

Mathematics/Numeracy Rationale

Introduction

Our Mathematics/Numeracy curriculum is being strengthened in response to the changes in circumstances our learners now face, in response to Covid, a different type of learner we are now experiencing and the need for focussing on independence and skills for adulthood.

The new Scheme of work will link Mathematics and Numeracy to Skills for Life. These key skills will support learners to become more independent for their futures.

For Pathway 1, our Early Years learners, Mathematics will largely remain the same as before. A holistic play-based and sensory approach to enable learners to establish early maths skills and engage in Mathematics. Depending on the provision and individual, this may look more like Pathway 2 or Pathway 3.

For Pathway 2, (and those in Pathway 4 who have followed Pathway 2 for their earlier years in school) progress and attainment will take a holistic approach using the Engagement Model as a framework which will then be enhanced and enriched with Mathematics/Numeracy skills linked to future life learning. Improving learner's ability to use their senses, as well as their motor skills and communication, which all helps to improve pupils' ability to engage in Mathematics and Numeracy.

For Pathway 3, progress and attainment will take a more academic approach, however elements from the Life Skills Curriculum will be evident and form the backbone of their contextual learning as well as working towards accreditations where possible.

For Pathway 4, our post 14 learners, holistic and more formal academic approaches will both be evident, depending on the route those individuals have taken so far during their time in school.

Please see the Overview document for more clarification.

Organisation of the Curriculum

Strands of Mathematics will be taught in a tight cyclical formation so there is a return to skills and knowledge quickly, but through contexts for everyday living and things that are most important to our learners. This is because it is very common for learners at this stage of development to not easily transfer the skills they have learned in one setting — they may need to be taught the skill or concept across different settings or contexts or by using different communication methods to ensure they are able to use the skill more widely. Therefore the newly arranged curriculum/Scheme of work enables teachers to deliver similar skills in various contexts to support with the preservation of these skills/knowledge for those with short or long term memory challenges or regressive conditions. Their learning is complex and unique and may not develop in a linear way.

Overviews for all learners are now organised over a longer time span, so skills can be embedded more, hopefully resulting in more recall and better memory.

Mastery can be achieved, by being fluent in recall for these type of activities and by problem solving in these real life everyday contexts.

LEARNING

Processes of Learning

- Become responsive
- Exercise curiosity
- Become interested in being discoverers

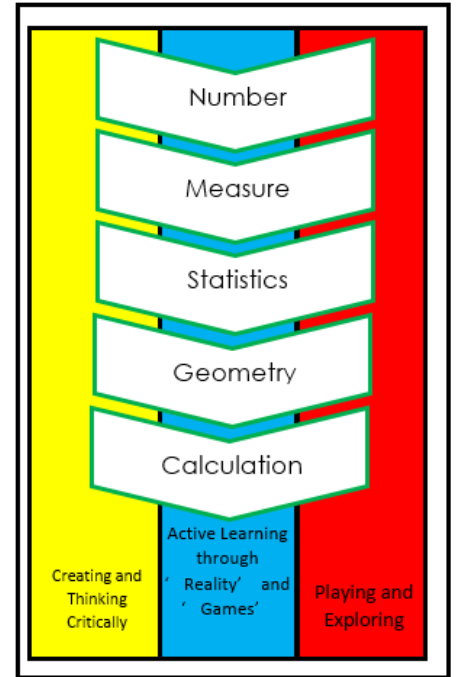
- Develop anticipation
- Initiate and persist in investigating problems
- Take problem solving on into a new and wider situation

These processes are all linked to the Engagement model and are clearly associated with its 5 main areas; exploration, realisation, anticipation, persistence and initiation.

In mathematics pupils and students will learn in a cycle of:

- **Playing and Exploring**
- **Active Learning (both learning through 'reality' and learning through 'games')**
- **Creating and thinking critically**

Using a combination of these should enable learners to learn new skills, apply their knowledge to relevant contexts for living with increasing fluency and develop their thinking skills to problem solve and reason.



