syniadau a chysyniadau cynyddol gymhleth sy'n rhan o'r datganiadau o'r hyn sy'n bwysig”

[Gwyddoniaeth a Thechnoleg: Egwyddorion cynnydd - Hwb \(gov.wales\)](http://gov.wales)

Enghraifft YHSB 4: dysgu sut y gellir trin deunyddiau:

- ar gamau cynharach trwy chwarae, cymysgu deunyddiau a gwybod y gall deunyddiau newid, ac o dan rai amodau byddant yn ymateb i ffurfio rhywbeth newydd, yn ogystal â chael eu cyfuno i greu cynhyrchion newydd
- yn nes ymlaen, gellir archwilio gwahanol fathau o adweithiau cemegol



Cysylltiadau allweddol gyda MDaPh eraill?

Key links to other AoLE's?



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Partnriaeth Ddysgu Proffesiynol Yr Athrofa
Yr Athrofa Professional Learning Partnership

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Prawf Teg

Fair test



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Prawf teg

- ▶ **Mae cwestiynau prawf teg yn gwneud cymariaethau, yn aml maen nhw'n ceisio darganfod beth yw'r "gorau" neu'r "mwyaf".**
- ▶ Mae profi'n deg yn rhoi'r cyfle i ddisgyblion ymchwilio'r berthynas achosol rhwng dau newidyn. E.e. ydy uchder y llethr yn effeithio ar gyflymder y car yn rholio lawr os yw popeth arall yn aros yr un peth?
- ▶ Mae profion cymharol yn rhoi'r cyfle i ddisgyblion gymharu un digwyddiad gydag un arall E.e. ydy'r car coch yn teithio'n gyflymach na'r car gwyrdd?

Addaswyd y diffiniad o 'It's not fair - or is it?' (Turner, Keogh, Lawrence & Naylor, 2011)



Mae profi'n deg a gwneud cymariaethau yn rhoi cyfleoedd i ddisgyblion:

- Adnabod a deall bod un peth (newidyn) yn effeithio ar rywbeth arall
- Adnabod pan fod profion yn deg
- Creu cwestiynau prawf teg eu hunain
- Archwilio'r newidynnau a allai gael effaith
- Adnabod newidynnau
- Adnabod y gwahaniaethau maen nhw wedi'u harsylwi
- Deall sut i fesur neu arsylwi'r effeithiau

Prawf teg *Fair test*



Working scientifically

Developing children's skills in fair tests

Introduction

Like comparative tests, fair test enquiries are an opportunity for children to explore cause and effect relationships in science. Children find the answers to 'big questions' in fair test enquiries by planning tests to collect data through changing, measuring and controlling variables. Fair tests involve making systematic changes and analysing data to identify how one variable influences another. Due to the increased challenge in this type of enquiry they are introduced in KS2.

Big questions

Here are some examples of 'big questions' that pupils can explore through fair tests in KS2. There is almost one for every area of the curriculum so it is easy to plan opportunities for children to revisit this type of enquiry regularly and develop their skills.



Year 3	Year 4	Year 5	Year 6
How does the length of the carnation stem affect how long it takes for the food colouring to dye the petals?	Does the amount of light affect how many woodlice move around?	How does the level of salt affect how quickly brine shrimp hatch?	How does the temperature affect how much gas is produced by yeast?
How does the angle that your elbow/knee is bent affect the circumference of your upper arm/thigh?	How does the mass of a block of ice affect how long it takes to melt?	How does age affect a human's reaction time?	How does the length of time we exercise for affect our heart rate?

<https://www.ogdentrust.com/about-us/news/working-scientifically>

Helping children's development of inquiry skills Wynne Harlen

Inquiry in primary science education (IPSE) 1: 5-19, 2014 ©
2014 PRI-SCI-NET

Action that teachers can take

- Stimulate curiosity through classroom displays, posters, and inviting questions through a question board or box.
- Help children to refine their questions and put them into investigable form.
- Provide opportunities for planning by starting from a question to be answered by inquiry without giving instructions.
- Scaffold planning a fair test using a planning board.
- Talk through an inquiry that has been completed to identify how it could have been better planned.

