Maths

Shortstay
Northumberland's P.R.U.

Policy date – 15.06.18

RATIONALE

The PRU seeks to implement this Curriculum Policy with regard to the needs and aspirations of their learners and local community. We believe our learners are entitled to a broad and balanced curriculum, which can vary from the national legal requirements and be suitably differentiated to meet their particular learning needs.

A number of policies support the delivery of our Curriculum and a brief outline is given in the document which prefixes all policies in the Curriculum Portfolio.

AIMS

Our aim is to help all learners develop a positive attitude to, and enjoyment of mathematics whilst maintaining progress, celebrating their achievements, building confidence and raising standards.

We aim to enable all pupils to develop within his or her capabilities, the mathematical skills and understanding that may be needed for the study of other subjects, for adult life, including both employment and recreation ,and, where appropriate, for further study and training.

We hope to achieve this by:
- ✓ Encouraging learners to extend their knowledge of mathematical language.
- ✓ Encouraging logical thinking.
- ✓ Working with others to carry out investigations and surveys.
- ✓ Using a range of appropriate mathematical programs on the computer.
- ✓ Exploring mathematical concepts through other subjects.
- ✓ Recording and displaying work
- ✓ Promoting independent learning
- ✓ Encouraging learners to become reflective in their work
- ✓ Inspiring positive thinkers through growth mind set
- ✓ Delivering creative lessons to engage all learner groups and individualise learning experiences.
- ✓ Presenting maths in real life contexts.
- ✓ Developing the students' awareness of the power of Mathematics as a tool for understanding the world we live in and as a means of communication about that understanding
- ✓ Promote SMSC through delivery of Maths
- ✓ Fostering in students an enjoyment of Mathematics itself and an appreciation of its intrinsic aesthetic qualities
- ✓ Ensuring all learners have the opportunities to gain recognised maths qualifications where appropriate.
- ✓ Providing cross curricular links within maths to allow learners to make connections to their wider learning.
- ✓ Giving students the opportunity to understand and develop themselves in the field of financial wellbeing.

Schemes of Work

With the wide range of abilities and specific learning difficulties amongst the pupils at Northumberland PRU a large part of any scheme of work needs to be to some extent tailored to the individual student. There are different stages and materials for different ability students. These schemes should take account of where more extensive work is needed on particular concepts or skills due to perceptual and specific learning difficulties and SEMH difficulties.

In this time of curriculum change and uncertainty brought on by the changes in government policy, it is essential that the schemes of work reflect the needs of children and the statutory requirements. Northumberland PRU uses the Assertive Mentoring system to track pupil progression and identify gaps in knowledge so that teaching can be planned and delivered to meet the individual needs of pupils. This system takes learning objectives from the National Curriculum yearly objectives and organises them into appropriate Stages.

Lesson Structures / Students Mathematical Experiences

All students are given the widest possible range of mathematical experiences including practical, investigative and problem solving exercises. Planning and delivery of lessons take into account preferred learning styles of pupils (auditory, visual or kinaesthetic).

All pupils receive daily maths lessons, differentiated and tailored to their individual needs.

The classic three part lesson can form the basis of whole class lessons, however the varied needs of many of our pupils means this isn't always the best model in our school.

Despite this, features of this structure are used and an understanding of preferred learning styles is explicit in all lessons.

1. **An oral or mental starter** whole-class work to rehearse, sharpen and develop mental skills, including recall skills, and visualisation, thinking and communication skills. An oral or mental starter will also often be used to precede a session of work on individual programmes of work.

2. **The Main Teaching Activity** The Main teaching input/ modelling and scaffolding and student activities

3. **A Final Plenary** Whole class/ small group work to summarise key facts and ideas, share progress and set homework if appropriate.

Often there will be a need to incorporate mini- plenaries within lessons to check/ consolidate learning and inform teacher's to enhance progression.

Assessment

A baseline assessment is given to pupils during their first week at Northumberland PRU to enable appropriate planning and personalisation of lessons.

Assertive mentoring assessments are then carried out half termly, with scores recorded on a pupil friendly tracker in the front of each maths book. .

Data is collected and analysed half termly to identify individual targets, pupils for targeted interventions and to identify specific areas for development across the subject.