Playing and Exploring

At this level of child development, it is vital that learners have to opportunities to explore their learning in more depth through 'play'. Careful observation and knowledge of play schemas are vital to encourage playing which the learners will connect with. Play can take many forms and all class adults should be mindful of which schemas learners are in at that given time and be creative to enable learners to best use their play to develop mathematical understanding or experience. Play for some of our pupils may be more sculpted or modelled than others, but it is important they get to use/do/make etc under their own terms and through their own development.

Play Schema's are describes as patterns of repeated behaviour with allow children to explore and express developing ideas and thoughts through their play and exploration. The repetitive actions of schematic play allow children to construct meaning in what they are doing.

| Types of Play Schema | |
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| <u>Rotation</u> <ul style="list-style-type: none"> • Interest in things that spin or go round, • Enjoys spinning themselves • Likes to run round in circles or being swung in circles • Drawing or mark making circles | <u>Connection</u> <ul style="list-style-type: none"> • Setting out and dismantling • Joining things together • connecting objects • opening and closing things |
| <u>Enveloping</u> <ul style="list-style-type: none"> • Covering themselves or others completely • Wrapping items up or placing them inside containers • Hiding things in discreet places | <u>Transforming</u> <ul style="list-style-type: none"> • Exploring the changing states of materials • transforming them from a solid to liquid state again • mixing things together |
| <u>Enclosure/Containment</u> <ul style="list-style-type: none"> • Containing things – fences round animals • Creating boarders around themselves or objects • Enclosing themselves in - Cardboard boxes | <u>Orientation</u> <ul style="list-style-type: none"> • Experimenting with different view points, • Positioning themselves or objects in different places or positions, eg, upside down or on their side, • Turning objects around to look at them |

- Sport
- Dance
- Pretend
- Domestic
- Social
- Party games
- Games of chance
- Circle and take turn games
- Memory
- Wordplay
- Dramatic
- Storytelling
- Creative
- Music
- Computer/ipad/wii
- Arts and crafts
- Mark making
- Manipulation skill
- Table games
- Board games
- Puzzles
- Construction
- Materials/sand/water
- Physical skills

Learning through REALITY

This new curriculum includes various contexts for the 7 different areas of mathematics learning all linked to independence, functional everyday life and working towards adulthood. These are opportunities for all maths learning to be done in the context of life skills. The contextual areas are:

- Maths for Self Care
- Maths for Food
- Maths for Travel
- Maths for Home
- Maths for Leisure/Socialising/Culture
- Maths for The High street
- Maths for School/Careers

Teachers will use the list of mathematical links and applications for each context area (see appendix 4 & 5) when planning along with the Mathematics Continuums (see appendix 3) (for each strand from the mathematics curriculum) to ensure the learning is at the appropriate level for each learner.

Learning through GAMES

The diet of mathematical games planned and facilitated in class should be varied and appropriate. When devising games, all these different types of games should be considered.

- Sensory sharing – developing shared attention to sensory experiences, objects or activities
- Giving and receiving – experiences of exchanging, collecting and distributing things
- Alternating activities – turn taking actions and sounds
- Manipulation and play with objects and materials – placing, arranging, filling, emptying, tearing and folding
- Constructions and tracts – building and connecting
- Hiding and revealing – develop problem solving, searching, memory and object permanence
- Sequential actions and consequences
- Games of chance or choice – roll a dice, spinner, lucky dip etc – generate anticipation – forms of scoring and collecting
- Games of skill – using fine motor skill games to generate winning, losing, scoring, pursuing goals etc

