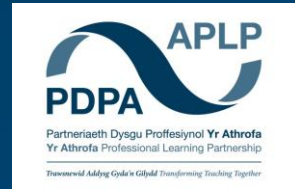




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Y Drindod Dewi Sant
University of Wales
Trinity Saint David



ECAD4017C – Lecture 2

Mathematics and Numeracy

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Aims



- * The Numeracy Framework
- * Teaching Maths Cross-Curricular
- * Good practice across Wales in Numeracy

Statements of what matters.

AREA OF LEARNING AND EXPERIENCE

Mathematics and Numeracy

Guidance to help schools and settings develop their own curriculum, enabling learners to develop towards the four purposes.

Contents

- | | |
|---|--|
| 1. Introduction | 4. Descriptions of learning |
| 2. Statements of what matters | 5. Designing your curriculum |
| 3. Principles of progression | |



- The number system is used to represent and compare relationships between numbers and quantities
- Algebra uses symbol systems to express the structure of mathematical relationships
- Geometry focuses on relationships involving shape, space and position, and measurement focuses on quantifying phenomena in the physical world
- Statistics represent data, probability models chance, and both support informed inferences and decisions

[Mathemateg a Rhifedd: Cynllunio eich cwricwlwm - Hwb](#)

Dyfodol Llwyddiannus 2022 Successful Futures

Y Cwricwlwm yng Nghymru | The Curriculum in Wales



Y 12 Egwyddor Addysgeol:

Mae dysgu ac addysgu da yn;

1. Canolbwyntio'n gyson
2. Yn rhoi her i'r holl ddysgwyr
3. Defnyddio cymysgedd o ddulliau
4. Defnyddio cymysgedd o ddulliau gan gynnwys y rheini sy'n hybu sgiliau datrys problemau, sgiliau creadigol a'r gallu i feddwl mewn modd beirniadol
5. Gosod tasgau a dewis adnoddau sy'n adeiladu ar wybodaeth a phrofiad blaenorol ac yn ennyn diddordeb
6. Creu cyd-destunau dilys ar gyfer dysgu
7. Dilyn egwyddorion asesu ar gyfer dysgu
8. Ymestyn oddi mewn ac ar draws Meysydd Dysgu a Phrofiad
9. Cryfhau'n gyson cyfrifoldebau trawsgwricwlaidd a chyfluoedd yn cael eu darparu i'w harfer
10. Cymell plant a phobl ifanc i gymryd cyfrifoldeb cynyddol dros eu dysgu eu hunain
11. Hybu datblygiad cymdeithasol ac emosiynol a pherthnasoedd cadarnhaol
12. Hybu cydweithio

The Twelve Pedagogical Principles:

Good teaching and learning;

1. Maintains a consistent focus on the overall purposes of the curriculum
2. Challenges all learners by encouraging them to recognise the importance of sustained effort in meeting expectations that are high but achievable for them
3. Means employing a blend of approaches including direct teaching
4. Means employing a blend of approaches including those that promote problem solving, creative and critical thinking
5. Sets tasks and selects resources that build on previous knowledge and experience and engage interest
6. Creates authentic contexts for learning
7. Means employing assessment for learning principles
8. Ranges within and across Areas of Learning and Experience
9. Regularly reinforces Cross-curriculum Responsibilities, including literacy, numeracy and digital competence, and provides opportunities to practise them
10. Encourages children and young people to take increasing responsibility for their own learning
11. Supports social and emotional development and positive relationships
12. Encourages collaboration

6 Areas of Learning and Experience

1. Expressive arts
2. Health and well-being

Addysgeg

Pedagogy



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Trawsnewid Addysg, Trawsnewid Bywydau
Transforming Education, Transforming Lives

Active and experiential learning

Effective foundation phase practice in delivering literacy
and numeracy in Year 1 and Year 2

December 2017

Discuss the main findings (pages 11-13)

Active and experiential learning -
Effective foundation phase practice in
delivering literacy and numeracy in Year
1 and Year 2 - Estyn



The Review recommends that literacy, numeracy and digital competence should be Cross-Curricular Responsibilities for all teachers and people working with children and young people. It must be ensured, through the structure of the curriculum, that children and young people develop high levels of competence in those aspects and that they have frequent opportunities to develop, extend and apply them across the curriculum.

Successful Futures 2015



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Transforming Education, Transforming Lives

Co-ordinated planning to develop pupils' literacy, numeracy and digital competence skills

Effective Practice 6 February 2023

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Ysgol Caer Elen



Discuss

What impact has this work had on learner provision and standards?