Teachers track and monitor progress using the Northumberland PRU teacher tracker proforma. Teachers will use evidence from workbooks, observations and AfL to make professional judgements regarding the progress of learners.

SLT triangulate information from a range of sources to ensure the effective delivery of lessons and appropriate progression/ attainment of all pupils.

For further information see Assessment policy

Cross-curricular links

It is the responsibility of all teachers to promote numeracy. Most subjects offer opportunities for practising mental calculation skills, data handling and practical mathematics. However specific subjects lend themselves more to the exploration of maths:

Science
- Convert between units of measurement e.g. km to miles.
- Measure in variety of units' e.g. mass, volume, length.
- Check our findings by using mathematical operations.
- Calculate speed/ distance and time by using the correct formulas.
- Convert and calculate formulas.
- Balance equations and find unknown quantities.
- Estimate and make accurate predictions.
- Read a range of charts and tables to extract important information.
- Draw a range of charts, tables and graphs to present and interpret information/ data.

P.E
- Convert between units of measurement such as miles/ km, kg/ stones.
- Calculate speed and distance over time using the correct formula when using the fitness suite
- Count our pulse rates and measure BPM
- Calculate our BMI by using the correct mathematical formula
- Record and analyse data in charts and graphs and draw conclusions
- Use addition to score in a variety of games
- Use division to make teams equal and fair
- Calculate a range of averages to find our overall fitness and level.
- Use temperature scales to measure body temp before and after exercise.
- Measure using appropriate equipment and units of measurement e.g. sit and reach test.
- Measure time accurately using a stop watch to hundredths of a second/ 3dp.
- Complete timetables using data in our daily activity logs.
- Order times and measures from smallest to largest.
- Balance equations in terms of consumption and output.

- Use multiplication to complete sets and reps.
- Calculate percentages in terms of a balanced diet.

Cookery
- Converting between weights and measures – We can convert grams (g) into kg and visa versa to measure ingredients accurately.
- Measuring out quantities accurately by reading scales – we can read a range of scales to measure a range of quantities.
- Solving problems relating to ratio and proportion when following recipes - we can use ratio to alter recipe amounts for more or less people.
- Multiplying and dividing quantities according to recipes – we can use our knowledge of times tables to increase/ decrease measures in ingredients.
- Reading nutritional information found in numerical form on packaging – we can extract numerical information relating to nutrition and comment on how these relate to our health and wellbeing.
- Understanding percentages in terms of RDA – we can identify information on packaging relating to our RDA of food groups/ vitamins.
- Calculate percentages of amounts to solving problems – we can use the correct formula to work out percentages of amounts when dealing with quantities.
- Calculate cost using addition – we can budget for a meal and work out accurate costs for recipes.
- Estimate sizes for containers and packaging.
- Record and monitor times for preparation and cooking.
- Temperature conversions – we can read and convert temperatures to follow instructions accurately.

SMSC in Maths
At Northumberland PRU we try to develop the spiritual, moral, social and cultural well-being of the students through the teaching and learning within the lessons and through extra-curricular activities. Our Maths teaching actively encourages risk taking which enables students to explore and try new ideas without the fear of failure.

Spiritual
Spiritualism within Maths is concerned with developing deep thinking and questioning the way in which the world works and promotes the spiritual growth of students.
In Maths lessons pupils are always encouraged to delve deeper into their understanding of Mathematics and how it relates to the world around them. The skills of analysing data are taught to enable students to make sense of vast amounts of data available in the modern world around them. Students are able to extend this knowledge through the study of Statistics.
Sequences, patterns, measures and ultimately the entire study of Mathematics was created to make more sense of the world around us and we enable each of our students to use Maths as a tool to explore it more fully.
Education involves the awe and wonder of mathematics that is shown to children. Mathematics can be used to explain the world and the mathematical patterns that occur in nature such as the symmetry of snowflake patterns or the stripes of a tiger. There is a sense of wonder in the exactness of mathematics as well as a sense of personal achievement in solving problems. Further mathematics can also be used to consider the idea of infinity.