| Skills involved in Playing Games | | |
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| Social Skills | Communication | Maths |
| Awareness – <ul style="list-style-type: none"> • Rights • Responsibility • Role • Others • self Participation <ul style="list-style-type: none"> • turns – sequence/doing /waiting • looking listening • anticipation • make choices • consequences • concentration • persistence • collaboration Toleration <ul style="list-style-type: none"> • proximity • noise • behaviour Interaction <ul style="list-style-type: none"> • impulse control • confidence • responding • initiating • follow example • adapting • role | Verbal <ul style="list-style-type: none"> • maintaining topic • start/finish • feelings – win/loose/fair/unfair • express – yes/no, like/dislike, want/don't want • Information – listen/respond, ask for info, give info, seeks to repair understanding Non Verbal <ul style="list-style-type: none"> • Pointing • Gesture • Body language • Facial expression • Attract attention • Look and listen • Share attention | Quantity <ul style="list-style-type: none"> • Gain • Compare • lose Probability <ul style="list-style-type: none"> • yes • likely • no Manipulation <ul style="list-style-type: none"> • positions • movement • comparisons Judgement <ul style="list-style-type: none"> • change • quantity • distance • weight • speed • time • position Language <ul style="list-style-type: none"> • everyday • special sequences <ul style="list-style-type: none"> • progressions • random • ordered |
| | | |

Creating and Thinking Critically

Opportunities for learners will be made to develop their thinking skills through mathematics. The CPA (Concrete, Pictorial, Abstract) approach is embedded within this and teachers should be mindful of the different stages when planning for individuals. Mathematizing is essential for our learners.


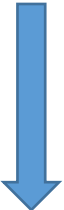
Linked also to this area of the curriculum is where the development of problem solving or reasoning skills sit.

This provides the perfect opportunity for learners to solve problems either set by teachers as part of their learning or by letting their own play or exploring develop to a point where they are resolving problems with increased independence.

These thinking activities should where possible be linked to the contextual reality which the maths curriculum is based.

Thinking is a multi layered process that has overlapping phases of development, the table below shows an overview of the phases that learners go through from birth and should be used as a help tool when planning and delivering sessions.

Phases of developing thinking

| | | | |
|--------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Phases overlap as they develop – early phases continue to be used. | Thinking at the beginning of learning | | Beginning biological responses |
| | Core Knowledge | <p>Innate awareness Learners at this stage have awareness of objects, persons, spatial relations. They even have intuitions that create expectations and affect their responses to events, these responses might be seen as their early forms of thought.</p> | |
| | Cause and Effect | <p>Contingency awareness As learners become more aware that their actions cause effects they deliberately use and repeat actions to see and refine – the memories and refinements seen in their actions are forms of thought.</p> |  |
| | Developing concrete thinking through actions | | Working through sensory/ concrete actions |
| | Developing schema | <p>Developing Patterns of action Learners extend their cause and effect actions to explore and combine patterns of action which become formulas of responses</p> |  |
| | Enactive thinking | <p>Thinking with things Initially thinking is 'concrete' – without words. It begins with observing and acting on or arranging real things. Often children start to use showing objects and pointing as their means of expression.</p> | |
| | Thinking adopts more abstraction | | Remembering and representing |
| | Visualisation | <p>Using memories Learners start to use memories as forms of thought using ideas of object permanency. They can build upon the core knowledge of number sense which enables them to discern differences between small groups.</p> | |
| | Representational 'iconic' thinking | <p>Understanding images Learners can appreciate that images are depictions and understand that pictures, or the particular related sounds we make are acting as representations They may have their own mental images (this is the beginning of imagination and visualisation). They make their own representations with their first words; later with marks or drawing, which can carry 'iconic' or pictorial meaning.</p> | |
| | Using narrative | <p>Developing structure Thinking develops as a sequential narrative. Being aware of the 'storyboard' creates structure and memorability.</p> | |
| Abstract thinking | <p>Understanding symbols Learners generalise their understanding of imagery and appreciate that symbols can represent things – and ideas.</p> | | |

Our Very Complex Learners

For those very complex learners, it is important that teachers develop and support the learning of the pre requisite skills linked to 'core knowledge' and 'learning how to learn' in order for learners to establish Mathematical Awareness through the 5 areas of engagement, (exploration, realisation, anticipation, persistence and initiation) a precursor to them beginning to move forward through the Mathematics Continuums, developing their skills in the different areas of mathematics/numeracy within the contextual areas of the Life Skills Curriculum.