[Co-ordinated planning to develop pupils' literacy, numeracy and digital competence skills - Estyn](#)

Areas of learning and experience



Expressive Arts



Health and Well-being



Humanities



Languages, Literacy and Communication



Mathematics and Numeracy



Science and Technology



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Estyn say

'Inspectors do not have literacy and numeracy boxes to tick whenever they observe lessons during inspections. Teachers should take advantage of opportunities that occur naturally in the curriculum to reinforce learning in literacy and numeracy. However, this should not mean that literacy and numeracy become mantras for repetition in every lesson in the school day no matter what the topic.'

Inspection Clarified (Estyn, 2015, Q6)

'Schools are not expected to create opportunities for pupils to show their skills in ICT, numeracy, literacy or Welsh in every single lesson.'

Inspection Clarified (Estyn, 2015, Q22)

Number skills

Context

Pupils practise their recall of number bonds and doubles while developing their gross motor skills and building physical strength and stamina.

What do pupils do?

Pupils practise their recall of number bonds and doubling of numbers to 10 as a group indoors.

Once outdoors, pupils work in pairs. They read the number on a card and double it mentally. They then check the 'how to travel' card to see how they should travel from the starting point to a bucket with the correct answer on it.

They run lightly, skip, and hop on different legs, take small jumps, big jumps or gallop to travel to the answer buckets in the correct way. Once there they pick up their ball and place it in the bucket.

Some of the buckets are set higher up on a wall to encourage stretching and throwing skills.

Pupils check that they are right by looking at the correct answers under the flaps on the 'checking board'. If they are correct, they put a point up on the tally chart and begin again with the next number card and 'how to travel' card.

High performing schools share a passion and vision for making sure that pupils have plenty of opportunities to be physically active and learn outdoors. They believe that this leads to high levels of engagement and involvement from the pupils, which in turn leads to high standards. Teachers find imaginative ways for pupils to develop and apply their mathematical skills across the curriculum through active learning in the outdoors.

What is the impact?

Most pupils use mental recall of number facts to 10 to double and halve numbers accurately. They select and use relevant number facts and mental strategies quickly, recalling doubles and near doubles to 10 correctly. Nearly all pupils co-operate well with each other and talk about what they are doing enthusiastically. Most read words accurately and follow instructions successfully. Nearly all understand and use relevant mathematical vocabulary appropriately.



Number and measuring skills

Context

Pupils transfer mathematical skills to play and classroom activities

What do pupils do?



In a 'pop up' bakery in the role-play area, pupils weigh, measure and cost ingredients to make cakes.

They read the recipe instructions, accurately weighing out ingredients and design posters for opening and closing times, the costs of various cakes and to advertise the shop.

Pupils decide how much each cake should be sold for to cover the cost of the ingredients, working out answers by applying their knowledge of addition and multiplication. They design clocks to display opening and closing times and write a weekly timetable, which varies according to the need to have early closing.

The shopkeeper and shop assistants work out how much change they need to keep in the till to be able to give customers change quickly.



Pupils use the story of 'Charlie and the Chocolate Factory' as a stimulus to design and make their own chocolates. They calculate the costs by visiting a local supermarket to look at what chocolates sell for.

They conduct a survey of pupils' favourite chocolate in order to decide what sort to make. Different groups measure and weigh ingredients to make white and flavoured chocolates in different shaped moulds.

They sell these in the summer fair and take charge of marketing, packing and selling the items. After the event they work out the profit margin and design a simple bar chart depicting the most popular items sold.



Pupils discover 'dinosaur bones' buried in sand outside. They use paint brushes in different sizes to excavate and clean them. They carefully uncover and piece back together to create the full skeleton of the dinosaur. They compare this to their own bodies, estimating how much longer it is.

They decide to find other body parts in the outdoors. For example, some find sticks for smaller bones and small stones as teeth. This creates lots of discussion and estimates about size.

Pupils then create dinosaur footprints of different sizes on the yard, using coloured paper, measuring and cutting them out carefully. They estimate how many pupils' feet will fit in each footprint.

Pupils that are more able take this further and decide to map out the size of another large 40m dinosaur. They use a trundle wheel to measure it out and then they record this on a tablet computer and mark it out in chalk so that other children can see how big a Diplodocus was.

What was the impact?

Most pupils use every day mathematical language to talk about their own ideas and use checking strategies to decide if answers are reasonable.

Many pupils find totals and give change for items up to £1.

Many pupils demonstrate a good understand of and accuracy in weighing items in grams.

Most pupils read and set times in hours and minutes on a clock, including half past and quarter to and quarter past.

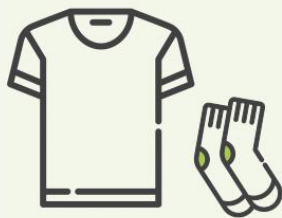
Many pupils use their knowledge and practical experience to inform accurate estimates of length, using standard and non-standard measurements.