- Pupils investigating different number sequences and where they occur in the real world (1)
- Analysis of a range of data and interpretation of information. (2)
- Links to Science and the universe; where Maths can make sense of more abstract ideas.(1, 2,7)
- The wonder of mathematics, for example, the golden ratio, concept of infinity (7)
- Group work on a shared topic or investigation promoting an appreciation of the input of all members of the group.(3, 4,8)
- The promotion of positive attitudes towards mathematics through appropriate groupings.(3, 4, 8)
- Learning to cope with new mathematical methods, and difficult mathematics through perseverance (8, 9, 10)
- Risks, application of probability in real life, gambling with money (6)

Moral
The moral development of pupils is an important thread running through the entire mathematics syllabus.
In KS3 students are exposed to mastery activities; to use Maths in real life contexts, applying and exploring the skills required to solve various problems. We encourage students to develop self-confidence within mathematics, and to build their self-esteem within the subject.

Moral education concerns the use and interpretation of data that is becoming more prevalent in society. Pupils are given the opportunity to be aware of the use and misuse of data in all issues including those supporting moral argument.

• Pupils conducting an opinion survey on a moral issue (1, 3,4, 5, 7)
• Allowing discussion and debate on the use and abuse of statistics in the media
• Risks, application of probability in real life, gambling with money
• Financial decisions, calculating interest, mortgages, coping with less income, consequences of debt etc.
(1, 3,4, 5, 7)

Social

Problem solving skills and teamwork are fundamental to Mathematics, through creative thinking, discussion, explaining and presenting ideas. Students are always encouraged to develop their Mathematical reasoning skills, communicating with others and explaining concepts to each other. Self and peer reviewing are very important to enable pupils to have an accurate grasp of where they are and how they need to improve. Working together in pairs or groups and supporting others is a key part of Maths lessons.

Social education in Maths concerns pupils being given the opportunity to work together. Experimental and investigative work provides an ideal opportunity for pupils to work collaboratively. Mathematics also allows children to apply their own intuitive feelings and check these against what they have learnt in order to make more sense of the world.

• Pupils learning how mathematics is used to communicate climate change

Cultural

Mathematics is a universal language with a myriad of cultural inputs throughout the ages. At Northumberland PRU we encourage the teaching of various approaches to Mathematics.
 We also explore the Mathematics applied in different cultures such as Rangoli patterns*, symmetry, tessellations, the Chinese lattice method for multiplication and Islamic geometric patterns. The ability to use exchange rates for foreign travel are also important life skills students will learn.
Cultural education concerns the wealth of mathematics in all cultures and the opportunities pupils are given to explore aspects of personal culture and identity through mathematics.
 Recognition is given to symmetry patterns, number systems and mathematical thinking from other cultures.

• Symmetry – Rangoli patterns expose pupils to the Hindu religion and explains how other religions and cultures differ from their own. (3)
• Allowing discussion on the cultural and historical roots of mathematics – Fibonacci sequences, Pythagoras theory, Roman numerals (3)
• Pupils discussing the use of mathematics in cultural symbols and patterns (3)
• Pupils considering the development of pattern in different cultures including work on tessellations
• Discussing the contribution made to mathematics by non-western cultures, such as the Bengali number system
• The history of mathematics, use of maths in real life
• In KS2 - an understanding that mathematics has an historical and cultural base through topic work on – Greek, Arabic, Egyptian. An understanding of the role and importance of these cultures.

For further details of mathematical links to SMSC see "SMSC in Maths" document available on request.

The PRU - Yearly overview for Maths (Upper school)

Autumn Term		
Number and assessment	Number and place value to be well embedded by end of Autumn 1 to form basis for progression	Week 1 – Number – *addition and subtraction with place value*
		Week 2 – Number – *Multiplication and division with place value*
		Week 3 - Number – Multiplication and division with place value and inverse operations
		Week 4 – Number – *sequences*
		Week 5 – Number – *sequences followed by negative numbers*
		Week 6 – Number – *negative numbers*
	Starters should still relate to Number objectives	Week 1 – Measurement - *Area and perimeter*
		Week 2 - Measurement - *Area and perimeter*
		Week 3- Statistics - Averages
		Week 4 – Statistics - *Averages*
		Week 5 – Number - *Fractions*