Mathematical Awareness involves developing a sense of:

- Size
- Quantity
- Difference
- Space/orientation/location/dimension
- Movement/Direction/Speed
- Rhythm and Sequence
- Time/Interval/duration
- Possession and Loss

The skills involved in achieving this awareness could include:

| | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Auditory <ul style="list-style-type: none"> • Tracking • Locating • Discriminating • Selecting • Attending – sustained/turntaking • Memorising – | Visual <ul style="list-style-type: none"> • Mapping objects – foreground and background • Object permanence • Comparing • Space – group perception | Tactile <ul style="list-style-type: none"> • Holding • Tracing • Pointing • Haptic Touching • Touching |
| Proprioceptive <ul style="list-style-type: none"> • Positioning – themselves and things • Movement • Rhythm | Motor <ul style="list-style-type: none"> • Fine • Gross | Attention <ul style="list-style-type: none"> • Environment and objects • People and spaces |
| Awareness <ul style="list-style-type: none"> • Movement awareness • Landmark awareness • Spatial awareness • comparing | Listening and responsiveness <ul style="list-style-type: none"> • Mirroring • Shared looking • Collaborating • Realising people are agents of action • Observing changes • Turn taking | |

The Scheme of Work

Learners will cover the strands of Mathematics outlined in the Overviews depending on which pathway or Key Stage they are in. It is each class teachers' responsibility to plan and deliver exciting and relevant lessons covering the specific content across the year.

Teachers and class leaders are encouraged to 'LOOK FOR and UNPICK' the maths/numeracy skills needed for these different contexts/life skills and then deliver appropriate learning opportunities

for their pupils and students to become more adept at these skills or more knowledgeable in mathematical facts associated with them.

Each learner will access their learning from the stage/level they are at, working through Mathematics Continuums, with teachers using the document to establish next steps to broaden or increase their understanding and knowledge of each strand.

Whichever pathway or age of our learners, developing skills in FLUENCY/RECALL, REASONING and PROBLEM SOLVING is fundamental to their experience and learning in every strand of Mathematics/Numeracy. Teachers are expected to use the CPA Approach. (Concrete/Pictorial/Abstract)

Various Schemes/published resources such as White Rose, Numicon, Villa Real Sensory, Entry Level and the Calculation Policy can all be dipped into and used if deemed appropriate for the age and level of learners.

The diversity of our learners is reflected in the diversity of our Mathematics Curriculum.

Vocabulary

Teachers must ensure learners are exposed to appropriate vocabulary for their learning. This should be progressive and move through the curriculum in line with their individual development. Key words for each stage in learning can be found in the VR EYFS Document, National Curriculum, Bridging Documents and Calculation Policy. This language should be established in classrooms during all parts of the learning process – in 'playing and exploring', whilst 'actively learning', and when 'creating and thinking critically'.

Attention Autism sessions or the Curiosity Programme are both fantastic ways to introduce or recap key vocabulary from the mathematics/numeracy curriculum.

Planning for Progression

It is vital we continue to plan for progression. This might focus on:

- creating opportunities to practice, consolidate, maintain and generalise mathematical skills and concepts
- introducing new skills, knowledge and understanding and increasing the breadth of the curriculum content
- introducing opportunities to apply skills, knowledge and understanding in new settings and environments
- including age-appropriate activities and resources and a wider range of people and environments
- increasing engagement and participation by providing pupils with a variety of support equipment that provides them with the opportunity to take control of their environment, to increase mobility and to develop and use different ways of communicating
- introducing a range of teaching methods and styles – movement through from concrete to pictorial or pictorial to abstract where appropriate
- providing opportunities for pupils to move away from adult support and towards autonomy in using a new mathematical skill

In practice, all of these will be linked. Planning can ensure that different forms of progression relate to and support one another, for example, providing mathematical opportunities outside pupils' familiar environments can help them apply skills in a range of contexts. This is progress.

APPENDICES:

- 1 Movement through Pathways –
- 2 Curriculum Overviews
- 3 Mathematics Continuums
- 4 Contexts for Learning
- 5 Contexts for Learning/Numeracy Links