Teachers' questions:

- 'what would you like to know about ...?'
- 'what do you think will happen if your idea is correct?'
- 'what do you think will happen if... or when...?'
- 'why do you think that will happen?'
- 'what will you need to do to find out...'
- 'how will you be make it 'fair'

<https://ipsejournal.files.wordpress.com/2015/03/3-ipse-volume-1-no-1-wynne-harlen-p-5-19.pdf>

Prawf Teg Newidynnau

Newid
(Newidyn annibynnol)

Mesur
(Newidyn dibynnol)

Cadw'r un fath
(newidynnau rheoli)

Fair Test Variables

Change
(Independent variable)

Measure
(Dependent variable)

Keep the same
(control variables)

Cynllunio Prawf Teg

Ein bwrdd cynllunio ar gyfer Prawf Teg

Byddwn yn newid

Byddwn yn mesur neu'n arsylwi'r effaith a gaiff ar

Byddwn yn cadw'r pethau hyn yr un fath i'w gwneud yn deg

:

Planning a Fair Test

Our Planning Board for a Fair Test

We will change

We will measure or observe the effect it has on

We will keep these things the same to make it fair

1. Plant growth and water

Adding different amounts of water to a plant could affect its growth. To investigate this, plant some seeds and water each plant with different amount over time.



Independent variable?

Dependent variable?

Control variables?

Y Cwestiwn

Pam fod pengwiniiaid yn cwtsio?
Why do penguins huddle?

The Question

Cam cynnydd 3
Progression step 3



Tasg

Sut allech chi ymchwilio i pam mae pengwiniad yn cwtsio, yn eich ystafell ddosbarth?

1. Syniadau: Ymchwil?
2. Dull: Beth ydyn ni'n mynd i'w wneud?
3. Cynllun:
 - Pa gyfarpar?
 - Rhagfynegiad?
 - Prawf teg?
 - Mesur?
 - Cynrychioli data?
 - Casgliad?
 - Myfyrio?

Cofiwch! Strategaeth AagD?

Task

How could you investigate why penguins huddle, in your classroom?

1. Ideas : Research?
2. Method : What are we going to do ?
3. Plan :
 - What apparatus?
 - Predictions?
 - Fair test?
 - Measure?
 - Represent data?
 - Conclusion?
 - Reflection?

Remember ! Afl Strategy?

Adnoddau :Cam cynnydd 1,2 a 3

Resources:Progression Step 1,2 & 3

Ymchwilio, Arbrowi, Creu, Darganfod

Cam Cynnydd 1&2



<https://primarylibrary.crestawards.org/all-star-challenges-in-welsh/64363075>

Cam Cynnydd 2&3



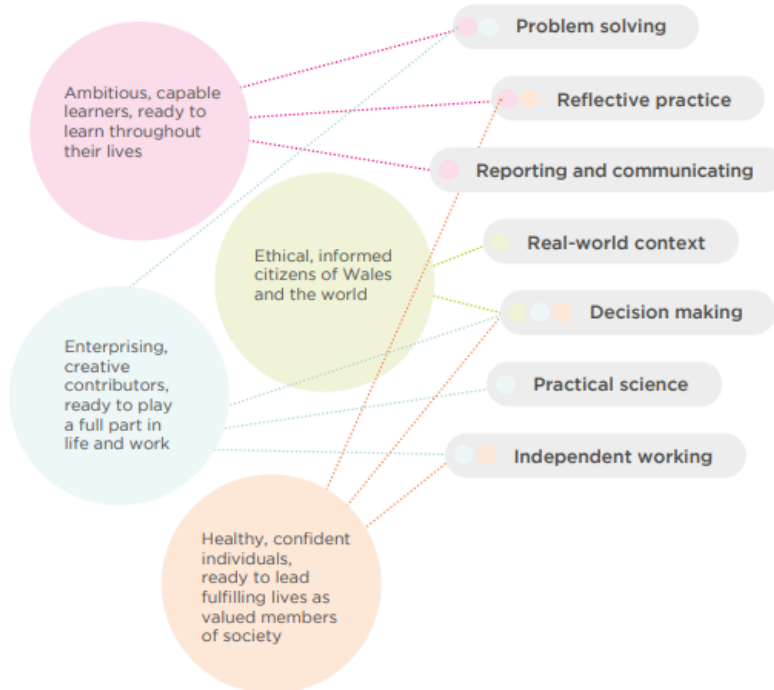
<https://primarylibrary.crestawards.org/all-superstar-challenges-in-welsh/64363180>