		Week 6 – Number – *Fractions* *Assessment window*
Spring Term		
Statistics, Geometry & Measurement	Statistics depend on learner level as to what is taught.	Week 1 – Statistics – *pictograms/ bar charts/ pie charts; interpreting*
		Week 2 - Statistics – *pictograms/ bar charts/ pie charts; constructing and presenting data*
		Week 3 – Geometry - *Angles*
		Week 4 – geometry – *Angles*
		Week 5 – Number – *order of operations (BODMAS)*
		Week 6 – Number - *Algebra*
		Week 1 – Number - *Rounding*
		Week 2 – Measurement – *Converting units (length, time)*
		Week 3 – Measurement – *converting units (volume, mass)*
		Week 4 – Number (Ratio & proportion) – *percentages, 10%, 1%, 25%, 50% 75%*
		Week 5 – Number (ratio & proportion) – *Percentages of amounts/ real life*
		Week 6 - Geometry – *Symmetry/ translation* *Assessment window*
Summer term		
Number, Geometry & Statistics	Many areas revisited to ensure deep understanding and embedded knowledge of subject area	Week 1 – Number – *factors, multiples, HCF,LCM*
		Week 2 – geometry – *properties of shapes*
		Week 3 – Geometry – *properties of shapes*
		Week 4 – Number - *+-x/ revisited and developed*
		Week 5 – Number – *fractions revisited*
		Week 6 – Geometry – *position and direction - coordinates*
	Many areas revisited to ensure deep understanding and embedded knowledge of subject area	Week 1 – Number – *algebra*
		Week 2 – Statistics – *Line graphs; interpreting*
		Week 3 – statistics – *line graphs; constructing and presenting data*
		Week 4 – Measurement – *Area and perimeter revisited and developed*
		Week 5 – Problem solving – *all areas*
		Week 6 – Problem solving – *all areas* *Assessment window.*

The PRU - Yearly overview for Maths (Lower school)

Autumn Term		
Number and assessment	Number and place value to be well embedded by end of Autumn 1 to form basis for progression	Week 1 – Number –*place value*
		Week 2 – Number – addition and subtraction
		Week 3 - Number – addition and subtraction
		Week 4 – Number – patterns and *sequences (counting on and back in varying steps)*
		Week 5 – Number – patterns and *sequences*
		Week 6 – Number – Multiplication and division with place value/ Multiplication and division with place value and inverse operations
	Starters should still relate to Number objectives	Week 1 – Measurement - money
		Week 2 - Measurement - money
		Week 3- Position and Direction – movement and turns
		Week 4 – Position and Direction – movement and turns
		Week 5 – Number - *Fractions*
		Week 6 – Number – *Fractions* *Assessment window*
Spring Term		
Statistics, Geometry & Measurement	Statistics depend on learner level as to what is taught.	Week 1 – Statistics – *pictograms/ bar charts/ tables; interpreting*
		Week 2 - Statistics – *pictograms/ bar charts/ tables; constructing and presenting data*
		Week 3 – Measurement – length/ height/ temperature/ capacity
		Week 4 – Measurement – length/ height/ temperature/ capacity
		Week 5 – Number – place value revisited
		Week 6 – Number – operations revisited
		Week 1 – Number – *Rounding/ estimating*
		Week 2 – Measurement – *Length/ Time*

		Week 3 – Properties of shapes
		Week 4 – Properties of shapes
		Week 5 – Number– *Fractions revisited*
		Week 6 - Geometry – *Symmetry/ translation* *Assessment window*
Summer term		
Number, Geometry & Statistics	Many areas revisited to ensure deep understanding and embedded knowledge of subject area	Week 1 – Number – *multiplication and division revisited*
		Week 2 – geometry – *properties of shapes*
		Week 3 – Geometry – *properties of shapes*
		Week 4 – Number - *+-x/ revisited and developed*
		Week 5 – Number – *fractions revisited*
		Week 6 –Problem solving
	Many areas revisited to ensure deep understanding and embedded knowledge of subject area	Week 1 – Number revisited and developed
		Week 2 – Statistics – revisited and developed
		Week 3 – statistics – revisited and developed
		Week 4 – Measurement – *Area and perimeter revisited and developed*
		Week 5 – Problem solving – *all areas*
		Week 6 – Problem solving – *all areas* *Assessment window.*