Number and mathematical reasoning skills

Context

Pupils transfer mathematical skills to play and classroom activities

What do pupils do?



Pupils look at a bag full of clothes that have been mixed up in the wash. They sort them into small, medium sized and large.

The pupils discuss how they can measure the clothes and what sort of equipment they need to do the measuring. A few are familiar with standard measures and use a ruler or metre stick while other use non-standard measures. They sort the clothes into the correct piles and justify their choices when challenged by an adult.



Pupils read word problems based around sharing out gold coins from a treasure chest discovered by pirates.

Examples of problems are:

If you share four gold coins between four pirates, how many gold coins will they get each?

Pupils use magnetic, toy fishing rods to fish for the correct number of coins in the water tray. They collect the correct number of pirate cards and work practically to solve the problem. They record the number sentence to show the answer.



Pupils follow a set of instructions outdoors to find and solve mathematical problems hidden outside. As they do this, they draw a simple map of their journey. This involves counting out their steps and the number of forwards, backwards, left and right paces needed. They write the number of steps onto their map and use arrows to identify left or right turns, and whether these are half or full turns.

They work in pairs to find the clues and solve them using their mental recall of number facts. For example, they find and hook ducks that have numbers on the bottom. They have to add the two digits together, then double or halve the answer. Pupils also find clocks and have to move the fingers to show different times including half past and quarter to and past. Pupils that are more able have then to show what the time would be an hour later or four hours later.

What was the impact?

- Many pupils use their 2, 3, 4 5 and 10 times table to solve division problems and begin to understand remainders.
- Most select and use relevant number facts and mental strategies confidently.
- Many sort items by size accurately and explain their thinking clearly.
- Many pupils present their work pictorially in the form of a map, showing clear directions, and using non-standard measurements and an awareness of directional turns.
- Pupils that are more able can read and change the time accurately on an analogue clock.

Provision for the delivery of numeracy

Context

Using a grocer's shop in the role-play area to consolidate pupils' understanding of doubling numbers and using money in a mixed Year 2 and Year 3 class

Accessing resources that enable pupils to use choice and develop independence in their learning

Consolidating and extending literacy and numeracy skills across areas of learning

What do pupils do?

They hold a dialogue using language prompts, between the shopper and the shopkeeper.

They act out a scene, in Welsh, from the time of O.M. Edwards to a high standard.

They practise their mathematical skills learnt during the focused teaching session.

They adopt a persona, dressing up as people from a bygone era and deciding between themselves which roles they will take.

Pupils who are shoppers choose to buy items in twos in order to practise doubling numbers. For example, they buy two apples at 23p, and two oranges at 17p each.

Pupils acting as the shopkeeper work out how much the shopper must pay and choose how many coins the shopper has to use to pay, using either three, four or five coins of different denominations.

Pupils develop their own dialogues by improvising and thinking about the characterisation.

What is the impact?

Nearly all pupils strengthen their procedural mathematics skills effectively.

They develop and extend their vocabulary well, including learning interesting idioms.

Pupils whose home language is not Welsh practise and embed language patterns successfully, including learning correct mutations.

Pupils learn to act out different roles confidently, developing their imaginations and creative skills well.

Nearly all pupils enjoy what they are doing and engage well in their learning.



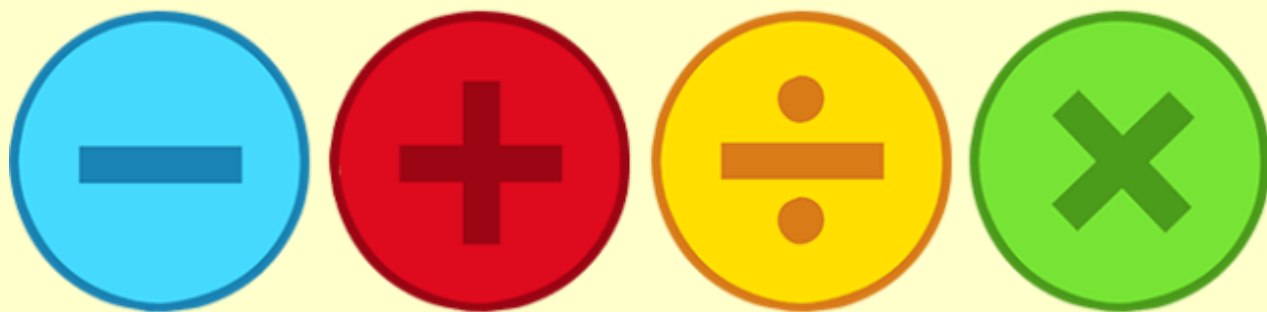
Cross-curricular skills frameworks

Part of Curriculum for Wales

Link to LNF 2022

[Numeracy Framework](#)





Differentiation

Siôn has 8 apples. He gets 3 more apples, gives 2 apples to his sister, and then gets 4 more apples.