Curriculum for Wales

The four principles of the Curriculum for Wales match well with the CREST guiding principles.

The curriculum for Wales aims to help children develop into:

CREST guiding principles:



We suggest the following CREST Star challenges for the six science content areas in the Curriculum for Wales for ages 5-7:

Curiosity

- Brilliant bubbles
- Discovery bag
- Muddy mess
- Music maker
- Sneaky shadow

Design thinking and engineering

- Testing timers
- Starting sounds
- Music maker

Living things

- Animal adventure
- Plant detectives

Matter and its behaviours

- Scrapyard scraps
- Sniffley sneezes
- Teabag trouble
- Useless umbrella

Computation and the digital world *

- Slippery slidey shoes
- Speedy scooters
- Music maker

* You can use digital tools such as cameras and microphones to record results in these challenges

Forces and energy

- Confusing cans
- Slippery slidey shoes
- Speedy scooters

The following CREST SuperStar challenges map onto the six science content areas in the Curriculum for Wales for ages 7-11:

Curiosity



- A hole in my bucket
- A sticky problem
- Bumblebee mystery
- Camouflaged creatures
- Colorado brown stain
- Over to you

Living things

- Making toothpaste
- Buy them and try them
- Colorado brown stain
- Outdoor gym
- Playground games



Design thinking and engineering

- Bridge blunder
- Band rollers
- Bowled over
- Crafty rafts
- Discus dilemma
- Kite calamity
- Outdoor gym
- Spinning solutions



Matter and its behaviours

- A hole in my bucket
- A sticky problem
- Cheesy challenge
- Get set jellies
- Investigating ink
- Just my cup of tea
- Polymer problem
- Protecting polymers
- Surprising stains
- Testing and comparing tea
- Tomato sauce
- Yummy yogurt



Forces and energy

- Band rollers
- Bowled over
- Bridge blunder
- Super spinners
- Racing rockets



Computation and the digital world *

- Bumblebee mystery
- Drifting dandelions
- Super spinners

* You can use digital tools such as cameras to record and analyse results in these challenges



You can read about the curriculum for Wales in full here:

<https://hwb.gov.wales/curriculum-for-wales/>

YHSB 2



<https://hwb.gov.wales/api/storage/960ea21d-b304-4b8c-af31-9faf2d53de0d/Cardiau%20Her%20Ardal%20Adeiladu%20Wal%20Fawr%20Tsieina.pdf>



[Repository - Hwb \(gov.wales\)](https://hwb.gov.wales/)

YHSB 3 - Camau cynnydd 1-3

Eco-Schools



Eco-Sgolion



Adnoddau Dysgu yn yr Awyr Agored -
Lleihau Gwastraff

<https://hwb.gov.wales/repository/resource/2b591435-5fd1-40d1-8d8c-8cf3ad370d77>



Adnoddau Dysgu yn yr Awyr Agored - Tir
yr Ysgol

<https://hwb.gov.wales/repository/resource/656686a2-386c-4b66-87e6-fec940db4241>

YHSB/SOWM 4 & 5 : Camau cynnydd/Progression steps 1-3



Cardiff
Metropolitan
University



Prifysgol
Metropolitan
Caerdydd



why&
how?
PRIMARY SCIENCE
TEACHING TRUST



BATH
SPA
UNIVERSITY

TAPS Cymru cynllunio ar
gyfer Asesiad Ffocws



[Repository - Hwb \(gov.wales\)](https://gov.wales/hwb)



Cardiff
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University



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why&
how?
PRIMARY SCIENCE
TEACHING TRUST



BATH
SPA
UNIVERSITY

TAPS Cymru plans for
Focused Assessment

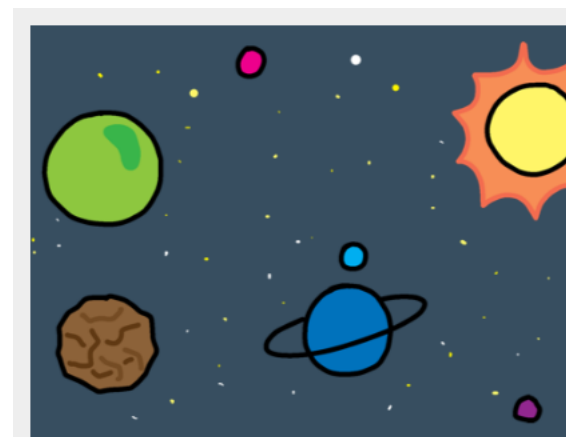


[Repository - Hwb \(gov.wales\)](https://gov.wales/hwb)

YHSB 6 : Mae cyfrifiaduraeth yn gosod sail i'n byd digidol



[About Us - Technocamps - What We Do at Technocamps](#)



 Dysgu sut i godio Scratch: ar goll yn y gofod

[Repository - Hwb \(gov.wales\)](#)



 Botio

[Repository - Hwb \(gov.wales\)](#)



 Ceisio lansio Minecraft Education Edition?

[Repository - Hwb \(gov.wales\)](#)

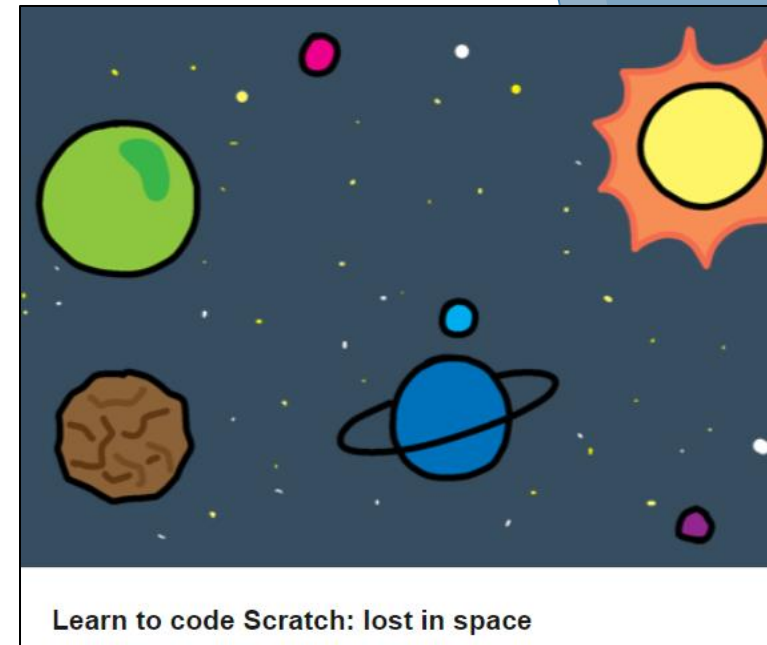
SOWM 6 :



[About Us - Technocamps -](#)
[What We Do at Technocamps](#)



[Download | Minecraft Education](#)



[Repository - Hwb \(gov.wales\)](#)