Start with 8 apples:



Add 3 apples: 

Take away 2 apples: 

Add 4 apples: 

Count the apples left to find **13 apples!**

Start at 8.

- Jump 3 spaces forward: $8 \rightarrow 11$
- Jump 2 spaces backwards: $11 \rightarrow 9$
- Jump 4 spaces forward: $9 \rightarrow 13$

$$1. 8 + 3 = 11$$

$$2. 11 - 2 = 9$$

$$3. 9 + 4 = 13$$

Emma has 6 teddy bears. 🧸

- She gets 4 more teddy bears.
- She gives 3 teddy bears to her friend.
- She gets 2 more teddy bears.

How many teddy bears does Emma have at the end?

Start with 6 teddy bears:



Add 4 more:



Give 3 away:



Add 2 more:



Count the teddy bears left. There are **9 teddy bears!**

Start at 6.

- Jump 4 spaces forward: $6 \rightarrow 10$
- Jump 3 spaces backwards: $10 \rightarrow 7$
- Jump 2 spaces forward: $7 \rightarrow 9$

$$1. 6 + 4 = 10$$

$$2. 10 - 3 = 7$$

$$3. 7 + 2 = 9$$

Mali has 15 sweets. 🍬

- She gets 8 more sweets from her mum.
- She gives 6 sweets to her friend.
- She gets 5 more sweets from her dad.

How many sweets does Mali have at the end?

Start with 15 sweets:



Add 8 more sweets: 🍬🍬🍬🍬🍬🍬🍬🍬

Give 6 sweets away: ✖✖✖✖✖✖

Add 5 more sweets: 🍬🍬🍬🍬🍬

Count the sweets left to find 22 sweets!

Start at 15.

- Jump 8 spaces forward: $15 \rightarrow 23$
- Jump 6 spaces backwards: $23 \rightarrow 17$
- Jump 5 spaces forward: $17 \rightarrow 22$

1. Mali gets 8 more sweets:

$$15 + 8 = 23$$

2. She gives 6 sweets to her friend:

$$23 - 6 = 17$$

3. She gets 5 more sweets:

$$17 + 5 = 22$$

Answer: Mali has 22 sweets! 🍩

Cross-curricular themes

What would make a good cross-curricular theme for your different classes?



Show example of Numeracy lesson plan

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Student-teacher:	Bethan Sturrock	Class / Group:	Year 1		
AoLE or Subject:	Mathematics and Numeracy	Date <i>(please note that this may be a continuous session):</i>	6.2.25 / 10.2.25		
Meaningful links to Curriculum (What Matters Statements, Descriptions of learning, 'previous' curriculum...)	- The number system is used to represent and compare relationships between numbers and quantities. - Statistics represent data, probability models chance, and both support informed inferences and decisions.				
Meaningful links across the curriculum <i>Links to other AoLEs or the Cross-curricular skills frameworks</i>	- I can <i>segment and blend</i>. - I can use context and pictures to help me understand the meaning of words. - I have experienced the counting sequence of numbers in different ways, reciting forwards and backwards, and starting at different points. - I can notice, recognise and write numbers in a range of media, through a multisensory approach, from 0 to 10 and beyond. - I have used money, and the language of money, in play and real-life situations and I can understand that I need to exchange money for items. - I can create simple digital work. - I can present and evaluate my data by creating simple charts, e.g. <i>pictogram</i>				
Personal Targets (targets and consequent impact on learning - refer to any targets that have been identified in learning journal or weekly reflection meeting and describe the desired impact on learning)					
Learning Intention <i>'This should focus on the pupils' learning during the lesson, rather than what they will be doing, and should be short, achievable and measurable.'</i> (Crichton, H., and Mcdaid, A. 2016 p. 196)					
WALT – Use money (coins) to buy fruit and make totals of up to 20p. and begin to add two sums of money together					
Success Criteria <i>What the pupils need to demonstrate to successfully meet the Learning Intention.</i>					

Task

Use the numeracy framework to support you with your ideas.

1. Choose 2 or 3 themes.

2. In your groups, think of some interesting mathematical activities which fall into your theme.

3. Be ready to show your ideas.

- Purpose: To prepare for the planning and delivery of effective lessons and to gather evidence for QTS standards
- Supporting documents: Successful Futures (12 Principles of Pedagogy) & specific material Maths and Numeracy
- You will teach as a group of up to 4 students
- Arrange your roles effectively - consider when you'll be working with whom, and how to 'share' the teaching and support roles

Duration: limited to 15 minutes

Age group/Progression step:
Please state this clearly
when submitting

Resources: Prepare
resources for the session

You have to practice
Possible structure:
introduction, activities,
finale