Crazy Character Algorithms

An introduction to sequences of instructions

<https://www.barefootcomputing.org/resources/crazy-character-algorithms>

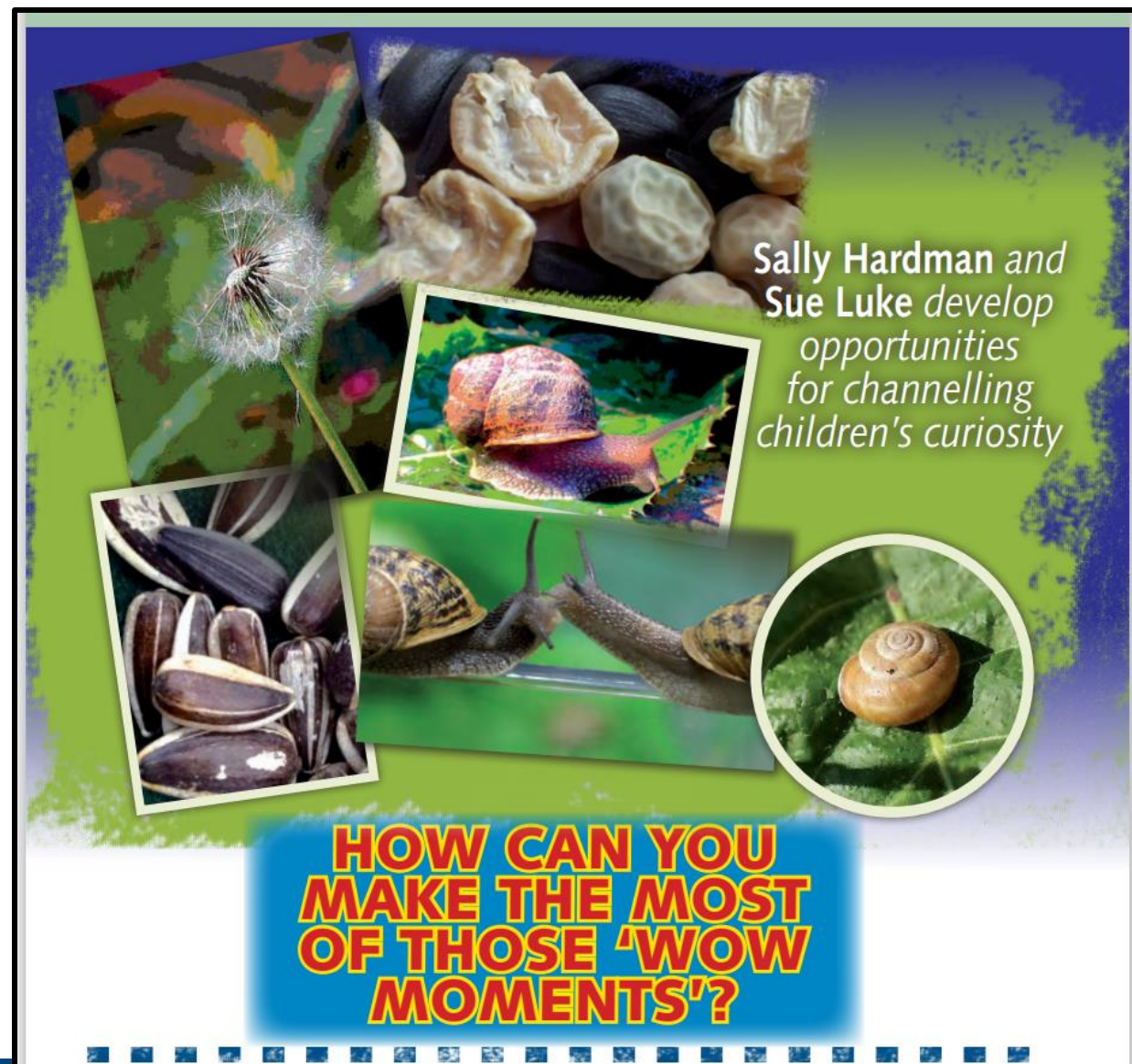
Testunau diddorol : An interesting read:

Trainee teachers, Toni Cain, Jemima Davey, Georgi Colliety, Maddy Hayward, Camilla Robinson, Regan Kerr and Rob Shaw, talk about science and explore their reasons for becoming science specialists

The trainee teacher journey



The trainees get to grips with making birdfeeders





“Rydym yn cynnig ystod o gynhyrchion a gwasanaethau sy'n cefnogi addysgu a dysgu pynciau STEM yng Nghymru yng nghydestun y byd go iawn.”

<https://www.gweld-gwyddoniaeth.co.uk/>



“We offer a range of products and services that support the teaching and learning of STEM subjects in Wales within a real world context.”

<https://www.see-science.co.uk/>



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Llyfrau Gwyddoniaeth a Thechnoleg

[Allen, J. et al \(2012\), Primary ICT: Knowledge, Understanding and Practice, London: Learning Matters.](#)

[Loxley, P. et al. \(2014\) Teaching Primary Science, Promoting Enjoyment and Developing Understanding. Oxon. Routledge](#)

[Futurelab \(2008\) Digital Literacy across the Curriculum](#)

[Byron, T. \(2008\) Safer Children in the Digital World](#)

[Weavers, G., Keogh, B., & Naylor, S. \(2008\). Made you look, made you think, made you talk. Sandbach: Millgate House. WELSH](#)

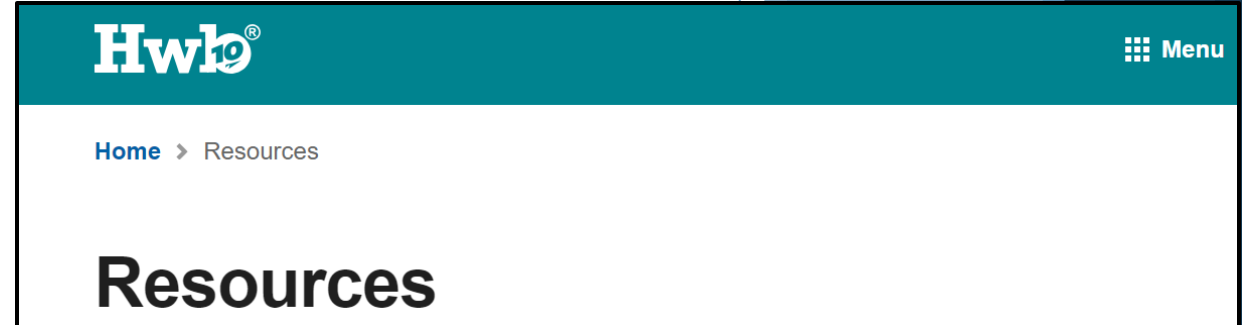
[Russell, T. & McGuigan, L. \(2016\) Exploring science with young children : a developmental perspective 1st ed.](#)

Syniadau ac Adnoddau?



[Adnoddau - Hwb \(gov.wales\)](https://www.gov.wales/adnoddau)

Resources and Ideas?



[Resources - Hwb \(gov.wales\)](https://www.gov.wales/resources)

Cysylltiadau defnyddiol

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://explorify.wellcome.ac.uk/>

Supporting practical work in science,
D&T and art

CLEAPSS
primary

CLEAPSS Explore#23

22 Feb 2025

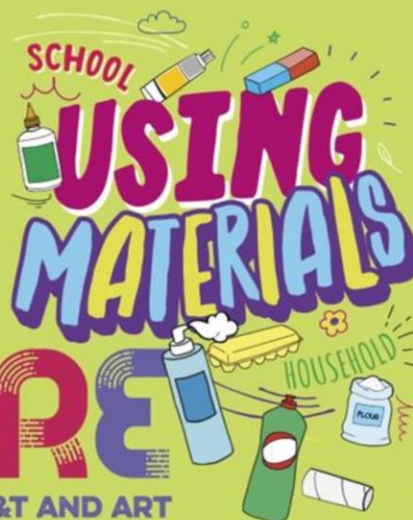
In this issue: guidance on how to safely use a variety of materials.

Click here to [view EXPLORE#23](#)

CLEAPSS

EXPLORE

SCIENCE, D&T AND ART



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Eich tro chi - ewch amdani!

